



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 28, 2015

Mr. Robert Braun
President and Chief Nuclear Officer
PSEG Nuclear LLC - N09
P.O. Box 236
Hancocks Bridge, NJ 08038

SUBJECT: SALEM NUCLEAR GENERATING STATION, UNIT NO. 2 – RELIEF FROM THE
REQUIREMENTS OF THE ASME CODE (TAC NO. MF4591)

Dear Mr. Braun:

By letter dated July 30, 2014, PSEG Nuclear LLC (the licensee) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) for relief from certain American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI requirements at the Salem Nuclear Generating Station (Salem), Unit No. 2.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g)(6)(i), the licensee requested relief and to use alternative requirements, if necessary, for inservice inspection (ISI) items on the basis that the code requirement is impractical.

As set forth above, the NRC staff determines that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i). Therefore, subject to the NRC imposed alternative that the inspection of weld 10-SJ-1211-16 will not be considered or counted as part of the risk-informed ISI program in the fourth inspection interval, the NRC staff grants Relief Request S2'-13-R-132 at Salem, Unit No. 2, for the third 10-year ISI interval.

R. Braun

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If you have any questions, please contact the Project Manager, Carleen Parker, at 301-415-1603 or Carleen.Parker@nrc.gov.

Sincerely,



Douglas A. Broaddus, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-311

Enclosure:
Safety Evaluation

cc w/enclosure: Distribution via Listserv



UNITED STATES
NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST NO. S2-13R-132

PSEG NUCLEAR LLC

EXELON GENERATION COMPANY, LLC

SALEM NUCLEAR GENERATING STATION, UNIT NO. 2

DOCKET NO. 50-311

1.0 INTRODUCTION

By letter dated July 30, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML14211A589 and ML14211A590), PSEG Nuclear LLC (PSEG or the licensee) submitted Relief Request S2-13R-132, which requested relief from performing the essentially 100 percent volumetric inspection requirements specified in Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) for the inservice inspection (ISI) of Class 1 and Class 2 components at the Salem Nuclear Generating Station (Salem), Unit No. 2.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g)(6)(i), the licensee requested relief and to use alternative requirements, for inservice inspection items on the basis that the code requirements are impractical.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) must 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 regulation requires that inservice examination of components and system pressure tests conducted during the first 10-year interval, and subsequent intervals, complies with the requirements in the latest edition and addenda of Section XI of the ASME Code, incorporated by reference in 10 CFR 50.55a(a), 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein.

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 edition and addenda as required by

Enclosure

10 CFR Section 50.55a(g), except where specific relief has been granted by the U.S. Nuclear Regulatory Commission (NRC or the Commission) pursuant to 10 CFR 50.55a(g)(6)(i). As stated, in part, in 10 CFR 50.55a(g)(5)(iii), licensees may determine that conformance with certain code requirements is impractical and that the licensee shall notify the Commission and submit information in support of the determination. Determination of impracticality in accordance with this section must be based on the demonstrated limitations experienced when attempting to comply with the code requirements during the ISI interval for which the request is being submitted. Requests for relief made in accordance with this section must be submitted to the NRC no later than 12 months after the expiration of the initial 120-month inspection interval or subsequent 120-month inspection interval for which relief is sought. The Salem, Unit No. 2, third ten-year ISI interval began November 27, 2003, and ended on November 27, 2013. The ASME Code of record for Salem, Unit No. 2, for the third 10-year ISI interval was the ASME Code Section XI, 1998 Edition through the 2000 addenda.

As stated, in part, in 10 CFR 50.55a(g)(6)(i):

[t]he Commission will evaluate determinations under paragraph (g)(5) of this section that code requirements are impractical. The Commission may grant such relief and may impose such alternative requirements as it determines are authorized by law, will not endanger life or property or the common defense and security, and are otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

During the Salem, Unit No. 2, third 10-year ISI interval, PSEG implemented a risk-informed ISI (RI-ISI) program based on Electric Power Research Institute (EPRI) Topical Report (TR)-112657, Revision B-A, and Code Case N-578-1, "Risk-Informed Requirements for Class 1, 2, or 3 Piping, Method B," as specified in TR-112657. The RI-ISI program is an alternative to the ASME Code Section XI program. The NRC authorized the use of the RI-ISI program for the third 10-year ISI interval at Salem, Unit No. 2, by letter dated April 1, 2005 (ADAMS Accession No. ML050800154). The scope of the program is limited to the inspection of ASME Code Class 1 and 2 piping.

3.0 TECHNICAL EVALUATION

3.1 ASME Code, Section XI, Examination Category B-B, Item B2.11, "Pressure Retaining Welds in Vessels Other than Reactor Vessels"

Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the ASME Code-required 100 percent volumetric examination of circumferential shell-to-head weld 2-PZR-CIRC DUH on the pressurizer.

ASME Code Requirement

ASME Code, Section XI, Examination Category B-B, Item B2.11, requires essentially 100 percent volumetric examination, as defined by Figures IWB-2500-1, of the circumferential

shell-to-head weld and 1 foot of the intersecting longitudinal weld on the pressurizer. Essentially 100 percent, as clarified by ASME Code Case N-460, is greater than 90 percent coverage of the examination volume, or surface area, as applicable. ASME Code Case N-460 has been approved for use by the NRC in Revision 17 of Regulatory Guide (RG) 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1" (ADAMS Accession No. ML13339A689).

Licensee's Basis for Relief Request

Full ASME Code-required coverage is impractical due to portions of the weld being obscured at numerous locations around the pressurizer by the permanently installed support ring, three weld pads, and insulation supports. To increase examinations coverage, the insulation support ring would require a design modification and would impose a burden to PSEG. The licensee has examined these component welds to the extent practical and determined them to be acceptable with no observed signs of degradation. Also, VT-2 visual examinations performed in conjunction with system pressure testing after each refueling outage found these welds to be acceptable with no leakage observed and provided additional assurance that the structural integrity of the subject components are maintained.

NRC Staff Evaluation

The ASME Code requires essentially 100 percent volumetric examination of the accessible length of the subject pressurizer welds. However, for weld 2-PZR-CIRC DUH, insulation supports restrict access for volumetric examinations. To gain access for complete examination, the vessel insulation supports would have to be removed and modified. Imposing this requirement would create a burden on the licensee.

As shown on the sketches and technical descriptions included in the licensee's submittals, examinations of the subject welds have been performed to the extent practical with the licensee obtaining volumetric coverage of approximately 62.5 percent for shell-to-upper head weld 2-PZR-CIRC DUH. No unacceptable indications were noted during the subject examinations. An insulation support ring clamped on the outside of the pressurizer head just above weld 2-PZR-CIRC DUH and three weld pads severely restrict access for ultrasonic scans such that the total 360-degree weld length could not be volumetrically examined.

The licensee has shown that it is impractical to meet the ASME Code-required 100 percent volumetric examination coverage for the subject welds due to their design and proximity of other components. Based on the examinations performed, in combination with examination of ASME Code-required volumes in other welds on the pressurizer, it is concluded that if significant service-induced degradation were occurring, there is reasonable assurance that evidence of it would have been detected. Additionally, the operational experience with pressurizer shell-to-upper head welds has not shown any degradation at the licensee's or other facilities. Therefore, the NRC staff concludes that there is reasonable assurance of structural integrity of weld 2-PZR-CIRC DUH.

3.2 Examination Category C-A, Item C1.20, "Pressure Retaining Welds in Pressure Vessels"

Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the ASME Code-required 100 percent volumetric examination of Class 2 vessel welds shown in Table 3.2.1.

Table 3.2.1 - ASME Code, Section XI, Examination Category C-A		
Code Item	Weld ID	Weld Type
C1.20	2-CVCT-2	Shell to Lower Head (Chemical and Volume Control Tank (CVCT))
C1.20	2-BIT-A	Lower Head (Boron Injection Tank (BIT))

ASME Code Requirement

ASME Code, Section XI, Examination Category C-A, Item C1.20, requires essentially 100 percent volumetric examinations of the length of Class 2 pressure vessel head-to-shell circumferential welds, as defined by Figure IWC-2500-1. The examinations may be limited to one vessel among the group of vessels performing a similar function. Essentially 100 percent, as clarified by ASME Code Case N-460, is greater than 90 percent coverage of the examination volume, or surface area, as applicable.

Licensee's Basis for Relief Request

Full ASME Code-required coverage is impractical due to portions of each weld being obscured by support legs that are welded to the vessel shell. Weld 2-BIT-A is also impacted by two thermowells. To increase examination coverage, the support connections would require design modifications that would impose a burden to PSEG. PSEG has examined these welds to the extent practical and determined them to be acceptable, with no observed signs of degradation. In addition, other similar vessel welds have been examined to the extent required by the Code and also found to be acceptable with no observed signs of degradation. In addition, VT-2 visual examinations performed in conjunction with system pressure testing have found these welds to be acceptable with no leakage observed.

NRC Staff Evaluation

The ASME Code requires essentially 100 percent volumetric examination of the length of the subject Class 2 vessel welds. However, as shown in Table 3.2.2, complete examinations are restricted by several factors, including adjacent interferences from support plates. To gain access for examination, the Class 2 vessels would require design modifications. Imposing this requirement would create a burden on the licensee; therefore, the ASME Code-required 100 percent volumetric examinations are impractical.

Table 3.2.2 - ASME Code, Section XI, Examination Category C-A Limitations		
Weld ID	Limitation Description/Interference	Coverage
2-CVCT-2	Tank leg support plates welded to the CVCT.	81.4%
2-BIT-A	Tank leg support plates welded to BIT.	87.0%

As shown on the sketches and technical descriptions included in the licensee's submittal, examinations of the subject welds have been performed to the extent practical with the licensee obtaining volumetric coverage of approximately 81.4 percent to 87 percent. Various scan limitations were caused by the configuration of the welds and adjacent components (see Table 3.2.2). No unacceptable indications were noted during the performance of these examinations.

The licensee has shown that it is impractical to meet the ASME Code-required volumetric examination coverage for the subject welds due to the design and proximity of other components. Based on the examinations performed, along with the examination of pressure retaining welds in other ASME Code, Section XI, Class 2 vessels, it is concluded that if significant service-induced degradation were occurring in the subject welds, there is reasonable assurance that evidence of it would have been detected. Additionally, operational experience in these and similar Class 2 vessel welds has shown no signs of cracking to date. Therefore, the NRC staff concludes that there is reasonable assurance of structural integrity of the subject welds based on the examinations that have been performed.

3.3 Examination Category C-B, Item C2.21, "Pressure Retaining Nozzle Welds in Vessels"

Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the ASME Code-required 100 percent volumetric examination of nozzle-to-head Weld 2-BIT-2 on the Boron Injection Tank (BIT).

ASME Code Requirement

ASME Code, Section XI, Examination Category C-B, Item C2.21, requires 100 percent volumetric and surface examinations, as defined by Figures IWC-2500-4(a) or IWC-2500-4(b), as applicable, of nozzle-to-shell (or nozzle-to-head) welds in Class 2 vessels greater than 1/2-inch nominal thickness. The requirements include only those piping runs selected for examination under Examination Category C-F. ASME Code Case N-460 states that a reduction in examination coverage due to part geometry or interference for any ASME Code, Section XI, Class 1 and 2, weld is acceptable, provided that the reduction is less than 10 percent (i.e., greater than 90 percent examination coverage is obtained).

Licensee's Basis for Relief Request

Full ASME Code-required coverage is impractical due to weld crown and nozzle configuration. To increase volumetric examination coverage would require an altered configuration and the

weld crown reduction and would impose a burden to PSEG. PSEG has examined this weld to the extent practical, and determined it to be acceptable, with no observed signs of degradation. In addition, other similar vessel welds have been examined to the extent required by the ASME Code and also found to be acceptable with no observed signs of degradation. In addition, VT-2 visual examinations performed in conjunction with system pressure testing have found these welds to be acceptable with no leakage observed. The 2-BIT-2 weld also required a magnetic particle examination, which achieved 100 percent coverage with acceptable results.

NRC Staff Evaluation

The ASME Code requires 100 percent volumetric and surface examination of the subject pressure retaining nozzle-to-head weld. However, weld crown and nozzle configuration limit access for full volumetric examination. To gain access for examination, the vessels would require design modifications. Imposing this requirement would create a burden on the licensee; therefore, the ASME Code-required 100 percent volumetric examinations are impractical.

As shown on the sketches and technical descriptions included in the licensee's submittal, examinations of the subject welds have been performed to the extent practical with the licensee obtaining volumetric coverage of 62.5 percent for the BIT nozzle-to-head weld 2-BIT-2. The outer diameter surface caused by the blend radius of the nozzles limited ultrasonic scans to the head side of the welds only. In addition, the licensee performed the ASME Code-required surface examinations with no limitations. No unacceptable indications were noted during the examinations performed.

The licensee has shown that it is impractical to meet the ASME Code-required 100 percent volumetric examination coverage for the subject nozzle-to-shell (or nozzle-to-head) welds due to their design and proximity of the nozzles to other support components and welds. Based on the examinations performed, along with the examination of other pressure retaining Class 2 nozzle welds, it is concluded that if significant service-induced degradation were occurring in the subject welds, there is reasonable assurance that evidence of it would have been detected. As such, the NRC staff further concludes that there is reasonable assurance of structural integrity of the subject welds based on the examinations that have been performed.

3.4 Examination Category R-A Risk Informed Piping Examinations

Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the ASME Code-required 100 percent volumetric examination of Class 1 welds shown in Table 3.4.1.

Table 3.4.1 - Examination Category R-A		
Code Item	Weld ID	Weld Type
R1.11-2	3-CV-1241-13	Valve 2CV80 to Elbow
R1.11-2	3-CV-1231-16	Valve 2CV78 to Pipe
R1.16-5	10-SJ-1241-14	Tee to Pipe
R1.11-5	10-SJ-1231-14	Tee to Valve
R1.16-5	10-SJ-1211-15	Tee to Pipe

ASME Code Requirement

ASME Code, Section XI, Code Case N-578-1,¹ Table 1, Examination Category R-A, Items R1.11-2, R1.11-5, and R1.16-5, require 100 percent volumetric and surface examinations, as defined by EPRI TR-112659, Figure 4-1, for piping welds less than nominal pipe size (NPS) 4 with a degradation mechanism of thermal fatigue, Figure 4-2 for piping welds NPS 4 or larger with a degradation mechanism of thermal fatigue, and Figure 4-11 for piping welds NPS 4 or larger with a degradation mechanism of intergranular stress corrosion cracking. ASME Code Case N-460 states that a reduction in examination coverage due to part geometry or interference for any ASME Code, Section XI, Class 1 and 2, weld is acceptable, provided that the reduction is less than 10 percent (i.e., greater than 90 percent examination coverage is obtained).

In accordance with 10 CFR 50.55(a)(g)(6)(ii)(C)(1), PSEG implemented Appendix VIII of the ASME Code, which provides that volumes that cannot be examined within the limits of qualification are considered not examined. Typically, when R-A weld examination limitations are identified as part of the RI-ISI implementation, a substitute weld is selected, and examination is scheduled as applicable.

Licensee's Basis for Relief Request

Full ASME Code-required coverage is impractical for the subject welds due to component configurations and/or acoustical material properties. To increase volumetric examination, coverage would require design modifications, fabrication, and installation of special fittings, and would impose a burden to PSEG. PSEG has examined these welds to the extent practical and determined them to be acceptable with no observed signs of degradation. During the implementation of the third ISI interval, there were 21 weld examinations that were identified as limited examinations. Of these 21 welds, only 5 of the welds were not successfully substituted with additional welds. These 5 welds fall into three different R-A groups.

The first group of welds is in the CVC system and are Class 1 welds with R-A Item No. R1.11, Risk Category 2, requiring 25 percent examination sample. Two welds were originally selected, but both were found during examination to be limited. One additional weld was added as a substitution but was also found to be limited. The remaining two welds have both

¹ PSEG bases its RI-ISI inspection sample size and examination methodology on Table 1 of ASME Code Case N-578-1, as authorized for use by the NRC in a letter dated April 1, 2005.

been selected for examination during the fourth ISI interval and are not expected to have limited examination coverage.

The second group of welds is in the Safety Injection system (SIS) and includes a total of two Class 1 welds with R-A item No. R1.11, Risk Category 5, requiring 10 percent examination sample. Weld 10-SJ-1231-14 was selected for examination, in which no examination coverage was obtained. Weld 10-SJ-1231-14 was scheduled during the last outage of the third ISI interval, and a suitable substitution was not able to be scheduled. The only other remaining weld in this group was selected for the first outage of the fourth ISI interval to substitute this weld.

The third group of welds is also in the SIS and includes 23 Class 1 welds with R-A Item No. R1.16, Risk Category 5, requiring 10 percent examination coverage. Three welds were originally selected, and two were found during examination to be limited. Two additional weld examination substitutions have been selected and are scheduled for examination during the fourth ISI interval and are not expected to have limited examination coverage.

In addition, VT-2 visual examinations performed in conjunction with system pressure testing have found these welds to be acceptable with no leakage observed.

NRC Staff Evaluation

The ASME Code requires essentially 100 percent volumetric examination of the length of the subject Class 1 welds. However, as shown in Table 3.4.2, complete examinations are restricted by several factors, including configuration of the valve and acoustic properties of the materials. To gain access for examination would require design modifications. Imposing this requirement would create a burden on the licensee; therefore, the ASME Code-required 100 percent volumetric examinations are impractical.

As shown on the sketches and technical descriptions included in the licensee's submittal, examinations of the subject welds have been performed to the extent practical with the licensee obtaining volumetric coverage of approximately 50 percent, except for weld 10-SJ-1231-14 where no coverage was obtained. No unacceptable indications were noted during the performance of these examinations.

As the licensee was not able to effectively inspect weld 10-SJ-1231-14, the required inspection in this weld category will be conducted by inspecting 10-SJ-1211-16 in the first outage of the fourth ISI interval. As an alternative, this substituted inspection of weld 10-SJ-1211-16 in the twentieth refueling outage will be considered an extra inspection and not considered or counted as part of the RI-ISI program in the fourth inspection interval.

Table 3.4.2 – ASME Code, Section XI, Examination Category R-A Limitations		
Weld ID	Limitation Description/Interference	Coverage
3-CV-1241-13	Upstream side of the weld obstructed by the configuration of the valve.	50%
3-CV-1231-16	Upstream side of the weld obstructed by the configuration of the valve.	50%
10-SJ-1241-14	Limitations from the tee side of the weld. The weld is obstructed due to acoustic properties of the cast stainless steel tee.	50%
10-SJ-1231-14	Obstructed due to configuration of valve 23SJ56 on the downstream side of the weld and no ability to scan from the upstream tee side of the weld due to acoustic properties of the cast stainless steel tee.	0%
10-SJ-1211-15	Limitations from the tee side of the weld. The weld is obstructed due to acoustic properties of the cast stainless steel tee.	50%

The licensee has shown that it is impractical to meet the ASME Code-required volumetric examination coverage for the subject welds due to the design and proximity of other components. Based on the examinations performed, along with the examination of pressure retaining welds in other ASME Code, Section XI, Class 1, welds, it is concluded that if significant service-induced degradation were occurring in the subject welds, there is reasonable assurance that evidence of it would have been detected. Therefore, the NRC staff further concludes that there is reasonable assurance of structural integrity of the subject welds based on the examinations that have been performed.

4.0 CONCLUSION

As set forth above, the NRC staff determines that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i). Therefore, subject to the NRC imposed alternative that the inspection of weld 10-SJ-1211-16 will not be considered or counted as part of the RI-ISI program in the fourth inspection interval, the NRC staff grants Relief Request S2-13R-132 at Salem, Unit No. 2, for the third 10-year ISI interval.

All other ASME Code, Section XI, requirements for which relief has not been specifically requested and approved remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: S. Cumblidge

Date: July 28, 2015

R. Braun

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If you have any questions, please contact the Project Manager, Carleen Parker, at 301-415-1603 or Carleen.Parker@nrc.gov.

Sincerely,

/RA/

Douglas A. Broaddus, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-311

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Safety Evaluation

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