Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

MAR 2 3 2000

10 CFR 50.55(a)

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

| | | |
|---|---|---|
| In the Matter of | ) | Docket No. 50-390 |
| Tennessee Valley Authority | ) | |

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) SECTION XI INSERVICE TESTING PROGRAM REQUEST FOR RELIEF ISPT-08

The purpose of this letter is to request relief from ASME Section XI Code requirements, Paragraph IWA-5242(a) which states, "*For systems borated for the purpose of controlling reactivity, insulation shall be removed from pressure retaining bolted connections for visual examination VT-2.*"

TVA is requesting NRC's approval of the enclosed proposed alternative from the requirement to remove insulation for visual VT-2 examination of bolted connections during a system pressure test on systems borated for the purpose of controlling reactivity. TVA considers the proposed alternate testing to provide an adequate level of assurance of operational readiness and an acceptable level of quality and safety.

The Enclosure provides the relief request ISPT-08 for removal of insulation from pressure retaining bolted connections. This relief request has previously been approved for several nuclear

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plants, e.g., Bryron Units 1 and 2 on October 22, 1998, Callaway Nuclear Plant on July 30, 1999, Farley Units 1 and 2 on January 22, 1998, Palo Verde Units 1, 2, and 3 on April 26, 1999, and Arkansas Nuclear One Unit 2 and Waterford Unit 3 on December 1, 1998, etc.

TVA requests that NRC review and approve the relief request by September 1, 2000. This relief request is needed for the third refueling outage which is scheduled to begin mid-September 2000. If you should have any questions concerning this matter, please contact me at (423) 365-1824.

Sincerely,

P. L. Pace
Manager, Site Licensing
and Industry Affairs

Enclosure

cc (Enclosure):

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ENCLOSURE

WATTS BAR NUCLEAR PLANT UNIT 1
REQUEST FOR RELIEF ISPT-08

## Summary

Relief is being requested from the requirement of ASME Section XI, Paragraph IWA-5242(a), to remove insulation from certain bolted connections when performing the VT-2 examination for leakage at the connection. Paragraph IWA-5242(a) requires removal of insulation from bolted connections in systems that are borated for the purposes of reactivity control when performing the VT-2 examination. Removal of this insulation is costly, both in terms of dose received, financial resources expended, and potential impact to plant generation. For bolted connections that are assembled with corrosion resistant materials and are thus not subject to degradation from borated water corrosion, removal of the insulation does not provide a significantly more meaningful examination. Therefore, relief is being requested from removing insulation from certain bolted connections when performing the VT-2 examination for leakage.

## Subject:

| | |
|---|---|
| Code Class: | 1 |
| Examination Category: | B-P |
| Item Numbers: | Item Numbers Listed Under Examination Categories B-P |
| Description: | Alternate Rules for Insulation Removal During IWA-5000 Pressure Tests at Bolted Connections in Systems Borated for the Purpose of Controlling Reactivity |
| Component Numbers: | Bolted Connections Listed in attached Table |

## Code Requirement From Which Relief is Requested:

ASME Section XI, 1989 Edition, Paragraph IWA-5242(a) states, "For systems borated for the purpose of controlling reactivity, insulation shall be removed from pressure retaining bolted connections for visual examination VT-2."

## Basis for Relief:

Authorization is requested for a proposed alternative from the requirement to remove insulation for visual VT-2 examination of bolted connections during a system pressure test on systems borated for the purpose of controlling reactivity.

TVA considers the removal of insulation at bolted connections on components inside the polar crane wall for the sole purpose of visual examination is impractical and will result in hardship and unusual difficulty for the reasons listed below per 10CFR50.55a(a)(3)(ii):

1) The visual VT-2 examination of the reactor coolant system (RCS) is performed following the majority of outage maintenance activities and just prior to reactor criticality. The RCS is at a normal operating temperature and pressure (557°F and 2235 psig) during the pressure test as required by IWA-5000. Performance of a visual VT-2 examination, re-installation of insulation, and disassembly of scaffolding under these conditions is a personnel safety hazard. The only relief from these conditions realized by the use of Code Case N-533, "*Alternative Requirements for VT-2 Visual Examination of Class 1 Insulated Pressure-Retaining bolted Connections,*" is that removal/reinstallation of insulation on bolted connections, performance of the VT-2 examination of bolted connections, and installation/removal of the necessary scaffolding at bolted connections may be performed at cold shutdown conditions.

2) Class 1 bolted connections listed in the attached table were inspected without insulation in accordance with Code Case N-533 during Refueling Outages 1 and 2. None of the bolted connections exhibited any evidence of degradation due to boric acid corrosion. Exposure from insulation removal performed in the WBN Refueling Outage 2 totaled 6.384 Person-Rem, with no evidence of degradation discovered. This represented a 16.4% increase in dose over Refueling Outage 1 for the same activities. The dose for insulation removal during Refueling Outage 3 is expected to show a similar increase in total dose with the dose attributable to removal of insulation on the components listed in the attached table expected to exceed 4.0 Person-Rem. This is considered an excessive amount of dose relative to the benefits gained from the anticipated inspection results.

3) Differential thermal expansion occurs when insulation is removed from a bolted connection that creates a greater chance for leakage. When insulation is

removed, the flanges expand at a rate greater than the bolts, causing stress on the joint to increase, thus increasing gasket compression. Once the bolts expand, the stress on the joint is relaxed, reducing the gasket compression, and effectively unloading the fasteners in the connection. The less tightened connection then has a higher probability of leaking.

4) Code Class 1 systems borated for the purpose of controlling reactivity are extensive and consist of large systems covering many areas inside the polar crane wall on multiple elevations. Scaffolding will be required to access many of the bolted connections. In addition, many of the bolted connections are located in medium to high radiation areas. Insulation removal combined with scaffolding requirements will increase outage costs. Based on man-hour expenditures during Refueling Outages 1 and 2 for installation and removal of this insulation, craft support costs for these inspections during Refueling Outage 3 is estimated to be between $20,180 and $25,511, depending upon the work shift in effect. These costs conservatively assume that the insulation material removed can be reinstalled. Therefore, no replacement cost is included. These costs are incurred despite the relief provided by Code Case N-533. If the examination were to be performed during the normal VT-2 between Modes 3 and 2 ascending, critical path time would be extended by several hours to accommodate the insulation installation and scaffold removal inside the polar crane wall and throughout containment after the examination is complete.

It is TVA's opinion that the established WBN programs described below and the alternative examination proposed below, will provide an acceptable level of safety and quality for bolted connections in systems borated process fluids for the purpose of controlling reactivity. This process, as described, meet the criteria of acceptable alternatives to the ASME Code requirements as delineated in 10CFR50.55a(a)(3)(ii).

1) In response to NRC Generic Letter 88-05, "Boric Acid Corrosion of Carbon Steel Components," WBN established a program to inspect boric acid leaks discovered in the Containment Building and to evaluate the impact of those leaks on carbon steel or low alloy steel components. Evidence of leaks, including boric acid crystals or residue, are

inspected and evaluated regardless of whether the leak was discovered at power or during an outage. Issues such as the following are considered in the inspection and resulting evaluations: 1) evidence of corrosion or metal degradation, 2) effect the leak may have on the pressure boundary, 3) possibility of boric acid traveling along the inside of insulation on piping, and 4) possibility of dripping or spraying on other components. Based on this evaluation, appropriate corrective actions are initiated to prevent reoccurrence of the leak and to repair, if necessary, any degraded materials or components.

2) The bolted connections in the attached table consists of SA-453 Grade 660 for studs and SA-194 Grade 6 for nuts. The stainless steels were designed to be corrosion resistant in corrosive applications. This is substantiated for the 410 stainless steels (SA-194) by documents, such as EPRI Report NP-5769 Volumes 1 and 2, "*Degradation and Failure of Bolting in Nuclear Power Plants,*" which attests to the resistance of stainless steels to boric acid corrosion. EPRI Report TR-104748, Revision 1, "*Boric Acid Corrosion Guidebook: Recommended Guidance for Addressing Boric Acid Corrosion and Leakage Reduction Issues,*" further confirms in Section 7.2.1 that the 410 stainless steels are superior to the low alloy and carbon steel bolting materials. That grade of stainless steel is an acceptable nut material as the nuts experience a combination of compressive and shear stresses. Generally, tensile stresses are required for initiation of stress corrosion cracking. Therefore, only studs comprised of 410 stainless steel are potentially susceptible to stress corrosion cracking. EPRI Report TR-104748 also identifies the A-286 (SA-453) as a superior fastening material. The superalloy was designed for resistivity to acid corrosion environments due to its high nickel and chrome content and the inclusion of molybdenum specifically to inhibit inorganic acids such as boric acid. To ensure that degradation mechanisms in these metals are mitigated, TVA maintains a program that controls materials (insulation, thread lubricant, boron, etc.) that may come in contact with safety related components, including bolting. Compliance with this program ensures

that impurities are not present in concentrations that would promote development of stress corrosion cracking in stainless steel bolted connections. Bolted connections containing carbon steel bolting materials [such as, steam generator and pressurizer manways, and reactor coolant pump main flanges] continue to be VT-2 inspected with the insulation removed in accordance with Code Case N-533 as previously approved by NRC in a letter dated September 23, 1997 as Relief Request ISPT-06.

3) During Refueling Outage 2, WBN verified the integrity of Class 1 bolted connections listed in the attached table during cold shutdown with the insulation removed and during the normal VT-2 examination with insulation installed in accordance with Code Case N-533 and no evidence of degradation was discovered. Based on the material properties of these bolted connections, degradation is not anticipated.

Alternative Testing:

The proposed alternative examination is requested for use at WBN. This Alternative is not a request for use of Code Case N-533 as NRC has already approved its use for WBN as Relief Request ISPT-06 in a letter dated September 23, 1997.

Bolted connections inside the polar crane wall and fabricated of materials resistant to boric acid corrosion in systems borated for the purpose of controlling reactivity shall receive a visual VT-2 examination during the system pressure tests of IWB-5000 and IWC-5000 with the insulation installed. If evidence of leakage is detected, either by discovery of active leakage or evidence of boric acid crystals, the insulation shall be removed and the bolted connection shall be re-examined and the source of the leakage identified. If necessary, the mechanical connections shall be evaluated in accordance with the corrective measures of Subarticle IWA-5250, as modified by Relief Request ISPT-03 previously approved by NRC in a letter dated September 23, 1997.

Carbon steel bolted connections within the System Pressure Test boundaries will continue to receive an inspection for boric acid residue with the insulation removed in accordance with ASME Code Case N-533, as approved by the NRC for use at WBN in relief request ISPT-06.

If insulation is removed for planned maintenance, repair, or other inspection at a bolted connection in a system borated for the purpose of controlling reactivity, a visual examination shall be performed on the bolted connection prior to disassembly and, if evidence of leakage is discovered, evaluated in accordance with the corrective measures of Subarticle IWA-5250, as modified by previously approved relief request ISPT-03.

Conclusion:

In summary, removal of insulation to perform a VT-2 visual inspection for leakage at bolted connections in borated water systems imposes an impact in terms of dose to the workers removing and reinstalling the insulation, financial burden, and delays in the units return to service. For bolted connections that are assembled with material that is susceptible to boric acid corrosion, removal of the insulation provides confirmation that an environment that is detrimental to the bolting does not exist. However, for bolted connections that are assembled using corrosion resistant bolting material the presence of boric acid residue from minor system leaks does not challenge the integrity of the bolted connections. The probability of loss of structural integrity of such a joint due to corrosion of the bolting is essentially non-existent. Therefore, the impact incurred by removing the insulation from joints assembled with corrosion resistant bolting does not provide a corresponding increase in the level of quality or safety.

ENCLOSURE

WATTS BAR NUCLEAR PLANT UNIT 1
REQUEST FOR RELIEF ISPT-08

**TABLE**
**CODE CLASS 1 BOLTED CONNECTIONS INSIDE THE POLAR CRANE WALL**

| IDENTIFIER | SIZE | COMPONENT | DESCRIPTION | STUD | NUT | RFO2 Dose Rate[1] | Estimated Man-Hours[2] | Projected RFO3 Dose[2] |
|---|---|---|---|---|---|---|---|---|
| 1-CKV-62-638 | 3" | Check valve | CVCS Normal Charging Check Valve | ↑ | ↑ | 40/40/40 | ↑ | ↑ |
| 1-CKV-62-640 | 3" | Check valve | CVCS Alternate Charging Check Valve | | | GA 30-50 | | |
| 1-CKV-62-659 | 3" | Check valve | CVCS Normal Charging Check Valve | | | 40/40/40 | | |
| 1-CKV-62-660 | 3" | Check valve | CVCS Alternate Charging Check Valve | | | GA 30-50 | | |
| 1-CKV-62-661 | 3" | Check valve | CVCS Charging to RCS Spray Check Valve | | | 100/80/80 | | |
| 1-CKV-63-558 | 6" | Check valve | Hot Leg 4 Safety Injection Check Valve | | | 70/30/25 | | |
| 1-CKV-63-559 | 6" | Check valve | Hot Leg 2 Safety Injection Check Valve | | | 200/30/20 | | |
| 1-CKV-63-560 | 10" | Check valve | Cold Leg 1 Injection Header Check Valve | SA-453 | SA-194 | 140/100/80 | 668 | 4.02 |
| 1-CKV-63-561 | 10" | Check valve | Cold Leg 2 Injection Header Check Valve | Grade 660 | Grade B6 | 250/140/40 | | Person-Rem |
| 1-CKV-63-562 | 10" | Check valve | Cold Leg 3 Injection Header Check Valve | | | 160/80/40 | | |
| 1-CKV-63-563 | 10" | Check valve | Cold Leg 4 Injection Header Check Valve | | | GA 30-50 | | |
| 1-CKV-63-622 | 10" | Check valve | SIS Cold Leg Accumulator 1 Outlet Check | | | GA 10-20 | | |
| 1-CKV-63-623 | 10" | Check valve | SIS Cold Leg Accumulator 2 Outlet Check | | | 10/10/10 | | |
| 1-CKV-63-624 | 10" | Check valve | SIS Cold Leg Accumulator 3 Outlet Check | | | GA 10-20 | | |
| 1-CKV-63-625 | 10" | Check valve | SIS Cold Leg Accumulator 4 Outlet Check | ↓ | ↓ | GA 10-20 | ↓ | ↓ |

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**CODE CLASS 1 BOLTED CONNECTIONS INSIDE THE POLAR CRANE WALL**

| IDENTIFIER | SIZE | COMPONENT | DESCRIPTION | STUD | NUT | RFO2 Dose Rate[1] | Estimated Man-Hours[2] | Projected RFO3 Dose[2] |
|---|---|---|---|---|---|---|---|---|
| 1-CKV-63-641 | 6" | Check valve | Hot Leg 1 Injection Header Check Valve | | | GA 40-50 | | |
| 1-CKV-63-644 | 6" | Check valve | Hot Leg 3 Injection Header Check Valve | | | GA 60 | | |
| 1-FCV-62-69 | 3" | Globe Valve | CVCS Letdown Isolation Valve | | | 180/80/50 | | |
| 1-FCV-62-70 | 3" | Globe Valve | CVCS Letdown Isolation Valve | | | GA 50 | | |
| 1-FCV-68-332 | 3" | Gate Valve | Pressurizer PORV Block Valve | SA-453 | SA-194 | GA 10-20 | 668 | 4.02 |
| 1-FCV-68-333 | 3" | Gate Valve | Pressurizer PORV Block Valve | Grade 660 | Grade B6 | GA 10-20 | | Person-Rem |
| 1-FCV-74-1 | 12" | Gate Valve | Loop 4 Hot Leg to RHR Suction Isolation | | | GA 50-100 | | |
| 1-FCV-74-9 | 10" | Gate Valve | 1-FCV-74-1 Bypass RHR Suction Isolation | | | GA 50-100 | | |
| 1-ISV-68-580 | 3" | Gate Valve | RCS Loop 3 Letdown Isolation Valve | | | 200/100/35 | | |
| 1-PCV-68-340B | 4" | Gate Valve | RCS Loop 2 Pressurizer Spray Line Isolation | | | 300/100 | | |
| 1-PCV-68-340D | 4" | Gate Valve | RCS Loop 1 Pressurizer Spray Line Isolation | | | 150/100 | | |

Notes:

1. Where three numbers are presented, separated by a slash, they represent Dose on contact/Dose at 30 centimeters/General area dose. Numbers preceded by the letters GA are general area dose rates in the vicinity of the component. All dose rates are expressed in mrem/hour.
2. Man-hour and dose estimates are for insulation removal and replacement only.