UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 3, 2009

Mr. Ashok S. Bhatnagar
Senior Vice President, Nuclear Generation
Development and Construction
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 2 - RELIEF REQUEST WBN-2/PDI-4 RELATED TO ULTRASONIC EXAMINATION OF THE REACTOR PRESSURE VESSEL SHELL-TO-FLANGE WELDS (TAC NO. ME0022)

Dear Mr. Bhatnagar:

By letter dated October 30, 2008, Tennessee Valley Authority (TVA) submitted Relief Request WBN-2/PDI-4, which proposes an alternative to the requirements of American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI, paragraph IWA-2232 of the 2001 Edition through the 2003 Addenda, for the Preservice Inspection Program at Watts Bar Nuclear Plant, Unit 2. Specifically, TVA proposed the use of Appendix VIII and Performance Demonstration Initiative for examination of the reactor pressure vessel shell-to-flange welds in lieu of the requirements of Appendix I and the associated Article 4 of ASME Code Section V.

The Nuclear Regulatory Commission staff has completed its review of the subject relief request. The staff finds that TVA's proposed alternative provides an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the alternative proposed in Relief Request WBN-2/PDI-4 is authorized for the performance of the Preservice Inspection Program at Watts Bar Nuclear Plant, Unit 2. The staff's evaluation and conclusions are contained in the enclosed safety evaluation.

If you have any questions regarding this matter, please contact Joel S. Wiebe at 301-415-6606 or via e-mail at Joel.Wiebe@nrc.gov.

Sincerely,

L. Raghavan, Chief
Watts Bar Special Projects Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No: 50-391

Enclosure:
Safety Evaluation

cc w/encl: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
REQUEST FOR APPROVAL OF RELIEF REQUEST WBN-2/PDI-4
REGARDING USE OF APPENDIX VIII
WATTS BAR NUCLEAR PLANT, UNIT 2
TENNESSEE VALLEY AUTHORITY
DOCKET NO. 50-391

1.0 INTRODUCTION

By letter dated October 30, 2008, Tennessee Valley Authority (TVA) requested, pursuant to Section 50.55a(a)(3)(i) of Part 50 of Title 10 of the Code of Federal Regulations (10 CFR), approval of Relief Request (RR) WBN-2/PDI-4, which proposes an alternative to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, paragraph IWA-2232 of the ASME Section XI 2001 Edition through the 2003 Addenda. Specifically, in RR WBN-2/PDI-4, TVA proposes to use the requirements of Appendix VIII and Performance Demonstration Initiative (PDI) for examination of the reactor pressure vessel shell-to-flange welds in lieu of the requirements of Appendix I and the associated Article 4 of ASME Code Section V for the Preservice Inspection (PSI) Program at Watts Bar Nuclear Plant, Unit 2 (WBN-2).

2.0 REGULATORY EVALUATION

The regulations in 10 CFR 50.55a(g)(2) specify that for a boiling or pressurized water-cooled nuclear power facilities whose construction permit was issued on or after January 1, 1971, but before July 1, 1974, components (including supports) which are classified as ASME Code Class 1 and 2 must be designed and be provided with access to enable the performance of inservice examination of such components (including supports) and must meet the preservice examination requirements of ASME Section XI. As stated in 10 CFR 50.55a(a)(3), alternatives to the requirements of paragraph (g) may be used, when authorized by the Nuclear Regulatory Commission (NRC), if (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. It is stated in 10 CFR 50.55a(g)(5)(iii) that if the licensee has determined that conformance with certain code requirements is impractical for its facility, the licensee shall notify the Commission and submit information, as specified in 10 CFR 50.4, to support the determinations.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of components. The regulations require that inservice examination of components and system pressure tests conducted during

the first 10-year interval and subsequent intervals comply with the requirements of the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The applicable code of record for the preservice examinations at WBN-2 is the ASME Code, Section XI, 2001 Edition through the 2003 Addenda. The proposed RR is sought for the performance of the WBN-2 PSI Program. The information provided by the licensee in support of the request has been evaluated by the NRC staff and the bases for disposition are documented below.

3.0 TECHNICAL EVALUATION

3.1 Affected Components

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.

3.2 Applicable Code Requirements

In accordance with ASME Code, Section XI, Table IWB-2500-1 Category B-A, Item Number B1.30, upper vessel shell-to-flange welds require a volumetric examination of essentially 100 percent of the weld length. In addition, ASME Code, Section XI, Paragraph IWA-2232 states that: "Ultrasonic examinations shall be conducted in accordance with Appendix I." Further, ASME Code, Section XI, Appendix I, Paragraph I-2110 (b) states that: "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."

3.3 Proposed Alternative

TVA proposed as an alternative "to use the procedures, personnel, and equipment qualified to meet the requirements of ASME Code, Section XI, Appendix VIII, Supplements 4 and 6 as administered by the Electric Power Research Institute's PDI to conduct the required vessel-to-flange weld examinations."

3.4 TVA's Basis for the Alternative

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 signal amplitude. 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, resulting in increased reliability of RPV inspections.

3.5 NRC Staff Evaluation

TVA has proposed to examine the RPV flange-to-upper shell weld from the reactor vessel inside surface by using procedures, equipment, and personnel qualified by PDI. TVA will use remote mechanized equipment to examine the reactor vessel flange-to-shell weld from the inside

surface in accordance with the PDI requirements. In September 1999, 10 CFR 50.55a was issued and required an expedited implementation of the 1995 Edition with 1996 Addenda, ASME Code, Section XI, Appendix VIII supplements in accordance with specific dates and specific components to be examined. The RPV flange-to-upper shell weld was not included in the September 1999 10 CFR 50.55a PDI requirements.

Supplement 4 to Appendix VIII provides requirements for qualification of examinations of the cladding to base metal interface of the reactor vessel. Supplement 6 to Appendix VIII provides requirements for qualification of reactor vessel welds other than the cladding to base metal interface for reactor vessels. These PDI-qualified procedures are technically superior to the previous ASME Code, Section V, Article 4 methodologies that are amplitude based. The PDI examinations are more sensitive to identifying flaws, because the examination sensitivity levels, detailed procedure criteria, and blind demonstrations enhance or verify their effectiveness. Prior to implementing PDI examinations volumetric examinations in accordance with ASME Code, Section V were conducted at the less sensitive level of 50 percent distance amplitude correction curve (DAC) for flaws located in the outer 80 percent of the material thickness and 20 percent DAC for flaws located from the clad-base metal interface to a depth of about 20 percent of the material thickness. In addition the PDI qualified procedures provide a higher level of flaw probability of detection because all signals are interpreted as flaws and are not dependent on minimum amplitude response. All indications will be measured and assessed in accordance with the applicable criteria.

The NRC staff determined that the licensee's proposed alternative to use the ASME Code, Section XI, Appendix VIII examination requirements in the performance of the reactor vessel inside surface volumetric examination surpasses the quality of the examination techniques specified by Section V of the ASME Code. Therefore, TVA's proposed alternative provides an acceptable level of quality and safety of the RPV flange-to-upper shell weld.

4.0 CONCLUSION

The NRC staff has reviewed TVA's proposed RR WBN-2/PDI-4 submittal and concludes that the proposed alternative provides an acceptable level of quality and safety and is authorized, pursuant to 10 CFR 50.55a(a)(3)(i), for the performance of Preservice Inspection Program at Watts Bar Nuclear Plant, Unit 2. All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in the subject requests for relief remain applicable, including third-party review by the authorized Nuclear Inservice Inspector.

Principle Contributor: K. Hoffman

Date: September 3, 2009