Entergy

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10 CFR 50.55a(g)(5)(iii)

BVY 14-063

August 19, 2014

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

SUBJECT: Relief Request ISI-06 Inservice Inspection Limited Examinations for the Fourth Ten-Year Interval
Vermont Yankee Nuclear Power Station
Docket No. 50-271
License No. DPR-28

Dear Sir or Madam:

Pursuant to 10 CFR 50.55a(g)(5)(iii), Entergy Nuclear Operations, Inc. (Entergy) requests relief from the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, 1998 Edition through 2000 Addenda, for 100 percent examination coverage of the components identified in the attachment to this letter due to geometric or design configuration, which limited the examination coverage which could be obtained at Vermont Yankee Nuclear Power Station (VY). The requested relief applies to examinations performed at VY during the fourth ten-year Inservice Inspection (ISI) Program interval, which concluded on August 31, 2013.

The attachment contains Relief Request ISI-06. Entergy requests review and approval of this request by August 31, 2015.

There are no new regulatory commitments being made in this submittal.

If you have any questions or require additional information, please contact me at (802) 451-3374.

Sincerely,

CCC/plc

A047
NRR

Attachment: 1. Relief Request ISI-06, Inservice Inspection Impracticality

cc: Mr. William M. Dean
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Mr. Christopher Recchia, Commissioner
VT Department of Public Service
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Attachment 1

Vermont Yankee Nuclear Power Station

Relief Request ISI-06, Inservice Inspection Impracticality

LICENSEE/UTILITY NAME- Entergy Nuclear Operations, Inc. (Entergy)
PLANT NAME, UNIT- Vermont Yankee (VY)
10-YEAR INTERVAL- Fourth
REQUEST FOR RELIEF No. ISI-06
Proposed Alternative in Accordance with
10 CFR 50.55a(g)(5)(iii)

Inservice Inspection Impracticality

1. American Society of Mechanical Engineers (ASME) Code Component(s) Affected

Code Classes:	1 and 2
References:	Subarticle IWB-2500
	Subarticle IWC-2500
	Generic Letter 88-01
	NUREG-0313
	Code Case N-460
	Information Notice 98-42
	Code Case N-560
Examination Categories and Item numbers:	B-A (B1.12 & B1.22), B-D (B3.90), B-F (B5.10), B-J (B9.11 & B10.10), C-A (C1.10), C-C (C3.20) and C-F-2 (C5.51).
Description:	Surface and Volumetric Examination Coverage
Component Numbers:	See Table 3

2. Applicable ASME Code Edition and Addenda

ASME Section XI, 1998 Edition with 2000 Addenda

3. Applicable ASME Code Requirements

Subarticle IWB-2500 states, in part, "Components shall be examined and tested as specified in Table IWB-2500-1."

Table IWB-2500-1 requires a volumetric, visual and surface examination be performed on the component based on Category and Item Number. The applicable examination method and requirements are shown below in Table 1:

Table 1

Applicable Inspection Requirements from Table IWB-2500-1 of ASME Section XI, 1998 Edition with 2000 Addenda

Examination Category	Item Number	Examination Requirements/Figure Number	Examination Method
B-A	B1.12	IWB-2500-2	Volumetric
B-A	B1.22	IWB-2500-3	Volumetric
B-D	B3.90	IWB-2500-7	Volumetric
B-F	B5.10	IWB-2500-8(c)	Volumetric & Surface
B-J	B9.11	IWB-2500-8(c)	Volumetric & Surface
B-J	B10.10	IWC-2500-15	Surface

Subarticle IWC-2500 states, in part, "Components shall be examined and pressure tested as specified in Table IWC-2500-1."

Table IWC-2500-1 requires a volumetric, visual and surface examination be performed on the component based on Category and Item Number. The applicable examination method and requirements are shown below in Table 2:

Table 2

Applicable Inspection Requirements from Table IWC-2500-1 of ASME Section XI, 1998 Edition with 2000 Addenda

Examination Category	Item Number	Examination Requirements/Figure Number	Examination Method
C-A	C1.10	IWC-2500-1	Volumetric
C-C	C3.20	IWC-2500-5	Surface
C-F-2	C5.51	IWC-2500-7(a)	Surface & Volumetric

4. <u>Reason for Request – Impracticality of Compliance</u>

Pursuant to 10 CFR 50.55a(g)(5)(iii), relief is requested on the basis that the required "essentially 100 percent" coverage examination is impractical due to physical obstructions and limitations imposed by design, geometry and materials of construction of the component. Under 10 CFR 50.55a(g)(5)(iii) relief requests for these Code conformance impracticalities must be provided to the NRC not later than 12 months after the end of the active 120 month period of operation where examinations are determined to be impractical. The VY fourth ten-year Inservice Inspection Program interval ended August 31, 2013.

Relief is requested from performing a complete coverage examination of the entire examination volume or area. Entire examination volume or area required is defined by ASME Section XI Code Case N-460 titled "Alternative Examination Coverage for Class I and Class 2 Welds, Section XI, Division 1." Code Case N-460 states in part, " ... when the entire examination volume or area cannot be examined ... a reduction in examination coverage ... may be accepted provided the reduction in coverage for that weld is less than 10%."

The NRC, through Information Notice 98-42 (Reference 1) titled "Implementation of 10 CFR 50.55a(g) Inservice Inspection Requirements," termed the reduction in coverage of less than 10% to be "essentially 100 percent." Information Notice 98-42 states, in part, "The NRC has adopted and further refined the definition of "essentially 100 percent' to mean 'greater than 90 percent" ... has been applied to all examinations of welds or other areas required by ASME Section XI."

The physical restrictions for each component that could not receive "essentially 100 percent inspection" are listed in Table 3. These physical restrictions limit access to the examination area. In each case, the examination performed encompassed the maximum surface area or volume that could be achieved for each component. It is impractical to achieve essentially 100 percent coverage because a redesign of the reactor and piping components would be required.

5. Burden Caused by Compliance:

The burden that would be caused to attempt to comply with the Code requirement for "essentially 100 percent coverage" would be the need to redesign and replace the reactor and subject piping systems and supports to remove the physical interferences and weld design configurations which inhibit the accessibility to perform a full examination.

Relief is requested from performing examination of "essentially 100 percent" of the required volume or area for the identified welds listed in Table 3 for the fourth 10-Year ISI interval.

6. Proposed Alternative and Basis for Use

Entergy proposes that the examinations in Table 3 were performed to the maximum coverage possible and provide an acceptable level of quality and safety. VY's pre ASME Section XI design, coupled with the examinations completed to the extent practical, and with no unacceptable results documented, validate that the underlying objectives of the Inservice Inspection Program have been met.

Additionally, VT-2 examinations performed on the subject components during system pressure tests per IWB-2500-1 Examination Category B-P each refueling outage and category IWC-2500-1 Examination Category C-H each inspection period provides additional assurance that the structural integrity of the subject components is maintained.

Basis for Use

VY obtained a Construction Permit on July 7, 1967. VY's piping systems and associated components were designed and fabricated before the examination requirements of ASME Section XI were formalized and published. Since this plant was not specifically designed to meet the requirements of ASME Section XI, literal compliance is not feasible or practical within the limits of the current plant design.

Physical obstructions imposed by design, geometry and materials of construction are typical of vessel appurtenances, biological shield wall, insulation support rings, structural and component support members, adjacent component weldments in close proximity, unique component configurations (valves and pumps), and dissimilar metal weldments.

As a minimum, all components received the required examination(s) to the extent practical with regard to the limited or lack of access available. The examinations conducted confirmed satisfactory results evidencing no unacceptable flaws present, even though "essentially 100 percent" coverage was not attained in a portion of the Section XI examinations. VY concludes that if any active degradation mechanisms or patterns of degradation were to exist in the subject welds, those degradations would have been identified in the examinations performed in adjacent weldment or similar weld configurations.

For volumetric (ultrasonic) examinations, VY calculates percentage of coverage as follows:

> The required examination volume is calculated. The examination is performed in accordance with an approved ultrasonic procedure satisfying the governing Code requirements for a number of angles and beam directions for each angle. For each angle/beam direction combination the volume interrogated by that beam is calculated (within the required coverage volume). One of the following methods is then used to calculate volume coverage:
>
> 1. The value is divided by the required examination volume to determine a percentage of coverage for each angle/beam-direction combination. Then those required angle/beam-direction coverage percentages are averaged to determine an overall composite coverage (typical of reactor vessel welds), OR
> 2. The percentage of coverage of each segment of a weld with limited access around its circumference (typical of piping welds) is calculated and summed to determine the total weld volume percentage examined, OR
> 3. Where a pipe to nozzle, component or fitting can be scanned in both circumferential directions and the axial direction from the pipe side but not the axial direction from the fitting side, the coverage is listed as 75%.

For example, ASME Section V, Article 4 required 0 degree (°), 45°, and 60° search units for examining vessel welds from the outer diameter (OD) of the vessel. The 45° and 60° search units are each required to be scanned in four orthogonal directions. Therefore, a total of nine angle/beam-directions are required and a coverage percentage is calculated for each of those nine angle/beam-direction combinations. Those nine values are then averaged to determine the overall composite coverage. (Note: Since Appendix VIII was invoked for vessel welds, the required number of angle/beam-direction combinations now depends on the qualified procedure, and thus the calculation may be slightly different.)

When less than 90 percent examination coverage occurred, consideration was given to changes in the examination procedure to increase coverage. However, a change in the non-destructive examination (NDE) procedure will usually not make a dramatic change in the amount of coverage. Also, the original NDE procedure is typically optimized to perform the test with the greatest amount of confidence in the results. When a change is made to the procedure to achieve greater coverage, usually compromises in the NDE technique must be made. Further, since the implementation of Appendix VIII, it is not permissible to change ultrasonic techniques in order to attain more coverage because the ultrasonic testing (UT) technique would then not be qualified. It is more important to be confident in

the results that are obtained, rather than to compromise the technique to obtain a small increase in percent of coverage.

Typically VY did not select alternative welds when coverage was limited on the scheduled weld. A sample plan implies a certain amount of random choice in the selection of welds for examination - unless there are more conservative ways to select the sample, such as selecting high stress points or welds where industry experience indicates that damage mechanisms are more likely. This is why for Category C-F-2, terminal end welds are singled out; they are more typically high stressed. The reason the plant design includes physical interferences with examination coverage is usually independent of the potential flaw mechanisms. However, there may be cases where this is not true. For example, valve-to-pipe welds and pump-to-pipe weld geometries may inhibit coverage. But, these welds may actually have higher stresses because of their configurations. In these cases, if alternative welds were selected, the sample of higher stressed welds in the population would be diluted. If alternative welds are chosen, the selection randomness decreases. Flaw mechanisms associated with test limitations may be missed. It may be more conservative to accept the limited coverage than to select alternative welds.

There is Code precedent for allowing limited coverage due to inaccessibility. The VY fourth interval Code of Record (ASME Section XI 1998 Edition through 2000 Addenda) allows certain Class 1 and Class 2 welds to be exempt based on the criteria that they are inaccessible. Paragraphs IWB-1220(d) and IWC-1223 exempt examination requirements of welds that are inaccessible due to being encased in concrete, are buried underground, located inside a penetration, or are encapsulated by guard pipe. The Code recognizes that examination of these welds is not possible and, therefore, that a Relief Request would not be necessary. The same logic applies to portions of welds that are inaccessible and where examination of those portions of welds is not possible.

There is VY precedent for allowing limited examination coverage due to inaccessibility. During the VY third ten-year Inservice Inspection Program interval, relief for augmented limited examination coverage was granted by the NRC for Category B-A reactor pressure vessel shell welds by Reference 2. This prior approval concluded that limited examination percentage was performed to the maximum extent practical and constituted an acceptable level of quality and safety in accordance with 10 CFR 50.55a(g)(6)(ii)(A)(5). In addition, relief was also granted by the NRC for limited examination coverage for Category B-D reactor nozzle to vessel welds, Category B-F nozzle to safe end welds, Category B-H reactor support skirt weld, Category B-J piping circumferential welds, Category B-K lug welds, Category B-O CRD housing to flange welds, Category C-A RHR heat exchanger shell to flange welds, Category C-C RHR heat exchanger welded support, Category C-F-2 pipe to component welds and NUREG 0313 pipe to flange welds by Reference 3. This prior approval concluded that imposing 100% coverage of these examinations would require components to be redesigned which would be a significant burden upon the licensee, and that examinations performed provide a reasonable assurance of structural integrity of the subject welds. Relief was granted pursuant to 10CFR 50.55a(g)(6)(i) for the third 10-year ISI interval of VY.

Note that the Inservice Inspection Program implicitly assumes that the inspection program is a sampling program in that it is spread over ten years. If no flaws were acceptable, 100% of the safety related components in the plant would have to be inspected each inspection cycle.

The impact that a reduction of coverage would have is not significant when one takes the above implicit assumptions into account. Compliance with the proposed alternatives

described above will provide an adequate level of quality and safety for examination of the affected welds, and will not adversely impact the health and safety of the public.

7. Duration of Proposed Alternative

Relief is requested for the fourth ten-year interval of the Inservice Inspection Program for VY, which began September 1, 2003 and concluded August 31, 2013.

Table 3

FOURTH INTERVAL COMPONENTS WITH LESS THAN "ESSENTIALLY 100%" COVERAGE

Section XI Category & Item Number	System & Component Number	Component Description	Condition Limiting Coverage	Exam & Coverage Percent	Exam Performed
B-A B1.12	Nuclear Boiler E2	RPV Longitudinal Shell Weld	Core spray pipe & FDW Sparger Interference to Transducer Access	UT 78.75%	RF24
B-A B1.12	Nuclear Boiler F1	RPV Longitudinal Shell Weld	Core Shroud Tie Rod Obstruction Makes Weld Inaccessible	UT 0%	RF24
B-A B1.12	Nuclear Boiler F2	RPV Longitudinal Shell Weld	Core Shroud Tie Rod Obstruction Makes Weld Inaccessible	UT 0%	RF24
B-A B1.12	Nuclear Boiler E1	RPV Longitudinal Shell Weld	Core spray pipe & FDW Sparger Interference to Transducer Access	UT 78.58%	RF24
B-A B1.12	Nuclear Boiler G2	RPV Bottom Head Meridional Weld	Tool Reach Limited by Proximity of Reactor Internal Jet Pumps	UT 88.31%	RF24
B-A B1.22	Nuclear Boiler H1	RPV Bottom Head Meridional Weld	Tool Reach Limited to 28" above HJ Weld due to Permanent Insulation Interference above the Skirt Weld	UT 38.5%	RF26
B-A B1.22	Nuclear Boiler H2	RPV Bottom Head Meridional Weld	Tool Reach Limited to 28" above HJ Weld due to Permanent Insulation Interference above the Skirt Weld	UT 38.5%	RF26
B-A B1.22	Nuclear Boiler H3	RPV Bottom Head Meridional Weld	Tool Reach Limited to 28" above HJ Weld due to Permanent	UT 38.5%	RF26

Section XI Category & Item Number	System & Component Number	Component Description	Condition Limiting Coverage	Exam & Coverage Percent	Exam Performed
			Insulation Interference above the Skirt Weld		
B-A B1.22	Nuclear Boiler H4	RPV Bottom Head Meridional Weld	Tool Reach Limited to 28" above HJ Weld due to Permanent Insulation Interference above the Skirt Weld	UT 36.9%	RF26
B-A B1.22	Nuclear Boiler H5	RPV Bottom Head Meridional Weld	Tool Reach Limited to 28" above HJ Weld due to Permanent Insulation Interference above the Skirt Weld	UT 38.5%	RF26
B-A B1.22	Nuclear Boiler H6	RPV Bottom Head Meridional Weld	Tool Reach Limited to 28" above HJ Weld due to Permanent Insulation Interference above the Skirt Weld	UT 38.5%	RF26
B-A B1.22	Nuclear Boiler H7	RPV Bottom Head Meridional Weld	Tool Reach Limited to 28" above HJ Weld due to Permanent Insulation Interference above the Skirt Weld	UT 36.7%	RF26
B-A B1.22	Nuclear Boiler H8	RPV Bottom Head Meridional Weld	Tool Reach Limited to 28" above HJ Weld due to Permanent Insulation Interference above the Skirt Weld	UT 38.5%	RF26
B-A B1.22	Nuclear Boiler J1	RPV Bottom Head Meridional Weld	Exam Limited by Presence of CRD Guide Tubes to 20" on Each End of Weld	UT 23.1%	RF26
B-A B1.22	Nuclear Boiler J2	RPV Bottom Head Meridional Weld	Exam Limited by Presence of CRD Guide Tubes to 20" on Each End of	UT 24.4%	RF26

Section XI Category & Item Number	System & Component Number	Component Description	Condition Limiting Coverage	Exam & Coverage Percent	Exam Performed
			Weld		
B-D B3.90	Nuclear Boiler N3A	Nozzle to Vessel Weld	Nozzle to Vessel Weld Configuration Limits Transducer Access to a Portion of the Weld	UT 75.60%	RF27
B-D B3.90	Nuclear Boiler N3B	Nozzle to Vessel Weld	Nozzle to Vessel Weld Configuration Limits Transducer Access to a Portion of the Weld	UT 75.60%	RF27
B-D B3.90	Nuclear Boiler N3C	Nozzle to Vessel Weld	Nozzle to Vessel Weld Configuration Limits Transducer Access to a Portion of the Weld	UT 75.60%	RF27
B-D B3.90	Nuclear Boiler N3D	Nozzle to Vessel Weld	Nozzle to Vessel Weld Configuration Limits Transducer Access to a Portion of the Weld	UT 75.60%	RF27
B-D B3.90	Nuclear Boiler N4A	Nozzle to Vessel Weld	Nozzle to Vessel Weld Configuration Limits Transducer Access to a Portion of the Weld	UT 70.2%	RF26
B-D B3.90	Nuclear Boiler N4B	Nozzle to Vessel Weld	Nozzle to Vessel Weld Configuration Limits Transducer Access to a Portion of the Weld	UT 65.9%	RF26
B-D B3.90	Nuclear Boiler N4C	Nozzle to Vessel Weld	Nozzle to Vessel Weld Configuration Limits Transducer Access to a Portion of the Weld	UT 70.2%	RF26
B-D B3.90	Nuclear Boiler N4D	Nozzle to Vessel Weld	Nozzle to Vessel Weld Configuration Limits Transducer Access to a Portion of the Weld	UT 70.2%	RF26
B-D B3.90	Nuclear Boiler N5A	Nozzle to Vessel Weld	Nozzle to Vessel Weld Configuration Limits Transducer Access to a Portion	UT 76.3%	RF27

Section XI Category & Item Number	System & Component Number	Component Description	Condition Limiting Coverage	Exam & Coverage Percent	Exam Performed
			of the Weld		
B-F B5.10	Nuclear Boiler N6A-SE	9" nozzle to Safe End Butt Weld	As-welded OD Surface of the Weld Prevents Full Transducer Scan	UT 67%	RF25
B-J B9.11	Core Spray CS4B-MF5	Valve to Pipe Circumferential Weld	Weld Configuration Limits Exam Access to One Side of the Weld	UT 50%	RF27
B-J B9.11	RHR RH30-1	Circumferential Weld, Tee to Pipe	Elbow to Tee Weld Configuration Limited Axial Scan to One Side of Weld Joint	UT 75%	RF24
B-J B9.11	RHR RH30-6	Circumferential Weld, Elbow to Pipe	Elbow to Bent Pipe Weld Configuration Limited Axial Scan to One Side of Weld Joint	UT 75%	RF24
B-J B9.11	NB RR-BD-13	Circumferential Weld Downstream of Valve	Cross to Tee Weld Configuration Limited Axial Scan to One Side of Weld Joint	UT 50%	RF29
B-J B9.11	NB RR-AD-13	Circumferential Weld Downstream of Valve	Cross to Tee Weld Configuration Limited Axial Scan to One Side of Weld Joint	UT 50%	RF25
B-J B9.11	Nuclear Boiler RV-F9A	4" Circumferential Weld	Welded Flange to Reducer Weld Configuration Limited Axial Scan to One Side of Weld Joint	UT 75%	RF30
B-J B9.11	Nuclear Boiler RV-F9B	6" Circumferential Weld	Welded Flange to Reducer Weld Configuration Limited Axial Scan to One Side of Weld Joint	UT 75%	RF30
B-J B9.11	RWCU CU18-4	4" Circumferential Weld	Valve to Pipe Weld Geometry Limits Exam Access to Pipe Side Only	UT 50%	RF30

Section XI Category & Item Number	System & Component Number	Component Description	Condition Limiting Coverage	Exam & Coverage Percent	Exam Performed
B-J B10.10	Nuclear Boiler 0DEG RPV BRKT	Reactor Vessel Exterior Integral Attachment Weld	Support Bracket Weld Inspection Access is Limited by Proximity of Bioshield Wall	PT 20.77%	RF25
C-A C1.10	RHR A-HTEX10-4	Head Shell to Flange Circumferential Weld	Welded Attachment on OD Surface Limits Transducer Access	UT 80.15%	RF27
C-C C3.20	FDW FDW-HD36	Integral Attachment Weld	Pipe Support and Whip Restraint Design Geometry Does Not Allow Access to Half of the Integral Attachment Weld Surface	MT 50%	RF24
C-C C3.20	FDW FDW-HD36	Integral Attachment Weld	Pipe Support and Whip Restraint Design Geometry Does Not Allow Access to Half of the Integral Attachment Weld Surface	MT 50%	RF25
C-C C3.20	FDW FDW-HD39	Integral Attachment Weld	Pipe Support and Whip Restraint Design Geometry Does Not Allow Access to Half of the Integral Attachment Weld Surface	MT 50%	RF24
C-F-2 C5.51	PCAC AC11-S50	20" Circumferential Weld	Tee and OD Mismatch	UT 68.7%	RF25
C-F-2 C5.51	CORE SPRAY CS1B-S27	12" Circumferential Weld	Valve to Pipe Geometry Limits Scan to Pipe Side Only	UT 88.65%	RF27
C-F-2 C5.51	RHR RH14-S356	14" Circumferential Weld	Pipe to Tee Geometry Limits Scan to Pipe Side Only	UT 66.25%	RF25
C-F-2 C5.51	RHR RH2A-S58	24" Circumferential Weld	Proximity to Adjacent Weld Limits the Available Examination Area	UT 85.5%	RF25

Section XI Category & Item Number	System & Component Number	Component Description	Condition Limiting Coverage	Exam & Coverage Percent	Exam Performed
C-F-2 C5.51	RHR RH8-S294	20" Circumferential Weld	Valve to Pipe Geometry Limits Scan to Pipe Side Only	UT 87.75%	RF25
C-F-2 C5.51	RHR RH3D-S206	Circumferential Weld, Pipe to Valve	Component Configuration Caused Access Limitations for the 45 Degree Transducer Scan	UT 77%	RF29

8. References:

1. NRC Information Notice 98-42, "Implementation of 10 CFR 50.55a(g) Inservice Inspection Requirements," dated December 1, 1998
2. Letter, USNRC to Vermont Yankee Nuclear Power Corporation, "Augmented Examination of the Reactor Pressure Vessel Shell Welds at Vermont Yankee Nuclear Power Station (TAC No. M99389)" NVY 99-16, dated February 18, 1999
3. Letter, USNRC to Entergy Nuclear Operations, Inc., "Safety Evaluation of Relief Request B-5 – Vermont Yankee Nuclear Power Station (TAC No. MC0959)," NVY 05-115, dated September 19, 2005 (ML052560006)