



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
OF THE SECOND 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN  
RELIEF REQUESTS 3-SPT-3 AND 3-SPT-4  
FOR  
TENNESSEE VALLEY AUTHORITY  
BROWNS FERRY NUCLEAR PLANT, UNIT 3  
DOCKET NO. 50-296

1.0 INTRODUCTION

Title 10 of the Code of Federal Regulations (CFR), Part 50.55a (10 CFR 50.55a), requires, in part, that inservice inspection (ISI) of certain American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Class 1, 2, and 3 components be performed in accordance with Section XI of the ASME Code applicable Edition and Addenda, except where relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i).

Title 10 CFR, Part 50.55a(a)(1) requires that structures, systems, and components at nuclear power generating facilities shall be designed, fabricated, erected, constructed, tested, and inspected to quality standards commensurate with the importance of the safety function to be performed. Systems and components of boiling and pressurized water-cooled nuclear power reactors must meet the requirements of the ASME Code as specified in 10 CFR 50.55a(a)(2).

Proposed alternatives to the ASME Code requirements may be authorized by the Director of the Office of Nuclear Reactor Regulation pursuant to 10 CFR 50.55a(a)(3) when the licensee demonstrates that the proposed alternatives provide an acceptable level of quality and safety, or that 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 pre-service 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 in service 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 applicable edition of Section XI of the ASME Code for the Browns Ferry Nuclear Plant, Unit 3 second 10-year inservice inspection (ISI) interval is the 1989 Edition.

By a letters dated January 22, 1997, and June 12, 1998, the Tennessee Valley Authority (TVA) (the licensee) submitted its second 10-year interval inservice inspection plan and associated requests for relief.

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## 2.0 EVALUATION

The U.S. Nuclear Regulatory Commission staff, with technical assistance from its contractor, the Idaho National Engineering and Environmental Laboratory (INEEL), has evaluated the information provided by TVA in support of its Requests for Relief numbers 3-SPT-3, and 3-SPT-4 for Browns Ferry Nuclear Plant, Unit 3 (BFN-3). Based on the results of the review, the staff adopts the contractor's conclusions and recommendations presented in the Technical Letter Report (TLR) attached.

### Relief Request 3-SPT-3

ASME Code, Section XI, Paragraph IWA-2300, requires that personnel performing VT-2 visual examinations be qualified in accordance with comparable levels of competency as defined in American National Standards Institute (ANSI) N45.2.6.

In accordance with 10 CFR 50.55a(a)(3)(i), TVA proposed to use Code Case N-546 in lieu of the requirements of Paragraph IWA-2300 for VT-2 visual examination personnel. In the supplemental letter dated June 12, 1998, TVA provided additional discussion and committed to 1) develop procedural guidelines for obtaining consistent, quality VT-2 visual examinations (in accordance with ASME Section XI, Paragraph IWA-2210); 2) document and maintain records to verify the qualification of persons selected to perform VT-2 visual examinations [in accordance with ASME Section XI, Paragraph IWA-1400(k)], and 3) implement independent review and evaluation of leakage by persons other than those that performed the VT-2 visual examinations [in accordance with ASME Section XI, Paragraph IWA-1400(n)].

The ASME Code requires that VT-2 visual examination personnel be qualified to levels of competency comparable to those identified in ANSI N45.2.6. The Code also requires that the examination personnel be qualified for near and far distance vision acuity. In lieu of the ASME Code requirements, TVA proposed to implement Code Case N-546 for personnel performing VT-2 visual examinations, this Code Case includes the following requirements:

1. At least 40 hours of plant walkdown experience, such as that gained by licensed and nonlicensed operators, local leak rate personnel, system engineers, and inspection and nondestructive examination personnel.
2. At least 4 hours of training on Section XI requirements and plant specific procedures for VT-2 visual examination.
3. Vision test requirements of Paragraph IWA-2321, 1995 Edition.

The qualification requirements in Code Case N-546 are not significantly different from those for VT-2 visual examiner certification. Licensed and nonlicensed operators, local leak rate personnel, system engineers, and inspection and nondestructive examination personnel typically have a sound working knowledge of plant components and piping layouts. This knowledge makes them acceptable candidates for performing VT-2 visual examinations.

In addition to meeting the requirements contained in Code Case N-546, TVA's alternative includes commitments to: (1) use procedural guidelines for consistent, quality VT-2 visual examinations; (2) verify and maintain records of the qualification of persons selected to perform VT-2 visual examinations; and (3) perform independent reviews and evaluations of leakage by a

person(s) other than those that performed the VT-2 visual examination. Based on a review of Code Case N-546 and the additional commitments made by TVA, the staff concludes that the proposed alternative to the Code requirements provides an acceptable level of quality and safety. Therefore, TVA's request to implement Code Case N-546 with the additional commitments is authorized pursuant to 10 CFR 50.55a(a)(3)(i). Use of this Code Case is authorized for the current interval, or until such time as the Code Case is published in a future revision of Regulatory Guide 1.147. At that time, if TVA intends to continue to implement this Code Case, TVA is to follow all provisions in Code Case N-546 with limitations issued in Regulatory Guide 1.147, if any.

#### Request for Relief 3-SPT-4

ASME Code, Section XI, Paragraph IWA-5250 (a)(2), the Code states:

"If leakage occurs at a bolted connection, the bolting shall be removed, VT-3 visually examined for corrosion, and evaluated in accordance with IWA-3100."

In accordance with 10 CFR 50.55a(a)(3)(i), TVA proposed an alternative that involves an engineering evaluation of the bolted connection in lieu of mandatory removal of all bolts when leakage is detected.

In accordance with Paragraph IWA-5250(a)(2), if leakage occurs at a bolted connection, the bolting must be removed, VT-3 visually examined for corrosion, and evaluated in accordance with Paragraph IWA-3100. In lieu of this requirement, TVA has proposed to evaluate the bolting to determine its susceptibility to corrosion. TVA's proposed evaluation will consider, as a minimum, bolting materials, the corrosive nature of the process fluid, the leakage location and history, the service age of the bolting materials, and visual evidence of corrosion at the assembled connection.

Based on the items included in the evaluation process, the staff concludes that the evaluation proposed by TVA presents a sound engineering approach to determine structural integrity. In addition, if the initial evaluation indicates the need for a more detailed analysis, the bolt closest to the source of leakage will be removed, VT-1 visually examined, and evaluated in accordance with Paragraph IWA-3100(a). The VT-1 examination criteria are more stringent than the simple corrosion evaluation described in Paragraph IWA-5250. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), TVA's proposed alternative is authorized for the second interval at BFN-3.

#### 3.0 CONCLUSION

The staff has reviewed TVA's submittal and concludes that for Requests for Relief 3-SPT-3 and 3-SPT-4, TVA's proposed alternatives provide an acceptable level of quality and safety. Therefore, the staff concluded that TVA's proposed alternatives contained in Requests for Relief 3-SPT-3 and 3-SPT-4 are authorized for the second interval pursuant to 10 CFR 50.55a(a)(3)(i).

In addition, for Relief Request 3-SPT-3, the use of Code Case N-546 is authorized for the second interval or until it is published in Regulatory Guide 1.147. At that time, if TVA intends to continue to implement this Code Case, TVA is to follow all provisions in Code Case N-546 with limitations issued in Regulatory Guide 1.147, if any.

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TECHNICAL LETTER REPORT  
ON THE SECOND 10-YEAR INTERVAL Inservice INSPECTION  
REQUESTS FOR RELIEF 3-SPT-3 AND 3-SPT-4  
FOR  
TENNESSEE VALLEY AUTHORITY  
BROWNS FERRY NUCLEAR PLANT, UNIT 3  
DOCKET NUMBER: 50-296

1. INTRODUCTION

By letter dated January 22, 1997, the licensee, Tennessee Valley Authority (TVA), submitted the second 10-year interval inservice inspection (ISI) program, including several requests for relief from the requirements of the ASME Code, Section XI, for the Browns Ferry Nuclear Plant (BFN), Unit 3. In response to an NRC Request for Additional Information (RAI), the licensee provided revised Requests for Relief Nos. 3-SPT-3 and 3-SPT-4 in a letter dated June 12, 1998, and requested that these be expedited to facilitate planning for an upcoming refueling outage. In the June 12, 1998, correspondence, the licensee also stated that responses to other issues identified in the NRC RAI would be provided in a future submittal. The Idaho National Engineering and Environmental Laboratory (INEEL) staff's evaluation of the subject requests for relief is in the following section.

2. EVALUATION

The information provided by TVA in support of the subject requests for relief from, or proposed alternatives to, Code requirements has been evaluated and the bases for disposition are documented below. The Code of record for BFN's second 10-year ISI interval, which began November 19, 1996, is the 1989 Edition of Section XI of the ASME Boiler and Pressure Vessel Code.

2.1 Request for Relief 3-SPT-3, Use of Code Case N-546, Alternative Requirements for Qualification of VT-2 Examination Personnel, Section XI, Division 1

Code Requirement: Section XI, IWA-2300, requires that personnel performing VT-2 visual examinations be qualified in accordance with comparable levels of competency as defined in ANSI N45.2.6.

Licensee's Proposed Alternative: In accordance with 10 CFR 50.55a(a)(3)(i), the licensee proposed to use Code Case N-546 in lieu of the requirements of IWA-2300 for VT-2 visual examination personnel. In the supplemental letter dated June 12, 1998, the licensee provided additional discussion and committed to 1) develop procedural guidelines for obtaining consistent, quality VT-2 visual examinations (in accordance with ASME Section XI, IWA-2210); 2) document and maintain records to verify the qualification of persons selected to perform VT-2 visual examinations [in accordance with ASME Section XI, IWA-1400(k)], and 3) implement independent review and evaluation of leakage by persons other than those that performed the VT-2 visual examinations [in accordance with ASME Section XI, 1400(n)].

Licensee's Basis for Proposed Alternative (as stated):

"In accordance with 10 CFR 50.55a(a)(3)(i) TVA proposes to use an alternative to the ASME Section XI Code requirement specified above. The use of Code Case N-546, "Alternative Requirements for Qualification of VT-2 Examination Personnel," will allow experienced plant personnel to perform VT-2 visual examinations during the performance of system pressure tests and provide an acceptable level of quality and safety.

Experienced plant personnel are knowledgeable of the plant systems and routinely perform walkdowns of plant systems looking for abnormalities such as leaks in piping systems. They are more familiar with the location of piping systems and can therefore perform VT-2 examinations in a more timely manner. Using experienced plant personnel will also eliminate the need for hiring additional personnel fully certified VT-2 to IWA-2300. This is especially pertinent during refueling outages when pressure tests are performed and the number of IWA-2300 certified personnel are limited.

Since the VT-2 examination is a check for the evidence of leakage, the use of plant personnel qualified to the N-546 alternative requirements, and who typically perform this type of examination during their daily activities, will not compromise the quality or safety of the systems examined.

TVA considers the ASME Code Case N-546 requirements to be an acceptable alternative to the qualification of VT-2 (visual examination personnel) using a written, approved procedure prepared in accordance with SNT-TC-1A and the additional requirements of ASME Section XI, Division 1."

Evaluation: The Code requires that VT-2 visual examination personnel be qualified to levels of competency comparable to those identified in ANSI N45.2.6. The Code also requires that the examination personnel be qualified for near and far distance vision acuity. In lieu of the Code requirements, the licensee proposed to implement Code Case N-546 for personnel performing VT-2 visual examinations, this Code Case includes the following requirements:

1. At least 40 hours plant walkdown experience, such as that gained by licensed and nonlicensed operators, local leak rate personnel, system engineers, and inspection and nondestructive examination personnel.
2. At least four hours of training on Section XI requirements and plant specific procedures for VT-2 visual examination.
3. Vision test requirements of IWA-2321, 1995 Edition.

The qualification requirements in Code Case N-546 are not significantly different from those for VT-2 visual examiner certification. Licensed and nonlicensed operators, local leak rate personnel, system engineers, and inspection and nondestructive examination personnel typically have a sound working knowledge of plant components and piping layouts. This knowledge makes them acceptable candidates for performing VT-2 visual examinations.

In addition to meeting the requirements contained in Code Case N-546, the licensee has committed to use procedural guidelines for consistent, quality VT-2 visual examinations, verify and maintain records of the qualification of persons selected to perform VT-2 visual examinations, and perform independent reviews and evaluations of leakage by a person(s) other than those that performed the VT-2 visual examination. Based on a review of Code Case N-546 and the additional commitments made by the licensee, the INEEL staff believes that the proposed alternative to the Code requirements will provide an acceptable level of quality and safety. Therefore, it is recommended that the licensee's request to implement Code Case N-546 with the additional commitments be authorized pursuant to 10 CFR 50.55a(a)(3)(i). Use of this Code Case should be authorized for the current

interval, or until such time as the Code Case is published in a future revision of Regulatory Guide 1.147. At that time, if the licensee intends to continue to implement this Code Case, the licensee is to follow all provisions in Code Case N-546 with limitations issued in Regulatory Guide 1.147, if any.

2.2 Request for Relief 3-SPT-4, Proposed Alternative to IWA-5250, Corrective Measures for Leakage at Bolted Connections

Code Requirement: In IWA-5250 (a)(2), the Code states:

"If leakage occurs at a bolted connection, the bolting shall be removed, VT-3 visually examined for corrosion, and evaluated in accordance with IWA-3100."

Licensee's Proposed Alternative: In accordance with 10 CFR 50.55a(a)(3)(i), the licensee proposed an alternative that involves an engineering evaluation of the bolted connection in lieu of mandatory removal of all bolts when leakage is detected. The licensee stated:

"As a proposed alternative, in accordance with 10 CFR 50.55(a)(3)(i), to the mandatory removal of bolting from leaking bolted connections (ASME Code Section XI, Subarticle IWA-5250(a)(2)) it is requested that a corrective action plan should be allowed following a specific evaluation of the bolted connection structural integrity and susceptibility of the bolting to corrosion and potential failure. The corrective action plan may or may not require removal of bolting.

"As an alternative to the existing Section XI requirements, the source of all leakage at bolted connections detected by VT-2 examination during a system pressure test shall be evaluated to determine the susceptibility of the bolting to corrosion and potential failure. This evaluation will consider the following variables at a minimum:

- Location of leakage
- History of leakage
- Fastener materials
- Evidence of corrosion, with the connection assembled
- Corrosiveness of the process fluid
- History and studies of similar fastener material in a similar environment
- Other components in the vicinity that may be degraded due to the leakage

"When the evaluation of the above variables is concluded, and if the evaluation determines that the leaking condition has not degraded the fasteners, then no further action is required. However, reasonable attempts to stop the leakage shall be taken.

"If the bolted connection evaluation, using the variables above, indicates the need for further evaluation, or no evaluation is performed, then a bolt closest to the source of leakage shall be removed. The bolt will receive a VT-1 examination and be evaluated for corrosion in accordance with IWA-3100(a) and dispositioned in accordance with IWB-3140. If the information from the bolted connection evaluation is supportive, the removal of the bolt for VT-1 examination may be deferred to the next refueling outage. When the removed bolting shows evidence of rejectable degradation, all remaining bolts, in the connection, shall be removed and receive a VT-1 examination and evaluation in accordance with IWB-3140."



Licensee's Basis for Proposed Alternative (as stated):

"Relief from the bolt removal requirements of IWA-5250(a)(2) is requested under 10 CFR 50.55(a)(3)(i), in which the proposed alternative provides an acceptable level of quality and safety. Some of the problems associated with the current requirements of IWA-5250(a)(2) are summarized as follows:

IWA-3100 does not provide an acceptance standard for a VT-3 bolt inspection.

The requirement calls for bolt removal without regard to the size of the leakage.

The requirement increases the radiological dose to workers for leaks that are often not a challenge to operational or structural limits.

Bolts sometimes cannot be removed without damaging the bolt or cannot be removed due to component configuration.

It is not a requirement of the Code that the licensee must stop the leakage, and inspection of the bolting is not necessarily going to stop the leak.

Removing one bolt at a time, if allowed by system conditions, may actually increase the leakage.

In many cases, implementation of the requirement may cause the plant an unnecessary transient or delay startup.

"In addition to the problems associated with the requirements of IWA-5250(a)(2), the ASME Working Group-Pressure Testing concluded that the system integrity of a bolted connection is not necessarily compromised by leakage and recommended the approval of Code Case N-566. This relief request is essentially a conservative subset of the Code Case.

"This relief request is more prescriptive and more conservative than the Code Case. It also addresses many of the implementation and radiological hardships associated with IWA-5250(a)(2) and maintains the conclusions of the ASME Committee by assuring that a proper evaluation of the connection and/or the bolting is performed. The bolted connection evaluation must consider specific factors which, if indicative of degradation, must be dispositioned in accordance with IWB-3140 of ASME Section XI. Due to the fact that the bolted connection evaluation is more comprehensive than the simple bolt inspection currently required by IWA-5250, coupled with the benefit that these alternative requirements ensure structural integrity is maintained, and reduce the operational, maintenance, and radiological hardships of the current requirements, this relief request provides an acceptable level of quality and safety and should be considered as an acceptable alternative in accordance with 10 CFR 50.55a(a)(3)(i). This conclusion is further supported by the fact that the ASME has approved Code Case N-566 and this relief request is essentially a conservative subset of the Code Case."

Evaluation: In accordance with IWA-5250(a)(2), if leakage occurs at a bolted connection, the bolting must be removed, VT-3 visually examined for corrosion, and evaluated in accordance with IWA-3100. In lieu of this requirement, the licensee has proposed to evaluate the bolting to determine its susceptibility to corrosion. The

proposed evaluation will consider, as a minimum, bolting materials, the corrosive nature of the process fluid, the leakage location and history, the service age of the bolting materials, and visual evidence of corrosion at the assembled connection.

Based on the items included in the evaluation process, the INEEL staff believes that the evaluation proposed by the licensee presents a sound engineering approach. In addition, if the initial evaluation indicates the need for a more detailed analysis, the bolt closest to the source of leakage will be removed, VT-1 visually examined, and evaluated in accordance with IWA-3100(a). The VT-1 examination criteria are more stringent than the simple corrosion evaluation described in IWA-5250. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), it is recommended that the licensee's proposed alternative be authorized for the second interval at BFN, Unit 3.

3. CONCLUSION

The INEEL staff has reviewed the licensee's submittal and concludes that for Requests for Relief 3-SPT-3 and 3-SPT-4, the licensee's proposed alternatives will provide an acceptable level of quality and safety. Therefore, it is recommended that these proposed alternatives be authorized for the second interval pursuant to 10 CFR 50.55a(a)(3)(i).

For Request for Relief 3-SPT-3, the use of Code Case N-546 should be authorized for the second interval, or until it is published in Regulatory Guide 1.147. At that time, if the licensee intends to continue to implement this Code Case, the licensee is to follow all provisions in Code Case N-546 with limitations issued in Regulatory Guide 1.147, if any.