

William R. Kanda
Vice President - Nuclear

440-280-5579
Fax: 440-280-8029

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United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Perry Nuclear Power Plant
Docket No. 50-440
Submission of In-Service Examination Program Relief Requests

Ladies and Gentlemen:

In accordance with 10 CFR 50.55a(a)(3)(i), Nuclear Regulatory Commission (NRC) Staff review and approval of three requests for relief from certain Inservice Inspection (ISI) requirements associated with the implementation of Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code for the Perry Nuclear Power Plant (PNPP) is requested.

Attachment 1 contains Relief Request IR-050, which documents the request for relief from ASME Section XI Appendix VIII, Supplement 10 requirements for Class 1 dissimilar metal welds.

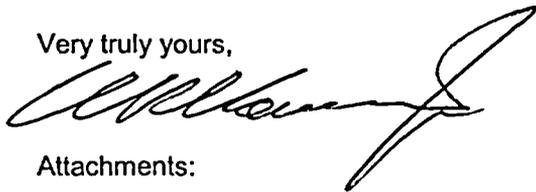
Attachment 2 contains Relief Request IR-051, which documents the request for relief from performing the Code required surface exams for Class 2 welds pursuant to ASME Code Case N-663.

Attachment 3 contains Relief Request IR-052, which documents the request for relief from the requirement to perform the Code required volumetric examination of Class 1 Reactor Pressure Vessel nozzle-to-vessel welds pursuant to Code Case N-613-1.

Attachments 1, 2, and 3 contain the identification of the affected components, the applicable code requirements, the description and basis of the proposed relief requests, and the proposed alternate examinations for each of the relief requests. The relief requests are proposed for use during the remainder of the current PNPP 10-year ISI interval. Review and approval of the attached relief requests is requested by January 1, 2005 to support PNPP's tenth refuel outage.

There are no regulatory commitments contained in this letter or its attachments. If you have questions or require additional information, please contact Mr. Vernon K. Higaki, Manager - Regulatory Affairs, at (440) 280-5294.

Very truly yours,



Attachments:

1. Relief Request IR-050
2. Relief Request IR-051
3. Relief Request IR-052

cc: NRC Project Manager
NRC Resident Inspector
NRC Region III
State of Ohio

A047

Perry Nuclear Power Plant Unit 1
RELIEF REQUEST No. IR-050, Rev 0

I. Identification of Components

Dissimilar metal piping welds subject to ultrasonic examination using procedures, personnel, and equipment qualified to 1995 Edition, 1996 Addenda, of the American Society of Mechanical Engineers (ASME) Code, Section XI, Appendix VIII, Supplement 10, "Qualification Requirements for Dissimilar Metal Piping Welds."

II. ASME B&PV Section XI Requirements

Perry Nuclear Power Plant is currently in its Second 10-Year Inservice Inspection Interval and the Code of reference for the 2nd Interval is the 1989 Edition, No Addenda, of the ASME Code, Section XI. Table IWB-2500-1, Examination Category B-F, provides the requirements for dissimilar metal piping welds and specifies ultrasonic examination of the non-exempt welds. For ultrasonic examinations, revisions to 10CFR50.55a published September 22, 1999 require implementation of Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," of ASME Section XI, 1995 Edition with the 1996 Addenda as modified by 10CFR50.55a(b)(2)(xiv, xv, and xvi). For dissimilar metal welds, the requirements of Appendix VIII, Supplement 10 applies. Of those requirements, relief is requested for the following:

Item 1 - Paragraph 1.1(b) states in part - Pipe diameters within a range of 0.9 to 1.5 times a nominal diameter shall be considered equivalent.

Item 2 - Paragraph 1.1(d) states - All flaws in the specimen set shall be cracks.

Item 3 - Paragraph 1.1(d)(1) states - At least 50% of the cracks shall be in austenitic material. At least 50% of the cracks in austenitic material shall be contained wholly in weld or buttering material. At least 10% of the cracks shall be in ferritic material. The remainder of the cracks may be in either austenitic or ferritic material.

Item 4 - Paragraph 1.2(b) states in part - The number of unflawed grading units shall be at least twice the number of flawed grading units.

Item 5 - Paragraph 1.2(c)(1) and 1.3(c) state in part - At least 1/3 of the flaws, rounded to the next higher whole number, shall have depths between 10% and 30% of the nominal pipe wall thickness. Paragraph 1.4(b) distribution table requires 20% of the flaws to have depths between 10% and 30%.

Item 6 - Paragraph 2.0 first sentence states - The specimen inside surface and identification shall be concealed from the candidate.

Item 7 - Paragraph 2.2(b) states in part - The regions containing a flaw to be sized shall be identified to the candidate.

Item 8 - Paragraph 2.2(c) states in part - For a separate length sizing test, the regions of each specimen containing a flaw to be sized shall be identified to the candidate.

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Item 9 - Paragraph 2.3(a) states - For the depth sizing test, 80% of the flaws shall be sized at a specific location on the surface of the specimen identified to the candidate.

Item 10 - Paragraph 2.3(b) states - For the remaining flaws, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.

Item 11 - Table VIII-S2-1 provides the false call criteria when the number of unflawed grading units is at least twice the number of flawed grading units.

III. Relief Request

Relief is requested in accordance with 10 CFR 50.55a(a)(3)(i) from the above listed Appendix VIII, Supplement 10 requirements.

IV. Proposed Alternatives and Technical Basis

In lieu of the ASME Code requirements listed above, this submittal is requesting to use the dissimilar metal weld criteria of the Electric Power Research Institute (EPRI) Performance Demonstration Initiative (PDI) Program. The following PDI alternatives to the ASME Code, Section XI Appendix VIII, Supplement 10 requirements are proposed for use during the remainder of the current 10-year ISI interval. The proposed alternatives will be implemented through the PDI Program.

Item 1 - The proposed alternative to Paragraph 1.1(b) states:

"The specimen set shall include the minimum and maximum pipe diameters and thicknesses for which the examination procedure is applicable. Pipe diameters within a range of 1/2 in. (13 mm) of the nominal diameter shall be considered equivalent. Pipe diameters larger than 24 in. (610 mm) shall be considered to be flat. When a range of thicknesses is to be examined, a thickness tolerance of $\pm 25\%$ is acceptable."

Technical Basis - The change in the minimum pipe diameter tolerance from 0.9 times the diameter to the nominal diameter minus 0.5 inch provides tolerances more in line with industry practice. Though the alternative is less stringent for small pipe diameters they typically have a thinner wall thickness than larger diameter piping. A thinner wall thickness results in shorter sound path distances that reduce the detrimental effects of the curvature. This change maintains consistency between Supplement 10 and the recent revision to Supplement 2.

Item 2 - The proposed alternative to Paragraph 1.1(d) states:

"At least 60% of the flaws shall be cracks, the remainder shall be alternative flaws. Specimens with IGSCC shall be used when available. Alternative flaws, if used, shall meet the following requirements:

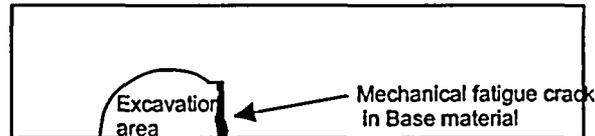
(1) Alternative flaw, if used, shall provide crack-like reflective characteristics and shall only be used when implantation of cracks would produce spurious reflectors that are uncharacteristic of actual flaws.

(2) Alternative flaw mechanisms shall have a tip width of less than or equal to 0.002 in. (.05 mm)."

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Note: To avoid confusion, the proposed alternative modifies instances of the term "cracks" or "cracking" to the term "flaws" because of the use of "alternative flaw mechanisms."

Technical Basis - As illustrated below, implanting a crack requires excavation of the base material on at least one side of the flaw. While this may be satisfactory for ferritic materials, it does not produce a useable axial flaw in austenitic materials because the sound beam, which normally passes only through base material, must now travel through weld material on at least one side, producing an unrealistic flaw response. In addition, it is important to preserve the dendritic structure present in field welds that would otherwise be destroyed by the implantation process. To resolve these issues, the proposed alternative allows the use of up to 40% fabricated flaws as an alternative flaw mechanism under controlled conditions. The fabricated flaws are isostatically compressed which produces ultrasonic reflective characteristics similar to tight cracks.



Item 3 - The proposed alternative to Paragraph 1.1(d)(1) states:

"At least 80% of the flaws shall be contained wholly in weld or buttering material. At least one and no more than 10% of the flaws shall be in ferritic base material. At least one and no more than 10% of the flaws shall be in austenitic base material."

Technical Basis - Under the current ASME Code requirement, as few as 25% of the flaws are contained in austenitic weld or buttering material. Recent experience has indicated that flaws contained within the weld are the likely scenarios. The metallurgical structure of austenitic weld material is ultrasonically more challenging than either ferritic or austenitic base material. The proposed alternative is therefore more challenging than the current ASME Code.

Item 4 - The proposed alternative to Paragraph 1.2(b) states:

"Personnel performance demonstration detection test sets shall be selected from Table VIII-S10-1. The number of unflawed grading units shall be at least 1-1/2 times the number of flawed grading units."

Technical Basis - Table S10-1 provides a statistically based ratio between the number of unflawed grading units and the number of flawed grading units. The proposed alternative reduces the ratio to 1.5 times to reduce the number of test samples to a more reasonable number from the human factors perspective. However, the statistical basis used for screening personnel and procedures is still maintained at the same level with competent personnel being successful and less skilled personnel being unsuccessful. The acceptance criteria for the statistical basis are in Table VIII-S10-1.

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Item 5 - The proposed alternative to the flaw distribution requirements of Paragraph 1.2(c)(1) (detection) and 1.3(c) (length) is to use the Paragraph 1.4(b) (depth) distribution table (see below) for all qualifications.

<u>Flaw Depth</u> <u>(% Wall Thickness)</u>	<u>Minimum</u> <u>Number of Flaws</u>
10-30%	20%
31-60%	20%
61-100%	20%

At least 75% of the flaws shall be in the range of 10 to 60% of wall thickness.

Technical Basis - The proposed alternative uses the depth sizing distribution for both detection and depth sizing because it provides for a better distribution of flaw sizes within the test set. This distribution allows candidates to perform detection, length, and depth sizing demonstrations simultaneously utilizing the same test set. The requirement that at least 75% of the flaws shall be in the range of 10 to 60% of wall thickness provides an overall distribution tolerance yet the distribution uncertainty decreases the possibilities for testmanship that would be inherent to a uniform distribution. It must be noted that it is possible to achieve the same distribution utilizing the present requirements, but it is preferable to make the criteria consistent.

Item 6 - The proposed alternative to Paragraph 2.0 first sentence states:

"For qualifications from the outside surface, the specimen inside surface and identification shall be concealed from the candidate. When qualifications are performed from the inside surface, the flaw location and specimen identification shall be obscured to maintain a "blind test"."

Technical Basis - The current ASME Code requires that the inside surface be concealed from the candidate. This makes qualifications conducted from the inside of the pipe (e.g., PWR nozzle to safe end welds) impractical. The proposed alternative differentiates between ID and OD scanning surfaces, requires that they be conducted separately, and requires that flaws be concealed from the candidate.

Items 7 and 8 - The proposed alternatives to Paragraph 2.2(b) and 2.2(c) state:

"... containing a flaw to be sized may be identified to the candidate."

Technical Basis - The current ASME Code requires that the regions of each specimen containing a flaw to be length sized shall be identified to the candidate. The candidate shall determine the length of the flaw in each region (Note, that length and depth sizing use the term "regions" while detection uses the term "grading units" - the two terms define different concepts and are not intended to be equal or interchangeable). To ensure security of the samples, the proposed alternative modifies the first "shall" to a "may" to allow the test administrator the option of not identifying specifically where a flaw is located. This is consistent with the recent revision to Supplement 2.

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Items 9 and 10 - The proposed alternative to Paragraph 2.3(a) and 2.3(b) state:

"... regions of each specimen containing a flaw to be sized may be identified to the candidate."

Technical Basis - The current Code requires that a large number of flaws be sized at a specific location. The proposed alternative changes the "shall" to a "may" which modifies this from a specific area to a more generalized region to ensure security of samples. This is consistent with the recent revision to Supplement 2. It also incorporates terminology from length sizing for additional clarity.

Item 11 - The proposed alternative modifies the acceptance criteria of Table VIII-S2-1 as follows:

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**TABLE VIII-S2-1
 PERFORMANCE DEMONSTRATION DETECTION TEST
 ACCEPTANCE CRITERIA**

Detection Test Acceptance Criteria		False Call Test Acceptance Criteria	
No. of Flawed Grading Units	Minimum Detection Criteria	No. of Unflawed Grading Units	Maximum Number of False Calls
5	5	10	0
6	6	12	1
7	6	14	1
8	7	16	2
9	7	18	2
10	8	20	15
11	9	22	17
12	9	24	18
13	10	26	20
14	10	28	21
15	11	30	23
16	12	32	24
17	12	34	26
18	13	36	27
19	13	38	29
20	14	40	29

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Technical Basis - The proposed alternative adds new Table VIII-S10-1 above. It is a modified version of Table VIII-S2-1 to reflect the reduced number of unflawed grading units and allowable false calls. As provided by the PDI as a part of ongoing Code activities, Pacific Northwest National Laboratories has reviewed the statistical significance of these revisions and offered the revised Table VIII-S10-1.

Note, that a Code Case and changes to the Code were processed through ASME Subcommittee XI to incorporate the dissimilar metal qualification process as implemented by the PDI Program. Code Case N-695, "Qualification Requirements for Dissimilar Metal Welds, Section XI, Division 1," and the accompanying Code change were approved on 5/01/03. The Code Case was published in Supplement 10 to the 2001 Code Cases and the Code change will be published in the 2004 Addenda to Section XI.

V. Justification for Granting Relief

Pursuant to 10 CFR 50.55a(a)(3)(i), approval is requested to use the proposed alternatives described above in lieu of the ASME Section XI, Appendix VIII, Supplement 10 requirements. Compliance with the proposed alternatives will provide an acceptable level of quality and safety for ultrasonic examination of the affected welds.

VI. Implementation Schedule

The next *scheduled* ultrasonic examinations of welds configurations governed by ASME Section XI, Appendix VIII, Supplement 10 at Perry Nuclear Power Plant is in RFO11, Spring of 2007. However, the potential to perform ultrasonic examinations of dissimilar metal welds exists now. Approval of the submitted alternatives to Supplement 10 examination requirements will allow implementation of the alternatives and expedite full licensee compliance with respect to 10 CFR 50.55a(g)(6)(ii)(C)(2), as stated within RIS 2003-01.

Upon approval by the NRC staff, this relief request will be utilized through the remainder of PNPP's second 10-Year inspection interval (November 18, 1998 – November 17, 2008).

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RELIEF REQUEST No. IR-051, Rev 0
Code Case N-663

I. Identification of Components

Class 2, Category C-F-2, carbon steel piping welds greater than nominal pipe size (NPS) 4. Note that PNPP has no Class 2 non-exempt austenitic, Category C-F-1, welds.

II. ASME Boiler & Pressure Vessel Code Section XI Requirements

PNPP is currently in its second 10-year inspection interval and is committed to the 1989 Edition of ASME XI. IWC-2500 requires components to be examined and pressure tested as specified in Table IWC-2500-1. The table requires a sampling of piping welds using volumetric, surface, or both, and also inspection of all Class 2 piping during pressure testing using VT-2 visual examination. Specifically, Category C-F-2, Items C5.51, C5.52 and C5.81 (the only Category C-F-2 item numbers applicable at PNPP), require a surface examination.

III. Relief Requested

Pursuant to 10 CFR 50.55a(a)(3)(i), relief is requested from performing the Code-required surface exams for the remaining Class 2 weld exams of the second 10-year inspection interval.

IV. Basis for Relief

ASME Section XI Task Group on ISI Optimization Report No. 92-01-01, "Evaluation of Inservice Inspection Requirements for Class 1, Category B-J Pressure Retaining Welds in Piping," dated July 1995, concluded (with 50 units responding with a total of 9333 welds inspected) only 2 welds (0.02%) were found to have flaws detected by Section XI surface examinations. These flaws were determined to be fabrication-induced.

In parallel with the above, several risk-informed Code cases have been developed for use on piping welds (e.g., ASME Code Cases N-560, N-577, and N-578). One of the methods for risk-informing piping examinations is via use of EPRI (Electric Power Research Institute) TA-112657, Revision B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure," (NRC Safety Evaluation Report, dated 10/28/99). Table 4-11 "Summary of Degradation-Specific Inspection Requirements and Examination Methods," of the EPRI report lists the required degradation mechanisms to be evaluated in Class 1, 2, and 3 piping. It also identifies the risk-informed examination method required for each of these degradation mechanisms. The only degradation mechanism that requires a surface examination is O.D. (Outside Diameter) chloride cracking. These two initiatives led ASME to investigate the value of surface examinations.

Code Case N-663 incorporates lessons learned from the risk-informed initiatives and industry examination experience into Section XI by requiring that an evaluation be conducted to identify locations, if any, where a surface examination would be of benefit from a generic piping degradation perspective.

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Code Case N-663

The results of this evaluation identify where O.D. degradation is most likely to occur by reviewing plant-specific programs and practices, and operating experience. If the potential for degradation is identified, Code Case N-663 defines examination techniques, volumes, and frequencies. As such, implementing Code Case N-663 will identify appropriate locations for surface examination, if any, and eliminate unnecessary examinations.

Use of Code Case N-663 would eliminate unnecessary surface exams and result in an average dose savings of 500 mRem per refueling outage.

V. Alternate Examination

In lieu of the surface examination requirements of Table IWC-2500-1 for examination Category C-F-2, the requirements of Code Case N-663, "Alternative Requirements for Class 1 and 2 Surface Examinations," will be used. Note that use of the N-663 for Class 1 welds is not being requested, as PNPP has already implemented RI-ISI for its Class 1 piping.

VI. Implementation Schedule

Upon approval by the NRC staff, this relief request will be utilized through the remainder of PNPP's second 10-Year inspection interval (November 18, 1998 – November 17, 2008).

Perry Nuclear Power Plant Unit 1
RELIEF REQUEST No. IR-052, Rev 0
Code Case N-613-1

I. Identification of Components

ASME Class 1 Reactor Pressure Vessel Pressure-retaining Nozzle-to-Vessel Welds

II. ASME Boiler & Pressure Vessel Code Section XI Requirements

PNPP is currently in its second 10-year inspection interval and is committed to the 1989 Edition of ASME XI. Additionally, for ultrasonic examinations Section XI, Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," of the 1995 Edition with the 1996 Addenda is implemented as required (and modified) by 10 CFR 50.55a.

Class 1 nozzle-to-vessel weld examination requirements are given in Subsection IWB, Table IWB-2500-1, Examination Category B-D Full Penetration Welds of Nozzles in Vessels - Inspection Program B, Item No. B3.90. For that item, the table indicates Figures IWB-2500-7(a) through (d) for the examination requirements. Of those figures, all the Category B-D nozzle-to-vessel welds at PNPP are of the Figure IWB-2500-7(b) configuration. Figure IWB-2500-7(b) defines the examination volume to include the weld and the base material for distance of one-half the vessel shell thickness on either side of the weld.

III. Relief Requested

The specific Code requirement from which relief is requested is the requirement to perform the volumetric examination of the indicated nozzle-to-vessel welds in accordance with the examination volume requirements of Figure IWB-2500-7(b). Pursuant to 10 CFR 50.55a(a)(3)(i), relief is requested to perform the Code examination on a reduced volume in accordance with Code Case N-613-1. Specifically, the volume will be reduced to one-half inch beyond the widest part of the boundary of the deposited weld material as shown in Figure 2 of the Case.

When performing the examinations of nozzle-to-vessel welds, PNPP will still comply with the special requirements imposed in 10 CFR 50.55a(b)(2)(xv)(K)(3) and, where access is achievable, 10 CFR 50.55a(b)(2)(xv)(G). Note that all of PNPP's nozzle-to-shell weld exams are conducted from outside of the vessel. These requirements dictate that the examination scanning processes must also be performed in such a manner to detect flaws oriented axially with the nozzle. PNPP will continue to perform the required UT examinations in accordance with the Final Rule, except that the exam volume will be reduced.

IV. Basis for Relief

The examination volume required by IWB-2500-7(b) for the reactor vessel pressure retaining nozzle-to-vessel welds extends far beyond the weld and the heat effected zones into the base metal, and is unnecessarily large. This extends examination time significantly, increases the radiation exposure of exam support personnel, and results in no net increase in safety; as the additional area being examined is a base-metal region of the reactor vessel shell or nozzle wall areas where industry experience has shown service-induced cracks are not prone to occur. In addition, these regions have been extensively examined during the fabrication and installation periods before the vessels were put in service and during the inservice examinations already performed.

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The reduction of UT examination volumes adjacent to the widest part of the weld from one-half of the vessel wall thickness to one-half inch beyond the weld boundary eliminates base metal material volume to be examined that was extensively examined during construction and preservice examinations, and eliminates areas which are not located in the weld or the immediate heat affected zone. The weld and the immediate heat affected zone are the areas where inservice flaws are most likely to initiate and they are adequately addressed and contained in the examination volume defined by the area one half inch beyond the weld boundary. Note that residual stresses in the weld and heat affected zones of the nozzle-to-shell welds are minimal as all these welds, including in-process weld repairs if any, were subjected to post-weld heat treatment during vessel fabrication. Furthermore, in the case of BWRs, EPRI Technical Report 1003557, "BWRVIP-108: BWR Vessel and Internals Project Technical Basis for the Reduction of Inspection Requirements for Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Blend Radii," concludes that the probability of failure due to the limiting loading event of low temperature over-pressurization is less than 1×10^{-6} for 40 years, even without any inservice inspection.

In addition, use of the proposed examination boundaries will be conducted in conjunction with PNPP's programmatic implementation of the mandated use of ASME Section XI, Appendix VIII. PNPP will implement these requirements in accordance with the requirements shown in ASME Section XI Appendix VIII of the 1995 Edition with the 1996 Addenda, as amended by the Final Rule and as required in paragraphs 10 CFR 50.55a(b)(2)(xiv), (xv), and (xvi); and in 10 CFR 50.55a(g)(6)(ii)(C). PNPP will comply with these requirements through the use of the Electric Power Research Institute (EPRI) Performance Demonstration Initiative (PDI) program document, "PDI Program Description," Revision 1, Change 1, as allowed in the discussion on the Final Rule published in the *Federal Register*, Volume 64, No. 183, page 51390, (See Section 2.7), dated September 22, 1999. These procedures will ensure that the performance-based UT methodologies used and the techniques will be qualified and examination personnel will be certified by a performance demonstration.

The use of the reduced examination volumes in lieu of the identified ASME Section XI referenced requirements will reduce on-vessel examination time by as much as 12 hours an outage, with approximately 4 hours of that involving manually performed exams. For the manually performed nozzle exams, on average there will be a dose savings of approximately 500 mRem per outage. During certain outages, inservice examination of Reactor Vessel nozzles are on critical path. As such, over the course of a 10-year inspection interval, it is conservatively estimated that at least 24 hours of critical path time will be saved by the reduced examination times. This reduction in the outage duration translates to a replacement power cost savings of approximately \$850,000. The personnel radiation exposure is dependent upon the choice of RPV examination equipment (i.e. automated versus manual) and by the degree of plant RPV contamination and/or decontamination conducted prior to the exam.

In conclusion, use of the reduced examination volume requirements in conjunction with the application of the Appendix VIII implementing PDI program will provide sufficient assurance that RPV nozzle-to-vessel welds have remained free of service induced flaws or identify such flaws prior to failure. The application of the PDI techniques will enhance quality of the UT examinations and ensure plant safety and pressure boundary reliability. Therefore, the proposed alternative provides for an acceptable level of quality and safety and, pursuant to 10 CFR 50.55a(a)(3)(i), relief to use the reduced examination volumes may be granted.

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Code Case N-613-1

V. Alternate Examination

PNPP will perform the examinations of the RPV nozzle-to-vessel welds as follows:

1. Ultrasonic examinations of the RPV nozzle-to-vessel welds in accordance with the requirements of ASME Section XI Appendix VIII with examination volumes as defined in Code Case N-613-1.
2. In accordance with the requirements shown in ASME Section XI Appendix VIII of the 1995 Edition with the 1996 Addenda, as amended by the Final Rule and as required in paragraphs 10 CFR 50.55a(b)(2)(xiv), (xv), and (xvi); and in 10 CFR 50.55a(g)(6)(ii)(C) through the use of the EPRI PDI program document, "PDI Program Description," Revision 1, Change 1, as allowed in the discussion on the Final Rule published in the Federal Register.
3. Continued periodic system pressure tests of the RPV per ASME Section XI requirements of Table IWB-2500-1, for Category B-P items.

VI. Implementation Schedule

Upon approval by the NRC staff, this relief request will be utilized through the remainder of PNPP's second 10-Year inspection interval (November 18, 1998 – November 17, 2008).