



LR-N17-0053

**MAR 01 2017**

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-0001

Salem Generating Station Units 1 and 2  
Renewed Facility Operating License Nos. DPR-70 and DPR-75  
NRC Docket Nos. 50-272 and 50-311

Subject: Request for Use of American Society of Mechanical Engineers (ASME)  
Code Cases N-695-1 and N-696-1

In accordance with 10 CFR 50.55a, "Codes and standards," PSEG Nuclear LLC (PSEG) hereby requests NRC approval of proposed Relief Request SC-I4R-171 for Salem Units 1 and 2. PSEG's relief request is associated with the use of alternatives to the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, Appendix VIII, Supplements 2 and 10 as modified by Code Case N-695, "Qualification Requirements for Dissimilar Metal Piping Welds," and Code Case N-696, "Qualification Requirements for Mandatory Appendix VIII Piping Examinations Conducted From the Inside Surface."

PSEG requests approval of the proposed request by October 6, 2017 to align with the Unit 1 refueling outage S1R25 when the first subject examinations are currently scheduled. Relief Request SC-I4R-171 applies to the Unit 1 Fourth 10-year interval which began on May 20, 2011, and is scheduled to end on December 31, 2020, and the Unit 2 Fourth 10-year interval which began on November 27, 2013, and is scheduled to end on December 31, 2021.

The Code of Record for the Salem Unit 1 and Unit 2 Fourth 10-year Inservice Inspection Interval is the ASME Code, Section XI, 2004 Edition with no Addenda. The proposed relief request is provided in Attachment 1.

There are no regulatory commitments contained in this letter.

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Should you have any questions concerning this matter, please contact Mr. Brian Thomas at 856-339-2022.

Sincerely,



David J. Mannai  
Senior Director, Regulatory Operations  
PSEG Nuclear LLC

Attachment 1: 10 CFR 50.55a Relief Request SC-I4R-171

cc: Administrator, Region I, NRC  
NRC Senior Resident Inspector, Salem  
C. Parker, Project Manager, Salem, USNRC  
P. Mulligan, Chief, NJBNE  
L. Marabella, Corporate Commitment Tracking Coordinator  
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**Attachment 1**

10 CFR 50.55a Relief Request SC-I4R-171

**Salem Generating Station Units 1 and 2  
Renewed Facility Operating License Nos. DPR-70 and DPR-75  
NRC Docket Nos. 50-272 and 50-311**

**10 CFR 50.55a Request SC-I4R-171**

Hardship in Accordance with 10 CFR 50.55a(z)(2)  
Hardship without a Compensating Increase in Quality and Safety

**1. ASME Code Component(s) Affected**

Code Class: 1  
 Examination Category: Code Case N-770-1 and R-A  
 Item Number: Inspection Items B, D, E and R1.20  
 Description: Reactor Pressure Vessel (RPV)  
 Nozzle to Safe End Alloy 600 Welds and  
 Safe End to Stainless Steel Pipe welds:

**Unit 1 Welds**

<b>Component ID</b>	<b>ASME Category</b>	<b>ASME Item</b>	<b>Description</b>	<b>Nominal Thickness</b>
27.5-RC-1110-5	N-770-1	D	NOZZLE TO SAFE-END (RPV-CL)	2.5in
27.5-RC-1120-5	N-770-1	D	NOZZLE TO SAFE-END (RPV-CL)	2.5in
27.5-RC-1130-5	N-770-1	D	NOZZLE TO SAFE-END (RPV-CL)	2.5in
27.5-RC-1140-5	N-770-1	D	NOZZLE TO SAFE-END (RPV-CL)	2.5in
29-RC-1110-1	N-770-1	D	NOZZLE TO SAFE-END (RPV-HL)	2.5in
29-RC-1120-1	N-770-1	D	NOZZLE TO SAFE-END (RPV-HL)	2.5in
29-RC-1130-1	N-770-1	D	NOZZLE TO SAFE-END (RPV-HL)	2.5in
29-RC-1140-1	N-770-1	E	NOZZLE TO SAFE-END (RPV-HL)	2.5in
29-RC-1110-2	R-A	R1.20	SAFE-END TO PIPE	2.5in
29-RC-1120-2	R-A	R1.20	SAFE-END TO PIPE	2.5in
29-RC-1130-2	R-A	R1.20	SAFE-END TO PIPE	2.5in
29-RC-1140-2	R-A	R1.20	SAFE-END TO PIPE	2.5in

### Unit 2 Welds

Component_ID	ASME Category	ASME Item	Description	Nominal Thickness
27.5-RC-1210-5	N-770-1	B	NOZZLE TO SAFE-END (RPV-CL)	2.5in
27.5-RC-1220-5	N-770-1	B	NOZZLE TO SAFE-END (RPV-CL)	2.5in
27.5-RC-1230-5	N-770-1	B	NOZZLE TO SAFE-END (RPV-CL)	2.5in
27.5-RC-1240-5	N-770-1	B	NOZZLE TO SAFE-END (RPV-CL)	2.5in
29-RC-1210-1	N-770-1	D	NOZZLE TO SAFE-END (RPV-HL)	2.5in
29-RC-1220-1	N-770-1	D	NOZZLE TO SAFE-END (RPV-HL)	2.5in
29-RC-1230-1	N-770-1	D	NOZZLE TO SAFE-END (RPV-HL)	2.5in
29-RC-1240-1	N-770-1	D	NOZZLE TO SAFE-END (RPV-HL)	2.5in
29-RC-1210-2	R-A	R1.20	SAFE-END TO PIPE	2.5in
29-RC-1220-2	R-A	R1.20	SAFE-END TO PIPE	2.5in
29-RC-1230-2	R-A	R1.20	SAFE-END TO PIPE	2.5in
29-RC-1240-2	R-A	R1.20	SAFE-END TO PIPE	2.5in

## **2. Applicable Code Edition and Addenda**

The American Society for Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Section XI, "Rules for Inservice Inspection and Testing of Components of Light-Water Cooled Plants," Code of record for Salem Units 1 and 2 Inservice Inspection (ISI) Fourth Intervals is the 2004 Edition with no Addenda.

The Salem Unit 1 Fourth ISI Interval began on May 20, 2011, and is scheduled to end on December 31, 2020, and the Salem Unit 2 Fourth ISI Interval began on November 27, 2013, and is scheduled to end on December 31, 2021.

## **3. Applicable Code Requirement**

Code Case N-770-1 as referenced in 10 CFR 50.55a (g)(6)(ii)(F) stipulates ultrasonic examination of dissimilar metal welds fabricated from Alloy 82/182 material. These requirements apply to the Salem Unit 1 and Unit 2 reactor pressure vessel (RPV) nozzle to safe-end welds and Risk-Informed Examination Category R-A, Item R1.20 (formerly Code Category B-J, B9.11) for the associated RPV safe-end to piping welds that are fabricated with stainless steel weld material.

All of the specified ultrasonic examinations (UT) are to be conducted per Appendix VIII Supplements 2 (wrought austenitic welds) and 10 (dissimilar metal welds). ASME Code Cases N-695 and N-696 provide alternatives to Appendix VIII Supplements 2 and 10 and include requirements for depth

sizing accuracy. Code Case N-695 3.3(c) states, "Examination procedures, equipment, and personnel are qualified for depth sizing when the RMS error of the flaw depth measurements, as compared to the true flaw depths, do not exceed 0.125 in. (3 mm)," while Code Case N-696 3.3(d) states, "Supplement 2 or Supplement 3 examination procedures, equipment, and personnel are qualified for depth sizing when the flaw depths estimated by ultrasonics, as compared with the true depths, do not exceed 0.125 in. (3 mm) RMS, when they are combined with a successful Supplement 10 qualification." Code Cases N-695 and N-696, are unconditionally approved for use in NRC Regulatory Guide 1.147, Revision 17 dated August 2014.

#### **4. Reason for Request**

PSEG is requesting to utilize Code Cases N-695-1 and N-696-1 which requires a 0.250 in. root mean square error (RMSE) depth sizing accuracy whereas the currently approved Code Cases N-695 and N-696 require a 0.125 in. RMSE depth sizing accuracy. To date, although examination vendors have qualified for detection and length sizing in accordance with the ASME Section XI Appendix VIII requirements for examinations from the inside diameter (ID), the vendors have not met the established RMSE of 0.125 in. for depth sizing despite numerous attempts. Consequently, relief from the currently approved Code Case specified 0.125 in. RMSE depth sizing accuracy requirements is necessary to support evaluation of findings from examinations when conducted from the inside surface. This relief is being requested in accordance with 10 CFR 50.55a(z)(2) as a hardship without a compensating increase in quality and safety.

Most recent UT examinations of the RPV nozzle to safe-end dissimilar metal and safe-end to pipe welds have been performed from the outside surface (OD) of the piping at Salem Unit 1 and Unit 2. Access to the OD of these welds is inside a "sandbox" which was installed during original plant construction after all welding was completed. Although these examinations can be performed from the OD of the RPV nozzles, these inspection activities would result in the unnecessary personnel radiation exposure for the personnel performing these examinations without a compensating increase in quality or safety as discussed below as compared to performing these examinations from the inside surface (ID) of the piping. Therefore Salem station has changed the examination for the welds identified in this relief request from performing the inspection from the OD to performing them from the ID to minimize personnel radiation exposure.

Based upon a review of dose records for similar RPV Cold Leg nozzle to safe-end weld volumetric UT examinations (Code Case N-770-1 item B welds) performed from the OD for the most recent Inservice inspections at Salem Unit 2, the dose exposure to personnel performing the NDE of 4 RPV Cold Leg weld UT examinations was approximately 3.5 REM. This is a

conservative estimate of the personnel exposure since it does include any additional dose received by supporting organizations (i.e., maintenance, radiation protection). Performing the examinations from the ID during refueling outages also reduces the overall exposure of the weld examinations since this examination technique is performed remotely and does not require personnel to access the exterior 'sandbox' area of the RPV.

PSEG believes that volumetric UT examination of all noted 24 welds (12 per unit) from the OD surface would create a hardship in that personnel would unnecessarily receive additional radiation exposure, in the order of over 21 REM without an increase in quality or safety as discussed above.

## **5. Proposed Alternative and Basis for Use**

10 CFR 50.55a(z)states:

*Alternatives to codes and standards requirements.* Alternatives to the requirements of paragraphs (b) through (h) of this section or portions thereof may be used when authorized by the Director, Office of Nuclear Reactor Regulation, or Director, Office of New Reactors, as appropriate. A proposed alternative must be submitted and authorized prior to implementation. The applicant or licensee must demonstrate that:

(1) *Acceptable level of quality and safety.* The proposed alternative would provide an acceptable level of quality and safety; or

(2) *Hardship without a compensating increase in quality and safety.* Compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

This relief is being requested in accordance with 10 CFR 50.55a(z)(2) as a hardship without a compensating increase in quality and safety.

As discussed in section 4, Salem station has changed the examination for the welds identified in this relief request from performing the examinations from the OD to performing them from the ID to minimize personnel radiation exposure.

To date, although examination vendors have qualified for detection and length sizing in accordance with the ASME Section XI Appendix VIII requirements for examinations from the ID, the vendors have not met the established RMSE of 0.125 in. for depth sizing despite numerous attempts. Consequently, relief from the currently approved Code Cases N-695 and N-696 specified

0.125 in. RMSE depth sizing accuracy requirements is necessary to support evaluation of findings from examinations when conducted from the ID.

PSEG is requesting to utilize Code Cases N-695-1 and N-696-1. Paragraph 3.3(d) of Code Case N-695-1 states:

For qualifications from the inside-surface, examination procedures, equipment, and personnel are qualified for depth sizing if the RMS error of the flaw depth measurements, as compared to the true flaw depths, does not exceed 0.125 in (3mm) for piping less than 2.1 in. (54 mm) in thickness, or 0.250 in. (6mm) for piping 2.1 in. (54 mm) or greater in thickness.

Paragraph 3.3(c) of Code Case N-695-1 states:

Supplement 2 examination procedures, equipment, and personnel are qualified for depth-sizing if the RMS error of the flaw depth measurements as compared to the true flaw depths, does not exceed 0.125 in. (3mm) for piping less than 2.1 in (54 mm) in thickness, or 0.250 in. (6mm) for piping 2.1 in. (54 mm) or greater in thickness, when they are combined with a successful Supplement 10 qualification.

All welds included in this request were most recently UT examined from the OD with an Appendix VIII qualified detection process and length sizing in the previous refueling outages. Greater than 90 percent coverage of the required examination areas was achieved in all cases. Prior examination history when examinations were performed from ID confirms that the inside surface profiles of the welds included in this request are suitable for ultrasonic examination.

The Salem Unit 1 and Unit 2 RPV nozzle to safe-end and safe-end to piping welds will be examined from the ID using personnel, procedures and equipment qualified by demonstration in all aspects. PSEG proposes to use a vendor qualified for ID detection and length sizing per Appendix VIII as applicable to the welds included in this request. Depth sizing qualification will meet the requirements of ASME Code Cases N-695-1 and N-696-1.

In the approval of the precedent relief requests listed in Section 7 of this attachment, the NRC safety evaluations identified the need for special treatment of flaws connected to the inside surface and are measured to be more than 50 percent through the wall thickness.

If a reportable flaw is detected and determined to be ID surface connected during examination of the welds in accordance with this relief request, PSEG will provide a flaw evaluation including the measured flaw size as determined by ultrasonic examination for NRC review. Eddy current testing will be used to determine if flaws are surface connected. Additional data including details of



the impracticable surrounding ID surface contour in the region of the flaw and percentage of the examination area where ultrasonic testing (UT) probe lift-off is evident, if any, will be included.

Indications requiring depth sizing during examination of welds in accordance with this relief request will be treated as discussed below:

- Flaws detected and measured as less than 50 percent through-wall will be sized in accordance the personnel, procedures and equipment qualified to meet the requirements of ASME Code Cases N-695-1 and N-696-1
- For flaws detected and measured as 50 percent through-wall depth or greater and to remain in service without mitigation or repair, PSEG will submit flaw evaluation(s) for review and approval prior to reactor startup. The flaw evaluation will include:
  1. Information concerning the mechanism that caused the flaw.
  2. Information concerning the inside surface roughness and/or profile of the region surrounding the flaw in the examined piping weld.
  3. Information concerning areas where UT probe lift-off is observed, if any.

All other ASME Code, Section XI requirements for which relief was not specifically requested apply including the third party review by the Authorized Nuclear Inservice Inspector.

## **6. Duration of Proposed Alternative**

The duration of the request for proposed alternative for Salem Unit 1 is through the end of the fourth interval currently scheduled to end on 12/31/2020; and for Salem Unit 2, the duration is through the end of the fourth interval currently scheduled to end on 12/31/2021.

## **7. Precedents**

Similar relief requests have been previously approved for relief from the 0.125 RMSE requirement for the following plants:

- (1) NRC letter to Entergy letter, "Arkansas Nuclear One, Unit 1 – Relief Request No. ANO1-ISI-025, Relief from American Society of Mechanical Engineers Section XI Table IWB-2500-1 Requirements (CAC No. MF7625)," dated August 29, 2016 (ADAMS Accession No. ML16237A082)

- (2) NRC Letter to Pacific Gas and Electric Company, "Diablo Canyon Power Plant, Unit No. 2 - Inservice Inspection Program Relief Request NDE-RCS-SE-2R19, Associated with the Use of Alternate Sizing Qualification Criteria Through a Protective Clad Layer (CAC No. MF5348)," dated November 4, 2015 (ADAMS Accession No. ML15299A034)
- (3) NRC Letter to Duke Energy Carolinas, "Catawba Nuclear Station, Unit 1: Proposed Relief Request 14-CN-003, American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code), Code Case N-695 (CAC NO. MF5447)," dated October 26, 2015 (ADAMS Accession No. ML15286A326)

## **8. Reference**

- 1) Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," Revision 17 dated August 2014.
- 2) Code Case N-770-1, "Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated with UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities, Section XI, Division 1".
- 3) Code Case N-695, "Qualification Requirements for Dissimilar Metal Piping Welds, Section I, Division1," approved May 21, 2003
- 4) Code Case N-696, Qualification Requirements for Appendix VIII Piping Examinations Conducted From the Inside Surface, Section XI, Division 1," approved may 21, 2003
- 5) Code Case N-695-1, "Qualification Requirements for Dissimilar Metal Welds, Section XI, Division 1," approved December 31, 2014
- 6) Code Case N-696-1, "Qualification Requirements for Mandatory Appendix VIII Piping Examinations Conducted From the Inside Surface, Section XI, Division 1," approved May 7, 2014.