



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

March 20, 2014

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

SUBJECT: SALEM NUCLEAR GENERATING STATION, UNIT NO. 2 - SAFETY
EVALUATION OF RELIEF REQUEST NO. S2-I4R-124 FOR THE REMAINDER
OF THE FOURTH 10-YEAR INTERVAL INSERVICE INSPECTION
(TAC NO. MF1433)

Dear Mr. Joyce:

By letter dated April 11, 2013,¹ Public Service Enterprise Group Nuclear LLC (PSEG) submitted relief request S2-I4R-124, to propose an alternative to the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," for Salem Nuclear Generating Station, Unit 2 (Salem 2) for the pressure testing requirements of buried piping.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(ii), the licensee requested relief from Subparagraph IWA-5244(b) of Section XI of the ASME Code to permit the conduct of a visual examination of the ground surface in areas above buried sections of service water piping in conjunction with inside surface visual examinations of buried service water piping currently conducted in accordance with the licensee's program implementing Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment," in lieu of the required pressure or flow tests.

The NRC staff has completed its review of this relief request and determined that the proposed alternative provides reasonable assurance of structural integrity of the subject components and that complying with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, the NRC staff authorizes the proposed alternative at Salem 2 for the remainder of the fourth 10 year inservice inspection interval which began on November 27, 2013, and is scheduled to end on November 27, 2023. The details of the NRC staff's review are included in the enclosed safety evaluation.

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

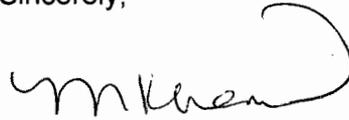
¹ Agencywide Documents and Access Management System Accession No. ML13101A266.

T. Joyce

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If you have any questions concerning this matter, please contact the Salem Project Manager, Mr. John Hughey, at (301) 415-3204 or via e-mail at John.Hughey@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read 'mKhanna', with a large, sweeping 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-124

FOURTH 10-YEAR INTERVAL INSERVICE INSPECTION

PSEG NUCLEAR LLC

SALEM NUCLEAR GENERATING STATION, UNIT NO. 2

DOCKET NO. 50-311

1.0 INTRODUCTION

By letter dated April 11, 2013,¹ Public Service Enterprise Group Nuclear LLC (PSEG or the licensee) submitted relief request S2-I4R-124, to propose an alternative to the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," for Salem Nuclear Generating Station, Unit 2 (Salem 2) for the pressure testing requirements of buried piping.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(ii), the licensee requested relief from Subparagraph IWA-5244(b) of Section XI of the ASME Code to permit the conduct of a visual examination of the ground surface in areas above buried sections of service water (SW) piping in conjunction with inside surface visual examinations of buried SW piping currently conducted in accordance with the licensee's program implementing Generic Letter (GL) 89-13, "Service Water System Problems Affecting Safety-Related Equipment," in lieu of the required pressure or flow tests. This request applies to the fourth 10-year inservice inspection (ISI) interval.

This safety evaluation (SE) is related to the SE dated September 19, 2011,² which addresses an identical request for relief and proposed alternative for Salem Nuclear Generating Stations, Units 1 and 2.

2.0 REGULATORY REQUIREMENTS

Adherence to Subparagraph IWA-5244(b) of Section XI of the ASME Code is mandated by 10 CFR 50.55a(g)(4) which states, in part, that throughout the service life of a boiling or pressurized water-cooled nuclear power facility, components (including supports) which are classified as ASME Code Class 1, Class 2, and Class 3 must meet the requirements, except

¹ Agencywide Document Access and Management System (ADAMS) Accession No. ML13101A266.

² ADAMS Accession No. ML112420175.

design and access provisions and preservice examination requirements, set forth in Section XI of editions and addenda of the ASME Boiler and Pressure Vessel Code.

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

Based on the above analysis, the NRC staff finds that regulatory authority exists to authorize an alternative to Subparagraph IWA-5244(b) of Section XI of the ASME Code, as requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1 Applicable Code Edition and Addenda

The ASME Code of record for the Salem 2, fourth 10-year ISI program interval, which began on November 27, 2013, and is scheduled to end on November 27, 2023, is the 2004 Edition of the ASME Boiler and Pressure Vessel Code, Section XI.

3.2 Components for Which Relief is Requested

Code Class:	3
Examination Category:	D-B
Item Number:	D2.10
Description:	Buried portions of the 24 inch diameter pre-stressed concrete cylinder pipe (PCCP) 21 and 22 Nuclear Service Water Supply Headers
Unit/Inspection:	Salem Unit 2/Fourth 10-Year Interval

3.3 Reason for Request

In its request, the licensee stated that IWA-5244(b)(1) and IWA-5244(b)(2) contain requirements for pressure testing or flow testing buried piping. The licensee also stated that these requirements have been the subject of two ASME Code interpretations (XI-1-07-28 and XI-1-07-37). The licensee further stated that the ASME Code requirements and interpretations in conjunction with the physical characteristics of the SW system at Salem 2 have led to confusion regarding the proper application of the requirements and, ultimately, to the NRC issuing a non-cited violation regarding the station's failure to perform the required tests. The licensee's purpose in submitting its request is to provide both regulatory clarity and technical adequacy in testing the buried SW piping under consideration.

3.4 Proposed Alternative

In accordance with 10 CFR 50.55a(a)(3)(ii) the licensee proposes to:

- a. During each outage, conduct a visual examination of the surface of the ground (including asphalt and other pavement) above the piping under consideration;
- b. Periodically visually examine the inside of the piping under consideration in accordance with the plant's current GL 89-13 program.

3.5 Licensee's Technical Basis

In its request, the licensee proposes that testing the piping under consideration in accordance with the ASME Code represents a hardship because:

- a. The pressure drop test described in IWA-5244(b)(1) requires that the piping system be fully isolated. The piping installed at the plant contains butterfly valves which are not designed to be leak tight and will not permit the piping system to be adequately isolated. The licensee proposes that its inability to isolate the piping under consideration requires that it either conduct a change in flow test, as required by IWA-5244(b)(1) or an unobstructed flow test described in IWA-5244(b)(2) or that, for each required inspection, it remove the existing butterfly valves and install blank flanges. The licensee proposes that the removal of the butterfly valves and installation of blank flanges will significantly disrupt outage schedules and, therefore, represents a hardship.
- b. The change in flow test as required by IWA-5244(b)(1) or the unobstructed flow test described in IWA-5244(b)(2), requires the installation of flow measurement equipment in the piping system. Due to the installed configuration of the piping system under consideration, there are no appropriate locations available for the installation of flow measurement equipment with sufficient accuracy to be of value in identifying pipe leakage or structural failure. The licensee proposes that the lack of a reasonable location in which to install the necessary hardware constitutes a hardship.

In its request, the licensee proposes that conducting the tests as required by the ASME Code will not provide a compensating increase in the level of quality and safety when compared to the proposed alternative because:

- i. Neither the change in flow test as described in IWA-5244(b)(1), the unobstructed flow test described in IWA-5244(b)(2) or the proposed alternative, are sufficiently precise to identify small amounts of leakage from the piping system under consideration.

- ii. The change in flow test as described in IWA-5244(b)(1), the unobstructed flow test described in IWA-5244(b)(2) (if they could be performed) and the proposed alternative, are all capable of detecting large leaks from piping systems.
- iii. Periodic visual examinations of the inside surfaces of the piping under consideration can identify and trend degradation of piping, reducing the risk of leakage and/or structural failure.
- iv. Soil sampling conducted around the piping under consideration indicates that the soil has low corrosivity.
- v. The steel liner in the licensee's pre-stressed concrete cylinder pipe (PCCP) is substantially thicker than the liners in commonly used PCCPs.
- vi. WEKO-seals are installed in the bell and spigot joints of each SW supply nuclear header and are periodically inspected to protect against leakage.
- vii. While there have been a few instances of deterioration of steel bell rings and bolting associated with the piping under consideration, there has been no history of degradation of pre-stressing wires or the steel cylinder of the piping under consideration.

Based on these considerations, the licensee proposes that conducting the testing of the piping under consideration as required by the ASME Code, will not provide a compensating level of quality or safety when compared with the licensee's proposed alternative.

3.6 NRC Staff Evaluation

As previously noted in the introduction, this SE is related to the SE dated September 19, 2011.³ The SE dated September 19, 2011, was written in response to an identical request and proposed alternative from the licensee for both Salem Nuclear Generating Station Units 1 and 2. In that SE, the proposed alternative was authorized for the remainder of the fourth 10-year ISI interval for Salem Unit No. 1, which began on May 20, 2011, and is scheduled to end on May 20, 2021, and for the remainder of the third 10-year ISI interval for Salem Unit No. 2, which began on November 27, 2003, and was scheduled to end on November 27, 2013.

The basis for authorization of the proposed alternative in the previous SE dated September 19, 2011, may be summarized as:

The NRC staff concludes that the combination of low soil corrosivity, high load carrying capacity of the 10 gauge steel cylinder, a service history without failure or significant degradation, visual internal inspection on alternating trains each refueling outage, and periodic walk downs of the surface above the pipe provide reasonable assurance of structural integrity of the SW PCCP, and that

³ ADAMS Accession No. ML112420175.

performance of the ASME Code-required leak down or flow tests would require extensive modification of the SW system, resulting in hardship without a compensating increase in the level of quality and safety.

Prior to authorizing the proposed alternative under 10 CFR 50.55a(a)(3)(ii), the NRC staff must find that the technical information provided in support of the proposed alternative is sufficient to demonstrate that compliance with ASME Code Section XI, IWA-5244(b): (1) would result in a hardship or unusual difficulty; and (2) would not provide a compensating increase in the level of quality and safety when compared to the proposed alternative.

In considering the hardship criterion, the NRC staff finds that points a and b in Section 3.5 above, are reasonable representations of the difficulties which may be encountered in conducting the testing as required by the ASME Code. The NRC staff also notes that, while the licensee characterized the difficulty in installing measurement instrumentation as a lack of an acceptable location to do so, the NRC staff views this issue in terms of the significant modifications to the piping system which would be required in order to install the measurement equipment. The NRC staff, therefore, finds that the disruption involved to outage schedules to replace valves with flanges and/or the modification of piping required to install flow measurement equipment if this request is not authorized, does constitute a hardship. This satisfies the first condition of 10 CFR 50.55a(a)(3)(ii).

In considering the quality and safety criterion, the NRC staff notes that the licensee's report on the condition of the piping under consideration was not substantially different than provided previously. The NRC staff also noted that while soil conditions do change over time, it is reasonable to conclude that any change in soil condition since the last SE is not significant. The NRC staff further noted that the technology associated with piping inspection and testing has not changed substantially since the previous SE was written. Based on these observations, the NRC staff finds that the observations made in the previous SE have not been invalidated by changes in the conditions of the piping system.

Section 3.5, Items i and ii, provide a basis for the licensee's assertion that complying with the ASME Code required inspections does not provide a compensating increase in the level of quality and safety when compared to the proposed alternative. Items iii – vii provide a basis that the risk of piping failure is low. These items do not affect the relative level of quality and safety achieved by conducting the ASME Code-required test or conducting the proposed alternative.

After reviewing items iii through vii in Section 3.5 above, with the possible exception of item iv, the NRC staff finds that these items do represent mitigating factors relative to the structural integrity and leak tightness of the piping under consideration. The NRC staff notes that item iv, low soil corrosivity, does not guarantee that buried pipe will not corrode. This observation is based on the fact that soil corrosivity varies with location within the plant and on the degradation of buried bare carbon steel auxiliary feedwater piping that has previously occurred at the Salem Nuclear Generating Station. While the NRC staff finds that low soil corrosivity is not a guarantee against corrosion, it does improve the probability that any corrosion that does occur, will occur slowly. The NRC staff also finds that, when compared to bare carbon steel piping, the

PCCP piping under consideration is expected to corrode slower due to the fact that the steel in the PCCP pipe is totally enclosed by high pH concrete.

In considering whether the ASME Code-required test provides a compensating level of quality and safety when compared with the proposed alternative, the NRC staff notes that, in the case when non-leak tight butterfly valves are installed, as is the current case, the Code directs that a change in flow or unobstructed flow test be conducted. The NRC staff will, therefore, consider these flow tests, as opposed to the pressure drop test, to be the Code requirement.

The licensee proposes that neither the ASME Code-required test nor the proposed alternative will be able to identify small leaks in the piping. The licensee makes this proposal based on the lack of availability of testing equipment that will detect very small amounts of leakage in applications measuring the difference in inlet and outlet flow rates for very large pipe fluid flow rates. Based on the NRC staff's understanding of available flow monitoring equipment, the NRC staff finds the licensee's assertion concerning the sensitivity of flow measurement equipment to be factual. While it is unclear to the NRC staff whether the test equipment or visual examination of the surface of the soil would find a smaller leak, it is clear to the NRC staff that neither test would find a small leak.

The NRC staff also notes that the licensee also proposes that either the ASME Code-required test or the proposed alternative would identify leakage from the piping under consideration before it lost structural integrity. Based on numerous incidents at both nuclear power plants and other utilities in which wet spots on the ground and/or sink holes developed well prior to the loss of structural integrity, the NRC staff finds the licensee's assertion to be credible.

Based on the above analysis, the NRC staff finds that, in the case of a large leak, both the ASME Code-required test and the proposed alternative are capable of detecting leakage prior to loss of structural integrity. As such, a compensating increase in the level of safety or quality is not achieved by conducting the ASME Code-required test. Also, based on the above analysis, the NRC staff finds that in the case of small amounts of leakage, neither the ASME Code required test nor the proposed alternative are capable of detecting leakage. As such, a compensating increase in the level of safety or quality is not achieved by conducting the ASME Code-required test. In the present case, the inability of either the ASME Code-required test or the proposed alternative to identify small amounts of leakage from the piping under consideration is of low safety significance, as the piping under consideration contains only raw water (no hazardous or licensed material is present).⁴ The second criterion in 10 CFR 50.55a(a)(3)(ii) is, therefore, met.

Based on the above analysis, the NRC staff finds that the technical requirements of 10 CFR 50.55a(a)(3)(ii) have been met and, therefore, that the licensee's proposal provides reasonable assurance of structural integrity of the subject components. The NRC staff, therefore, finds no technical basis that would preclude it from authorizing an alternative to IWA-5244(b), of Section XI, of the ASME Code as requested by the licensee.

⁴ See Section 3.0.3.2.10 of NUREG 2101, Safety Evaluation Report Related to the License Renewal of Salem Nuclear Generating Station and Generic Aging Lessons Learned (GALL) Report, Rev 2 (NUREG 1801 AMP 41).

4.0 CONCLUSION

As set forth above, the NRC staff determines that the proposed alternative provides reasonable assurance of structural integrity of the subject components and that complying with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. 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)(ii). Therefore, the NRC staff authorizes the proposed alternative at Salem 2 for the remainder of the fourth 10 year ISI interval which began on November 27, 2013, and is scheduled to end on November 27, 2023.

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 the third party review by the Authorized Nuclear In-service Inspector.

Principal Contributors: David Alley

Date: March 20, 2014

T. Joyce

- 2 -

If you have any questions concerning this matter, please contact the Salem Project Manager, Mr. John Hughey, at (301) 415-3204 or via e-mail at John.Hughey@nrc.gov.

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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