

April 26, 2001

Mr. Harold W. Keiser
Chief Nuclear Officer & President
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Post Office Box 236
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SUBJECT: SALEM NUCLEAR GENERATING STATION, UNIT NO. 1 - RELIEF FROM
ASME CODE REQUIREMENTS RELATED TO THE INSERVICE INSPECTION
PROGRAM, SECOND 10-YEAR INTERVAL, RELIEF REQUEST RR-B8
(TAC NO. MB1228)

Dear Mr. Keiser:

By letter dated February 9, 2001, as supplemented on April 10, 2001, PSEG Nuclear LLC (PSEG) submitted a request for relief from the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (the Code), Section XI, requirements for certain inservice inspections (ISI) of reactor pressure vessel-to-nozzle welds at Salem Nuclear Generating Station (Salem), Unit No. 1. In your April 10, 2001, letter, you requested approval to use a reduced examination volume of 1/2-inch from the widest part of the weld in lieu of the examination volume requirements of Figures IWB-2500-7(a) and (b) from the ASME Code, Section XI, 1983 Edition, 1983 Summer Addenda Examination Category B-D full penetration welds of nozzles in vessels. Relief was requested for Salem, Unit No. 1, for the second 10-year interval vessel examination scheduled for the spring 2001 refueling outage.

The U.S. Nuclear Regulatory Commission (NRC) staff has completed the review of the subject relief request. The NRC staff's Safety Evaluation (SE) is enclosed. Our SE concludes that the proposed alternative in relief request RR-B8 will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the staff authorizes the proposed alternative for the second 10-year inservice inspection interval for Salem, Unit No. 1.

Sincerely,

/RA/

James W. Clifford, Chief, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-272

Enclosure: Safety Evaluation

cc w/encl: See next page

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TEMPLATE = NRR-028

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO ALTERNATIVE WELD VOLUME REQUIREMENTS
FOR THE EXAMINATION OF FULL PENETRATION
REACTOR VESSEL-TO-NOZZLE WELDS
PSEG NUCLEAR LLC
SALEM NUCLEAR GENERATING STATION, UNIT NO. 1
DOCKET NO. 50-272

1.0 INTRODUCTION

The inservice inspection of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Code and applicable edition and addenda as required by Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). Pursuant to 10 CFR 50.55a(a)(3), alternatives to the requirements of paragraph (g) may be used, when authorized by the U.S. Nuclear Regulatory Commission (NRC), Director of the Office of Nuclear Reactor Regulation, 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 pre-service examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection (ISI) 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 components (including supports) may meet the requirements set forth in subsequent editions and addenda of the ASME Code incorporated by reference in 10 CFR 50.55a(b) subject to the limitations and modifications listed therein and subject to Commission approval.

ENCLOSURE

By letter dated February 9, 2001, as supplemented on April 10, 2001, PSEG Nuclear LLC (PSEG) submitted a request for relief from the ASME Code, Section XI, requirements for certain inservice inspections of reactor pressure vessel-to-nozzle welds at Salem Nuclear Generating Station (Salem), Unit No. 1. In its April 10, 2001, letter, PSEG requested approval to use a reduced examination volume of 1/2-inch from the widest part of the weld in lieu of the examination volume requirements of Figures IWB-2500-7(a) and (b) from the ASME Code, Section XI, 1983 Edition, 1983 Summer Addenda Examination Category B-D full penetration welds of nozzles in vessels. PSEG proposed to use ASME Code, Section XI, Division 1, 1995 Edition, 1996 Addenda, Appendix VIII, Supplements 4 and 6 as amended by *Federal Register* Notice 64 FR 51370, dated September 22, 1999, and currently reflected in 10 CFR 50.55a(b)(2)(xv), for the portion of the examination conducted from the vessel shell. PSEG stated that it would use a Performance Demonstration Initiative (PDI) qualified procedure, personnel, and equipment for this particular examination.

Relief was requested for Salem, Unit No. 1, for the second 10-year interval vessel examination scheduled for the spring 2001 refueling outage.

2.0 BACKGROUND

2.1 Component Description

Salem, Unit No. 1, ASME Section XI, Class 1, Reactor Pressure Vessel (RPV) Nozzle-to-Vessel welds.

2.2 ASME Code Examination Requirement for which Relief is Requested

ASME Code, Section XI, 1983 Edition, including 1983 Summer Addenda; Table IWB-2500-1, Examination Category B-D, Full Penetration Welds of Nozzles in Vessels, Code Item B3.90, Figure IWB-2500-7(a) and (b), defines weld examination volume requirements, and ASME Code, Section V, Article 4, specify ultrasonic (UT) examination procedure requirements. Specifically, the licensee is requesting relief from the $t_s/2$ examination volume requirements of Figures IWB-2500-7(a) and (b), and is requesting relief from the requirement to perform the UT examination in accordance with the required weld volumetric requirements specified in Table IWB-2500-1 of the ASME Code, Section V, Article 4.

Relief is requested for the Salem, Unit No. 1, 10-year second interval RPV examination scheduled for the spring 2001 refueling outage.

2.3 Licensee's Proposed Alternative to ASME Code

Pursuant to 10 CFR 50.55a(a)(3)(i), PSEG proposed reducing the examination volume to 1/2-inch from each side of the weld crown in lieu of one-half the through-wall thickness ($t_s/2$) from each side of the weld required by Figures IWB-2500-7(a) and (b).

2.4 Licensee's Basis for the Proposed Alternative

In its letter dated April 10, 2001, the licensee stated that it is required to perform ISI examinations of selected welds in accordance with the requirements of 10 CFR 50.55a, plant Technical Specifications, and the 1983 Edition, 1983 Summer Addenda, of the ASME Code,

Section XI. The ASME Code prescribes a $t_s/2$ examination volume requirement as described in Figures IWB-2500-7(a) and (b).

PSEG maintained that the examination volume for the RPV pressure retaining nozzle-to-vessel welds extends far beyond the weld into the base metal, and is unnecessarily large. This extends the examination time significantly, and results in no net increase in safety, as the area being examined is a base metal region which is not prone to inservice cracking, and has been extensively examined during construction, pre-service examination and during the first inservice examinations with acceptable results.

The licensee further explained that the UT examination of the RPV vessel-to-nozzle weld will be performed from the vessel shell side and from the nozzle bore to ensure full code-required through volume examination coverage. The portion of the examination from the vessel shell will be conducted utilizing Appendix VIII, Supplements 4 and 6, as amended by the Final Rule in *Federal Register* Notice 64 FR 51370, dated September 22, 1999, in lieu of Article 4 of Section V. PSEG will use a PDI-qualified procedure, personnel, and equipment for the examination. In addition, to the examination that will be conducted from the vessel wall, a UT examination from the nozzle bore will be performed per the requirements of Article 4 of Section V and the subsequent guidelines of Regulatory Guide (RG) 1.150, Revision 1. There are presently no PDI-qualified procedures for the bore examination of the nozzle-to-vessel weld. The Final Rule requires implementation of Appendix VIII, Supplement 7, "Qualification Requirements for Nozzle-To-Vessel Welds," by November 22, 2002. In Supplement 7, as amended, the requirements of Supplements 4 and 6 will be required at that time. Approval for the use of a qualified UT procedure, implementing Supplements 4 and 6, for the portion of the examinations conducted from the vessel shell will allow PSEG to utilize the same UT procedure and set-up being used to examine other adjacent welds during its 10-year ISI.

3.0 EVALUATION

The licensee proposed reducing the examination volume to 1/2-inch from each side of the weld crown in lieu of one-half the through-wall thickness from each side of the weld required by Figures IWB-2500-7(a) and (b). The acceptability of this reduced volume examination is based on prior examinations of the base metal and internal stress distribution near the weld. The base metal was extensively examined during construction, preservice inspection, and prior inservice inspections. These examinations show the ASME Code volume to be free of unacceptable flaws. The creation of flaws during plant service in the volume excluded from the proposed reduced examination is unlikely because of the low stress in the base metal away from the weld. The stresses caused by welding are concentrated at and near the weld. Cracks, should they initiate, occur in the high-stressed area of the weld. The high stressed areas are within the volume included in the reduced examination volume proposed by the licensee. The prior thorough examination of the base metal and the examination of the high stressed areas of the weld provides an acceptable level of quality and safety.

The licensee also proposed to perform the UT examination of the specified nozzle-to-vessel welds from inside the vessel with personnel and procedures qualified according to Supplements 4 and 6 of Appendix VIII of Section XI in lieu of the requirements of their ISI Code of record, and from the nozzle bore with personnel and procedures qualified according to their ISI Code of record. The ISI Code of record requires the use of prescriptive criteria for qualifying UT techniques. The staff has determined that the use of prescriptive criteria for qualifying UT

techniques may be less effective than the use of performance-based criteria, for detecting and sizing flaws in reactor vessels. This determination was made in a September 22, 1999, rulemaking (64 FR 51370) that revised 10 CFR 50.55a and mandated accelerated implementation of Appendix VIII to Section XI of the ASME Code. The rule requires that the examination of nozzle-to-vessel welds utilize performance-based UT techniques that are qualified according to the criteria in Section XI, Appendix VIII, Supplement 7 by November 22, 2002. The nuclear utilities are participating in the Electric Power Research Institute's PDI program that was created to develop a generic qualification process that would allow utilities to meet the implementation date established in the rule.

In the spirit of meeting Supplement 7 but absent a developed qualification process for Supplement 7, the licensee's proposed alternative is to perform the nozzle-to-vessel weld examinations with Appendix VIII qualified personnel and procedures, where possible. For examinations conducted from inside the vessel, the rule would require that the inner volume be examined to a minimum depth of 15% in four orthogonal directions with personnel and procedures qualified in accordance with Supplement 4, as modified by the rule. The licensee's proposed alternative will satisfy this criteria. The rule would also require that the volume not examined according to Supplement 4 be examined from the nozzle bore. The licensee's proposed alternative is to continue using the prescriptive criteria from their ISI Code of record for examinations conducted from the bore. This methodology is similar to the methodology for Supplement 7 examinations that will be required after November 22, 2002. Therefore, based on the above discussion, the staff has determined that the proposed alternative for the examinations of Salem, Unit No. 1, RPV nozzle-to-vessel welds during the spring 2001 refueling outage, second 10-year interval is acceptable.

4.0 CONCLUSION

Based on its review, the staff finds that the proposed alternative to reduce the examination volume to 1/2-inch from each side of the weld crown in lieu of one-half the through-wall thickness from each side of the weld will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the proposed alternative is authorized for the ASME Code, Section XI, Class 1, RPV nozzle-to-vessel welds during the spring 2001 refueling outage of the second 10-year interval at Salem, Unit No. 1.

Principal Contributor: R. Fretz

Date: April 26, 2001