August 6, 2001

Mr. J. A. Scalice
Chief Nuclear Officer and
Executive Vice President
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, Tennessee 37402-2801

SUBJECT: BROWNS FERRY NUCLEAR PLANT, UNITS 2 AND 3 - EVALUATION OF RELIEF REQUEST NOS. CISI-1 THROUGH CISI-5: IMPLEMENTATION OF SUBSECTIONS IWE AND IWL OF ASME SECTION XI FOR CONTAINMENT INSPECTION FOR TENNESSEE VALLEY AUTHORITY (TAC NOS. MB1634 AND MB1635)

Dear Mr. Scalice:

By letter dated June 12, 2001, Tennessee Valley Authority (TVA), the licensee for the Browns Ferry Nuclear Plant, Units 2 and 3, submitted Relief Requests CISI-1 through CISI-5 for the U.S. Nuclear Regulatory Commission staff review and approval.

Based on the enclosed safety evaluation, the staff finds that for Relief Requests CISI-2 and CISI-5, the licensee's proposed alternatives will provide an acceptable level of quality and safety. Therefore, the proposed alternatives may be authorized pursuant to Title 10, *Code of Federal Regulations* (10 CFR), Section 50.55a(a)(3)(i). For Relief Requests CISI-1, CISI-3, and CISI-4, the staff concludes that compliance with the American Society of Mechanical Engineers Code requirements would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety, and that the licensee's proposed alternatives will provide reasonable assurance of containment pressure integrity. Therefore, these proposed alternatives may be authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

This completes the staff review of TAC Nos. MB1634 and MB1635. If you have any comments, please contact Kahtan Jabbour at 301-415-1496.

Sincerely,

/RA/
Ronald W. Hernan, Acting Chief, Section 2
Project Directorate II
Division of Project Licensing Management
Office of Nuclear Reactor Regulation

Dockets Nos. 50-260 and 50-296

Enclosure: As stated

cc w/encl: See next page

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By letter dated June 12, 2001, Tennessee Valley Authority (TVA), the licensee for the Browns Ferry Nuclear Plant, Units 2 and 3, submitted Relief Requests CISI-1 through CISI-5 for the U.S. Nuclear Regulatory Commission staff review and approval.

Based on the enclosed safety evaluation, the staff finds that for Relief Requests CISI-2 and CISI-5, the licensee's proposed alternatives will provide an acceptable level of quality and safety. Therefore, the proposed alternatives may be authorized pursuant to Title 10, *Code of Federal Regulations* (10 CFR), Section 50.55a(a)(3)(i). For Relief Requests CISI-1, CISI-3, and CISI-4, the staff concludes that compliance with the American Society of Mechanical Engineers Code requirements would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety, and that the licensee's proposed alternatives will provide reasonable assurance of containment pressure integrity. Therefore, these proposed alternatives may be authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

This completes the staff review of TAC Nos. MB1634 and MB1635. If you have any comments, please contact Kahtan Jabbour at 301-415-1496.

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***See previous concurrence**

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION OF RELIEF REQUESTS FROM ASME SECTION XI REQUIREMENTS FOR CONTAINMENT INSPECTION TENNESSEE VALLEY AUTHORITY'S BROWNS FERRY NUCLEAR PLANT, UNITS 2 AND 3 DOCKET NOS. 50-260 AND 50-296

1.0 INTRODUCTION

As noticed in the *Federal Register* dated August 8, 1996 (61 FR 41303), the U.S. Nuclear Regulatory Commission (NRC) amended its regulations to incorporate by reference the 1992 edition with 1992 addenda of Subsections IWE and IWL of Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code). Subsections IWE and IWL provide the requirements for inservice inspection (ISI) of Class CC (concrete containment), and Class MC (metallic containment) of light-water cooled power plants. The effective date for the amended rule was September 9, 1996, and it requires the licensees to incorporate the new requirements into their ISI plans and to complete the first containment inspection by September 9, 2001. However, a licensee may propose alternatives to or submit a request for relief from the requirements of the regulation pursuant to Title 10, *Code of Federal Regulations* (10 CFR) Sections 50.55a(a)(3) and (g)(5).

By the letter dated June 12, 2001 (Reference 1), Tennessee Valley Authority (TVA), the licensee, proposed several alternatives to the requirements of Subsection IWE of Section XI of the ASME Code (Relief Requests CISI-1 through CISI-5) for its Browns Ferry Nuclear Plant (BFN), Units 2 and 3. The NRC's findings with respect to authorizing the alternative or denying the proposed request are discussed in this evaluation.

2.0 EVALUATION

2.1 Relief Request CISI-1:

2.1.1 Code Requirements:

Table IWE-2500-1, Examination Category E-D, Items E5.10 and E5.20, requires seals and gaskets on airlocks, hatches, and other devices to be VT-3 visually examined once each inspection interval to assure containment leak-tight integrity.

2.1.2 Code Requirement From Which Relief Is Requested:

Relief is requested from performing the visual examination, VT-3, on the metal containment seals and gaskets.

2.1.3 Basis for Relief Request:

The design configuration of the connections which include seals and gaskets precludes visual examination of the seals and gaskets without disassembly of the connection. Testing the seals and gaskets in accordance with 10 CFR Part 50, Appendix J, provides adequate assurance of the leak-tight integrity of the seals and gaskets.

2.1.4 Alternative Examination:

The leak-tight integrity of seals and gaskets is tested in accordance with 10 CFR Part 50, Appendix J. Type B testing is performed at least once each ISI interval as required by 10 CFR Part 50, Appendix J, in addition to the Type B tests performed prior to disassembly and after re-assembly. Appendix J, Type A tests provide additional assurance that there is no significant leakage through the containment pressure boundary. No additional alternatives are proposed.

2.1.5 Justification for Granting Relief:

Title 10 CFR 50.55a was amended in the *Federal Register* (61 FR 41303) to require the use of the 1992 Edition, 1992 Addenda, of ASME Section XI when performing containment examinations. These examinations include visual examinations of seals and gaskets. The penetrations discussed below contain seals and gaskets:

Electrical Penetrations

Electrical penetrations use a header plate(s), or header plate canister assembly, welded to the containment penetration nozzle. Modules through which electrical conductors pass are installed in the header plate(s). The electrical penetrations presently installed at B are manufactured by Physical Sciences, General Electric (GE), and Conax. Physical Sciences penetrations are canister type and consist of compressed glass penetration seals and hermetically-sealed connector receptacles mounted in steel heater plates. The seals of this type of penetration are inaccessible. Two types of GE penetrations are installed canister and modular types. The canister type penetrations have a double seal at each end of the penetration. Insulated electrical conductors pass through header plates at each end and are sealed by cast epoxy with most of the epoxy on the inner side of the header plates which is inaccessible. Modular type GE penetrations are sealed by redundant epoxy barriers and metallic or elastomer O-rings. The modular GE penetration seals are completely inaccessible without disconnecting cabling and removal of the modules. Conax penetrations use a set of compression fittings and may include sealant compounds and/or O-rings. The Conax penetration seals are completely inaccessible without disconnecting cabling and removal of the modules.

Containment Personnel Airlocks, Drywell Head, Equipment Hatches, and Flanges and Hatches

The personnel airlock doors utilize an inner and outer door with O-ring seals to ensure leak-tight integrity. These airlocks also contain other gaskets and seals for items such as the handwheel shaft seals, electrical penetrations, and equalizing valves which require disassembly to gain

access to the gaskets and seals. The drywell head, equipment hatches, and all flanges and hatches utilize double O-ring seals.

Seals and gaskets receive a 10 CFR Part 50, Appendix J, Type B test. As noted in 10 CFR Part 50, Appendix J, the purpose of the Type B test is to measure leakage of containment penetrations whose design incorporates resilient seals, gaskets, or sealant compounds or flexible metal seal assemblies. Examination of seals and gaskets require the joints, which are proven adequate through Appendix J testing, to be disassembled. For electrical penetrations, this would involve performance of an Appendix J, Type B test prior to disassembly; determination of cables at electrical penetrations if enough cable slack is not available; disassembly of the joint (if designed to permit disassembly); removal and VT-3 visual examination of the seals and gaskets; re-assembly of the joint; re-termination of the cables if necessary; post maintenance testing of the cables; and performance of an Appendix J, Type B test upon final assembly. This imposes the risk that equipment could be damaged. In addition, a VT-3 examination does not ensure that these items, when reassembled, will not leak.

Note 1 for Examination Category E-D was modified in the 1992 Edition, 1993 Addenda, of ASME Section XI to state that sealed and gasket connections need not to be disassembled solely for performance of examinations. However, without disassembly, all of the surface of the seals and gaskets would be inaccessible.

In addition to the testing conducted prior to disassembly and after re-assembly, the containment personnel airlocks receive a Type B test within 7 days after each opening. For periods of multiple containment entries where the airlock doors are routinely used for access more frequently than once every 7 days, door seals may be tested once every 30 days during this time period. The airlock door seals are visually inspected prior to closure, as a normal maintenance practice, at least once every thirty months. Since the Type B tests assure the leak-tight integrity of primary containment, the performance of a VT-3 visual examination would not increase the level of safety or quality.

For equipment hatches, which are routinely disassembled, a Type B test is required prior to disassembly and upon final assembly. Since the Type B tests assure the leak-tight integrity of primary containment, the performance of a VT-3 visual examination would not increase the level of safety or quality. In addition, when the hatch is disassembled, the O-ring seals are visually inspected as a normal maintenance practice.

For flanges and hatches, should the connection(s) be disassembled, a Type B test is required prior to disassembly and upon final assembly prior to startup. Since the Type B tests assure the leak-tight integrity of primary containment, the performance of the VT-3 visual examination would not increase the level of safety or quality.

When the airlock, hatches, and flanges containing these seals and gaskets are tested in accordance with 10 CFR Part 50, Appendix J, degradation of the seal and gasket material would be revealed by an increase in the leakage rate. Corrective measures would be initiated and the component re-tested. Repair or replacement of seals and gaskets is not subject to ASME Section XI rules in accordance with Paragraph IWA-4111(b)(5).

Containment leakage is verified by 10 CFR Part 50, Appendix J, Type A tests. Although the Type A test does not verify individual penetration leakage, it does provide additional assurance

that there is no significant leakage through the containment pressure boundary, which includes all sealed penetrations.

The visual examination of seals and gaskets in accordance with Table IWE-2500-1, Examination Category E-D, Items E5.10 and E5.20, is a burden without any compensating increase in the level of safety or quality. Compliance with the specified requirements of performing a VT-3 visual examination of seals and gaskets would result in hardship or unusual difficulty for TVA without a compensating increase in the level of safety and quality. Testing the seals and gaskets in accordance with 10 CFR Part 50, Appendix J provides adequate assurance of the leak-tight integrity of the seals and gaskets.

In addition, the requirements to examine seals and gaskets has been removed in the 1998 Edition of ASME Section XI Code. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), TVA requests that relief be granted.

2.1.6 Staff Evaluation of CISI-1:

In lieu of performing the VT-3 examinations for containment penetration seals and gaskets, the licensee proposes to use the current program for leakage testing containment penetrations in accordance with 10 CFR Part 50, Appendix J.

In its request, the licensee stated that because most of the surface of the seals and gaskets associated with these penetrations are not accessible for examination when the penetration is assembled, containment penetrations seals and gaskets must be disassembled and re-assembled for the purpose of performing the VT-3 visual examination. These activities (disassembly and re-assembly of seals and gaskets) associated with a VT-3 visual examination would introduce the possibility of component damage that would not otherwise occur. In addition, a VT-3 examination does not ensure that these items, when reassembled, will not leak. The periodical test (Type B test) of penetrations in accordance with 10 CFR Part 50, Appendix J will detect local leakage and measure leakage across the leakage-limiting boundary of containment penetrations whose design incorporates resilient seals, gaskets, sealant compounds, and electrical penetrations fitted with flexible metal seal assemblies. If unacceptable leakage is identified during the test, corrective measures would be taken.

Also, the 1993 Addenda to ASME Code, Section XI has incorporated changes recognizing that disassembly of joints for the sole purpose of performing visual examination is unwarranted. Requiring the licensee to disassemble components for the sole purpose of inspecting seals and gaskets would place a significant hardship on the licensee without a compensating increase in the level of quality and safety.

On the basis discussed above, the staff concludes that the alternative proposed by the licensee will provide reasonable assurance of the functionality and integrity of the containment penetration seals and gaskets during the testing required by 10 CFR Part 50, Appendix J. The proposed alternative is authorized pursuant to 10 CFR 50.55afa)(3)(ii) on the basis that compliance with the specific requirements of the Code would result in hardship without a compensating increase in the level of quality and safety.

2.2 Relief Request CISI-2:

2.2.1 Code Requirements:

Table IWE-2500-1, Examination Category E-P, Item E9.10, requires a system leakage test be performed for each repair, modification, or replacement. Paragraph IWE-5240 states that the requirements of Paragraph IWA-5240 are applicable for visual examinations performed following repair, modification, or replacement. Paragraph IWA-5240 provides requirements for the performance of a VT-2 visual examination for the detection of leakage.

2.2.2 Code Requirement From Which Relief Is Requested:

Relief is requested from performing the VT-2 visual examination of Paragraph IWA-5240 in connection with system pressure testing following repair, modification, or replacement as required by Paragraph IWE-5240.

2.2.3 Basis for Relief Request:

Table IWE-2500-1, Examination Category E-P, Item E9.10, requires that a leakage test be performed in accordance with 10 CFR Part 50, Appendix J following each repair, modification, or replacement. Performance of the Appendix J testing would detect any leakage which may exist in the containment pressure retaining boundary. In addition, the requirements of Article IWA-4000 must be met following repairs and replacements, including modifications. Performance of a VT-2 visual examination, as required by Paragraph IWE-5240, does not provide additional assurance of detection of containment pressure boundary leakage.

2.2.4 Alternative Examination:

In those cases where TVA elects not to perform a VT-2 visual examination of repaired or replaced areas during the 10 CFR Part 50, Appendix J leak rate testing, a VT-1 visual examination will be performed during or following the 10 CFR Part 50, Appendix J leak rate testing.

2.2.5 Justification for Granting Relief:

Title 10 CFR 50.55a was amended in the *Federal Register* (61 FR 41303) to require the use of the 1992 Edition, 1992 Addenda, of ASME Section XI when performing containment examinations. Paragraph IWE-5210 states that except as noted within Paragraph IWE-5240, the requirements of Article IWA-5000 are not applicable to Class MC or Class CC components. Paragraph IWE-5240 states that the requirements of Paragraph IWA-5240 (corrected from IWA-5246 to IWA-5240 in 1993 Addenda) for visual examinations are applicable. Paragraph IWA-5240 identifies requirements for performance of a VT-2 visual examination. Visual examinations (VT-2) are conducted to detect evidence of leakage from pressure retaining components, with or without leakage collection systems, during the conduct of a system pressure test. In addition, personnel performing VT-2 visual examinations are required to be qualified in accordance with Subarticle IWA-2300 of ASME Section XI.

Table IWE-2500-1, Examination Category E-P, Item E9.10, identifies the examination method of 10 CFR Part 50, Appendix J does not specifically identify a VT-2 visual examination.

Appendix J of 10 CFR Part 50 provides requirements for testing as well as acceptable leakage criteria. These tests are performed by qualified Appendix J test personnel and utilize calibrated equipment to determine leak rate acceptability. Additionally, 10 CFR 50.55a(b)(2)(ix)(E) requires a general visual examination of the containment each period that would identify structural degradation that may contribute leakage.

Repairs and replacements, including modifications, to the containment pressure retaining boundary and to integral attachments must be performed in accordance with Article IWA-4000. This article requires, among other things, preparation of a repair and replacement plan; requires repairs and installation of replacements, including performance of nondestructive examinations, to be performed in accordance with the original edition or later editions of the construction code or Section III; and requires performance of preservice inspections in accordance with Subsection IWE. Repairs and replacements of pressure retaining MC components and their integral attachments at BFN are performed in accordance with TVA's repair and replacement program. This program specifies the repair methods and nondestructive examinations necessary to ensure that the original quality and construction requirements of the containment vessel are met.

Performance of the Appendix J testing will detect leakage which may not exist in the containment pressure retaining boundary. Performance of the general visual examination and compliance with Article IWA-4000 will provide added assurance of the structural integrity of the containment pressure retaining boundary. Performance of a visual examination (VT-2) in addition to these requirements would not provide additional assurance for detection of containment pressure boundary leakage.

Pressure testing in accordance with 10 CFR Part 50, Appendix J, provides an adequate level of quality. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), TVA requests that relief be granted.

2.2.6 Staff Evaluation of CISI-2:

In lieu of performing VT-2 visual examination of Paragraph IWA-5240 in connection with system pressure testing following repair, replacement or modification as required by Paragraph IWE-5240, the licensee proposed that testing will be conducted in accordance with 10 CFR Part 50, Appendix J. The licensee also committed that a VT-1 visual examination will be performed during or following the 10 CFR Part 50, Appendix J testing.

In the "Basis for Relief Request" and "Justification for Granting Relief" sections, the licensee justified that repairs and replacements, including modifications, to the containment pressure retaining boundary and to integral attachments must be performed in accordance with Article IWA-4000. This article requires preparation of a repair and replacement plan; requires repairs and installation of replacements, including performance of nondestructive examinations, to be performed in accordance with the original edition or later editions of the construction code or Section III; and requires performance of preservice inspections in accordance with Subsection IWE. Also, Table IWE-2500-1 (examination category E-P) requires only an examination method of 10 CFR Part 50, Appendix J for the containment vessel pressure retaining boundary following each repair, replacement, or modification and does not specifically identify a VT-2 visual examination. In addition, 10 CFR Part 50, Appendix J provides requirements for testing including acceptable leakage criteria and the tests are performed by Appendix J Test personnel by utilizing calibrated equipment to determine acceptability. Furthermore, 10 CFR

50.55a(b)(2)(x)(E) requires a general visual examination of the containment each period that would identify any structural degradation that may contribute to leakage. Moreover, the licensee committed that a VT-1 visual examination will be performed during or following the 10 CFR Part 50, Appendix J testing.

From the discussion above, the staff finds that the alternative examination proposed by the licensee will provide an acceptable level of quality and safety for protecting the containment pressure boundary integrity. On this basis, the staff concludes that the alternative proposed by the licensee is authorized pursuant to 10 CFR 50.55a(a)(3)(i).

2.3 Relief Request CISI-3:

2.3.1 Code Requirements:

Paragraph IWE-2420(b) requires that when component examination results require evaluation of flaws, evaluation of areas of degradation, or repairs in accordance with Article IWE-3000, and the component is found to be acceptable for continued service, the areas containing such flaws, degradation, or repairs shall be reexamined during the next inspection period listed in the schedule of the inspection program of Paragraph IWE-2411 or Paragraph IWE-2412, in accordance with Table IWE-2500-1, Examination Category E-C. In accordance with Paragraph IWE-2420(c), when the reexaminations required by Paragraph IWE-2421(b) reveal that the flaws, areas of degradation, or repairs remain essentially unchanged for three consecutive inspection periods, the areas containing such flaws, degradation, or repairs no longer require augmented examination in accordance with Table IWE-2500-1, Examination Category E-C.

2.3.2 Code Requirement From Which Relief Is Requested:

Relief is requested from the requirement of Paragraphs IWE-2420(b) and IWE-2420(c) to perform successive examination of repaired areas.

2.3.3 Basis for Relief Request:

Examination results, which detect flaws or areas of degradation which exceed the acceptance criteria of IWE-3000, require engineering evaluation, repair, or replacement of the flaw or areas of degradation. Paragraphs IWE-2420(b) and IWE-2420(c) require performance of successive examinations for flaws or areas of degradation accepted for continued service based on engineering evaluation or repair. The purpose of a repair is to restore the component to an acceptable condition for continued service in accordance with the acceptance standards of Article IWE-3000. If the repair has restored the component to an acceptable condition, successive examinations are not warranted.

2.3.4 Alternative Examination:

Successive examinations in accordance with Paragraphs IWE-2420(b) and IWE-2420(c) will not be required for areas repaired in accordance with IWA-4000. Successive examinations will be performed in accordance with Paragraphs IWE-2420(b) and IWE-2420(c) for components whose examination results detect flaws or areas of degradation that exceed the acceptance criteria of IWE-3000 and are found acceptable for continued service without repair based on an engineering evaluation.

2.3.5 Justification for Granting Relief:

Title 10 CFR 50.55a was amended in the *Federal Register* (61 FR 41303) to require the use of the 1992 Edition, 1992 Addenda, of ASME Section XI when performing containment examinations. Examination results, which detect flaws or areas of degradation which exceed the acceptance criteria of Article IWE-3000, require engineering evaluation, repair, or replacement of the flaw or areas of degradation. The purpose of a repair is to restore the component to an acceptable condition for continued service in accordance with the acceptance standards of Article IWE-3000. Paragraph IWA-4150 requires the owner to conduct an evaluation of the suitability of the repair including consideration of the cause of failure.

If a repair has restored the component to an acceptable condition, successive examinations are not warranted. If the repair is not suitable, then the repair does not meet the code requirements and the component is not acceptable for continued service. Paragraphs IWB-2420(b), IWC-2420(b), and IWD-2420(b) for Class 1, 2, and 3 components, respectively, do not require a repair to be subject to successive examination requirements. Furthermore, if the repair area is subject to accelerated degradation, it would require augmented examination in accordance with Table IWE-2500-1, Examination Category E-C.

In SECY 96-80, “Issuance of Final Amendment to 10 CFR 50.55a to Incorporate by Reference the ASME Boiler and Pressure Vessel Code (ASME Code), Section XI, Division 1, Subsection IWE and Subsection IWL,” dated April 17, 1996, the response to Subsection IWE Comment 3.3 states, “The purpose of IWE-2420(b) is to manage components found to be acceptable for continued service (meaning no repair or replacement at this time) as an Examination Category E-C component. If the component had been repaired or replaced, then the more frequent examination would not be needed.”

The successive examination of repairs in accordance with Paragraphs IWE-2420(b) and IWE-2420(c) constitutes a burden on TVA without a compensating increase in quality or safety.

The requirement to perform successive examinations of repaired areas has been removed from Paragraphs IWE-2420(b) and IWE-2420(c) in the 1998 Edition of ASME Section XI. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), TVA requests that relief be granted.

2.3.6 Staff Evaluation of CISI-3:

In lieu of performing successive examinations in accordance with Paragraphs IWE-2420(b) and IWE-2420(c) for areas repaired in accordance with Article IWA-4000, the licensee proposed an alternative to perform the successive examinations only for components whose examination results detect flaws or areas of degradation that exceed the acceptance criteria of IWE-3000 and are found acceptable for continued service without repair based on an engineering evaluation.

The staff finds that the purpose of a repair is to restore the component to an acceptable condition for continued service in accordance with the acceptance standards of Article IWE-3000. After repairs are complete, IWA-4150 requires licensees to evaluate the suitability of the repair. When a repair is required because of failure of an item, the evaluation shall consider the cause of failure to ensure that the repair is suitable. Considering that the failure mechanism is identified and corrected as required and the repair receives pre-service examinations, as required, the proposed alternative will provide reasonable assurance of structural integrity. In doing this, the requirements of successive examinations are deemed to be unnecessary. Furthermore, IWB-2420(b), IWC-2420(b), and IWD-2420(b) do not require the successive inspection of repairs for ASME Code Class 1, 2, and 3 components as required in IWE-2420(b) for ASME Code Class MC components.

On the basis discussed above, the licensee's proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) that compliance with the specific code requirements would result in hardship without a compensating increase in the level of quality and safety.

2.4 Relief Request CISI-4:

2.4.1 Code Requirements:

Table IWE-2500-1, Examination Category E-G, Item E8.20, requires a bolt torque or tension test for bolted connections which have not been disassembled and reassembled during the inspection interval. It is permissible for the torque or tension test to be deferred to the end of the inspection interval.

2.4.2 Code Requirement From Which Relief Is Requested:

Relief is requested from performing a bolt torque or tension test on bolted connections that have not been disassembled and reassembled during the inspection interval as required by Table IWE-2500-1, Examination Category E-G, Item E8.20.

2.4.3 Basis for Relief Request:

Table IWE-2500-1, Examination Category E-G, Item E8.20, requires bolt torque or tension testing on bolted connections which have not been disassembled and reassembled during the inspection interval.

Performance of required Appendix J testing will detect containment pressure retaining boundary leakage. In addition, a visual examination (VT-1) is performed each inspection interval on

pressure retaining bolting in accordance with Item E8.10. Performance of a bolt torque or tension test will not provide additional assurance of detection of leakage or of structural integrity.

2.4.4 Alternative Examination:

The following examinations and tests required by Subsection IWE and 10 CFR Part 50, Appendix J ensure the structural integrity and the leak-tightness of Class MC pressure retaining bolting; and, therefore, no additional alternative examinations are proposed:

(1) Exposed surfaces of bolted connections will be VT-1 visually examined once each inspection interval in accordance with requirements of Table IWE-2500-1, Examination Category E-G, Item E8.10,

(2) Bolted connections will meet the pressure test requirements of table IWE-2500-1, Examination Category E-P, Item E9.40, and

(3) Containment leakage will be verified by 10 CFR Part 50, Appendix J, Type A tests.

2.4.5 Justification for Granting Relief:

Title 10 CFR 50.55a was amended in the *Federal Register* (61 FR 41303) to require the use of the 1992 Edition, 1992 Addenda, of ASME Section XI when performing containment examinations. Table IWE-2500-1, Examination Category E-G, Item E8.20, requires bolt torque or tension testing on bolted connections that have not been disassembled and reassembled during the inspection interval. Determination of the torque or tension value would require that the bolting be un-torqued and then re-torqued or re-tensioned. This activity is considered a maintenance activity which potentially affects the sealing characteristics/ability of the penetration and therefore would require a 10 CFR Part 50, Appendix J, Type B test prior to un-torquing and following re-torquing the bolting. The performance of the Type B test itself proves that the bolt torque or tension remains adequate to provide a leak rate that is within acceptable limits. In addition, exposed surfaces of bolted connections are visually examined (VT-1) once each inspection interval in accordance with the requirements of table WE-2500-1, Examination Category E-G, Item E8.10. Appendix J testing and the VT-1 visual examination are adequate to demonstrate that the design function is met. Torque or tension testing is not required on any other Class 1, 2, and 3 bolted connections or their supports as part of the ASME Section XI Inservice Inspection Program.

Containment leakage is verified by 10 CFR Part 50, Appendix J, Type A tests. Although the Type A test does not verify individual bolted connections, it does provide additional assurance that there is no significant leakage through the containment pressure boundary.

Un-torquing and subsequent re-torquing of bolted connections which are verified not to experience unacceptable leakage through 10 CFR Part 50, Appendix J, Type B testing, results in hardship or unusual difficulty for TVA without a compensating increase in the level of quality and safety.

The requirement to perform bolt torque or tension tests has been removed in the 1998 Edition of ASME Section XI. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), TVA requests that relief be granted.

2.4.6 Staff Evaluation of CISI-4:

In lieu of performing a bolt torque or tension test on bolted connections that have not been disassembled and reassembled during the inspection interval as required by Table WE-2500-1, Examination Category E-G, Item No. E8.20, the licensee relies on the examinations and tests required by Subsection WE and 10 CFR 50, Appendix J to ensure the structural integrity and the leak-tightness of Class MC pressure retaining bolted connections. The licensee justifies that the bolt torque or tension testing on bolted connections may potentially affect the sealing characteristics and/or ability of the penetrations. The performance of Appendix J, Type B test will prove that the bolt torque or tension remains adequate to provide a leak rate that is within acceptable limits. Also, exposed surfaces of bolted connections are VT-1 visually examined once each inspection interval in accordance with requirements of Table WE-2500-1, Examination Category E-G, Item No. E8.10. Appendix J testing and the VT-1 visual examination are adequate to demonstrate that design function is met. In addition, overall containment leakage test in accordance with 10 CFR Part 50, Appendix J (Type A tests) will provide additional assurance that there is no significant leakage through the containment pressure boundary. Therefore, the licensee concludes that the un-torquing and subsequent re-torquing of bolted connections will result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The staff finds that compliance with ASME Code requirements will cause a hardship or an unusual difficulty because un-torquing and subsequent re-torquing bolted connections which are verified to have acceptable leakage through 10 CFR Part 50, Appendix J testing do not provide an increase in the level of quality and safety. The staff also finds that the alternative approach proposed by the licensee will provide reasonable assurance of the containment leak-tight integrity. On this basis, the staff concludes that the alternative proposed by the licensee is authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

2.5 Relief Request CISI-5:

2.5.1 Code Requirements:

Subarticle WE-2500(c)(1) requires that areas subject to augmented examinations that are accessible from both sides be VT-1 visually examined. Subarticle WE-2500(c)(2) required that areas subject to augmented examinations that are accessible from only one side be examined for wall thinning using a ultrasonic testing (UT) thickness measurement method. Subarticle WE-2500(c)(3) requires 1-foot square grids be used when UT thickness measurements are performed on augmented examination surface areas. The number and location of the grids is determined by the “Owner.” Subarticle WE-2500(c)(4) requires the minimum wall thickness within each grid be determined.

2.5.2 Code Requirement From Which Relief Is Requested:

Relief is requested from using 1-foot square grids for augmented examination areas in accordance with Subarticle WE-2500(c)(3) and the requirement to determine the minimum wall thickness within each grid in accordance with Subarticle WE-2500(c)(4).

2.5.3 Basis for Relief Request:

Subarticles WE-2500(c)(3) and WE-2500(c)(4) require that the minimum thickness within each one-foot square grid of surface areas requiring augmented UT thickness measurements be marked such that periodic reexamination of that location can be performed. This provides for monitoring of a point that may not be the most susceptible to accelerated degradation and requires taking numerous ultrasonic thickness reading within a grid which may not have exhibited degradation. Code case N-605 provides for UT thickness measurements to be taken at grid line interactions. The code case also permits variations in grid line spacing, provides a sampling plan for performing the UT thickness measurements, and provides a plan for sample expansion for areas exhibiting degradation.

2.5.4 Alternative Examination:

TVA proposes to use Code Case N-605 to determine the examination requirements for VT-1 visual examinations and UT thickness measurements of areas requiring augmented examination.

2.5.5 Justification for Granting Relief:

Title 10 CFR 50.55a was amended in the *Federal Register* (61 FR 41303) to require the use of the 1992 Edition, 1992 Addenda, of ASME Section XI when performing containment examinations. Paragraph WE-1241 requires the augmented examinations of table WE-2500-1, Examination Category E-C, be performed on containment surface areas likely to experience accelerated degradation and aging. Subarticle WE-2500(c)(1) requires that areas subject to augmented examinations that are accessible from both sides be VT-1 visually examined. Subarticle WE-2500(c)(2) requires that areas subject to augmented examinations that are accessible from only one side be examined for wall thinning using a UT thickness measurement method. Subarticles WE-2500(c)(3) and WE-2500(c)(4) require that the minimum thickness within each 1-foot square grid of surface areas requiring augmented UT thickness measurements be marked such that periodic reexamination of that location can be performed. Thickness readings are point readings. Numerous reading are necessary to identify the minimum thickness within each grid. This only identifies the thinnest area. Periodic examination of the minimum thickness point only monitors that point and may not be the area that is the most susceptible to accelerated degradation.

Code Case N-605 provides a proposed alternative to the one-foot square grid area required by WE-2500(c)(3). Code Case N-605 requires examination at grid line interactions. The grid line intersections shall not exceed 12 inches and need not be less than two (2) inches. For a sample area of 50 square feet, Code Case N-605 requires a minimum of 100 locations be monitored. For a sample area of 50 square feet, Subarticle WE-2500(c)(3) would require only 50 locations be monitored. In this instance, utilizing Code Case N-605 monitors more locations

than required by Subarticle WE-2500(c)(3). For example areas greater than 100 square feet, Code Case N-605 requires that sufficient points be monitored to ensure at least a 95 percent confidence level that the thickness of the base metal is reduced by no more than 10 percent of the nominal plate thickness at 95 percent of the grid line intersections.

Code Case N-605 requires additional examinations when any measurements reveal wall thickness is reduced by more than 10 percent of the nominal plate thickness. For all UT thickness measurement areas, should the measurements at a grid line intersection reveal that the base material is reduced by more than 10 percent of the nominal plate thickness, Code Case N-605 requires the minimum wall thickness within each adjoining grid be determined. This is similar to the examination requirements of Subarticle WE-2500(c)(4) except that Code Case N-605 focuses resources on areas which have exhibited degradation.

Code case also incorporates the requirements of Subarticle WE-2500(c)(1) for performance of VT-1 visual examinations. Taking numerous ultrasonic thickness readings within a grid which had not previously exhibited degradation results in hardship or unusual difficulty for TVA without a compensating increase in the level of quality and safety.

The requirements of Code Case N-605 have been incorporated into the 1998 Edition of ASME Section XI. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), TVA requests that relief be granted.

2.5.6 Staff Evaluation of CISI-5:

In lieu of using 1-foot square grids for augmented examination areas in accordance with Subarticle WE-2500(c)(3) and the requirement to determine the minimum wall thickness within each grid in accordance with Subarticle WE-2500(c)(4), the licensee proposed an alternative to use Code Case N-605 for determining examination requirements for VT-1 visual examinations and UT thickness measurements of areas requiring augmented examination. The licensee justified that because the thickness readings based on WE-2500(3)(b) and WE-2500(3)(c) are point readings and numerous readings are necessary to identify the minimum thickness within each grid. In doing this, only the thinnest area can be identified and that area may not be the location that is the most susceptible to accelerated degradation. On the other hand, Code Case N-605 requires examination at the grid line intersections and these grid line intersections may not exceed 12 inches and need not be less than 2 inches. For a sample area of 50-square feet, Code Case N-605 requires a minimum of 100 locations be monitored. For a sample area of 50-square feet, Subarticle WE-2500(c)(3) would require only 50 locations be monitored. In this instance, Code Case N-605 monitors more locations than required by Subarticle WE-2500(c)(3). For sample areas greater than 100-square feet, Code Case N-605 requires that sufficient points be monitored to ensure at least a 95 percent confidence level that the thickness of the base metal is reduced by no more than 10 percent of the nominal plate thickness at 95 percent of the grid line intersections. Also, Code Case N-605 requires additional examinations when any measurements reveal wall-thickness is reduced by more than 10 percent of the nominal plate thickness.

On the basis discussed above, the staff finds that the alternative proposed by the licensee will provide reasonable assurance of the containment integrity. Therefore, the request for relief is authorized pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that the alternative provides an acceptable level of quality and safety.

3.0 CONCLUSION:

Based on our review of the information provided in the requests for relief (Relief Requests CISI-1 through CISI-5), the staff concludes that for Relief Requests CISI-2 and 5, the licensee's proposed alternative will provide an acceptable level of quality and safety. Therefore, the proposed alternatives are authorized pursuant to 10 CFR 50.55a(a)(3)(i). For Relief Requests CISI-1, 3 and 4, the staff concludes that compliance with the code requirements would result in a burden without a compensating increase in the level of quality and safety, and that licensee's proposed alternatives will provide reasonable assurance of containment pressure integrity. Therefore, these proposed alternatives are authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

4.0 REFERENCE

Letter from T. E. Abney, TVA to NRC, "Browns ferry Nuclear Plant, Units 2 and 3 - ASME Section XI, Subsection WE, Requirements for Class MC and Metallic liners of Class CC Components of Light Water Cooled Plants, Requests for Relief," dated June 12, 2001.

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