Tennessee Valley Authority, Post Office Box 2000, Decatur, Alabama 35609-2000

May 25, 2006

10 CFR 50.55a

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop: OWFN P1-35
Washington, D.C. 20555-0001

Gentlemen:

In the Matter of) Docket No. 50-296
Tennessee Valley Authority)

BROWNS FERRY NUCLEAR PLANT (BFN) - UNIT 3 - AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) SECTION XI, INSERVICE INSPECTION PROGRAM FOR THE THIRD TEN-YEAR INSPECTION INTERVAL - RESPONSE TO NRC INFORMAL REQUEST FOR ADDITIONAL INFORMATION (RAI) (TAC NOS. MC8790, MC8791, MC8792, AND MC8793

TVA submitted, by letter dated October 19, 2005, its Third Ten-Year Inservice Inspection (ISI) and System Pressure Test (SPT) Programs for Unit 3 of the Browns Ferry Nuclear Plant. The Code of record for the Third Ten-Year Interval ISI and SPT Programs is the 2001 Edition, 2003 Addenda of the ASME Boiler and Pressure Vessel Code, Section XI. The Third Ten-Year Interval began on November 19, 2005.

During its review of the BFN Unit 3 Third Interval Program, the NRC staff identified questions regarding requests for relief 3-PDI-2, 3-PDI-4, 3-ISI-16, and 3-ISI-17. These questions were discussed in a teleconference with the NRC staff on April 6, 2006. As a result of that teleconference, TVA is providing responses to the NRC questions in the enclosure to this letter.

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There are no new commitments contained in this letter. If you have any questions, please contact me at (256) 729-2636.

Sincerely,

William D. Crouch

William D. Crouch
Manager of Licensing
and Industry Affairs

Enclosure
cc: See Page 3

cc (Enclosure):

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ENCLOSURE

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNIT 3
AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
SECTION XI, INSERVICE INSPECTION (ISI) PROGRAM
THIRD TEN-YEAR INSPECTION INTERVAL PROGRAM

RESPONSE TO NRC INFORMAL REQUEST FOR
ADDITIONAL INFORMATION (RAI)

(SEE ATTACHED)

ENCLOSURE

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNIT 3
AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
SECTION XI, INSERVICE INSPECTION (ISI) PROGRAM
THIRD TEN-YEAR INSPECTION INTERVAL PROGRAM

RESPONSE TO NRC INFORMAL REQUEST FOR
ADDITIONAL INFORMATION (RAI)

During its review of the BFN Unit 3 Third Interval Program, the NRC staff identified questions regarding requests for relief 3-PDI-2, 3-PDI-4, 3-ISI-16, and 3-ISI-17. These questions were discussed in a teleconference with the NRC staff on April 6, 2006. As a result of that teleconference, TVA is providing responses to the NRC questions. Listed below are the specific NRC questions and the corresponding TVA responses.

NRC Request 1.1 (3-PDI-2)

Relief request No. 3-PDI-2 proposed an alternative to the examination volume of the reactor pressure vessel-to-nozzle weld. How does this request differ from Code Case N-613-1, which was endorsed in Regulatory Guide 1.147, Revision 14?

TVA Response to NRC Request 1.0

TVA is hereby withdrawing request for relief 3-PDI-2. Instead, TVA will adopt ASME Code Case N-613-1 as endorsed in Regulatory Guide 1.147, Revision 14.

NRC Request 2.1 (3-PDI-4)

Relief request No. 3-PDI-4 proposed an alternative to the qualification of procedures, personnel, and equipment used for examining the RPV shell-to-flange welds. The alternative references the 2001 Edition with 2003 Addenda of Supplements 4 and 6 to Appendix VIII of Section XI of the ASME Code. 10 CFR 50.55a(b)(2)(xxiv) prohibits the use of the 2002 Addenda through the latest edition and addenda of Appendix VIII and Article I-3000 of ASME Section XI. The proposed alternative is requesting to use a part of the ASME Code that is prohibited by the 10 CFR 50.55a. State the specific edition and addenda that will be used for Supplement 4 and 6 qualifications and Article I-3000 examinations requirements.

TVA Response to NRC Request 2.1

The 2001 Edition of ASME Section XI will be utilized for Supplements 4 and 6 qualifications. Article I-3000 first appeared in the 2002 Addenda and its use is prohibited by 10 CFR 50.55a(b)(2)(xxiv). Therefore, there is no Article I-3000 for use. This information has been incorporated into 3-PDI-4 which is being resubmitted in Attachment A of this enclosure.

NRC Request 2.2 (3-PDI-4)

Relief request No. 3-PDI-4 proposed an alternative to Section V, Article 4 which does not address scanning requirements. 10 CFR 50.55a(b)(2)(xv)(G) and 10 CFR 50.55a(b)(2)(xvi)(A) contain scanning requirements for vessel examinations performed using Appendix VIII qualified personnel and procedures. Identify the scanning criteria that will be used for the proposed examination.

TVA Response to NRC Request 2.2

TVA will use the techniques, personnel, and equipment qualified to meet the requirements of ASME Section XI Appendix VIII, Supplements 4, and 6 of the 2001 Edition, in accordance with 10 CFR 50.55a(b)(2)(xxiv) and, as amended by Sections 10 CFR 50.55a(b)(2)(xv)(B) through 10 CFR 50.55a(b)(2)(xv)(G), and 10 CFR 50.55a(b)(2)(xvi)(A), by following the Electric Power Research Institute's (EPRI) Performance Demonstration Initiative (PDI) processes. This information has been incorporated into 3-PDI-4 which is being resubmitted in Attachment A of this enclosure.

NRC Request 3.1 (3-ISI-16)

Relief Request No. 3-ISI-16 proposed an alternative for selected paragraphs of Supplement 10 to Appendix VIII of Section XI of the ASME Code. How does this request differ from Code Case N-695, which was endorsed in Regulatory Guide 1.147, Revision 14?

TVA Response to NRC Request 3.1

TVA is hereby withdrawing request for relief 3-ISI-16. Instead, TVA will adopt ASME Code Case N-695 as endorsed in Regulatory Guide 1.147, Revision 14.

NRC Request 4.1 (3-ISI-17)

Relief Request No. 3-ISI-17 proposed an alternative to the qualification of procedures, personnel, and equipment to examine structural weld overlays. The alternative references

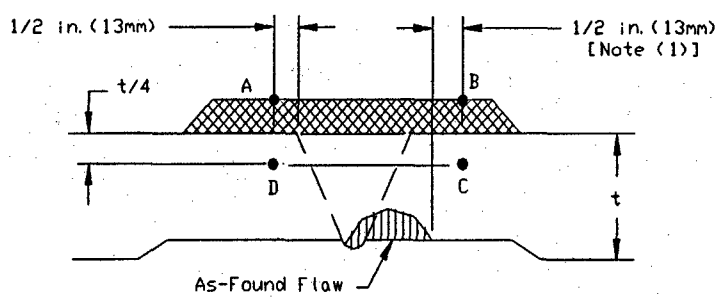
the 2001 Edition with 2003 Addenda of Supplement 11 to Appendix VIII of Section XI of the ASME Code. In 10 CFR 50.55a(b)(2)(xxiv), prohibits the use of the 2002 Addenda through the latest edition and addenda of Appendix VIII and Article I-3000 of ASME Section XI. The proposed alternative is requesting to use a part of the ASME Code that is prohibited by 10 CFR 50.55a. State the specific edition and addenda of the ASME Code that will be used for Supplement 11 and the scanning directions that will be used.

TVA Response to NRC Request 4.1

BFN has existing standard overlays. The definition of a standard overlay is taken from the Performance Demonstration Initiative (PDI) Generic Procedure. A "Standard" weld overlay is an overlay that does not join two different diameter components which are transitioned either with a reducer, expander or a tapered weld crown, such as a pipe to pipe, pipe to elbow, or nozzle to safe end.

Angle beam examinations will be performed from the overlay surface on both sides of the weld. The scanning will be performed with the beam looking in all four directions (upstream, downstream, clockwise, and counter-clockwise). The scan patterns shall provide a minimum 10 percent beam overlap.

The required volume to be examined will be in accordance with the figure below:



Examination Volume A-B-C-D

Attachment A

Request for Relief

3-PDI-4

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNIT 3
AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
SECTION XI, INSERVICE INSPECTION (ISI) PROGRAM
THIRD TEN-YEAR INSPECTION INTERVAL PROGRAM

REQUEST FOR RELIEF 3-PDI-4

EXECUTIVE SUMMARY:

In accordance with 10 CFR 50.55a(a)(3)(i), TVA is requesting relief from the specific requirements of performing the volumetric examination of the reactor pressure vessel (RPV) circumferential shell-to-flange welds in the subject TVA units in accordance with the requirement of Appendix I of Section XI. In addition, the guidance of Regulatory Guide (RG) 1.150, Revision 1, was historically applied with these processes. In lieu of the requirements of Appendix I and its associated sub-requirements of Article 4 of Section V, TVA will use the techniques, personnel, and equipment qualified to meet the requirements of ASME Section XI Appendix VIII, Supplements 4 and 6 of the 2001 Edition, in accordance with 10 CFR 50.55a(b)(2)(xxiv) and, as amended by Sections 10 CFR 50.55a(b)(2)(xv)(B) through 10 CFR 50.55a(b)(2)(xv)(G), and 10 CFR 50.55a(b)(2)(xvi)(A), by following the Electric Power Research Institute's (EPRI) Performance Demonstration Initiative (PDI) processes.

This proposed alternative represents the best available methodology in qualification of equipment and personnel performing ultrasonic examinations and uses an examination process that has provided and will provide the highest practical quality and greatest amount of coverage for the performance of the shell-to-flange weld examinations. As such, the proposed alternative methodology provides an acceptable level of quality and safety. In addition, the approval of this relief results in savings in the cost of performing the examinations, from having to incorporate the use of two different sets of examination equipment, and also results in lower personnel radiation exposure by not using a different methodology for the shell-to-flange weld. Note, this request for relief is consistent with that requested in the Duke Energy Company request for the Oconee, McGuire, and Catawba Nuclear Stations, RR-04-GO-002, submitted initially by letter to the NRC, dated July 14, 2004, and approved by the Staff in a letter dated October 20, 2004.

SYSTEM/COMPONENT(S) FOR WHICH RELIEF IS REQUESTED:

ASME Code Class 1 Reactor Pressure Vessel (RPV) Upper Vessel Shell-to-Flange Welds, Table IWB-2500-1 Category B-A, Item Number B1.30, TVA ISI Program Weld Designation 3-C-5-FLG.

APPLICABLE CODE EDITION AND ADDENDA FOR THE GIVEN EXAM:

ASME Section XI Code, 2001 Edition with the 2003 Addenda, as amended by 10 CFR 50.55a, "Mandatory Limitations and Modifications,"

CODE REQUIREMENTS FROM WHICH RELIEF IS REQUESTED:

In accordance with ASME Section XI, paragraph IWA-2232, "Ultrasonic examinations shall be conducted in accordance with Appendix I."

Further, in accordance with Appendix I, paragraph I-2110(b) "Ultrasonic examination of reactor vessel-to-flange welds, closure head-to-flange welds, and integral attachment welds shall be conducted in accordance with Article 4 of Section V, except that alternative examination beam angles may be used."

RELIEF REQUESTED:

Pursuant to 10 CFR 50.55a(a)(3)(i), TVA requests relief from performing the designated vessel shell-to-flange weld examination in accordance with the requirements of ASME Section XI, paragraph IWA-2232, Appendix I, and the associated Article 4 of Section V methodology in accordance with paragraph I-2110(b).

BASIS FOR RELIEF:

In accordance with ASME Section XI, Subarticle IWA-2232, TVA is required to perform ultrasonic examinations (UT) of the RPV upper shell-to-flange welds using Section XI, Appendix I, which in turn requires the use of the NDE methodologies and processes of ASME Section V, Article 4. In addition, the guidance of RG-1.150, Revision 1, has been historically applied. The above listed weld is the only circumferential shell weld in the RPV that is not examined in accordance with the requirements of ASME Section XI, Appendix VIII, as mandated in 10 CFR 50.55a with the issuance of the rule change shown in the Federal Register Notice 64 FR 51370, dated September 22, 1999. This rule change mandated the use of ASME Section XI, Appendix VIII, Supplements 4 and 6 for the conduct of RPV examinations. It has been recently stated in EPRI PDI coordination meetings between the PDI committee

members and the NRC Staff representatives that the NRC Staff expectations are that licensees should submit requests for relief to use the more technically advanced Appendix VIII/PDI processes for the shell-to-flange weld examinations, in lieu of the Section XI Appendix I and its associated Section V, Article 4 processes.

PROPOSED ALTERNATIVES:

TVA proposes the following. In lieu of the requirements of Appendix I and its associated sub-requirements of Article 4 of Section V, TVA will use the techniques, personnel, and equipment qualified to meet the requirements of ASME Section XI Appendix VIII, Supplements 4 and 6 of the 2001 Edition, in accordance with 10 CFR 50.55a(b)(2)(xxiv) and, as amended by Sections 10 CFR 50.55a(b)(2)(xv)(B) through 10 CFR 50.55a(b)(2)(xv)(G), and 10 CFR 50.55a(b)(2)(xvi)(A), by following the Electric Power Research Institute's (EPRI) Performance Demonstration Initiative (PDI) processes, to conduct the required vessel-to-flange weld examinations.

JUSTIFICATION FOR GRANTING RELIEF:

ASME Section V, Article 4, describes the required techniques to be used for the UT of welds in ferretic pressure vessels with wall thicknesses greater than 2 inches. The techniques were first published in ASME Section V in the 1974 Edition, summer 1975 Addenda. The calibration techniques, recording criteria and flaw sizing methods are based upon the use of a distance-amplitude-correction curve (DAC) derived from machined reflectors in a basic calibration block. UT performed in accordance with Section V, Article 4, used recording thresholds of 50 percent DAC for the outer 80 percent of the required examination volume and 20 percent DAC from the clad/base metal interface to the inner 20 percent margin of the examination volume. Indications detected in the designated exam volume portions, with amplitudes below these thresholds, were therefore not required to be recorded. Use of the Appendix VIII/PDI processes would enhance the quality of the examination results reported because the detection sensitivity is more conservative and the procedure requires the examiner to evaluate all indications determined to be flaws regardless of their associated amplitude. The recording thresholds in Section V, Article 4, requirements and in the guidelines of RG-1.150, Revision 1, are generic and somewhat arbitrary and do not take into consideration such factors as flaw orientation, which can influence the amplitude of UT responses.

The EPRI Report NP-6273, "Accuracy of Ultrasonic Flaw Sizing

Techniques for Reactor Pressure Vessels," dated March 1989, established that UT flaw sizing techniques based on tip diffraction are the most accurate. The qualified prescriptive-based UT procedures of ASME Section V, Article 4 have been applied in a controlled process with mockups of RPVs which contained real flaws and the results statistically analyzed according to the screening criteria in Appendix VIII of ASME Section XI. The results show that the procedures in Section V, Article 4, are less effective in detecting flaws than procedures qualified in accordance with Appendix VIII as administered by the PDI processes. Appendix VIII/PDI qualification procedures use the tip diffraction techniques for flaw sizing. The proposed alternative Appendix VIII/PDI UT methodology uses analysis tools based upon echo dynamic motion and tip diffraction criteria which has been validated, and is considered more accurate than the Section V, Article 4 processes.

UT performed in accordance with the Section V, Article 4 processes requires the use of beam angles of 0°, 45°, 60°, and 70° with recording criteria that precipitates equipment changes. Having to perform these process changes is time consuming and results in increased radiation exposure for the examination personnel.

Compliance with the specific ASME Section XI, Appendix I requirements for the RPV circumferential shell-to-flange weld, when the data is obtained using a less technically advanced process, results in an examination that does not provide a compensating increase in quality and safety for the higher costs and personnel exposures involved.

Past RPV shell-to-flange examinations already performed at TVA plants and units (i.e., for BFN Units 2 and 3) used automated and manual UT systems operated by qualified vendors. The examination coverage achieved during the 2001 exam of the Unit 2 weld (during the second Ten-Year ISI program interval) resulted in a coverage of approximately 76.6 percent which is less than the required essentially 100 percent. Manual examination techniques were performed from the outside surfaces of the RPV during the Unit 2 examination in order to maximize the coverage. Examination coverage performed from the inside surfaces was limited due to the taper in the vessel wall at the edge of the weld area and the obstructions encountered with the guide rods and the steam nozzle plugs with the specific UT equipment used during the exam. The manual examination of the weld volume performed from the outside surfaces was limited by the flange configuration. This limited exam with a percentage of coverage of less than 90 percent was the subject of a BFN

Unit 2 relief request number 2-ISI-14. This relief was reviewed by the NRC and found to be acceptable. A safety evaluation report (SER), for this relief, was issued by the NRC in a letter to J. A. Scalice, from Allen G. Howe, dated April 3, 2003. The examination performed on the Unit 3 RPV used a different set (newer designed) of UT equipment and, thereby, achieved a calculated coverage of 95 percent. Therefore, the Unit 3 examination results did not require the submittal and review of a relief request.

For future RPV shell-to-flange weld examinations, TVA does not anticipate any less coverage than the required minimum of 90 percent of coverage. However, if any such limitations are encountered during the conduct of the examinations, separate individual relief requests will be submitted, as needed.

Procedures, equipment, and personnel qualified through the Appendix VIII, Supplements 4 and 6 PDI programs have shown to have a high probability of detection of flaws and are generally considered superior to the techniques employed earlier for RPV examinations. This results in increased reliability of RPV inspections and conditions where an acceptable level of quality and safety is provided with the proposed alternative methodologies. Accordingly, approval of this alternative evaluation process is requested pursuant to 10 CFR 50.55a(a)(3)(i).

IMPLEMENTATION SCHEDULE AND DURATION:

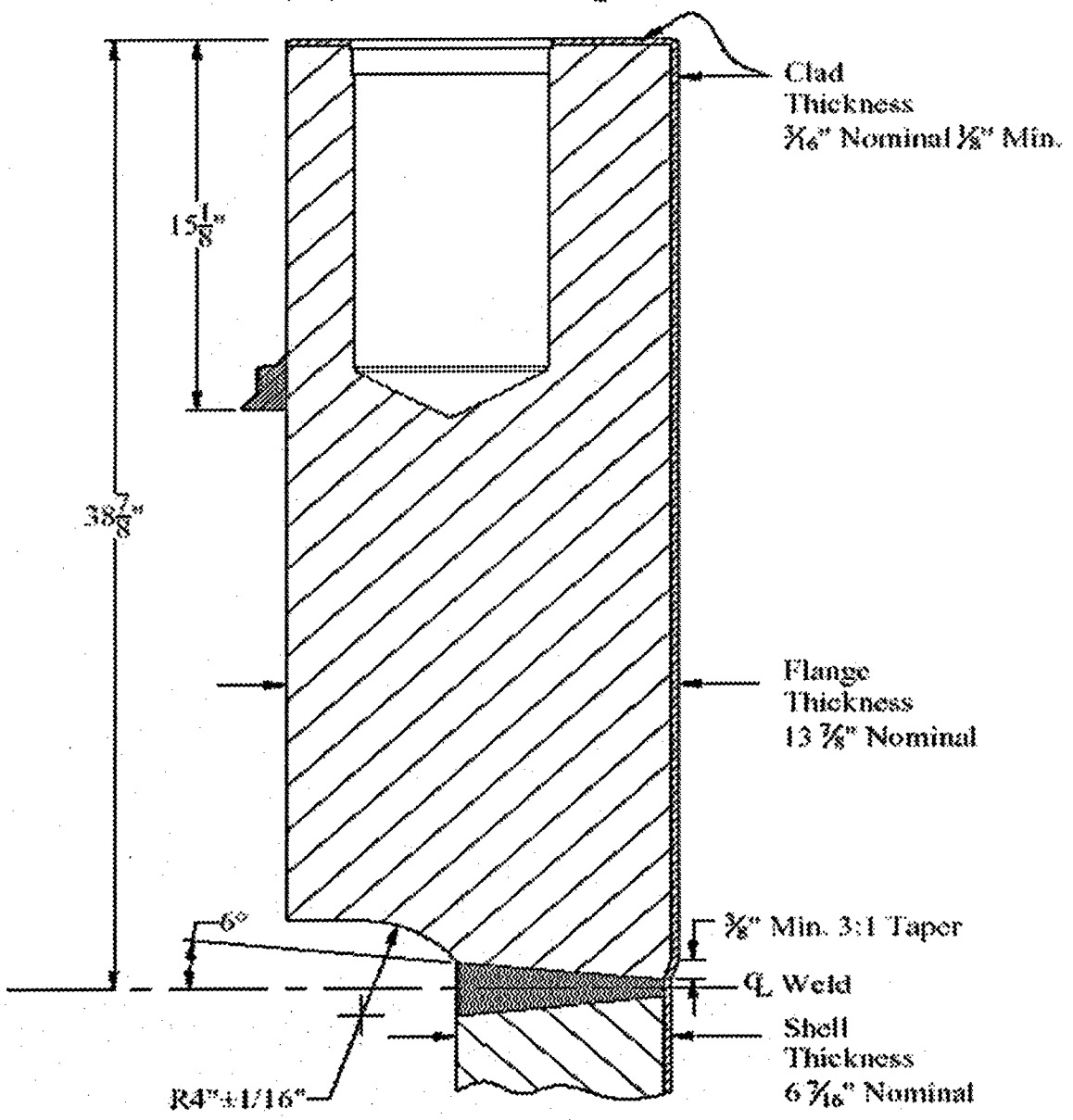
This alternative will be applied for BFN Unit 3 until the end of the unit's current Ten-Year ISI Program interval when the unit's corresponding ISI programs are updated.

BFN Unit 3 is currently in the first period of its third 10-year ISI program interval which extends from November 19, 2005 through November 18, 2015.

Precedents:

This request for relief is consistent with, and closely follows, the content and statements made in, the relief requested in the Duke Energy Company request for the Oconee, McGuire, and Catawba Nuclear Stations, RR-04-GO-002, submitted initially in a letter to the NRC, dated July 14, 2004 and approved by the NRC Staff in a letter dated October 20, 2004. In addition, other similar approved requests include those for the Southern California Edison Company with the San Onofre Unit 3 by letter dated January 3, 2003, and with the Public Service Enterprise Group, Salem Unit 1 plant by letter dated May 3, 2001.

Figure 1
BFN Units 1, 2, & 3 RPV Flange to Shell Weld



Attachment B

Request for Relief

3-ISI-17

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNIT 3
AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
SECTION XI, INSERVICE INSPECTION (ISI) PROGRAM
THIRD TEN-YEAR INSPECTION INTERVAL PROGRAM

REQUEST FOR RELIEF 3-ISI-17

Executive Summary:

In accordance with 10 CFR 50.55a(a)(3)(i), TVA is requesting relief from inservice inspection requirements of the 2001 Edition, as amended by 10 CFR 50.55a(b)(2)(xxiv), of Section XI, Appendix VIII, Supplement 11, "Qualification Requirements For Full Structural Overlaid Wrought Austenitic Piping Welds", of the ASME Boiler and Pressure Vessel Code. The Performance Demonstration Initiative (PDI) Program for implementation of the Supplement 11 qualification program for overlay welds is not in strict compliance with the requirements of Supplement 11 of the 2001 Edition, as amended by 10 CFR 50.55a(b)(2)(xxiv). TVA proposes to use the PDI Program for implementation of Appendix VIII, Supplement 11 as amended in the attachment to this request for relief. The amendments to Supplement 11 as shown in attachment were coordinated with PDI, NRC, and Pacific Northwest National Laboratory (PNNL).

System(s): Recirculation (RECIRC), and Residual Heat Removal (RHR) Systems

Components: Piping Welds with Structural Weld Overlay

ASME Code Class: ASME Code Class 1

Section XI Edition: 2001 Edition, 2003 Addenda, as amended by 10 CFR 50.55a(b)(2)(xxiv)

Code Table: Westinghouse Owners Group (WOG) Topical Report WCAP-14572, Revision 1-NP-A, Table 4.1-1

Examination Category: R-A, Risk-Informed Piping Examinations

Examination Item Number: R1.16, Elements Subject To Intergranular Stress Corrosion Cracking (IGSCC)

Code Requirement: The 2001 Edition of ASME Section XI, as amended by 10 CFR 50.55a(b)(2)(xxiv), WCAP-14572, Revision 1-NP-A, Table 4.1-1, Examination Category R-A, Item No. R1.16, requires a volumetric (UT) examination of the pipe weld including the overlay. The UT examination must be performed using personnel, procedures, and equipment qualified in accordance with Appendix VIII, Supplement 11.

Code Requirements From Which Relief Is Requested: Relief is requested from the requirement to qualify personnel, procedures, and equipment in accordance with Appendix VIII, Supplement 11 as stated in the 2001 Edition of the ASME Section XI Code, as amended by 10 CFR 50.55a(b)(2) (xxiv).

List Of Items Associated With The Relief Request:

Weld Overlays that currently require examination in the Unit 3 Risk-Informed ISI Program:

WELD #	SYSTEM	PIPE SIZE	CATEGORY
GR-3-53	RECIRC	28.0"	E
DSRHR-3-11	RHR	20.0"	E

Weld Overlays in the BFN Unit 3 Risk-Informed ISI Program that currently do not require examination:

WELD #	SYSTEM	PIPE SIZE	CATEGORY
GR-3-03	RECIRC	28.0"	E
GR-3-27	RECIRC	28.0"	E
GR-3-54	RECIRC	28.0"	E
GR-3-57	RECIRC	28.0"	E
GR-3-59	RECIRC	28.0"	E
GR-3-60	RECIRC	28.0"	E
GR-3-64	RECIRC	28.0"	E

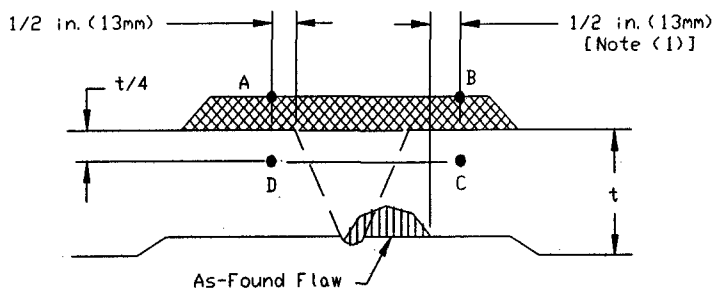
Basis For Relief: The requirements of ASME Section XI, Appendix VIII, Supplement 11, as stated in the 2001 Edition, as amended by 10 CFR 50.55a(b)(2)(xxiv), are not practical to implement. The requirements were amended to improve the implementation process. The amended requirements are contained in the attachment to this relief request. The EPRI sponsored PDI amendments to Supplement 11, as shown in the attachment, were coordinated with PDI, NRC, and PNNL.

The proposed amended requirements of Supplement 11 for the qualification of personnel, procedures, and equipment will provide an alternative with an acceptable level of quality and safety.

Alternate Requirement: TVA proposes to utilize personnel, procedures, and equipment qualified in accordance with ASME Section XI, Appendix VIII, Supplement 11 as amended by the Attachment, which is the EPRI administered PDI Program.

Angle beam examinations will be performed from the overlay surface on both sides of the weld. The scanning will be performed with the beam looking in all four directions (upstream, downstream, clockwise, and counter-clockwise). The scan patterns shall provide a minimum 10 percent beam overlap.

The required volume to be examined will be in accordance with the figure below:



Examination Volume A-B-C-D

Justification For The Granting Of Relief:

The proposed amended criteria (as shown in the attachment) to the requirements of the ASME Section XI, 2001 Edition, as amended by 10 CFR 50.55a(b)(2)(xxiv), Appendix VIII, Supplement 11, which were coordinated through PDI, NRC, and PNNL, provides an alternative with an acceptable level of quality and safety.

NOTE: This request for relief (RFR) is consistent with one submitted by Brunswick Steam Electric Plant to the NRC by letters dated July 16, 2002 and February 11, 2003. The NRC approved the request for relief by letter dated March 26, 2003. This request for relief is also consistent with the BFN Unit 3 second Ten-year Interval request for relief (3-ISI-17) which was approved by NRC letter dated December 19, 2003.

Implementation Schedule: This request for relief is applicable to the Unit 3 Third Ten-Year ISI inspection interval which expires on November 18, 2015.

Attachment: Table - Comparison of ASME Section XI, Appendix VIII, Supplement 11 and PDI Alternative.

ATTACHMENT

3-ISI-17

Comparison of ASME Section XI, Appendix VIII, Supplement 11 and PDI Alternative

SUPPLEMENT 11 - QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENETIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
1.0 SPECIMEN REQUIREMENTS	
Qualification test specimens shall meet the requirements listed herein, unless a set of specimens is designed to accommodate specific limitations stated in the scope of the examination procedure (e.g., pipe size, weld joint configuration, access limitations). The same specimens may be used to demonstrate both detection and sizing qualification.	**No Change**
1.1 General. The specimen set shall conform to the following requirements.	**No Change**
(a) Specimens shall have sufficient volume to minimize spurious reflections that may interfere with the interpretation process.	**No Change**
(b) The specimen set shall consist of at least three specimens having different nominal pipe diameters and overlay thicknesses. They shall include the minimum and maximum nominal pipe diameters for which the examination procedure is applicable. Pipe diameters within a range of 0.9 to 1.5 times a nominal diameter shall be considered equivalent. If the procedure is	*(b)* The specimen set shall consist of at least three specimens having different nominal pipe diameters and overlay thicknesses. They shall include the minimum and maximum nominal pipe diameters for which the examination procedure is applicable. Pipe diameters within a range of 0.9 to 1.5 times a nominal diameter

applicable to pipe diameters of 24 inches or larger, the specimen set must include at least one specimen 24 inches or larger but need not include the maximum diameter. The specimen set must include at least one specimen with overlay thickness within -0.1 inches to +0.25 inches of the maximum nominal overlay thickness for which the procedure is applicable.		shall be considered equivalent. If the procedure is applicable to pipe diameters of 24 inches or larger, the specimen set must include at least one specimen 24 inches or larger but need not include the maximum diameter. The specimen set shall include specimens with overlays not thicker than 0.1 inches more than the minimum thickness, nor thinner than 0.25 inches of the maximum nominal overlay thickness for which the examination procedure is applicable.
(c) The surface condition of at least two specimens shall approximate the roughest surface condition for which the examination procedure is applicable.		**No Change**
(d) Flaw Conditions		
(1) Base metal flaws. All flaws must be cracks in or near the butt weld heat-affected zone, open to the inside surface, and extending at least 75 percent through the base metal wall. Flaws may extend 100 percent through the base metal and into the overlay material; in this case, intentional overlay fabrication flaws shall not interfere with ultrasonic detection or characterization of the cracking. Specimens containing IGSCC shall be used when available.		(1) Base metal flaws. All flaws must be in or near the butt weld heat-affected zone, open to the inside surface, and extending at least 75 percent through the base metal wall. Intentional overlay fabrication flaws shall not interfere with ultrasonic detection or characterization of the base metal flaws. Specimens containing IGSCC shall be used when available. At least 70 percent of the flaws in the detection and sizing tests shall be cracks and the remainder shall be alternative flaws.

	Alternative flaw mechanisms, if used, shall provide crack-like reflective characteristics and shall be limited by the following: (a) The use of Alternative flaws shall be limited to when the implantation of cracks produces spurious reflectors that are uncharacteristic of actual flaws. (b) Flaws shall be semi-elliptical with a tip width of less than or equal to 0.002 inches.
(2) Overlay fabrication flaws. At least 40 percent of the flaws shall be non-crack fabrication flaws (e.g., sidewall lack of fusion or laminar lack of bond) in the overlay or the pipe-to-overlay interface. At least 20 percent of the flaws shall be cracks. The balance of the flaws shall be of either type.	**No Change**
(e) Detection Specimens	
(1) At least 20 percent but less than 40 percent of the flaws shall be oriented within ±20 degrees of the pipe axial direction. The remainder shall be oriented circumferentially. Flaws shall not be open to any surface to which the candidate has physical or visual access. The rules of IWA-3300 shall be used to determine whether closely spaced	(1) At least 20 percent but less than 40 percent of the base metal flaws shall be oriented within ±20 degrees of the pipe axial direction. The remainder shall be oriented circumferentially. Flaws shall not be open to any surface to which the candidate has physical or visual access.

flaws should be treated as single or multiple flaws.		
(2) Specimens shall be divided into base and overlay grading units. Each specimen shall contain one or both types of grading units.		(2) Specimens shall be divided into base metal and overlay fabrication grading units. Each specimen shall contain one or both types of grading units. Flaws shall not interfere with ultrasonic detection or characterization of other flaws.
(a)(1) A base grading unit shall include at least 3 inches of the length of the overlaid weld. The base grading unit includes the outer 25 percent of the overlaid weld and base metal on both sides. The base grading unit shall not include the inner 75 percent of the overlaid weld and base metal overlay material, or base metal-to-overlay interface.		*(a)(1)* The base metal grading unit includes the overlay material and the outer 25 percent of the original overlaid weld. The base metal grading unit shall extend circumferentially for at least 1 inch and shall start at the weld centerline and be wide enough in the axial direction to encompass one half of the original weld crown and a minimum of 0.50″ of the adjacent base material.
(a)(2) When base metal cracking penetrates into the overlay material, the base grading unit shall include the overlay metal within 1 inch of the crack location. This portion of the overlay material shall not be used as part of any overlay grading unit.		(a)(2) When base metal flaws penetrate into the overlay material, the base metal grading unit shall not be used as part of any overlay fabrication grading unit.
(a)(3) When a base grading unit is designed to be unflawed, at least 1 inch of unflawed overlaid weld and base metal shall exist on either side of the base grading unit. The segment of weld length used in one base grading unit shall not be used in		(a)(3) Sufficient unflawed overlaid weld and base metal shall exist on all sides of the grading unit to preclude interfering reflections from adjacent flaws.

another base grading unit. Base grading units need not be uniformly spaced around the specimen.	
(b) (1) An overlay grading unit shall include the overlay material and the base metal-to-overlay interface of at least 6 square inches. The overlay grading unit shall be rectangular, with minimum dimensions of 2 inches.	*(b)* (1) An overlay fabrication grading unit shall include the overlay material and the base metal-to-overlay interface for a length of at least 1 inch.
(b) (2) An overlay grading unit designed to be unflawed shall be surrounded by unflawed overlay material and unflawed base metal-to-overlay interface for at least 1 inch around its entire perimeter. The specific area used in one overlay grading unit shall not be used in another overlay grading unit. Overlay grading units need not be spaced uniformly about the specimen.	(b) (2) Overlay fabrication grading units designed to be unflawed shall be separated by unflawed overlay material and unflawed base metal-to-overlay interface for at least 1 inch at both ends. Sufficient unflawed overlaid weld and base metal shall exist on both sides of the overlay fabrication grading unit to preclude interfering reflections from adjacent flaws. The specific area used in one overlay fabrication grading unit shall not be used in another overlay fabrication grading unit. Overlay fabrication grading units need not be spaced uniformly about the specimen.
(b) (3) Detection sets shall be selected from Table VIII-S2-1. The minimum detection sample set is five flawed base grading units, ten unflawed base grading units, five flawed overlay grading units, and ten unflawed overlay grading units. For each type of grading unit, the set shall contain at least twice as many unflawed as flawed grading units.	(b) (3) Detection sets shall be selected from Table VIII-S2-1. The minimum detection sample set is five flawed base metal grading units, ten unflawed base metal grading units, five flawed overlay fabrication grading units, and ten unflawed overlay fabrication grading units. For each type of grading unit, the set shall

	contain at least twice as many unflawed as flawed grading units. For initial procedure qualification, detection sets shall include the equivalent of three personnel qualification sets. To qualify new values of essential variables, at least one personnel qualification set is required.
(f) Sizing Specimen	
(1) The minimum number of flaws shall be ten. At least 30 percent of the flaws shall be overlay fabrication flaws. At least 40 percent of the flaws shall be cracks open to the inside surface.	(1) The minimum number of flaws shall be ten. At least 30 percent of the flaws shall be overlay fabrication flaws. At least 40 percent of the flaws shall be open to the inside surface. Sizing sets shall contain a distribution of flaw dimensions to assess sizing capabilities. For initial procedure qualification, sizing sets shall include the equivalent of three personnel qualification sets. To qualify new values of essential variables, at least one personnel qualification set is required.
(2) At least 20 percent but less than 40 percent of the flaws shall be oriented axially. The remainder shall be oriented circumferentially. Flaws shall not be open to any surface to which the candidate has physical or visual access.	**No Change**
(3) Base metal cracking used for length sizing demonstrations shall be oriented circumferentially.	(3) Base metal flaws used for length sizing demonstrations shall be oriented circumferentially.

(4) Depth sizing specimen sets shall include at least two distinct locations where cracking in the base metal extends into the overlay material by at least 0.1 inches in the through-wall direction.		(4) Depth sizing specimen sets shall include at least two distinct locations where a base metal flaw extends into the overlay material by at least 0.1 inches in the through-wall direction.
2.0 CONDUCT OF PERFORMANCE DEMONSTRATION		
The specimen inside surface and identification shall be concealed from the candidate. All examinations shall be completed prior to grading the results and presenting the results to the candidate. Divulgence of particular specimen results or candidate viewing of unmasked specimens after the performance demonstration is prohibited.		The specimen inside surface and identification shall be concealed from the candidate. All examinations shall be completed prior to grading the results and presenting the results to the candidate. Divulgence of particular specimen results or candidate viewing of unmasked specimens after the performance demonstration is prohibited. The overlay fabrication flaw test and the base metal flaw test may be performed separately.

2.1 Detection Test.		
Flawed and unflawed grading units shall be randomly mixed. Although the boundaries of specific grading units shall not be revealed to the candidate, the candidate shall be made aware of the type or types of grading units (base or overlay) that are present for each specimen.		Flawed and unflawed grading units shall be randomly mixed. Although the boundaries of specific grading units shall not be revealed to the candidate, the candidate shall be made aware of the type or types of grading units (base metal or overlay fabrication) that are present for each specimen.

2.2 Length Sizing Test		
(a) The length sizing test may be conducted separately or in conjunction with the detection test.		**No Change**
(b) When the length sizing test is conducted in conjunction with the detection test and the detected flaws do not satisfy the requirements of 1.1(f), additional specimens shall be provided to the candidate. The regions containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the length of the flaw in each region.		**No Change**
For a separate length sizing test, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the length of the flaw in each region.		**No Change**
(d) For flaws in base grading units, the candidate shall estimate the length of that part of the flaw that is in the outer 25 percent of the base wall thickness.		*(d)* For flaws in base metal grading units, the candidate shall estimate the length of that part of the flaw that is in the outer 25 percent of the base metal wall thickness.
2.3 Depth Sizing Test.		
For the depth sizing test, 80 percent of the flaws shall be sized at a specific location on the surface of the specimen identified to the candidate. For the remaining flaws, the regions		(a) The depth sizing test may be conducted separately or in conjunction with the detection test.

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.		
		(b) When the depth sizing test is conducted in conjunction with the detection test and the detected flaws do not satisfy the requirements of 1.1(f), additional specimens shall be provided to the candidate. The regions 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.
		(c) For a separate depth sizing test, 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.
3.0 ACCEPTANCE CRITERIA		
3.1 Detection Acceptance Criteria.		
Examination procedures, equipment, and personnel are qualified for detection when the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for both detection and false calls. The criteria shall be satisfied separately by the demonstration results		(a) Examination procedures are qualified for detection when:

for base grading units and for overlay grading units.		
		1) All flaws within the scope of the procedure are detected and the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for false calls.
		(2) At least one successful personnel demonstration has been performed meeting the acceptance criteria defined in (b).
		(b) Examination equipment and personnel are qualified for detection when the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for both detection and false calls.
		(c) The criteria in (a), (b) shall be satisfied separately by the demonstration results for base metal grading units and for overlay fabrication grading units.
3.2 Sizing Acceptance Criteria.		
Examination procedures, equipment, and personnel are qualified for sizing when the results of the performance demonstration satisfy the following criteria.		**No Change**
(a) The RMS error of the flaw length measurements,		*(a)* The RMS error of the flaw length

as compared to the true flaw lengths, is less than or equal to 0.75 inches. The length of base metal cracking is measured at the 75 percent through-base-metal position.		measurements, as compared to the true flaw lengths, is less than or equal to 0.75 inches. The length of base metal flaws is measured at the 75 percent through-base-metal position.
(b) All extensions of base metal cracking into the overlay material by at least 0.1 inches are reported as being intrusions into the overlay material.		This requirement is omitted.
(c) The RMS error of the flaw depth measurements, as compared to the true flaw depths, is less than or equal to 0.125 inches.		*(b)* The RMS error of the flaw depth measurements, as compared to the true flaw depths, is less than or equal to 0.125 inches.