

February 27, 2008

Mr. William R. Campbell, Jr.
Chief Nuclear Officer and
Executive Vice President
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: BROWNS FERRY NUCLEAR PLANT, UNIT 3 - SAFETY EVALUATION FOR
RELIEF REQUEST 3-ISI-7 REGARDING LIMITED EXAMINATION COVERAGE
FOR REACTOR PRESSURE VESSEL NOZZLE-TO-VESSEL FULL
PENETRATION WELDS (TAC NO. MD5144)

Dear Mr. Campbell:

By a letter dated February 21, 2007, the Tennessee Valley Authority (TVA, the licensee) submitted Relief Request (RR) 3-ISI-7 requesting relief from the weld examination coverage requirements specified in the American Society of Mechanical Engineers (ASME), Boiler and Pressure vessel Codes Section XI, 1989 Edition, no addenda and the Code of Record for nondestructive examination is the 1995 Edition through the 1996 Addenda of the ASME Section XI, Division 1 Code. In lieu of the Code requirement for nearly 100 percent volume ultrasonic (UT) examination, the licensee proposes a UT examination of the accessible areas, to the maximum extent practical, given the component design configuration of the seven identified nozzle-to-vessel welds. However, in accordance with ASME Code, Section XI, IWA-2430, the licensee extended the second inspection interval by no more than 1 year to inspect the components addressed in RR 3-ISI-7. Section 50.55a(g)(5)(iv) requires submittal of a request for relief within 12 months of determining the requirement is impractical. The licensee's submittal of RR 3-ISI-7 was within 1 year of the date of these examinations.

Based on our review of your submittals, we have concluded that the ASME Code examination coverage requirements are impractical for the subject welds. Therefore, this request for relief is granted, pursuant to Title 10, *Code of Federal Regulations* (10 CFR) Section 50.55a(g)(6)(i), for the second inspection interval at Unit 3, pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Additionally, the NRC staff finds that the examination provided reasonable assurance of the structural integrity of the weld.

W. Campbell

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This relief is authorized for the second 10-year inservice inspection interval at Browns Ferry Nuclear Plant, Unit 3, which began November 19, 1995, and ended November 18, 2005.

Sincerely,

/RA/

Thomas H. Boyce, Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-296

Enclosure: Safety Evaluation

cc w/encl: See next page

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Tennessee Valley Authority

BROWNS FERRY NUCLEAR PLANT

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

INSERVICE INSPECTION PROGRAM

RELIEF REQUEST NO. 3-ISI-7

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT, UNIT 3

DOCKET NO. 50-296

1.0 INTRODUCTION

By a letter dated February 21, 2007, the Tennessee Valley Authority (TVA, the licensee) submitted Relief Request (RR) 3-ISI-7 requesting relief from the weld examination coverage requirements specified in American Society of Mechanical Engineers Boiler and Pressure Vessel (ASME) Code, Section XI, 1989 Edition, no addenda and the Code of Record for nondestructive examination (NDE) is the 1995 Edition through the 1996 Addenda of the ASME Section XI, Division 1 Code. For the 7 reactor pressure vessel (RPV) nozzle-to-shell welds, ASME Code requires volumetric examination of essentially 100 percent of the weld and adjacent base material as shown in Figure IWB-2500-7(a). In lieu of the ASME Code requirement of essentially 100 percent volume UT examination, TVA proposes an ultrasonic (UT) examination of accessible areas to the maximum extent practical given the component design configuration of the reactor pressure valve (RPV) nozzle-to-vessel welds. The subject relief is for the second 10-year inservice inspection (ISI) interval at Browns Ferry Unit 3, which began November 19, 1995, and ended November 18, 2005. However, in accordance with ASME Code, Section XI, IWA-2430, the licensee extended the second inspection interval by no more than 1 year to inspect the components addressed in Relief Request (RR) 3-ISI-7. The licensee's submittal of RR 3-ISI-7 was within 1 year of the date of these examinations.

2.0 REGULATORY REQUIREMENTS

The ISI of the ASME Code Class 1, Class 2, and Class 3 components is to be performed in accordance with Section XI of the ASME Code and applicable edition and addenda as required by Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g), except where specific relief has been granted by the Nuclear Regulatory Commission (NRC) pursuant to 10 CFR 50.55a(g)(6)(i). Section 50.55a(a)(3) to 10 CFR states that alternatives to the requirements of paragraph (g) may be used, when authorized by the 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.

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 the 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 in 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 ASME Code of record for the Unit 3 Second 10-year interval ISI program, which began on November 19, 1995, is the 1989 Edition of the ASME Code, Section XI, no Addenda. In accordance with 10 CFR 50.55a(g)(5)(iv), when an inspection requirement is determined to have been impractical, this determination must be demonstrated to the satisfaction of the Commission within 12 months of the end of the interval in which the examination was performed.

3.0 RELIEF REQUEST NO. 3-ISI-7

3.1 Component Description

The licensee requested relief from 100 percent volumetric examination for seven RPV nozzle-to-vessel welds with the following weld information and volumetric coverage:

Weld Number	Nozzle Type	Nozzle Size (OD)	Volumetric Coverage
N2G N/V	Recirculation outlet	12-inch	42 percent
N2H N/V	Recirculation inlet	12-inch	42 percent
N2J N/V	Recirculation inlet	12-inch	42 percent
N2K N/V	Recirculation inlet	12-inch	42 percent
N3C N/V	Main steam	26-inch	36 percent
N3D N/V	Main steam	26-inch	36 percent
N8D N/V	Recirculation jet pump instrumentation	4-inch	64 percent

3.2 Code Requirements for Which Relief is Requested

Examination Category B-D, Items B3.90 and B3.100, require 100 percent volumetric examination, as defined in Paragraph IWB-2500-7(a), of all Class 1 nozzle-to-shell welds, and nozzle inner radius sections, be performed during each inspection interval. ASME Code Case N-460, Alternative Examination Coverage for Class 1 and Class 2 Welds, as an alternative approved for use by the NRC in Regulatory Guide 1.147, "Inservice Inspection Code Case

Acceptability,” Revision 14, states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable provided that the reduction is less than 10 percent, i.e., greater than 90 percent examination coverage is obtained.

3.3 Licensee's Proposed Alternative

In lieu of the Code requirement for nearly 100 percent volume UT examination, the licensee proposes a UT examination of the accessible areas, to the maximum extent practical, given the component design configuration of the nozzle-to-vessel welds.

3.4 Evaluation

For RR 3-ISI-7, Revision 2, the ASME Code, Section XI, Table IWB-2500-1, Examination Category B-D, Items B3.90 and B3.100, Full Penetration Welds of Nozzles in Vessels, require all Class 1 nozzle-to-shell welds and nozzle inner radius sections to be inspected during each inspection interval. In accordance with 10 CFR 50.55a(g)(5)(iv), when an inspection requirement is determined to have been impractical, this determination must be demonstrated to the satisfaction of the Commission within 12 months of the end of the interval in which the examination was performed. The NRC staff confirmed that the licensee's submittal was made consistent with this requirement. The licensee proposed that, in lieu of the ASME Code-required essentially 100-percent volume UT examination, it would perform a UT examination of the accessible areas, to the maximum extent practical, given the component design configuration of the subject nozzle-to-vessel welds. As the licensee's RR submittal was made within 1 year of when the examinations were performed, the NRC staff determined it to have met the requirements of 10 CFR 50.55a(g)(5)(iv).

For RPV Nozzle-to-Vessel Welds N2G, N2H, N2J, N2K, N3C, N3D, and N8B, the NRC staff determined that the ASME Code-required examinations for the subject RPV nozzle-to-vessel welds are impractical to perform given the physical limitations caused by the geometries of the set-in barrel-type nozzle configurations and other access restrictions due to the proximity of the biological shield wall. In order for the licensee to perform the ASME Code-required examinations, the subject RPV nozzle-to-vessel welds would have to be redesigned, thus placing a significant burden on the licensee. Access to the nozzle-to-vessel welds is limited by a series of doorways in the concrete biological shield wall. Insulation behind these doorways is designed for removal around the nozzle circumference. In order to examine the welds in accordance with the ASME Code requirements the RPV would require extensive design modifications. The physical arrangements of the nozzle-to-vessel welds preclude UT examination from the nozzle side. The limitations are inherent to the barrel-type nozzle-to-vessel weld design and are compounded by the close proximity of the biological shield wall. Scanning from the nozzle surface is ineffective due to the weld location and the asymmetrical inside surface where the nozzle and vessel converge. Coverage was increased by scanning from the outside blend of radius of the weld where practical.

Radiographic examination as an alternate volumetric examination method was determined to be impractical due to the radiological concerns. Gaining access to the inside surface of the RPV to place radiographic film would require extensive personnel protection due to high radiation and contamination levels. Also, due to the varying thickness at the outside blend radius of the weld, several radiographs may be required of one area to obtain the required coverage and/or film density. The additional ASME Code coverage gained by radiography is impractical when weighed against the radiological concerns.

Scanning from the nozzle surface is ineffective due to the weld location and the asymmetrical inner surface where the nozzle and vessel converge. The RPV nozzle-to-vessel weld inspections were performed from the vessel side of the weldment.

The licensee obtained levels of coverage between 36 percent and 64 percent, for these nozzle-to-vessel welds from one side of the weld only. The areas receiving little or no examination coverage are located toward the outside surface of the reactor vessel in the general area of the nozzle outside blend radius. The reactor vessel inner-half thickness and inside surface were interrogated with the UT beam so that degradation located at the inside surface or inner-half of the vessel would be located. Given the weld configurations encountered, it is concluded that the risk-informed ISI-required weld and base material volumes were examined to the maximum extent practical. Current and previous examinations on the subject welds found no recordable indications or degradation in the examined areas. It is reasonable to conclude that if significant degradation were present, it would have been detected by the examinations that were performed. Therefore, the NRC staff determined that based on the information contained in the licensee's submittal, and the discussion above, the ASME Code-required volumetric examinations are impractical. To require the licensee to perform the ASME Code-required examinations would be a significant burden because the welds would be required to be redesigned. The NRC staff determined it is reasonable to conclude that any significant patterns of degradation would have been detected and the volumetric coverage obtained provides reasonable assurance of structural integrity of welds N2G, N2H, N2J, N2K, N3C, N3D, and N8B.

4.0 CONCLUSION

The NRC staff concludes that the ASME Code examination coverage requirements are impractical for the subject welds listed in Section 3.1. Based on the coverages obtained, if significant service-induced degradation were occurring, there is reasonable assurance that evidence of it would be detected by the examinations that were performed on the subject welds, and that the coverages obtained provides reasonable assurance of structural integrity of the subject welds. Therefore, this request for relief is granted, pursuant to 10 CFR 50.55a(g)(6)(i), for the Second inspection interval at Unit 3. This grant of relief is authorized by law and will not endanger life or property, or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. All other requirements of the ASME Code, Sections III and XI for which relief has not been specifically requested remain applicable, including a third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: Carolyn Fairbanks

Date: February 27, 2008