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GNRO-2011/00009

April 6, 2011

U. S. Nuclear Regulatory Commission
Attn.: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Request for Alternative GG-ISI-013
Proposed Alternative to 10 CFR 50.55a Examination Requirements for
Reactor Pressure Vessel Weld Inspections
Docket No. 50-416
License No. NPF-29

Dear Sir or Madam:

Pursuant to 10 CFR 50.55a(a)(3)(i), Entergy Operations, Inc. (Entergy) requests NRC approval of a proposed alternative to American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, Subarticle IWB-2500. Specifically, Entergy proposes to utilize the 25% sampling provision of ASME Code Case N-702, *Alternative Requirements for Boiling Water Reactor (BWR) Nozzle Inner Radius and Nozzle-to-Shell Welds, Section XI, Division 1*, at the Grand Gulf Nuclear Station (GGNS).

Proposed Request for Alternative GG-ISI-013 is contained in Attachment 1 with supporting information provided in Attachment 2. Entergy requests GG-ISI-013 for the third 10-year interval of the GGNS Inservice Inspection (ISI) Program and requests approval by December 31, 2011 to support planning for the next refueling outage.

This letter contains no new regulatory commitments.

If you have any questions concerning this letter, please contact Mr. Ernest Rufus at (601) 437-6582.

Respectfully,

A handwritten signature in black ink, appearing to read "Christina Perino".

CP/jas

- Attachments:
1. Grand Gulf Nuclear Station (GGNS) Third 10 year Interval Inservice Inspection Program Request for Alternative GG-ISI-013
 2. Responses to BWRVIP-108 Plant-Specific Applicability Criteria

cc: Mr. Elmo Collins Jr.
Regional Administrator, Region IV
U. S. Nuclear Regulatory Commission
612 E. Lamar Blvd., Suite 400
Arlington, TX 76011-4125

NRC Senior Resident Inspector
Grand Gulf Nuclear Station
Port Gibson, MS 39150

U. S. Nuclear Regulatory Commission
ATTN: Mr. A. B. Wang, NRR/DORL (w/2)
Mail Stop OWFN/8 B1
Washington, DC 20555-0001

ATTACHMENT 1

GNRO-2011/00009

GRAND GULF NUCLEAR STATION (GGNS)
THIRD 10 YEAR INTERVAL INSERVICE INSPECTION PROGRAM

REQUEST FOR ALTERNATIVE

GG-ISI-013

GRAND GULF NUCLEAR STATION (GGNS)
REQUEST FOR ALTERNATIVE
GG-ISI-013

Components/Numbers:	1. Nozzle-to-Vessel Welds (see Table 1) 2. Nozzle Inner Radius Sections (see Table 2)
Code Classes:	American Society of Mechanical Engineers (ASME) Code Class 1
Examination Category:	B-D, Full Penetration Welds of Nozzles in Vessels
Description:	1. Nozzle-to-Vessel Welds 2. Nozzle Inner Radius Sections
Item Number(s):	B3.90, B3.100
Unit / Inspection Interval Applicability:	GGNS, 3 rd 10-year interval June 2008 - June 2017

I. Code Requirement(s)

ASME Section XI, Table IWB-2500-1, "Examination Category B-D, Full Penetration Welds of Nozzles in Vessels – Inspection Program B" (Reference 1):

- Item B3.90 - Requires a volumetric examination of Reactor Vessel Nozzle-to-Vessel Welds.
- Item B3.100 - Requires a volumetric examination of Reactor Vessel Nozzle Inside Radius Sections.

II. Alternative Requested

Currently, all Class 1 nozzle-to-vessel weld and nozzle inner radius examinations are required during the current inservice inspection (ISI) interval (June 2008 – June 2017). The 25% sampling provision of ASME Code Case N-702 (Reference 2) provides a significant reduction in worker radiological exposure. Entergy estimates this reduction to be at least 19 Rem over the Third 10 year ISI Interval.

III. Proposed Alternative Examinations

Pursuant to 10 CFR 50.55a(a)(3)(i), Entergy requests an alternative from performing the ASME Code required examinations on 100% of the nozzle-to-vessel assemblies and nozzle inner radius sections identified in Tables 1 and 2, respectively. Specifically, Entergy proposes to adopt ASME Code Case N-702, which allows examination of a minimum of 25% of the nozzle-to-vessel welds and nozzle inner radius sections, including at least one nozzle from each system and nominal pipe size. For each of the

identified nozzle assemblies, both the inner radius and the nozzle-to-vessel weld will be examined.

The indications on the Nozzle to Vessel welds and Inner Radius welds listed in Table 1 and Table 2 were recorded and evaluated in accordance with ASME Section XI and determined to be within the allowable limits of IWB-3000 and as such were NOT reportable. Based on sizing and evaluation all recordable indications listed below are believed to be geometric and/or fabrication related. In addition, none of the recorded indications required repair. Refer to Table 1 and Table 2 below in the Exam Results column for the disposition of indications for each applicable nozzle weld examined at GGNS.

Table 1: Nozzle-to-Vessel Weld Examinations

Item Number	Comp. ID	Item Description	Exam Results
B3.90	N01A-KA	24" RPV Outlet Nozzle to Vessel	NRI (No Recordable Indications)
B3.90	N01B-KA	24" RPV Outlet Nozzle to Vessel	NRI
B3.90	N02A-KA	12" RCS Inlet Nozzle to Vessel	NRI
B3.90	N02B-KA	12" RCS Inlet Nozzle to Vessel	NRI
B3.90	N02C-KA	12" RCS Inlet Nozzle to Vessel	NRI
B3.90	N02D-KA	12" RCS Inlet Nozzle to Vessel	NRI
B3.90	N02E-KA	12" RCS Inlet Nozzle to Vessel	Spot Indications in the base metal recorded. No indication of growth from previously recorded examinations.
B3.90	N02F-KA	12" RCS Inlet Nozzle to Vessel	NRI
B3.90	N02G-KA	12" RCS Inlet Nozzle to Vessel	NRI
B3.90	N02H-KA	12" RCS Inlet Nozzle to Vessel	NRI
B3.90	N02J-KA	12" RCS Inlet Nozzle to Vessel	NRI
B3.90	N02K-KA	12" RCS Inlet Nozzle to Vessel	NRI
B3.90	N02M-KA	12" RCS Inlet Nozzle to Vessel	NRI
B3.90	N02N-KA	12" RCS Inlet Nozzle to Vessel	NRI
B3.90	N03A-KA	24" Main Steam Nozzle to Vessel	Spot Indications in the base metal recorded. No indication of growth from previously recorded examinations
B3.90	N03B-KA	24" Main Steam Nozzle to Vessel	Base Metal Indications recorded. No indication of growth from previously recorded examinations
B3.90	N03C-KA	24" Main Steam Nozzle to Vessel	NRI
B3.90	N03D-KA	24" Main Steam Nozzle to Vessel	Nozzle Cladding Cut Back Geometry Indication.
B3.90	N04A-KA	14" Feed water Nozzle to Vessel	Not Applicable
B3.90	N04B-KA	14" Feed water Nozzle to Vessel	Not Applicable
B3.90	N04C-KA	14" Feed water Nozzle to Vessel	Not Applicable
B3.90	N04D-KA	14" Feed water Nozzle to Vessel	Not Applicable
B3.90	N04E-KA	14" Feed water Nozzle to Vessel	Not Applicable
B3.90	N04F-KA	14" Feed water Nozzle to Vessel	Not Applicable

Table 1: Nozzle-to-Vessel Weld Examinations

Item Number	Comp. ID	Item Description	Exam Results
B3.90	N05A-KA	12" Core Spray Nozzle to Vessel	Geometric Indication due to Core Spray Bracket Pad Buildup and Nozzle Cladding Strip Backing. No indication of growth from previously recorded examinations
B3.90	N05B-KA	12" Core Spray Nozzle to Vessel	Geometric Indication due to Core Spray Bracket Pad Buildup and Nozzle Cladding Strip Backing. No indication of growth from previously recorded examinations
B3.90	N06A-KA	12" RHR/LPCI Inlet Nozzle to Vessel	NRI
B3.90	N06B-KA	12" RHR/LPCI Inlet Nozzle to Vessel	NRI
B3.90	N06C-KA	12" RHR/LPCI Inlet Nozzle to Vessel	NRI
B3.90	N07-KA	15.5" RCIC Top Head Spray Inlet Nozzle	NRI
B3.90	N08-KA	15.5" RCIC Top Head Spray Spare Inlet Nozzle	NRI
B3.90	N09A-KA	4" Jet Pump Instrument Nozzle to Vessel	Inner Diameter (ID) cladding cut-back and nozzle bore geometry indications
B3.90	N09B-KA	4" Jet Pump Instrument Nozzle to Vessel	One Laminar reflector in the base metal recorded. ID cladding cut-back and nozzle bore geometry indications recorded.
B3.90	N10-KA	4" CRD Return Nozzle to Vessel	Not Applicable
B3.90	N16-KA	8" Vibration Instrument Nozzle to Vessel	Not Applicable

Table 2: Nozzle Inner Radius Examinations

Item Number	Comp. ID	Item Description	Exam Results
B3.100	N01A-IR	24" RPV Nozzle Inner Radius	NRI
B3.100	N01B-IR	24" RPV Nozzle Inner Radius	NRI
B3.100	N02A-IR	12" RCS Inlet Nozzle Inner Radius	NRI
B3.100	N02B-IR	12" RCS Inlet Nozzle Inner Radius	NRI
B3.100	N02C-IR	12" RCS Inlet Nozzle Inner Radius	NRI
B3.100	N02D-IR	12" RCS Inlet Nozzle Inner Radius	NRI
B3.100	N02E-IR	12" RCS Inlet Nozzle Inner Radius	NRI
B3.100	N02F-IR	12" RCS Inlet Nozzle Inner Radius	NRI
B3.100	N02G-IR	12" RCS Inlet Nozzle Inner Radius	NRI
B3.100	N02H-IR	12" RCS Inlet Nozzle Inner Radius	NRI
			NRI
B3.100	N02J-IR	12" RCS Inlet Nozzle Inner Radius	
B3.100	N02K-IR	12" RCS Inlet Nozzle Inner Radius	NRI
B3.100	N02M-IR	12" RCS Inlet Nozzle Inner Radius	NRI
B3.100	N02N-IR	12" RCS Inlet Nozzle Inner Radius	NRI
B3.100	N03A-IR	24" Main Steam Nozzle Inner Radius	NRI
B3.100	N03B-IR	24" Main Steam Nozzle Inner Radius	NRI
B3.100	N03C-IR	24" Main Steam Nozzle Inner Radius	NRI
B3.100	N03D-IR	24" Main Steam Nozzle Inner Radius	NRI
B3.100	N04A-IR	14" Feed water Nozzle Inner Radius	Not Applicable
B3.100	N04B-IR	14" Feed water Nozzle Inner Radius	Not Applicable
B3.100	N04C-IR	14" Feed water Nozzle Inner Radius	Not Applicable
B3.100	N04D-IR	14" Feed water Nozzle Inner Radius	Not Applicable
B3.100	N04E-IR	14" Feed water Nozzle Inner Radius	Not Applicable
B3.100	N04F-IR	14" Feed water Nozzle Inner Radius	Not Applicable
B3.100	N05A-IR	12" Core Spray Nozzle Inner Radius	Geometric reflectors recorded.
B3.100	N05B-IR	12" Core Spray Nozzle Inner Radius	NRI
B3.100	N06A-IR	12" RHR/LPCI Inlet Nozzle Inner Radius	NRI
B3.100	N06B-IR	12" RHR/LPCI Inlet Nozzle Inner Radius	NRI

Table 2: Nozzle Inner Radius Examinations			
Item Number	Comp. ID	Item Description	Exam Results
B3.100	N06C-IR	12" RHR/LPCI Inlet Nozzle Inner Radius	NRI
B3.100	N07-IR	15.5" RCIC Top Head Spray Inlet Nozzle Inner Radius	NRI
B3.100	N08-IR	15.5" RCIC Top Head Spray Inlet Spare Nozzle Inner Radius	NRI
B3.100	N09A-IR	4" Jet Pump Instrument Nozzle Inner Radius	NRI
B3.100	N09B-IR	4" Jet Pump Instrument Nozzle Inner Radius	NRI
B3.100	N10-IR	4" CRD Return Nozzle Inner Radius	Not Applicable
B3.100	N16-IR	8" Vibration Instrument Nozzle Inner Radius	NRI

Table 3: Nozzle Assemblies to be Examined			
Group	Description of Nozzle Assemblies	Quantity	Minimum Examination
N01	24" Recirculation Outlet	2	1
N02	12" Recirculation Inlet	12	3
N03	24" Main Steam Line	4	1
N05	12" Core Spray	2	1
N06	12" RHR/LPCI Inlet	3	1
N07	15.5" RCIC Top Head Spray Inlet Nozzle	1	1
N08	15.5" RCIC Top Head Spray Inlet Spare Nozzle	1	1
N09	4" Jet Pump Instrumentation	2	1
N16	8" Vibration Instrumentation	1	1

The ASME Code requires that all thirty five (35) nozzle assemblies listed in Tables 1 and 2 be examined during each ISI inspection interval. Table 3 identifies those nozzle assemblies to be examined during the Third 10 year ISI Interval when adopting GG-ISI-013.

ASME Code Case N-702 excludes the Feed water (N04) and Control Rod Drive Return (N10) nozzle assemblies; therefore, these are not within the scope of this request and will continue to meet the requirements of ASME Code Table IWB-2500-1.

ASME Code Case N-702 stipulates that the VT-1 visual examination method may be used in lieu of the volumetric examination method for the inner radius sections (Item No. B3.100). GGNS adopted ASME Code Case N-648-1, *Alternative Requirements for Inner Radius Examination of Class 1 Reactor Vessel Nozzles*, with the provisions stipulated in Regulatory Guide 1.147, in the GGNS Third Interval ISI Program Plan. Code Case N-648-1 contains a similar allowance; therefore, GGNS may perform examinations on inner radius sections with either the VT-1 or the volumetric examination method.

IV. Basis for Alternative

Electric Power Research Institute (EPRI) Technical Report 1003557, *BWR Vessel and Internals Project (BWRVIP), Technical Basis for the Reduction of Inspection Requirements for the Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Blend Radii*, (Reference 2) provides the basis for ASME Code Case N-702. The evaluation found that the failure probability due to a Low Temperature Overpressure event at the nozzle blend radius region and nozzle-to-vessel shell weld is very low (i.e., $< 1 \times 10^{-6}$ for 40 years) with or without ISI. The report concludes that inspection of 25% of each nozzle type is technically justified.

BWRVIP-108 was originally submitted to the NRC for review and approval via BWRVIP letter 2002-323 on November 25, 2002 (Reference 4) and supplemented by Tennessee Valley Authority (TVA) letter dated November 15, 2004 (Reference 5), and BWRVIP letters dated July 25, 2006, and September 13, 2007 (References 6 and 7).

On December 19, 2007, the NRC issued a Safety Evaluation Report (SER) approving the use of BWRVIP-108 (Reference 8). Section 5 of the SER states that each licensee should, within the request for alternative, demonstrate the plant meets the specified criteria. This demonstration is provided in Attachment 2.

V. Conclusion

This proposed alternative to use ASME Code Case N-702 in lieu of the ASME Code, Section XI requirements provides an acceptable level of quality and safety in accordance with 10 CFR 50.55a(a)(3)(i) for all applicable RPV nozzle-to-vessel welds and nozzle inside radius sections excluding the N04 and N10 nozzles listed in Tables 1 and 2, identified respectively.

VI. Duration of Purposed Relief Request

Upon approval by NRC, this request for alternative will be utilized during the Third ISI Inspection Interval for the nozzle assemblies excluding the N04 and N10 nozzles listed in Tables 1 and 2, identified respectively.

VII. Precedents

The NRC Staff has recently approved similar requests for alternative for the following plants:

- River Bend Station, Docket No. 50-458, TAC No. ME2817, August 2, 2010 (ADAMS Accession No. ML0101440097)

- Cooper Nuclear Station, Docket No. 50-298, TAC No. ME3319, October 8, 2010 (ADAMS Accession No. ML100470703)
- Pilgrim Nuclear Power Station, Docket No. 50-293, TAC No. ME3290, August 25, 2010 (ADAMS Accession No. ML100350096)

VIII. References

1. ASME Section XI 2001 Edition 2003 Addenda, Table IWB-2500-1
2. ASME Boiler and Pressure Vessel Code, Code Case N-702, "Alternative Requirements for Boiling Water Reactor (BWR) Nozzle Inner Radius and Nozzle-to-Shell Welds, Section XI, Division 1," February 20, 2004
3. EPRI Technical Report 1003557, *BWRVIP-108: BWR Vessel and Internals Project, Technical Basis for the Reduction of Inspection Requirements for the Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Bend Radii*, October 2002
4. Letter from the BWRVIP to the NRC (2002-323), *Project No. 704 – BWRVIP-108: BWR Vessel and Internals Project, Technical Basis for the Reduction of Inspection Requirements for the Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Bend Radii*, November 25, 2002 (ADAMS Accession No. ML023330203)
5. Letter from TVA to the NRC, *Browns Ferry Nuclear Plant (BFN) – Units 2 and 3 – American Society of Mechanical Engineers (ASME) Section XI, Inservice Inspection (ISI) Program – Requests for Relief 2-ISI-22, and 3-ISI-18 for Examination of Reactor Pressure Vessel (RPV) Nozzle-to-Vessel Shell Welds and Nozzle Inner Radius Sections – Response to NRC request for Additional Information (RAI) (TAC Nos. MC0167 and MC0168)*, November 15, 2004 (ADAMS Accession No. ML043380321)
6. Letter from the BWRVIP to the NRC (2006-349), *Project 704 – BWRVIP Response to NRC Request for Additional Information on BWRVIP-108*, July 25, 2006 (ADAMS Accession No. ML062080159)
7. Letter from the BWRVIP to the NRC (2007-268), *Project 704 – Supplemental Analyses Supporting BWRVIP-108*, September 13, 2007 (ADAMS Accession No. ML072600167)
8. Letter from the NRC to the BWRVIP, *Safety Evaluation of Proprietary EPRI Report, "BWR Vessel and Internals Project, Technical Basis for the Reduction of Inspection Requirements for the Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Inner Radius (BWRVIP- 108)"*, December 19, 2007 (ADAMS Accession No. ML073600374)
9. GGNS Calculation MC-Q1B13-10002, *Reduction of Inspection Requirements on Recirculation Inlet and Outlet Nozzles*, Rev. 0.

ATTACHMENT 2

GNRO-2011/00009

RESPONSES TO BWRVIP-108
PLANT-SPECIFIC APPLICABILITY CRITERIA

RESPONSES TO BWRVIP-108
PLANT-SPECIFIC APPLICABILITY CRITERIA

Section 5 of the NRC's Safety Evaluation Report (SER) that approved the use of BWRVIP-108 states in part:

“Licensees who plan to request relief from the ASME Code, Section XI requirements for RPV nozzle-to-vessel shell welds and nozzle inner radius sections may reference the BWRVIP-108 report as the technical basis for the use of ASME Code Case N-702 as an alternative. However, each licensee should demonstrate the plant-specific application of the BWRVIP-108 report to their units in the relief request by showing that all the following general and nozzle-specific criteria are satisfied:”

Grand Gulf Nuclear Station (GGNS) applicability was evaluated and demonstrated as documented in GGNS Calculation MC-Q1B13-10002, *Reduction of Inspection Requirements on Recirculation Inlet and Outlet Nozzles*, Rev. 0. This demonstration is summarized below.

Applicable GGNS Terms and Parameters

- Reactor Pressure Vessel (RPV) constant for inlet nozzle, $C_{RPV2} = 19,332$ psi
- RPV constant for inlet nozzle, $C_{Nozzle3} = 1,637$ psi
- RPV constant for outlet nozzle, $C_{RPV4} = 16,171$ psi
- RPV constant for outlet nozzle, $C_{Nozzle5} = 1,977$ psi
- Reactor core pressure = 1,056 psig or 1,070.696 psia
- Maximum RPV radius = 126.75 inches
- RPV wall thickness at Nozzle N2, $t_2 = 7.4479$ [(AvgLong + AvgTrans) / 2]
- RPV wall thickness at Nozzle N1, $t_4 = 7.4948$ inches [(AvgLong + AvgTrans) / 2]
- Nozzle inner radius for outlet nozzles, $r_i = 10.84375$ inches
- Nozzle outer radius for outlet nozzles, $r_o = 20.03125$ inches
- Nozzle inner radius for inlet nozzles, $r_i = 5.8125$ inches
- Nozzle outer radius for inlet nozzles, $r_o = 13.125$ inches

General Criterion

Criterion 1

The maximum Reactor Pressure Vessel (RPV) Heat/Cool down rate is limited to less than 115°F/hour.

GGNS Compliance

Maximum heat up and cool down rates are limited to $\leq 100^\circ\text{F}$ in any one-hour period, in accordance with GGNS Technical Specification Surveillance Requirement 3.4.11.1.

Criteria for the Recirculation Inlet Nozzles

Criterion 2

$$\frac{(p \times r)}{C_{RPV2} t_2} < 1.15$$

GGNS Compliance

$$\frac{(p \times r)}{C_{RPV2} t_2} = \frac{(1056 \text{ psi} \times 126.75 \text{ in})}{19332(7.4479 \text{ in})} = 0.9296 < 1.15$$

Criterion 3

$$\frac{p \times (r_o^2 + r_i^2)}{C_{nozzle3} (r_o^2 - r_i^2)} < 1.15$$

GGNS Compliance

$$\frac{p \times (r_o^2 + r_i^2)}{C_{nozzle3} (r_o^2 - r_i^2)} = \frac{(1056 \text{ psi}) \times ((13.125)^2 + (5.8125)^2)}{1637((13.125)^2 - (5.8125)^2)} = 0.9598 < 1.15$$

Criteria for the Recirculation Outlet Nozzles

Criterion 4

$$\frac{(p \times r)}{C_{RPV4} t_4} < 1.15$$

GGNS Compliance

$$\frac{(p \times r)}{C_{RPV4} t_4} = \frac{(1056 \text{ psi} \times 126.75 \text{ in})}{16171(7.4948)} = 1.104 < 1.15$$

Criterion 5

$$\frac{p \times (r_o^2 + r_i^2)}{C_{nozzle5} (r_o^2 - r_i^2)} < 1.15$$

GGNS Compliance

$$\frac{p \times (r_o^2 + r_i^2)}{C_{nozzle5} (r_o^2 - r_i^2)} = \frac{1056 \text{ psi} \times ((20.03125)^2 + (10.84375)^2)}{1977((20.03125)^2 - (10.84375)^2)} = 0.97698 < 1.15$$

The results of the above equations demonstrate the applicability of BWRVIP-108 to GGNS by showing the five criteria specified in Section 5 of the NRC SER are met.