



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

June 23, 2014

Mr. Thomas Joyce
President and Chief Nuclear Officer
PSEG Nuclear LLC
P.O. Box 236, N09
Hancocks Bridge, NJ 08038

SUBJECT: SALEM GENERATING STATION, UNIT NO. 2 - SAFETY EVALUATION OF
RELIEF REQUEST NO. S2-I4R-131 REGARDING THE FOURTH 10-YEAR
INSERVICE INSPECTION INTERVAL (TAC NO. ME2442)

Dear Mr. Joyce:

By letter dated July 9, 2013,¹ PSEG Nuclear, LLC (PSEG, the licensee) requested approval of Relief Request S2-I4R-131 pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(i). The submittal requested U.S. Nuclear Regulatory Commission (NRC) authorization to continue using the NRC approved Salem Generating Station, Unit 2 (SGS-2), alternate risk-informed (RI) in-service inspection (ISI) program as an alternative to the requirements in the 2004 Edition of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI inspection requirements for specific Class 1 and Class 2 piping welds. The licensee requested use of the alternative for the SGS-2 fourth 10-year ISI interval which began on November 23, 2013, and ends on November 23, 2023. The NRC staff authorized the licensee's original request to use of the SGS-2, RI-ISI program alternative for the third period of the second 10-year ISI interval, and the third 10-year ISI interval by letter dated October 1, 2003.²

The NRC staff has completed its review of this relief request and determined that the requested alternative will provide an acceptable level of quality and safety. Therefore, the NRC staff authorizes continued use of the RI-ISI program as described in the submitted relief request at SGS-2 for the fourth 10-year ISI interval. The details of the NRC staff's review are included in the enclosed safety evaluation.

All other ASME Code, Section XI requirements for which relief was specifically requested and approved in the subject request for relief remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

¹ Agencywide Documents Access and Management System (ADAMS) Accession No. ML13191A448.

² ADAMS Accession No. ML032390034.

T. Joyce

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If you have any questions concerning this matter, please contact the Salem Project Manager, Mr. John Lamb, at (301) 415-3100.

Sincerely,

A handwritten signature in black ink, appearing to read 'Meena Khanna', with a large, circular flourish at the end.

Meena Khanna, 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/encl: Distribution via Listserv



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

RELATED TO RELIEF REQUEST NO. S2-I4R-131 REGARDING

USE OF AN ALTERNATIVE RI-ISI PROGRAM TO THE

ASME SECTION XI 2004 EDITION

PSEG NUCLEAR LLC

SALEM GENERATING STATION, UNIT NO. 2

DOCKET NO. 50-311

1.0 INTRODUCTION

By letter dated July 9, 2013,¹ PSEG Nuclear, LLC (PSEG, the licensee) requested approval of Relief Request S2-I4R-131, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(i). The submittal requests U.S. Nuclear Regulatory Commission (NRC) authorization to continue using the NRC-approved Salem Generating Station, Unit 2 (SGS-2), alternate risk-informed (RI) in-service inspection (ISI) program as an alternative to the requirements in the 2004 Edition of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI inspection requirements for specific Class 1 and Class 2 piping welds. The licensee requested use of the alternative for the SGS-2 fourth 10-year ISI interval which began on November 23, 2013, and ends on November 23, 2023. The NRC staff authorized the licensee's original request to use of the SGS-2, RI-ISI program alternative for the third period of the second 10-year ISI interval, and the third 10-year ISI interval by letter dated October 1, 2003.²

2.0 REGULATORY REQUIREMENTS

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 In-service Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of components. Paragraph 50.55a(g)(4)(i) requires that inservice examination of components and system pressure tests conducted during the first 10-year inspection interval comply with the requirements of the

¹ Agencywide Documents Access and Management System (ADAMS) Accession No. ML13191A448.

² ADAMS Accession No. ML032390034.

10 CFR 50.55a(b)(2) 12 months prior to the issuance of the operating license, subject to the conditions listed therein. Paragraph 50.55a(g)(4)(ii) requires that inservice examination of components and system pressure tests conducted during subsequent 10-year inspection intervals comply with the requirements of the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b)(2) 12 months prior to the start of the 120-month inspection interval, subject to the conditions listed therein.

Pursuant to 10 CFR 50.55a(g), a certain percentage of ASME Code Category B-F, B-J, C-F-1, and C-F-2 pressure retaining piping welds must receive ISI during each 10-year ISI interval. The ASME Code requires 100 percent of B-F welds and 25 percent of B-J welds greater than 1-inch nominal pipe size be selected for volumetric or surface examination, or both, on the basis of existing stress analyses. For Categories C-F-1 and C-F-2 piping welds, 7.5 percent of non-exempt welds are selected for volumetric or surface examination, or both.

The regulations in 10 CFR 50.55a(a)(3) state, in part, that alternatives to the requirements of paragraph (g) may be used, when authorized by the Nuclear Regulatory Commission (NRC), if (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.

The NRC staff finds that there is a regulatory basis for the licensee to request and the NRC to authorize this alternative, pursuant to the technical evaluation that follows. The information provided by the licensee in support of the request has been evaluated by the NRC staff and the bases for disposition are documented below.

The NRC staff issued the following documents associated with the evaluation of proposed RI-ISI programs:

- Regulatory Guide (RG) 1.174, Rev. 2, "An Approach for Using Probabilistic Risk Assessment In Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis;"³
- RG 1.178, Rev. 1, "An Approach for Plant-Specific Risk-Informed Decisionmaking For Inservice Inspection of Piping;"⁴
- RG 1.200, Revision 1, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities;"⁵ and
- NUREG-0800, Chapter 3.9.8, September 2003, "Standard Review Plan [SRP] for the Review of Risk-Informed Inservice Inspection of Piping."⁶ (SRP Section 3.9.8)

RG 1.174 provides guidance on the use of probabilistic risk assessment (PRA) findings and risk insights in support of licensee requests for changes to a plant's licensing basis. The guidance in RG 1.178 describes an RI-ISI program as one that incorporates risk-insights that can focus inspections on more important locations while at the same time maintaining or improving public

³ ADAMS Accession No. ML100910006.

⁴ ADAMS Accession No. ML032510128.

⁵ ADAMS Accession No. ML070240001.

⁶ ADAMS Accession No. ML032510135.

health and safety. The guidance in RG 1.200 describes an acceptable approach for determining whether the quality of the PRA, in total or the parts that are used to support an application, is sufficient to provide confidence in the results, such that the PRA can be used in regulatory decision-making. SRP 3.9.8 describes review procedures and acceptance guidelines for NRC staff reviews of proposed plant-specific, risk-informed changes to a licensee's ISI program for piping.

3.0 TECHNICAL EVALUATION

3.1 Licensee's Request for Alternative

Code Requirements

By letter dated April 18, 2013,⁷ the NRC staff authorized SGS-2 alternative request S2-I4R-123 to update the SGS-2 ISI program to the requirements in the 2004 Edition of the ASME Code, Section XI, rather than the 2007 Edition with the 2008 Addenda, which is the latest edition/addenda approved for use in 10 CFR 50.55a(b)(2).

Licensee's Proposed Alternative

PSEG proposes to continue using the SGS-2 RI-ISI program as an alternative to the 2004 Edition, ASME Section XI inspection requirements for Class 1, Examination Category 8-F and 8-J, and Class 2, Examination Category CF-1 and C-F-2 piping welds. The NRC staff authorized the licensee's original request to use of the SGS-2, RI-ISI program alternative for the third period of the second 10-year ISI interval, and the third 10-year ISI interval by letter dated October 1, 2003.

Basis for Proposed Alternative

The licensee's process used to develop the initial RI-ISI program was based on Electric Power Research Institute (EPRI) Topical Report (TR)-112657, Revision B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure."⁸

3.2 Staff Evaluation

The NRC staff reviewed and evaluated the licensee's proposed RI-ISI program, including those portions related to the applicable methodology and processes, based on guidance and acceptance guidelines provided in RGs 1.174 and 1.178, SRP 3.9.8, and EPRI TR-112657, Revision B-A. An acceptable RI-ISI program is expected to meet the five key principles of risk-informed decision-making discussed in RGs 1.174 and 1.178, SRP 3.9.8, and EPRI TR-112657, as stated below:

1. The proposed change meets the current regulations unless it is explicitly related to a requested exemption or rule change.

⁷ ADAMS Accession No. ML13088A219.

⁸ ADAMS Accession No. ML013470102.

2. The proposed change is consistent with the defense-in-depth philosophy.
3. The proposed change maintains sufficient safety margins.
4. When proposed changes result in an increase in core damage frequency (CDF) or risk, the increases should be small and consistent with the intent of the Commission's Safety Goal Policy Statement.
5. The impact of the proposed change should be monitored by using performance measurement strategies.

The first key principle is met in this relief request because an alternative ISI program may be authorized pursuant to 10 CFR 50.55a(a)(3)(i) and, therefore, an exemption request is not required.

The second and third key principles require assurance that the alternative program is consistent with the defense-in-depth philosophy and that sufficient safety margins are maintained, respectively. Assurance that the second and third key principles are met is based on the application of the approved methodology and not on the particular inspection locations selected. The methodology used to develop the fourth interval RI-ISI program is unchanged from the methodology approved for use in the second and third intervals. The approved methodology was applied to the piping added in accordance with the 2004 Edition of the ASME Code, Section XI. Since the methodology used to develop the RI-ISI program for the fourth 10-year interval is unchanged from the methodology approved for development of the RI-ISI program used in the second and third 10-year ISI intervals, the second and third key principles are met.

The fourth key principle requires an estimate of the change in risk. The change in risk estimate is dependent on the location of inspections in the proposed RI-ISI program compared to the location of inspections that would be performed using the requirements of the ASME Code, Section XI. The NRC staff has previously determined that it is not necessary to develop a new deterministic ASME program for each new 10-year ISI interval. Instead, it is acceptable to compare the new proposed RI-ISI program with the last deterministic ASME program. In Section 5 of the relief request, the licensee stated that the delta risk assessment was re-evaluated and was determined to continue to meet the delta risk acceptance criteria in EPRI TR-112657; therefore, the NRC staff finds that implementation of the RI-ISI program would have a small and acceptable impact on risk consistent with the acceptance guidelines in RG 1.174.

The fourth key principle also requires demonstration of the technical adequacy of the PRA. As discussed in RGs 1.178 and 1.200, an acceptable change in risk evaluation (and risk-ranking evaluation used to identify the most risk significant locations) requires the use of a PRA of appropriate technical adequacy that models the as-built and as-operated plant. The licensee stated that the Pressurized Water Reactor Owners Group conducted a peer review of the Salem PRA in accordance with RG 1.200, Revision 1, in November of 2008, and that it has made the changes to the PRA model post peer review. The licensee provided its evaluation of all identified gaps and stated that the latest PRA model is adequate to support this RI-ISI application based on a review of the gaps and their significance. Based on a review of the identified gaps using the NRC-approved EPRI TR-1021467, "Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-Informed In-service

Inspection Programs,”⁹ the NRC staff finds that the licensee has assessed the technical adequacy of its PRA using an appropriate version of RG 1.200 and the PRA is of sufficient technical adequacy to support the proposed RI-ISI program. Based on the previous two paragraphs, the NRC staff finds that the fourth key principle is met.

The fifth key principle requires that the impact of the proposed change be monitored by using performance measurement strategies. The RI-ISI program is a living program and, as such, is subject to periodic reviews. In Section 5 of the relief request, the licensee stated that changes in the inspection locations are due to: (1) plant modifications impacting the total number of RI-ISI piping welds; (2) RI-ISI piping welds required to be included in other augmented inspection programs; (3) PRA updates impacting the consequence category; (4) degradation mechanism changes (due to improved or updated information) impacting the failure potential category; and (5) improved or updated information regarding radiation exposure, access, inspectability, or other factors. Also, the licensee stated that the majority of the RI-ISI inspection locations for the fourth interval are identical to those in the third interval and the Class 1 percentage welds to be examined in the fourth interval has remained effectively constant compared with the third interval at approximately 8.5 percent. In addition to the continued application of EPRI TR-112657, the licensee indicated that those welds subject to primary water stress-corrosion cracking (PWSCC) have been included in an augmented inspection program. The augmented inspections for PWSCC are in accordance with ASME 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,”¹⁰ as conditioned by 10 CFR 50.55a(g)(6)(ii)(F). Based on the considerations in this paragraph, the NRC staff finds that the licensee’s proposed alternative provides assurance that the fifth key principle is met.

4.0 CONCLUSIONS

Based on the discussion in Section 3.2 of this safety evaluation, the NRC staff concludes that the five key principles of risk-informed decision-making are ensured by the licensee’s proposed fourth 10-year RI-ISI program. Therefore, the licensee’s proposed fourth 10-year RI-ISI program is acceptable. The NRC staff finds that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a, and the proposed alternative Relief Request S2-I4R-131 provides an acceptable level of quality and safety.

⁹ ADAMS Accession No. ML12171A450.

¹⁰ The NRC final rule (76 FR 36232) published in Federal Register on June 21, 2011, amended 10 CFR 50.55a to incorporate by reference (with conditions on its use), ASME Code Case N-770-1.

Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(i), and is in compliance with the ASME Code's requirements for which no relief was requested. Therefore, the NRC staff authorizes continued use of the RI-ISI program as described in the relief request at SGS-2 for the fourth 10-year ISI interval.

All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in the subject request for relief remain applicable, including third-party review by the authorized Nuclear Inservice Inspector.

Principal Contributors: Jonathan DeJesus, NRR/DRA
Margaret Audrain, NRR/DE

Date: June 23, 2014

T. Joyce

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If you have any questions concerning this matter, please contact the Salem Project Manager, Mr. John Lamb, at (301) 415-3100.

Sincerely,

/RA/

Meena Khanna, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-311

Enclosure:
Safety Evaluation

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