June 25, 2003

Mr. Roy A. Anderson
President & Chief Nuclear Officer
PSEG Nuclear LLC - X04
Post Office Box 236
Hancocks Bridge, NJ 08038

SUBJECT: HOPE CREEK GENERATING STATION - EVALUATION OF RELIEF REQUEST HC-RR-A06 (TAC NO. MB7836)

Dear Mr. Anderson:

By letter dated February 20, 2003, as supplemented on April 9 and May 9, 2003, PSEG Nuclear, LLC (PSEG) submitted a request for relief from Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) under the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(a)(3)(i) for the Hope Creek Generating Station (Hope Creek). Specifically, Relief Request HC-RR-A06 sought approval for the use of ASME Code Case N-566-2 as an alternative to certain requirements of IWA-5250(a)(2) for corrective actions associated with leakage detected at bolted connections.

Based on the information provided, the U.S. Nuclear Regulatory Commission (NRC) staff concludes that your proposal to use ASME Code Case N-566-2, as described in Relief Request HC-RR-A06, provides an acceptable level of quality and safety. Therefore, the NRC staff authorizes you to use the proposed alternatives pursuant to 10 CFR 50.55a(a)(3)(i) for the second 10-year interval at Hope Creek. Use of Code Case N-566-2 is authorized until such time as the Code Case is published in a revision to Regulatory Guide (RG) 1.147. At that time, if you intend to continue to implement this Code Case, you must follow all provisions in Code Case N-566-2 with limitations issued in RG 1.147, if any.

The NRC staff's Safety Evaluation is enclosed. If you have any questions, please contact your Project Manager, Rick Ennis, at 301-415-1420.

Sincerely,

/RA by RLaufer for/

James W. Clifford, Chief, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-354

Enclosure: As stated

cc w/encl: See next page

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Hope Creek Generating Station

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR RELIEF

SECOND 10-YEAR INSERVICE INSPECTION INTERVAL

HOPE CREEK GENERATING STATION

PSEG NUCLEAR, LLC

DOCKET NO. 50-354

1.0 INTRODUCTION

By letter dated February 20, 2003, as supplemented on April 9 and May 9, 2003, PSEG Nuclear, LLC (PSEG or the licensee), submitted a request for relief (HC-RR-A06) from Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) for the Hope Creek Generating Station (Hope Creek). PSEG requested that the U.S. Nuclear Regulatory Commission (NRC or Commission) authorize the use of ASME Code Case N-566-2, "Corrective Action for Leakage at Bolted Connections, Section XI, Division 1," as an alternative to certain requirements of IWA-5250(a)(2) for the evaluation and corrective actions associated with leaking ASME Class 1, 2, and 3 bolted connections.

2.0 BACKGROUND

Inservice inspection (ISI) of the ASME Code Class 1, 2, and 3, components is to be performed in accordance with Section XI of the ASME Code and applicable addenda as required by Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(g), except where specific relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). As stated in 10 CFR 50.55a(a)(3)(i), alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the licensee demonstrates that: (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.

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 pre-service 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 regulations require that inservice examinations of components and system pressure tests conducted during the first 10-year interval, and subsequent intervals, comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) twelve months prior to the start of the 120-month interval,

subject to the limitations and modifications listed therein. For Hope Creek, the applicable edition of Section XI of the ASME Code for the second 10-year ISI interval is the 1989 Edition, without Addenda.

3.0 EVALUATION

3.1 Relief Request HC-RR-A06

Components for which Relief is Requested: Relief is being requested for ASME Code, Section XI, Class 1, 2, and 3 bolted connections.

Applicable Code Requirement from which Relief is Requested: PSEG requests relief from Section XI of the ASME Code, 1989 Edition, sub-paragraph IWA-5250(a)(2). This ASME Code sub-paragraph states that if leakage occurs at a bolted connection, all bolting shall be removed, VT-3 visually examined for corrosion, and evaluated in accordance with IWA-3100.

Licensee's Code Relief Request: Pursuant to 10 CFR 50.55a(a)(3)(i), PSEG has requested relief from the requirements of the 1989 Edition of the ASME Code, Section XI, sub-paragraph IWA-5250(a)(2). Relief is being requested for the second 10-year ISI interval at Hope Creek.

Licensee's Proposed Alternative: In lieu of the requirements of sub-paragraph IWA-5250(a)(2), the licensee proposed performing an evaluation in accordance with the alternative requirements of ASME Code Case N-566-2 in the event that leakage is found in a Class 1, 2, or 3 bolted connections. These alternative requirements specify that, if leakage is detected at a bolted connection, one of the following requirements shall be met:

(a) The leakage shall be stopped, and the bolting and component material shall be evaluated for joint integrity as described in (c) below.

(b) If the leakage is not stopped, the licensee shall evaluate the structural integrity and consequences of continuing operation, and the effect on the system operability of continued leakage. This engineering evaluation shall include the considerations listed in (c) below.

(c) The evaluation of (a) and (b) above is to determine the susceptibility of the bolting to corrosion and failure. This evaluation shall include the following:

(1) the number and service age of the bolts;
(2) bolt and component material;
(3) corrosiveness of process fluid;
(4) leakage location and system function;
(5) leakage history at the connection or other system components;
(6) visual evidence of corrosion at the assembled connection.

Licensee's Basis for Proposed Alternative (as stated):

> Pursuant to 10 CFR 50.55a(a)(3)(i), relief is requested on the basis that the proposed alternative provides an acceptable level of quality and safety.

PSEG Nuclear, LLC requests the use of Code Case N-566-2, *Corrective Action for Leakage at Bolted Connections, Section XI, Division 1* for the Hope Creek Second Inspection Interval.

Removal of bolts for VT-3 visual examination is not always the most prudent action when leakage is discovered at a bolted connection. Leakage at bolted connections is typically identified during system leakage tests. For Class 1 systems, this leakage test is conducted prior to plant startup following each refueling outage. This test is performed at full operating pressure (1000 psia) and temperature. When leakage is discovered during this test, the corrective action (i.e. removal of bolts) must be performed with the system at full temperature and pressure, or the plant must be cooled down. The removal of a bolt at full temperature and pressure conditions can be extremely physically demanding due to the adverse heat environment. Cooling down the plant subjects the plant to additional heat up and cool down cycles, and can add 3-4 days to the duration of the refueling outage. Bolted connections associated with pumps and valves are typically studs threaded into the body of the component. Removal of these studs is typically very difficult and time consuming due to [the] length of time they have been installed and are often damaged during the removal process. This difficulty is compounded when the removal must be performed under heat stress conditions.

The requirements of IWA-5250(a)(2) must be applied regardless of the significance of the leakage or the corrosion resistance of the materials used in the bolted connection. Implementation of Code Case N-566-2 permits factors such as the number and service age of the bolts, the bolting materials, the corrosiveness of the system fluid, the leakage location and system function, leakage history at the connection or at other system components, and visual evidence of corrosion at the bolted connection be used to evaluate the need for corrective measures.

Granting the proposed alternative will provide an acceptable level of quality and safety, and will not adversely impact the health and safety of the public.

By letter dated April 9, 2003, in response to a request for additional information (RAI) dated April 1, 2003, PSEG stated the following:

In the event that the relevant condition cannot be accepted for continuing operation using Code Case N-566-2 paragraphs (a) or (b), Hope Creek Generating Station would correct the condition in accordance with its ASME [Section] XI Article IWA-4000 Repair/Replacement Activities and PSEGs [sic] ASME [Section] XI Repair Program Requirements.

In the event that the evaluation of Code Case N-566-2 paragraphs (a) or (b) determines that the relevant condition can be accepted for continuing service, Hope Creek Generating Station would periodically conduct visual inspections of affected components to verify operating conditions have not changed affecting earlier calculation assumptions. These activities would be completed in accordance with PSEGs [sic] ASME [Section] XI Repair Program requirements.

> If the component's operating conditions have changed, then an additional calculation would be prepared using the newly acquired information to support assumptions made. If the calculation determines that the relevant condition cannot be accepted for continuing operation or PSEG elects to correct the condition, the condition would be corrected in accordance with its ASME [Section] XI Article IWA-4000 Repair/Replacement Activities and PSEG Nuclear's ASME [Section] XI Repair Program requirements.

By letter dated May 9, 2003, PSEG further clarified that:

> If the equipment that is leaking can be isolated, the equipment will be isolated and Code Case N-566-2 would not be invoked. If the leakage cannot be isolated and the system affected causes entry into a Technical Specification [(TS)] Action Statement, Code Case N-566-2 would be invoked and a work plan would be developed for removal and inspection of one bolt at a time. At any time in this process if it is determined that structural integrity cannot be shown to exist, the appropriate actions would be taken in accordance with the plants' Technical Specifications.

In addition, the licensee stated in its May 9, 2003, letter that:

> If Code Case N-566-2 is used for a leaking bolted connection, subsequent inspections of the leaking joint would be scheduled based on the leakage rate from the bolted connection and its affect on the systems or components in the vicinity of the leak, the potential degradation rate of the materials involved, and when the component is scheduled to be out of service for maintenance or testing.

3.2 NRC Staff's Evaluation

The 1989 Edition of the ASME Code, sub-paragraph IWA-5250(a)(2) requires that, if leakage occurs at a bolted connection, all bolts shall be removed from the leaking bolted connection, a VT-3 visual examination must be performed to inspect for corrosion, and the results evaluated in accordance with IWA-3100. The Code requirements provide assurance that bolting corroded by system leakage will be detected and that corrective actions will be taken. However, the Code requirements may be overly conservative since the removal and examination of all bolting may not be necessary to assure continued integrity of a bolted connection. Furthermore, corrosion in the joint region may depend on other factors beyond leakage. Thus, in the instances where leakage has been identified at bolted connections, the requirements of Section XI of the ASME Code do not always provide for the most reasonable course of action.

In lieu of the ASME Code requirement, the licensee has proposed to implement Code Case N-566-2, which requires the following: (1) the leakage shall be stopped and the bolting and component material shall be evaluated for joint integrity; and (2) if the leakage is not stopped, the licensee shall evaluate the structural integrity and consequences of continuing operation, and the effect on the system operability of continued leakage. In both instances, an engineering evaluation is performed to determine the need for corrective action, and this evaluation must consider the criteria listed in paragraph (c) of the Code Case. This alternative allows licensees the flexibility to utilize an engineering evaluation, provided that as a minimum,

all of the evaluation factors listed in the Code Case are included in the evaluation. These evaluation factors provide an acceptable means of assessing the structural integrity of the bolted connection to determine whether further corrective action beyond the Code Case is necessary.

By letters dated April 9 and May 9, 2003, the licensee provided responses to the staff's questions. In these letters, the licensee stated that if a bolted connection that is leaking can be isolated, the equipment will be isolated and Code Case N-566-2 would not be invoked. PSEG further stated that, if the leakage cannot be isolated and the system affected causes entry into a TS Action Statement, Code Case N-566-2 would be invoked and a work plan would be developed for removal and inspection of one bolt at a time. Repairs and/or component replacement activities would be performed in accordance with Section IWA-4000 of the ASME Code, Section XI. These actions would replace degraded bolting, as appropriate, thereby ensuring that joint integrity is maintained.

If the engineering evaluation that is performed in accordance with paragraphs (a) or (b) of Code Case N-566-2 determines that structural integrity can be assured, given the current conditions, PSEG will periodically conduct visual inspections of the leaking connection to verify operating conditions have not changed, such that the engineering evaluation is affected. Subsequent inspections of the bolted connection will be scheduled based on the leakage rate, the effect on systems or components in the vicinity of the leak, the potential degradation rate of the materials involved, and when the component is scheduled to be out of service for maintenance or testing. At any time in this process, if it is determined that structural integrity cannot be shown to exist, the appropriate actions would be taken in accordance with the plants TSs.

4.0 CONCLUSION

The NRC staff has evaluated the licensee's request to selectively implement alternatives to Code requirements contained in Code Case N-566-2, in lieu of the requirements of IWA-5250(a)(2), and has concluded that the licensee's proposed alternative will continue to assure the structural integrity of ASME Class 1, 2, and 3 bolted connections. The NRC staff has determined that selective implementation of this Code Case will continue to provide an acceptable level of quality and safety. Therefore, the proposed alternative is approved for use pursuant to 10 CFR 50.55a(a)(3)(i) for the second 10-year ISI interval, provided that all requirements of the Code Case are satisfied. Use of Code Case N-566-2 is authorized until such time as the Code Case is published in a revision to RG 1.147. At that time, if the licensee intends to continue to implement this Code Case, the licensee must follow all provisions in Code Case N-566-2 with limitations issued in RG 1.147, if any. All other requirements of the ASME Code, Section III and XI for which relief has not been specifically requested remain applicable, including third party review by the Authorized Nuclear Inspector.

Principal Contributors: C. Sydnor
R. Fretz

Date: June 25, 2003