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Subject: Alternative Examination Requirements for James A. FitzPatrick Nuclear Power Plant Nozzle-to-Vessel Welds and Nozzle Inner Radii Using ASME Code Case N-702 and BWRVIP-241

James A. FitzPatrick Nuclear Power Plant
Docket No. 50-333
License No. DPR-59

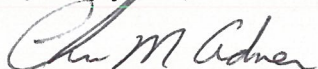
Dear Sir or Madam:

Pursuant to 10 CFR 50.55a(z)(1), Entergy Nuclear Operations, Inc. (Entergy) requests NRC authorization to implement alternative examination requirements based on the American Society of Mechanical Engineers (ASME) Code Case N-702 and Boiling Water Reactor Vessel Inspection Program (BWRVIP) -241 as documented in the enclosed James A. FitzPatrick Nuclear Power Plant (JAF) Inservice Inspection Program Relief Request (RR) -18.

The NRC provided a Safety Evaluation approving the generic technical bases and acceptability criteria for application of Code Case N-702 and BWRVIP-241, which Entergy has followed as detailed in the enclosure. Entergy requests approval of the proposed alternative on or before August 1, 2016 to accommodate application of this request during the next refueling outage. Entergy plans to implement this alternative for the remainder of the fourth ISI interval. Although this review is neither exigent nor emergency, your prompt review is requested.

There are no commitments made in this letter. Should you have any questions, please contact the Regulatory Assurance Manager, Mr. Chris M. Adner, at (315) 349-6766.

Very truly yours,


Chris M. Adner
Regulatory Assurance Manager

CMA:ds

Enclosure 1: James A. FitzPatrick Nuclear Power Plant Inservice Inspection Program RR-18

cc: USNRC, Regional Administrator, Region I
USNRC, Project Directorate
USNRC, Resident Inspector

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1. ASME Code Component(s) Affected

Code Class: ASME Section XI Code Class 1

Component Numbers: N2

Code References: ASME Section XI, 2001 Edition with 2003 Addenda

ASME Code Cases N-702: "Alternative Requirements for Boiling Water Reactor (BWR) Nozzle Inner Radius and Nozzle-to-Shell Welds, Section XI, Division 1."

BWRVIP-108NP: 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 Blend Radii."

BWRVIP-241: BWR Vessel and Internals Project: "Probabilistic Fracture Mechanics Evaluation for the Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Blend Radii."

Examination Category: B-D (Inspection Program B)

Item Number(s): B3.90 and B3.100

Unit/Inspection Interval: James A FitzPatrick Nuclear Power Plant (JAF) / Fourth (4th) 10-year interval starting March 1, 2007, ending December 31, 2016

2. Applicable ASME Code Requirements

ASME Section XI, 2001 Edition with the 2003 Addenda (Reference 1), Table IWB-2500-1, Examination Category B-D, Full Penetration Welded Nozzles In Vessels – Inspection Program B requires a volumetric examination of all nozzles with full penetration welds to the vessel shell (or head) and integrally cast nozzles each 10-year interval. Additionally, for ultrasonic examinations, ASME Section XI, Appendix VIII, "Performed Demonstration for Ultrasonic Examination Systems," is implemented; as required and modified by 10CFR50.55a(b)(2)(xv). The subject components for this request for alternative examination requirements are the N2 Recirculation Inlet Nozzle-to-Vessel Welds (Items B3.90) and the N2 Recirculation Inlet Nozzle Inner Radius Sections (Item B3.100).

3. Reason for Request

The twenty-five percent sampling level stated in Code Case N-702 (Reference 2) provides a significant cost savings and reduction in worker dose exposure. JAF has estimated that the proposed reduction of inspection requirements would result in an approximate cost savings

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of \$1,520,000 and reduction in worker dose of 4 Rem over the remainder of the current interval while providing an acceptable level of quality and safety.

4. Proposed Alternative and Basis for Use

Pursuant to 10 CFR 50.55a(z)(1), an alternative is requested from performing the required examinations on 100% of the N2 Recirculation Inlet nozzles (listed in Attachment 1). As an alternative, incorporation of Code Case N-702 would require examination of a minimum, 25% of the nozzle-to-vessel welds and nozzle inner radius sections, including at least one nozzle from each nominal pipe size. JAF has a total of ten N2 Recirculation Inlet nozzle assemblies, all of a nominal 12" pipe size. Fulfillment of the Code Case N-702 requirement will be accomplished via inspection of three N2 Recirculation Inlet nozzle assemblies. Two of the N2 Recirculation Inlet nozzle assemblies were inspected during Refueling Outage (RFO) 20. Pending approval of the proposed alternative, JAF will inspect the remaining N2 Recirculation Inlet nozzle assembly in RFO 22. Inspection of the N2 Recirculation Inlet nozzle assemblies includes examination of both the inner radius region and nozzle-to-shell weld.

JAF received NRC approval to utilize ASME Code Case N-702 for the fourth 10-year inservice inspection interval by letter dated October 17, 2012 (Relief Request No. 8; Reference 10). The N2 Recirculation Inlet nozzles were excluded from the alternative associated with Relief Request No. 8 because these nozzles did not meet the third criterion specified in Section 5.0 of the staff's safety evaluation for the BWRVIP-108 report for plant-specific application of ASME Code Case N-702. On April 19, 2013, the NRC issued a safety evaluation (Reference 9) approving the use of BWRVIP-241, which contains relaxed criteria. As demonstrated herein, JAF meets the BWRVIP-241 criteria. Therefore, JAF is requesting NRC approval to apply ASME Code Case N-702 to the N2 Recirculation Inlet nozzles for the remainder of the fourth 10-year inservice inspection interval (ending December 31, 2016).

Code Case N-702 stipulates that the VT-1 examination method may be used in lieu of the volumetric examination method for the inner radius sections (Item No. B3.100). JAF has adopted ASME Code Case N-648-1 "Alternative Requirements for Inner Radius Examination of Class 1 Reactor Vessel Nozzles" (Reference 3), with the provision stipulated in Regulatory Guide 1.147, in the JAF Fourth Interval ISI Program Plan. Therefore, JAF may perform examinations on inner radius sections with either the VT-1 or the volumetric examination method.

5. Basis for Proposed Alternative

Electric Power Research Institute (EPRI) Technical Report 1021005, "BWRVIP-241: BWR Vessel and Internals Project (BWRVIP), Probabilistic Fracture Mechanics Evaluation for the Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Blend Radii" (Reference 6)

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provides the technical basis for use of Code Case N-702. BWRVIP-241 was developed to propose a relaxation of the criteria in BWRVIP-108 allowing BWR's to obtain inspection relief for their Reactor Recirculation inlet and outlet nozzles. The evaluation found that failure probabilities due to a low temperature overpressure event at the nozzle blend radius region and nozzle-to-vessel shell weld are very low (i.e. $< 1 \times 10^{-6}$ for 40 years) with or without inservice inspection. The report concludes that inspection of 25% of each nozzle type is technically justified.

BWRVIP-108 (Reference 5) was originally submitted to the NRC for review and approval by the BWRVIP via BWRVIP Letter 2002-323 (Reference 4) on November 25, 2002. This report was supplemented by Tennessee Valley Authority (TVA) letter dated November 15, 2004, and BWRVIP letters dated July 25, 2006, and September 13, 2007. Reference 7 provided the NRC Safety Evaluation approving use of ASME Code Case N-702 in accordance with BWRVIP-108 guidance.

On April 19, 2013, the NRC issued a Safety Evaluation (SE) (Reference 9) approving the use of BWRVIP-241. Within Section 5 of the SE, it states that each licensee should demonstrate the plant-specific applicability of the BWRVIP-241 report to their units in the request for alternative by meeting the criteria discussed in Section 5 of the SE.

The applicability of the BWRVIP-241 report to JAF is demonstrated by showing the criteria within Section 5 of the SE are met for the recirculation inlet nozzles.

- The general terms used in the SE Section 5 applicability evaluations are:

$C_{i\text{RPV}}$ = recirculation inlet nozzles (from BWRVIP-108NP model) = 19332 psi

$C_{i\text{-NOZZLE}}$ = recirculation inlet nozzles (from BWRVIP-108NP model) = 1637 psi

- The JAF nozzle-specific terms to be used in the SE Section 5 applicability evaluations are as follows:

Heatup / Cooldown rate $< 100^{\circ}$ F/hr

p = Reactor Pressure Vessel (RPV) normal operating pressure, $p = 1040$ psig

r = RPV inner radius, $r = 110.375$ "

t = RPV wall thickness, $t = 6.875$ "

r_{iN2} = inner radius for Recirculation Inlet N2 nozzles, $r_{iN2} = 6.19$ "

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r_{oN2} = outer radius for Recirculation Inlet N2 nozzles, $r_{oN2} = 10.22''$

James A FitzPatrick's conformance with the three (3) criteria is demonstrated as follows:

(1) Max RPV Heatup / Cooldown Rate

First criterion – the maximum RPV heatup / cooldown rate is limited to $< 115^{\circ}\text{F/hr}$.

In accordance with Technical Specification 3.4.9, RCS Pressure and Temperature (P/T) Limits, the maximum RPV heatup / cooldown rate is limited to $\leq 100^{\circ}\text{F}$ when averaged over any one hour period. JAF meets this criterion.

(2) Recirculation Inlet (N2) Nozzles

Second criterion – Equation: $(pr/t) / C_{i-RPV} < 1.15$

$[(1040)(110.375)/6.875]/19332 = 0.864 < 1.15$

The JAF result is 0.864, which meets the requirement of this criterion.

(3) Recirculation Inlet (N2) Nozzles

Third criterion – Equation: $[p(r_{oN2}^2 + r_{iN2}^2) / (r_{oN2}^2 - r_{iN2}^2)] / C_{i-NOZZLE} < 1.47$

$[1040 (10.22^2 + 6.19^2) / (10.22^2 - 6.19^2)] / 1637 = 1.371 < 1.47$

The JAF result is 1.371, which meets the requirement of this criterion.

The NRC Safety Evaluation Section Criteria are met for all nozzles listed in Attachment 1. Therefore, the basis for using Code Case N-702 is demonstrated for the JAF N2 Recirculation Inlet nozzles.

5. Duration of Proposed Alternative

Upon approval by the NRC staff, this alternative will be utilized through the remainder of JAF's fourth inspection interval (March 1, 2007 – December 31, 2016) for the N2 Recirculation Inlet nozzle assemblies (Attachment 1).

6. Precedents

The NRC Staff has approved similar Requests for Alternative for the following plants:

- 1) COLUMBIA GENERATING STATION - REQUEST FOR ALTERNATIVE 3ISI-14 TO THE REQUIREMENTS OF THE ASME CODE (TAC NO. MF3435) dated February 13, 2015, ML15036A220
- 2) PILGRIM NUCLEAR POWER PLANT - RELIEF REQUEST PRR-24 REGARDING NOZZLE-TO-VESSEL WELDS AND NOZZLE INNER RADII EXAMINATIONS (TAC NO. MF4187) dated April 21, 2015, ML 15103A069

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7. References

- 1) ASME Boiler and Pressure Vessel Code, Section XI, Division 1, 2001 Edition with the 2003 Addenda.
- 2) ASME Boiler and Pressure Vessel Code, Code Case N-702, "Alternate Requirements for Boiling Water Reactor (BWR) Nozzle Inner Radius and Nozzle-to-Shell Welds, Section XI, Division 1," February 20, 2004.
- 3) ASME Boiler and Pressure Vessel Code, Code Case N-648-1, "Alternative Requirements for Inner Radius Examination of Class 1 Reactor Vessel Nozzles," September 7, 2001.
- 4) BWRVIP letter 2002-323, Carl Terry, BWRVIP Chairman, to NRC Document Control Desk, "Project No. 704-BWRVIP-108NP: 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 Blend Radii," November 21, 2007.
- 5) 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 Blend Radii," EPRI Technical Report 1003557, October 2002.
- 6) EPRI Technical Report 1021005, "BWRVIP-241, Probabilistic Fracture Mechanics Evaluation for the Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Blend Radii," dated October 2010.
- 7) NRC Safety Evaluation of Proprietary EPRI Report, "BWR Vessels 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)," dated December 19, 2007.
- 8) BWRVIP-108NP: 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 Blend Radii," EPRI Technical Report 1016123, November 2007.
- 9) NRC SE of the Boiling Water Reactor Vessel Internals Project (BWRVIP) – 241 Report, Probabilistic Fracture Mechanics for the Boiling- Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Blend Radii (TAC NO. ME6238) dated April 19, 2013.
- 10) James A. Fitzpatrick Nuclear Power Plant Issuance of Relief From the Requirements of The American Society of Mechanical Engineers Boiler And Pressure Vessel Code (TAC No. ME7243) dated October 17, 2012

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Attachment 1

Table of ASME Code Components Affected at JAF

Component ID	Description	Code Category	Code Item	Inspections	Indications (see notes below)
N-2A-IR	12" Recirc Inlet Nozzle to Inner Radius	B-D	B3.100	1985, 1987, 1990, 1992, 1998	NRI
N-2A	12" Recirc Inlet Nozzle to Vessel Weld	B-D	B3.90	1977, 1985, 1987, 1990, 1992, 1998	1990 (note 2) 1998 (note 4)
N-2B-IR	12" Recirc Inlet Nozzle to Inner Radius	B-D	B3.100	1985, 1987, 1992, 1995, 1998	NRI
N-2B	12" Recirc Inlet Nozzle to Vessel Weld	B-D	B3.90	1985, 1987, 1992, 1995, 1998	NRI
N-2C-IR	12" Recirc Inlet Nozzle to Inner Radius	B-D	B3.100	1985, 1988	NRI
N-2C	12" Recirc Inlet Nozzle to Vessel Weld	B-D	B3.90	1978, 1985, 1989	NRI
N-2D-IR	12" Recirc Inlet Nozzle to Inner Radius	B-D	B3.100	1985, 1988	NRI
N-2D	12" Recirc Inlet Nozzle to Vessel	B-D	B3.90	1985, 1989	1989 (note 1)

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Component ID	Description	Code Category	Code Item	Inspections	Indications (see notes below)
	Weld				
N-2E-IR	12" Recirc Inlet Nozzle to Inner Radius	B-D	B3.100	1985, 1987, 1995, 1998	NRI
N-2E	12" Recirc Inlet Nozzle to Vessel Weld	B-D	B3.90	1977, 1985, 1987, 1995, 1998	NRI
N-2F-IR	12" Recirc Inlet Nozzle to Inner Radius	B-D	B3.100	1985, 2002	NRI
N-2F	12" Recirc Inlet Nozzle to Vessel Weld	B-D	B3.90	1985, 1989, 2002	NRI
N-2G-IR	12" Recirc Inlet Nozzle to Inner Radius	B-D	B3.100	1985, 1988	NRI
N-2G	12" Recirc Inlet Nozzle to Vessel Weld	B-D	B3.90	1985, 1989	NRI
N-2H-IR	12" Recirc Inlet Nozzle to Inner Radius	B-D	B3.100	1985, 1987, 1995, 1998, 2012	NRI
N-2H	12" Recirc Inlet Nozzle to Vessel Weld	B-D	B3.90	1977, 1985, 1987, 1995, 1998, 2012	NRI
N-2J-IR	12" Recirc Inlet Nozzle to Inner Radius	B-D	B3.100	1981, 1985, 1988, 1992	NRI

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Component ID	Description	Code Category	Code Item	Inspections	Indications (see notes below)
N-2J	12" Recirc Inlet Nozzle to Vessel Weld	B-D	B3.90	1981, 1985, 1992	1992 (note 3)
N-2K-IR	12" Recirc Inlet Nozzle to Inner Radius	B-D	B3.100	1985, 1987, 1995, 1998, 2012	NRI
N-2K	12" Recirc Inlet Nozzle to Vessel Weld	B-D	B3.90	1985, 1987, 1995, 1998, 2012	1998 (note 5)

Notes:

1. N-2D - 1989, Base metal, evaluated – acceptable.
2. N-2A – 1990, Length of indication is 1 inch, evaluated – acceptable.
3. N-2J – 1992, Fabrication flaws identified in 1974, re-evaluated in 1992 – acceptable.
4. N-2A – 1998, Typical of plate segregates and requires no evaluation for acceptance – acceptable.
5. N-2K - 1998, Typical of plate segregates and requires no evaluation for acceptance – acceptable.
6. No Reportable Indications (NRI)