April 15, 2010

Mr. Thomas Joyce
President and Chief Nuclear Officer
PSEG Nuclear LLC
P.O. Box 236
Hancock's Bridge, NJ 08038

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING ASME SECTION XI, SUBSECTION IWE FOR THE SALEM NUCLEAR GENERATING STATION UNITS 1 AND 2 LICENSE RENEWAL APPLICATION (TAC ME1836 AND ME1834)

Dear Mr. Joyce:

By letter dated August 18, 2009, as supplemented by letter dated January 23, 2009, Public Service Enterprise Group Nuclear, LLC (PSEG), submitted an application pursuant to 10 *Code of Federal Regulation* Part 54 (10 CFR Part 54) for renewal of Operating License DPR-70 and DPR -75 for Salem Nuclear Generating Station (SNGS) Units 1 and 2, respectively. The staff of the U.S. Nuclear Regulatory Commission (NRC or the staff) is reviewing this application in accordance with the guidance in NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants." During its review, the staff has identified areas where additional information is needed to complete the review. The staff's requests for additional information are included in the Enclosure. Further requests for additional information may be issued in the future.

Items in the enclosure were discussed with John Hufnagel and other members of your staff during a telephone call on April 8, 2010, and a mutually agreeable date for the response is within 30 days from the date of this letter. If you have any questions, please contact me by telephone at 301-415-3191 or by e-mail at donnie.ashley@nrc.gov.

Sincerely,

Donnie J. Ashley, Senior Project Manager ***/RA/***
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-272 and 50-311

Enclosure:
As stated

cc w/encl:

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President and Chief Nuclear Officer
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Donnie J. Ashley, Senior Project Manager ***/RA/***
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Office of Nuclear Reactor Regulation

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DATE	04/15/10	04/15/10	04/15/10	04/15/10

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Letter to PSEG Nuclear from D. Ashley, dated April 15, 2010

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Salem Nuclear Generating Station
Unit Nos. 1 and 2

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Mr. Earl R. Gage
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Salem, NJ 08079

REQUEST FOR ADDITIONAL INFORMATION REGARDING ASME SECTION XI, SUBSECTION IWE FOR THE SALEM NUCLEAR GENERATING STATION UNITS 1 AND 2 LICENSE RENEWAL APPLICATION (TAC ME1836 AND ME1834)

RAI B.2.1.28-1

Background:

GALL Report (NUREG-1801), AMP XI.S1, "ASME Section XI, Subsection IWE," Program Element 10 states that implementation of ASME Section XI, Subsection IWE, in accordance with 10 CFR 50.55a, is a necessary element of aging management for steel components of steel and concrete containments through the period of extended operation.

Issue:

Program Element 10 for the Salem ASME Section XI, Subsection IWE aging management program discusses operating experience related to containment steel liner plate corrosion as described in NRC Information Notices IN 97-10 and IN 2004-09. However, Program Element 10 for the Salem ASME Section XI, Subsection IWE aging management program does not discuss operating experience related to liner plate corrosion recently reported at Beaver Valley. In addition, a review of the operating experience of the Salem Unit 1 (PIRS # 950706252-78) in 1995, (Notification # 20344017) in 2007, and Unit 2 (Notification #20235636) in 2005 indicate that borated water was running down the containment liner plate behind the insulation which resulted in indications of corrosion of the containment liner plate and seepage of water into moisture barrier. According to Notification # 20344017, borated water has been leaking in one area of containment for last 30 years.

Request:

1. Provide details of borated water leakage, if any, observed inside Units 1 and 2 containments during the most recent refueling outages.

2. Explain why augmented inspection of the Unit 2 liner plate and moisture barrier was not performed in successive inspection intervals as required by IWE-1242 since 1995. According to IWE-1242, augmented inspection is required of areas exposed to standing water, repeated wetting and drying, and persistent leakage.

3. Provide a summary of the liner plate degradation, including loss of liner plate thickness due to corrosion, integrity of leak chase channels and condition of moisture barrier, as observed during the most recent inspections of Unit 1 and 2 containments.

4. Provide detailed future plans for determining corrective actions, including commitments and completion schedules, for addressing steel liner plate corrosion and moisture barrier deterioration in Unit 1 and 2 containments.

The staff needs the above information to confirm that the effects of aging of the containment pressure boundary metal will be adequately managed so that it's intended function will be maintained consistent with the current licensing basis for the period of extended operation as required by 10 CFR 54.21(a)(3).

RAI B.2.1.28-2

Background:

GALL Report (NUREG-1801), AMP XI.S1, "ASME Section XI, Subsection IWE," Program Element 1, requires inspection of steel containment components including liners, liner anchors, and integral attachments for loss of material due to general, pitting, and crevice corrosion. Inservice inspection (ISI) requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, Subsection IWE for steel containments (Class MC) and steel liners for concrete containments (Class CC) are imposed by 10 CFR 50.55a.

Issue:

Program Element 10 for the Salem ASME Section XI, Subsection IWE aging management program discusses sampling inspections of normally inaccessible areas of steel liner plate located behind the insulation panels around the lower 30 feet of the Unit 2 containment completed in 2009. Similar inspections are scheduled for Unit 1. However, details of the sampling methodology used for the inspection is not described in the LRA and program basis document.

Request:

1. Describe the sampling methodology used in 2009 inspection to select the locations for inspecting containment liner plate and moisture barrier behind the insulating panels.

2. The sampling methodology planned for future inspections. Would the sampling methodology provide a statistical confidence level of at least 95% that the results of inspections will meet the acceptance criteria of IWE 3500.

The staff needs the above information to confirm that the effects of aging of the containment pressure boundary metal will be adequately managed so that it's intended function will be maintained consistent with the current licensing basis for the period of extended operation as required by 10 CFR 54.21(a)(3).

RAI B.2.1.29-1

Background:

GALL Report, Section XI.S2, Element 6 states that ASME Section XI, Subsection IWL, Article IWL-3000 provides acceptance criteria for concrete containments. The GALL Report further states that quantitative acceptance criteria based on the "Evaluation Criteria" provided in Chapter 5 of ACI 349.3R may also be used to augment the qualitative assessment of the responsible engineer. Salem Generating Station Units 1 and 2, document SA-PBD- AMP-XI.S2, Rev. 2, Section 3.6 also states that quantitative acceptance criteria, developed based on Chapter 5 of ACI 349.3R, are included in the program implementing documents to augment the qualitative assessment by the responsible engineer.

Issue:

A review of the Salem Units 1 and 2 records indicate that IWL inspections performed in 2005, 2007, and 2009 indicate that Section 5.4 of S-C-CAN-SEE-1353, Rev. 0, "Acceptance Criteria for Containment Concrete Defects", has been used by the applicant for inspection of Salem Units 1 and 2 containment concrete surface examinations. According to this document, the acceptance criteria for concrete surfaces is significantly different and less stringent from the acceptance criteria specified in Section 5.1 of ACI 349.3R.

In addition, Notification 000020234570 describes the actual condition of the concrete on the north side of the Unit 2 containment involving surface spalling ranging up to 6 ft long and 16 inch wide, and spalling at joints that is up to 3 ft long and 4 in. wide. Notification 000020234570 also describes a condition on the north side of the containment between the equipment hatch and the fuel handling penetration area involving the protrusion of a pipe from the penetration wall. The applicant did not describe the purpose for the pipe, but the applicant reported that the pipe is broken at the flange. The notification also describes a piece of wood (1 in. by 8 in. by 4 in.) protruding from the penetration wall in the main steam area.

Request:**:**

The applicant is requested to provide the following information:

1. The basis for the acceptance criteria in Section 5.4 of S-C-CAN-SEE-1353, Rev. 0, including the reasons for it being significantly less stringent than the ACI 349.3R requirements.

2. Provide information about broken pipe and flange protruding from the Unit 2 containment surface, and its impact on the containment leak tightness.

3. Confirm that the piece of wood (1 in. by 8 in. by 4 in.) is not embedded in the Unit 2 concrete containment wall.

4. Details of corrective actions that the applicant plans to implement for using the acceptance criteria described in Section 5.4 of S-C-CAN-SEE-1353, Rev. 0 which does not conform with the current industry practice and ACI 349.3R.

The staff needs the above information to confirm that the effects of aging of the concrete containment will be adequately managed so that it's intended function will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

RAI B.2.1.29-2

Background:

GALL Report (NUREG-1801), AMP XI.S2, "ASME Section XI, Subsection IWL," Program Element 10 states that implementation of ASME Section XI, Subsection IWL, in accordance with 10 CFR 50.55a, is a necessary element of aging management for concrete containments through the period of extended operation.

Issue:

Program Element 10 for the Salem ASME Section XI, Subsection IWL aging management program describes results of concrete inspections conducted in April 2001 and October 2005 for Unit 1, and November 2000, May 2005, and August 2009 for Unit 2. In addition to isolated areas of physical damage to concrete surfaces on both units, normal shrinkage cracking was also observed. Salem Units 1 and 2 containments are constructed from reinforced (non-prestressed) concrete; therefore, cracking of the concrete in some areas is likely and is expected over the 60-year operating life. In Notification 000020234570, the applicant reported cracks in the concrete coating over the entire outside of the Unit 2 containment. Long-term exposure of concrete cracks to salt spray originating from the Delaware Bay could result in corrosion of the embedded steel reinforcing bars located nearest to the outer surface of the containment concrete during the extended period of operation.

Request:

The applicant is requested to provide the following:

1. The extent and maximum width of the cracks observed in Salem Unit 1 and 2 containments.

2. Actions that are planned to mitigate the consequences of chloride ion penetration to the level of the embedded steel reinforcing bars over the period of extended operation. This may be necessary since the Salem Units 1 and 2 concrete containment surface inspection reports documented scaling and spalling of up to 3 inches.

3. If no actions are anticipated to mitigate the consequences of chloride ion penetration to the level of the embedded steel reinforcing bars, the applicant is requested to provide an assessment of this time-dependent phenomenon and the basis for this decision.

The staff needs the above information to confirm that the effects of aging of the concrete containment will be adequately managed so that it's intended function will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

RAI-B2.1-33-1

Background:

NRC Information Notice 2004-05, "Spent Fuel Pool Leakage to Onsite Groundwater," notes that leakage of the spent fuel pools has occurred at Salem Unit 1.

Issue:

The licensee at Salem NGS in 2002 identified evidence of radioactive water leakage through the interior wall of the Unit 1 auxiliary building mechanical penetration room. In the years since initial startup, materials such as boric acid and minerals have accumulated in the leak collection and detection system that restricted normal drainage of fluid. Modification of the tell-tale drains that are used to detect, monitor, and quantify potential leakage from the spent fuel pool liner

resulted in inadvertent further restriction of free drainage of leakage from the liner that resulted in accumulation of borated water between the liner and concrete and migration to other locations through penetrations, construction joints, and cracks. The seismic gap was confirmed to contain water with radionuclides characteristic of the Unit 1 spent fuel pool water and leakage into the seismic gap has continued. Leakage into the tell-tale drains is occurring at a rate of about 100 gallons per day.

Request:

a. Provide historical data on the leakage occurrence and volume, and available information from chemical analysis performed on the leakage.
b. Provide a summary of the root cause analysis that was used to identify the source of leakage through the liner that has resulted in accumulation of borated water between the liner and concrete, including information on the path of the leakage and structures that could potentially be affected by the presence of the borated water.
c. Discuss plans for remedial actions or repairs to address leakage through the spent fuel pool liner. In the absence of a commitment to fix the leakage prior to the period of extended operation, explain how the structures monitoring program, or other plant-specific program, will address the leakage to ensure that aging effects, especially in inaccessible areas, will be effectively managed during the period of extended operation.
d. Provide background information and data to demonstrate that the concrete and embedded steel reinforcement have not been degraded by exposure to the borated water and that the liner will not be impacted. If experimental results will be used as part of the assessment, provide evidence that the test program is representative of the materials and conditions that exist in the region between the spent fuel pool liner and concrete. This information should also include the MPR Associates report that documents the details of the tests performed and evaluation of SNP spent fuel pool concrete and rebar.
e. If a concrete sampling program (e.g., obtaining concrete cores in region affected) can not be implemented, please explain why this is not feasible.

The staff needs the information to confirm that the potential effect of aging of the spent fuel pool reinforced concrete, liner, and steel reinforcement due to presence of borated water will be adequately managed so that the intended function of impacted structural members will be maintained consistent with the current licensing basis for the period of extended operation as required by 10 CFR 54.21(a)3.

RAI-B2.1-33-2

Background:

The LRA states that leakage of borated water has occurred in SNGS Units 1 and 2 reactor cavities during refueling outages, but the leaks have been contained within the Containment Building.

Issue:

In April 2006 visual structural examinations of the accessible portions of the containment reinforced concrete structures for SNGS Units 1 and 2 indicated that the concrete was apparently in good structural condition. It is unclear to the staff that leakage of the borated water has not resulted in degradation of either the concrete or embedded steel reinforcement that is inaccessible for inspection.

Request:

a. Provide historical data on the leakage occurrence and volume, and available information from chemical analysis performed on the leakage.
b. Provide the root cause analysis that was used to identify the source of leakage, including information on the path of the leakage and structures that could potentially be affected by the presence of the borated water.
c. Discuss plans for remedial actions or repairs to address leakage. In the absence of a commitment to fix the leakage prior to the period of extended operation, explain how the structures monitoring program, or other plant-specific program, will address the leakage to ensure that aging effects, especially in inaccessible areas, will be effectively managed during the period of extended operation.
d. Provide background information and data to demonstrate that concrete and embedded steel reinforcement potentially exposed to the borated water have not been degraded. If experimental results will be used as part of the assessment, provide evidence that the test program is representative of the materials and conditions that exist.

The staff needs the information to confirm that the potential effect of aging of the reinforced concrete due to presence of borated water will be adequately managed so that the intended function of impacted structural members will be maintained consistent with the current licensing basis for the period of extended operation as required by 10 CFR 54.21(a)3.

RAI-B2.1-33-3

Background:

The LRA states that groundwater intrusion has been observed through seismic expansion joints, concrete construction joints, and expansion and shrinkage cracks in the concrete. Underground reinforced concrete structures and structures in contact with raw water at SNGS are subject to an aggressive environment. Groundwater and raw water chemistry results in 2008 and 2009 indicate chloride levels up to 15,000 ppm that exceeds the GALL Report threshold limit for chlorides (< 500 ppm). The applicant stated that inspection of below-grade structures will be done when exposed during plant excavations done for construction or maintenance activities. The LRA states that the structures monitoring program has been enhanced to require periodic sampling, testing, and analysis of groundwater chemistry for pH, chlorides, and sulfates, and assessing its impact on buried structures. Also the LRA states that the service water intake structure will be monitored to provide a bounding condition and indicator of the likelihood of concrete degradation for inaccessible portions of concrete structures.

Issue:

As noted in the LRA, there are several subgrade exterior walls at SNGS that have evidence of past or present groundwater penetration. During the on-site audit, the applicant was asked if they had any plans for inspections of inaccessible reinforced concrete areas prior to the period of extended operation to confirm the absence of concrete degradation. The applicant responded that they did not and that operating experience indicates that there is no evidence of corrosion appearing on the interior surfaces of the concrete structures having inaccessible exterior surfaces. ACI 349.3R-96 recommends an inspection frequency of ten years for below-grade structures. It was noted that the thickness of some of these walls however may be on the order of four feet. Since the applicant does not have plans for inspections of inaccessible areas, the groundwater is aggressive, there have been several incidences of groundwater penetration into the structures, and the interior of the walls may not indicate the condition of the exterior walls, it is unclear to the staff that this is an adequate approach to managing aging of inaccessible concrete structures subjected to aggressive groundwater.

Request:

a. Provide locations where groundwater test samples were/are taken relative to safety related and important-to-safety embedded concrete walls and foundations and provide historical results (i.e., pH, chloride content, and sulfate content) including seasonal variation of results.
b. In locations adjacent to embedded reinforced concrete structures where chloride levels exceed limits in GALL Report, provide any plans for inspections, or if no inspections or coring of concrete is planned to evaluate condition of structures (e.g., presence of steel corrosion or determination of chloride profiles), provide a basis to demonstrate that the current level of chlorides in the groundwater is not causing structural degradation of embedded walls or foundations.

The staff needs the information to confirm that the potential effect of aging of the reinforced concrete due to presence of high chloride levels will be adequately managed so that the intended function of impacted structural members will be maintained consistent with the current licensing basis for the period of extended operation as required by 10 CFR 54.21(a)3.

RAI-B2.1-33-4

Background:

IN GALL Report AMP XI.S6, program elements 3 and 4 state that for each structure/aging effect combination the specific parameters monitored or inspected are selected to ensure that the aging degradation leading to loss of intended function will be detected and quantified before there is a loss of intended function.

Issue:

As a result of the field walk-down with the applicant's technical staff on February 12, 2010, the staff noticed minor indications of degradation in several areas (e.g., cracking, efflorescence, leaching, and water). At Salem Unit 1 Auxiliary Building Elevation 64 (below ground water level)

there was evidence of water in-leakage through the wall and the area was roped off as an exclusion zone. The applicant was asked about this and informed the staff that the source of the contamination was from in-leakage of groundwater and that the groundwater had picked up the contamination external to the wall.

Request:

Provide information on how the in-leakage of contaminated groundwater will be addressed under your corrective action program.
The staff needs the above information to confirm that the effects of aging such as noted above will be adequately managed so that the intended function of impacted structural members will be maintained consistent with the current licensing basis for the period of extended operation as required by 10 CFR 54.21(a).(3)