

January 25, 2005

Mr. Karl W. Singer
Chief Nuclear Officer and
Executive Vice President
Tennessee Valley Authority
6A Lookout Place
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SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 1 - SAFETY EVALUATION OF
INSERVICE INSPECTION RELIEF REQUEST NOS. 1-ISI-14 AND 1-ISI-15
FIRST 10-YEAR INSPECTION INTERVAL (TAC NOS. MC2368 AND MC2369)

Dear Mr. Singer:

By letter dated March 19, 2004, and supplemented by letter dated August 6, 2004, Tennessee Valley Authority (the licensee) requested relief, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g)(5)(iii), from certain volumetric examination requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, 1989 Edition for the Watts Bar Nuclear (WBN) Plant, Unit 1 for the first 10-year inservice inspection (ISI) interval. The relief, applicable to the nozzle and the piping welds in Unit 1, pertains to the limited volumetric examination conducted for each of the welds due to the configuration of the weld.

The staff has evaluated Relief Requests 1-ISI-14 for the pressurizer nozzle-to-vessel welds and 1-ISI-15 for the safety injection system piping welds against the requirements of the ASME Code, Section XI, 1989 Edition. The NRC staff concludes that compliance with the Code examination requirements are impractical, and would require design modification of the welds resulting in significant burden to the licensee. The NRC staff believes that reasonable assurance of structural integrity of the welds has been provided with the licensee's examination. Therefore, request for relief RR-1-ISI-14 and RR-1-ISI-15 is granted pursuant to 10 CFR 50.55a(g)(6)(l) for WBN Plant, Unit 1 for the first 10-year ISI interval. This grant of relief is authorized by law and will not endanger life, property, or the common defense and security and is otherwise in the public interest given due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. All other ASME Code, Section XI

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requirements for which relief was not specifically requested and approved in this relief request remain applicable including third party review by the Authorized Nuclear Inservice Inspector.

The details of the staff's evaluation are provided in the enclosed Safety Evaluation.

Sincerely,

/RA BMozafari for/

Michael L. Marshall, Jr., Chief, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-390

Enclosure: As stated

cc: See next page

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*See TChan to MMarshall memorandum dated September 7, 2004

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Tennessee Valley Authority

WATTS BAR NUCLEAR PLANT

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

FIRST 10-YEAR INSERVICE INSPECTION INTERVAL

REQUEST FOR RELIEF NOS. 1-ISI-14 AND 1-ISI-15

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT, UNIT 1

DOCKET NO. 50-390

1.0 INTRODUCTION

By letter dated March 19, 2004, as supplemented by letter dated August 6, 2004, Tennessee Valley Authority (the licensee) requested relief from certain volumetric examination requirements of the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (Code), Section XI, 1989 Edition for the pressurizer nozzle-to-vessel welds and the safety injection system piping welds for Watts Bar Nuclear (WBN) Plant, Unit 1 for the first 10-year inservice inspection (ISI) interval. The relief, applicable to the nozzle and the piping welds in Unit 1 pertains to the limited volumetric examination conducted for each of the welds due to the configuration of the weld. The examinations were conducted as part of ISI conducted during the WBN, Unit 1 Cycle 5 refueling outage. The requests for reliefs 1-ISI-14 and 1-ISI-15 covering the limited volumetric examination were submitted by the licensee pursuant to 10 CFR 50.55a(g)(5)(iii). The NRC staff has evaluated the relief requests against the requirements of the applicable Code, the 1989 Edition of the ASME Code, Section XI pursuant to 10 CFR 50.55a(g)(6)(i).

2.0 REGULATORY EVALUATION

The ISI of ASME Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Code and applicable addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(l). 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the licensee demonstrates that (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 applicable ISI Code of Record for the first 10-year ISI interval of WBN Plant, Unit 1, is the 1989 Edition.

3.0 TECHNICAL EVALUATION (RR-1-ISI-14)

Systems/Component(s) for Which Relief is Requested:

Five Pressurizer Nozzle Welds identified as WP-11, WP-12, WP-13, WP-14, and WP-15 ASME Code, Section XI Examination Category B-D.

Code Requirements:

The ASME Code, Section XI, 1989 Edition, Table IWB-2500-1, Examination Category B-D, Item No. B3.110, Pressurizer nozzle-to- vessel welds, require volumetric examination of essentially 100 percent of examination volume identified in Figure IWB-2500-7(b).

Code Requirements for which Relief is Requested:

Relief is requested from performing the required volumetric examination of essentially 100 percent of the full volume of the Pressurizer nozzle-to-vessel welds.

Licensee's Proposed Alternative:

In lieu of the code required 100 percent ultrasonic examination, an ultrasonic examination was performed on accessible areas to the maximum extent practical, given the physical limitations of the Pressurizer nozzle-to-vessel welds.

Licensee's Basis for Relief:

The design configuration of the Pressurizer precludes an ultrasonic examination of the required volume for the following nozzle-to-vessel welds: WP-11, WP-12, WP-13, WP-14 and WP-15. The design configuration limits ultrasonic examination to approximately 68 percent of the required examination volume as calculated in the examination reports.

Staff Evaluation

The NRC staff finds that the configuration of the pressurizer nozzle-to-vessel welds precludes ultrasonic examination of essentially 100 percent of the code required examination volume. The physical arrangement of the subject nozzle welds in conjunction with the close curvature of the outside wall surfaces of the nozzle precludes effective ultrasonic examination from the nozzle side. The composite coverage of 9 scans using 0, 45, and 60 degree sound beams resulted in an average of 68 percent volumetric coverage for each nozzle. In order to meet the ASME Code requirements, the nozzles and/or pressurizer would have to be modified to facilitate scanning of the entire examination volume. Imposition of this requirement would place a significant burden on the licensee. However, one circumferential scan from the head side of the weld was unobstructed and, therefore, it is reasonable to assume that there was no flaw

parallel to the weld that is likely to have been missed. From the vessel head side 76 percent of the weld volume was effectively scanned for transverse flaws. Therefore, it is reasonable to assume that if there was a pattern of degradation in the subject welds, the examination of the accessible volume would have detected it. From a material standpoint, the welds for which relief from Code-required examination coverage is requested are made of low-alloy carbon steel which is not susceptible to stress corrosion cracking in the exposed environment. There is no degradation mechanism other than fatigue active in the subject welds which would cause a failure of the weld. Moreover, in the first 10-year ISI interval it is highly unlikely that a fatigue crack would have grown to a critical size to cause a failure of the weld which would have been missed during the volumetric examination. The NRC staff, therefore, has determined that the licensee's examination of the accessible weld volume provides reasonable assurance of structural integrity. The NRC staff believes that it is impractical to obtain the examination coverage required by the Code unless the components are redesigned and replaced which would impose a significant burden on the licensee.

4.0 CONCLUSION

Based on the above, the NRC staff concludes that the compliance with the Code examination requirements are impractical, and would require design modification of the welds resulting in significant burden to the licensee. The NRC staff believes that reasonable assurance of structural integrity of the welds has been provided with the licensee's examination. Therefore, request for relief RR-1-ISI-14 is granted pursuant to 10 CFR 50.55a(g)(6)(I) for WBN Plant, Unit 1 for the first 10-year ISI interval. This grant of relief is authorized by law and will not endanger life, property, or the common defense and security and is otherwise in the public interest given due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in this relief request remain applicable including third party review by the Authorized Nuclear Inservice Inspector.

5.0 TECHNICAL EVALUATION (RR-1-ISI-15)

Systems/Component(s) for Which Relief is Requested

One 3-inch Safety Injection System piping weld identified as SIF-D086-02
One 8-inch Safety Injection System piping weld identified as RHRF-D054-09

Code Requirement:

The 1989 Edition of ASME Section XI and the WCAP-14572, "Westinghouse Owners Group Application of Risk-Informed Methods to Piping Inservice Inspection Topical Report, Revision 1-NP-A, dated February 1999," Table 4.1-1, Examination Category R-A, Risk-Informed Piping Examinations, Item Number R1.11, Elements Subject to Thermal Fatigue, specify the examination requirement as shown in Figure IWB-2500-8(c).

Code Requirements for which Relief is Requested:

Relief is requested from performing the required volumetric examination on essentially 100 percent of the lower one-third volume of the referenced weld.

Licensee's Proposed Alternative:

In lieu of the code required examination coverage and qualification demonstration requirement, a best effort ultrasonic examination was performed, as qualified through the Performance Demonstration Initiative (PDI) for Supplement 2 to the ASME Section XI, Appendix VIII with demonstrated best effort for single side examination.

Licensee's Basis for Relief:

10 CFR 50.55a(b)(2)(xv)(A) requires that if access is available, the weld shall be scanned in each of the four directions (parallel and perpendicular to the weld) where accessible. Coverage credit may be taken for single side exams on ferritic piping. However, for austenitic piping, a procedure must be qualified with flaws on the inaccessible side of the weld. There are currently no qualified single side examination procedures for austenitic piping welds. Current technology is not capable of reliably detecting or sizing flaws on the far side of an austenitic weld for configurations common to United States nuclear plant applications. The PDI Program conforms to the 10 CFR 50.55a(b)(2)(xv)(A) regarding single side access for piping.

PDI Performance Demonstration Qualification Summary personnel certificates for austenitic piping list the limitation that single side examination is performed on a best effort basis. The best effort qualification is provided in place of complete single side qualification to demonstrate that the examiners qualification and the subsequent weld examination is based on application of the best available technology. When the examination area is limited to one side of an austenitic weld, examination coverage does not comply with 10 CFR 50.55a(b)(2)(xvi)(B) and full coverage credit may not be claimed.

The design configuration and materials used in fabrication of the subject safety injection system welds precludes an ultrasonic examination of the required volume because there are no current qualified single side examination procedures that demonstrate equivalency to two-sided examination procedures on austenitic piping. The design configuration and material limits ultrasonic examination to the extent indicated:

<u>Weld</u>	<u>Best Effort Coverage</u>	<u>ASME Section XI Coverage(1)</u>
SIF-D086-02	50%	100%
RHRF-D054-09	50%	100%

Note (1) - Coverage does not consider the inherent limitations associated with the PDI methodology for one-sided access.

Staff Evaluation

The piping welds were examined under the PDI program for Supplement 2 to the ASME Section XI, Appendix VIII. Both welds are made of austenitic stainless steel where ultrasonic scanning in the axial direction could be performed from only one side of the weld due to component configuration which prevented scanning from the tapered surface on the other side of the weld. With stainless steel material, the sound beam is markedly attenuated on the far side to detect and size flaws. 10 CFR 50.55a(b)(2)(xv)(A) requires that if access is available, the weld shall be scanned in each of the four directions (parallel and perpendicular to the weld) where accessible. For austenitic stainless steel piping, however, a procedure must be qualified

with flaws on the inaccessible side of the weld. There are currently no qualified single side examination procedures for austenitic piping welds. Current technology is not capable of reliably detecting or sizing flaws on the far side of an austenitic weld for configurations common to United States nuclear plant applications. In lieu of the code required examination coverage and qualification demonstration requirement, a best effort ultrasonic examination was performed, as qualified through the PDI for Supplement 2 to the ASME Section XI, Appendix VIII with demonstrated best effort for single side examination. The PDI Program conforms to 10 CFR 50.55a(b)(2)(xv)(A) regarding single side access for piping. The licensee's best-effort examination with single-sided access achieved volumetric coverages of 50 percent. The NRC staff, however, has determined that the examination coverage was reduced due to component configuration which restricted scanning from the far side of the weld, allowing only single-sided access. Therefore, it is impractical to meet the Code requirements. In order to meet the Code requirements, the components would have to be redesigned, fabricated, and installed in the systems, which would impose a significant burden on the licensee. The results of examination did not identify any rejectable indications. The NRC staff further believes that, if there were any service-induced flaws existing in the welds and/or in the base metal adjacent to the welds, the examination of the accessible weld volume would have at least detected a portion of them with high degree of confidence. Therefore, the NRC staff has determined that the licensee's limited examination of the welds provides reasonable assurance of structural integrity of the subject welds.

6.0 CONCLUSION

Based on the above, the NRC staff concludes that compliance with the Code examination requirements are impractical, and would require design modification of the welds resulting in significant burden to the licensee. The NRC staff believes that reasonable assurance of structural integrity of the welds has been provided with the licensee's examination. Therefore, request for relief RR-1-ISI-15 is granted pursuant to 10 CFR 50.55a(g)(6)(I) for WBN Plant, Unit 1 for the first 10-year ISI interval. This grant of relief is authorized by law and will not endanger life, property, or the common defense and security and is otherwise in the public interest given due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in this relief request remain applicable including third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: P. Patnaik, EMCB/NRR

Date: January 25, 2005