

U.S. Nuclear Regulatory Commission
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Enclosure

cc (Enclosure):

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**REQUEST FOR ADDITIONAL INFORMATION
WATTS BAR NUCLEAR PLANT UNIT 1
INSERVICE INSPECTION RELIEF REQUEST PDI-2**

Request for Relief (RR) No. PDI-2 is for the Second 10-year inservice inspection (ISI) interval, in which Watts Bar Nuclear Plant (WBN), Unit 1 adopted the 2001 Edition with addenda through the 2003 Addenda of the American Society of Mechanical Engineers (ASME) Code, Section XI as the ASME Code of record.

In its letter dated July 25, 2007, Tennessee Valley Authority (TVA) provided additional information regarding its proposal to perform volumetric examinations on reactor pressure vessel (RPV) nozzle-to-vessel welds at a reduced volume of 1/2 inch beyond the widest part of the boundary of the deposited weld material in lieu of the requirements of ASME Code, Section XI, Figures IWB-2500-7(a) and 1WB-2500-7(b).

QUESTION 1

In its request for additional information (RAI) dated July 9, 2007, the staff asked the licensee in Question 1(f): "Have the subject welds been previously ultrasonically examined using the examination volumes of ASME Code, Section XI, Figures IWB-2500-7(a) and (b)?"

TVA's response to Question 1 (f) is stated below:

...Inservice examination of the eight RPV inlet and outlet nozzles was performed in 2005 by Southwest Research Institute to the requirements of ASME [Code,] Section XI, 1995 Edition, 1996 Addenda, for a modified Inspection volume including the weld plus 1/2" on both sides, in accordance with Request for Relief PDI-2. Utilizing the modified inspection volume, essentially 100% [percent] coverage was not obtained for the outlet nozzles and Request for Relief 1-ISI-19 was submitted to the NRC [Nuclear Regulatory Commission] for approval. Relief was granted in a safety evaluation [SE] issued October 27, 2006 (Accession, number ML062480232)...

In the staff's SE dated October 27, 2006, Request for Relief (RR) 1-IS-19 was evaluated based on the 1989 Edition of the ASME Code and Figure IWB-2500-7(b), and not for a modified inspection volume, nor to the 1995 Edition, 1996 Addenda of the ASME Code as implied in the RAI response above. In addition, based on the above RAI response, it appears to the staff that the RPV nozzle-to-vessel welds were examined at a reduced volume during the first 10-year WBN, Unit 1 ISI interval in lieu of the requirements of ASME Code, Section XI, Figure IWB-2500-7(b) prior

to receiving authorization for the proposed alternative contained in RR PDI-2.

Please clarify prior response to RAI Question 1 (f) regarding these points.

TVA RESPONSE

At the time RR 1-ISI-19 was submitted, WBN's first interval Section XI Inservice Inspection program utilized the 1989 edition of Section XI of the ASME Code. The examinations performed in 2005 were performed to meet the requirements of the site's ISI Program Procedure, 1-TRI-0-10, in accordance with the 1989 Edition of the ASME Code. However, the NDE examinations were performed in accordance with the current NDE procedures, developed from ASME Code, Section XI, Appendix VIII of the 1995 Edition, 1996 Addenda Code, as approved by NRC safety evaluation dated 5/24/2002 [Reference ML021490190]. The statement in TVA's first response, "Inservice examination of the eight RPV inlet and outlet nozzles was performed...to the requirements of ASME Section XI, 1995 Edition, 1996 Addenda" refers only to the PDI qualified NDE procedures used for performance of the inspection.

The Relief Request submittal package, "WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) INSERVICE INSPECTION (ISI) PROGRAM REQUEST FOR RELIEF 1-ISI-16, 1-ISI-17, 1-ISI-18 AND 1-ISI-19," dated January 25, 2006 [Reference ML060300405] provides in enclosure 5 the Examination Area Coverage Report for the 2005 performance of the subject examinations. This report, specifically referenced in Enclosure 4, contains a discussion of the coverage calculation based on performance of the reduced volume examination approved in the first interval RR PDI-2. It was TVA's intent that the limitation described in RR 1-ISI-19 be evaluated with consideration that the reduced volume examination of previously approved first interval RR PDI-2 had been performed.

The following paragraphs provide a timeline of the events described in question 1 of the NRC's second RAI. This information clarifies that the reduced volume examinations of the RPV nozzle-to-vessel welds were performed AFTER issuance of the NRC's SE granting permission to use RR PDI-2 for the first inspection interval.

TVA submitted generic Relief Request PDI-2 for the first inspection interval on February 23, 2001, requesting reduction in weld examination volume for the reactor vessel hot and cold leg nozzle-to-shell welds, similar to the guidelines found in ASME Code Case N-613. RR PDI-2 was submitted to reduce the amount of RPV and nozzle base metal volume which is required to be examined during the performance of the subject examinations, thus reducing

the amount of radiation exposure to personnel performing the examinations. The request incorporated the aspects of Code Case N-613, which was not yet approved for generic use at that time, as a requested alternative that provided an acceptable level of quality and safety. With the equivalent level of safety, the extra man-rem exposure that would have been incurred using the larger examination volume was deemed unnecessary. Relief was requested from the 1989 edition of the ASME Code under the provisions of 10 CFR 50.55a(a)(3)(i) [Reference ML010590085]. On September 19, 2001, NRC issued a Safety Evaluation granting permission to use RR PDI-2 with reduced exam volume [Reference ML012620377] for the first inspection interval.

In March 2005, during Watts Bar's sixth refueling outage, examinations were performed on the Unit 1 nozzle-to-shell welds, including N-15, N-16, N-17, & N-18. Examinations were performed to meet the requirements of the site's first interval ISI Program Procedure, 1-TRI-0-10, in accordance with the 1989 Edition of the ASME Code. The examinations were performed in accordance with the current NDE procedures, developed from Section XI, Appendix VIII of the 1995A96 Code, the PDI developed procedures, and the augmented RPV examination requirements of 10 CFR 50.55a(g)(6)(ii)(A) and (C). The examinations were performed on a reduced examination volume, as allowed by the SER on first interval Relief Request PDI-2, issued on September 19, 2001.

During the 2005 examination, a limitation was encountered when the qualified PDI transducers were applied to the exam area, due to signal loss from transducer lift-off resulting from the physical configuration and contour of the nozzle and shell weld transition area. As a result of this limitation, Watts Bar Nuclear Plant submitted site specific Relief Request 1-ISI-19 to the NRC for consideration on January 25, 2006. 1-ISI-19 cites the impracticality of covering essentially 100% of the N-15, N-16, N-17 and N-18, RPV hot-leg outlet nozzle-to-shell welds due to the configuration of the interior nozzle area surfaces. This relief request addressed the physical limitation encountered at the time of the performance of the examinations. Relief was requested under the provisions of 10 CFR 50.55a(g)(5)(iii) [Reference ML060300405]. RR 1-ISI-19 requested relief from the 1989 Edition of the ASME Code with reference to the reduced examination volume of the approved first interval RR PDI-2. Relief was granted via a NRC Safety Evaluation issued on October 27, 2006 [Reference ML062480232].

QUESTION 2

For the second 10-year ISI interval in RR PDI-2, the licensee is requesting an alternative to the ASME Code requirements pursuant to Title 10 Code of Federal Regulations (10 CFR) 50.55a(a)(3)(i). In the licensee's RAI response to Question 1(d), it was noted that 76 percent volumetric coverage was obtained for RPV Outlet

Nozzles Weld Nos. N18, N17, N16, and N15 during the first 10-year ISI interval 2005 Refueling Outage (RFO) 6. For the closeout of the first 10-year ISI interval, the licensee submitted a request for relief under 10 CFR 50.55a(g)(5)(iii) because it was impractical to obtain essentially 100 percent coverage for the subject welds as required by the ASME Code. Relief was granted in a NRC SE dated October 27, 2006.

Since the proposed modified area to be examined in RR PDI-2 is an alternative to the ASME Code requirements; 10 CFR 50.55a(g)(5)(iii) does not have provisions to allow subsequent relief based on impracticality for authorized alternatives to the ASME Code. If the licensee expects that it will obtain less than essentially 100% volumetric coverage of the proposed modified area during the second 10-year ISI interval examination, it should include a discussion of that reduced examination volume in RR PDI-2.

Please clarify the percent of the reduced examination volume (assuming RR PDI-2 is authorized) that you expect to be able to examine. If this examination will be "less than essentially 100%" of the reduced volume, justify in the context of RR PDI-2 why obtaining less than "essentially 100%" coverage of the reduced examination volume still provides for an adequate examination.

TVA RESPONSE

TVA expects it will obtain less than essentially 100% volumetric coverage on RPV Outlet Nozzles Welds N18, N17, N16, and N15 during performance of the second interval NDE examinations. This conclusion is based on the limitation encountered during the previous examination, performed in accordance with the approved first interval RR PDI-2, as documented in the RR 1-ISI-19. Data reports from this previous examination indicate the maximum achievable coverage for the subject outlet nozzles is approximately 76%. The licensee assumes subsequent performances utilizing this same inspection volume of RR PDI-2 will achieve similar coverage. Note however, the achievable coverage may differ from that of the previous examinations due to improvements in NDE technology, performance, and/or examination methods.

To clarify, TVA is requesting that the second interval RR PDI-2, submitted February 7, 2007, be amended to request relief from both 1.) the ASME Code exam volume of IWB-2500-7(b), as stated in the original request for relief, and 2.) from performing the required volumetric examination of essentially 100% of the reactor vessel outlet nozzle-to-vessel welds.

TVA's second interval RR PDI-2 states that the reduced volume examination eliminates a portion of the excess base material from the examination area, thus reducing examination time and

personnel dose. Since the nozzle and vessel base materials are less susceptible to cracking than the weld area and heat affected zone, this proposed reduction in examination volume does not reduce the effectiveness of the examination and will still maintain an acceptable level of safety and quality by maintaining a high level of confidence that any relevant indications will be identified. Since the justification for granting relief from the ASME Code examination volume of Figure IWB-2500-7(a) has previously been provided, this response focuses on the justification for granting relief from examining essentially 100% of the reduced volume due to the anticipated coverage limitation.

Extension of the examination volume to the original required dimensions (i.e., to a distance of 1/2 the RPV shell thickness on either side of the weld) in lieu of using the provisions of the proposed second interval RR PDI-2 will still result in the same type of physical limitation in coverage due to the phenomenon of transducer lift-off. In utilizing the RR PDI-2 exam area, the achievable coverage is expected to be at least as high as the estimated coverage achievable using the required examination volume from the 2001A03 Code Figure IWB-2500-7(a). Research identified that the same limitation is also documented in the pre-service examination data package for nozzles N-15, N16, N-17, and N-18, examined using the full specified volumes of ASME Code, Section XI, Figure IWB-2500-7(a); but the report does not quantify the achievable coverage as a percentage. Based on this information, TVA is confident the anticipated limitation encountered during performance of the reduced volume examination will not adversely impact the quality of the examination, when considering the same limitation is present using the full code examination volume of 1/2 t.

Previous examination of the outlet nozzle-to-vessel welds, performed in accordance with the proposed RR PDI-2 examination volume, achieved 100 percent two-direction parallel coverage and 100 percent two-direction transverse coverage from the shell side of the nozzle to vessel weld, with the sound beam directed toward the weld. The two-direction transverse scans performed from the integral extension side were limited. A one-direction parallel examination was also performed from the nozzle bore resulting in 100 percent coverage. The results of these examinations recorded two ASME Code allowable indications in nozzle N18, and no reportable indications in any nozzle. This best-effort ultrasonic examination, covering approximately 76% of the required volume, provided reasonable assurance of an acceptable level of quality and safety; and data obtained from the volume examined provides sufficient information to judge the overall integrity of the outlet nozzle-to-vessel welds. Future examinations performed using the same (or improved) techniques will provide an equal level of confidence in quality and safety.