March 13, 2007

Mr. William Levis
Senior Vice President & Chief Nuclear Officer
PSEG Nuclear LLC-X04
Post Office Box 236
Hancocks Bridge, NJ 08038

SUBJECT: HOPE CREEK GENERATING STATION - REQUEST FOR ADDITIONAL INFORMATION REGARDING REQUEST FOR EXTENDED POWER UPRATE (TAC NO. MD3002)

Dear Mr. Levis:

By letter dated September 18, 2006 (Agencywide Documents and Management System (ADAMS) Accession No. ML062680451), as supplemented on October 10, 2006 (Accession No. ML062920092), October 20, 2006 (Accession No. ML063110164), February 14, 2007 (Accession No. ML070530099), and February 16, 2007 (Accession No. ML070590178), PSEG Nuclear, LLC submitted an amendment request for an extended power uprate for Hope Creek Nuclear Generating Station. The proposed amendment would increase the authorized maximum power level by approximately 15 percent, from 3339 megawatts thermal (MWt) to 3840 MWt.

The Nuclear Regulatory Commission (NRC) staff has been reviewing the submittal and has determined that additional information is needed to complete its review. The specific questions are found in the enclosed request for additional information. The questions were sent by e-mail to you on February 20, (Accession No. ML070660199 and ML070660619) and February 23, 2007 (Accession No. ML070660638), to ensure that the questions were understandable, the regulatory basis was clear and to determine if the information was previously docketed. In subsequent discussions with your staff, questions were revised for further clarification. Mr. Paul Duke of your staff agreed to respond by March 30, 2007, for the enclosed questions.

Please note that if you do not respond to this letter within the prescribed response times or provide an acceptable alternate date in writing, we may reject your application for amendment under the provisions of Title 10 of the *Code of Federal Regulations*, Section 2.108. If you have any questions, I can be reached at (301) 415-1388.

Sincerely,

/ra/

James J. Shea, Project Manager
Project Directorate I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-354

Enclosure: As Stated

cc w/encl: See next page

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OFFICE	PDI-2/PM	PDI-1/LA	SBWB/BC	IHPB/BC	CPTB/BC	SCVB/BC	PD1-2/BC
NAME	JShea	SLittle	GCranston	TFrye	JMcHale	RDennig	HChernoff (w/comments)
DATE	3/12/07	3/12/07	1/11/07	2/16/07	3/1/07	2/13/07	3/13/07

OFFICIAL RECORD COPY

Hope Creek Generating Station

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REQUEST FOR ADDITIONAL INFORMATION

REGARDING TECHNICAL SPECIFICATION CHANGES FOR

EXTENDED POWER UPRATE

HOPE CREEK GENERATING STATION

DOCKET NO. 50-354

By letter dated September 18, 2006 (Agencywide Documents and Management System (ADAMS) Accession No. ML062680451), as supplemented on October 10, 2006 (Accession No. ML062920092), October 20, 2006 (Accession No. ML063110164), February 14, 2007 (Accession No. ML070530099), and February 16, 2007 (Accession No. ML070590178), PSEG Nuclear, LLC (PSEG or licensee) submitted an amendment request for an extended power uprate (EPU) for Hope Creek Nuclear Generating Station. The proposed amendment would increase the authorized maximum power level by approximately 15%, from 3339 megawatts thermal (MWt) to 3840 MWt.

The Nuclear Regulatory Commission (NRC) staff has been reviewing the submittal and has determined that additional information is needed to complete its review.

11) Health Physics Branch (IHPB)

11.1 In the Hope Creek Power Uprate Safety Analysis Report (PUSAR), Section 8.4.1 (page 8-5) you state that Nitrogen Isotope (N^{16}) in the turbine components is expected to increase approximately 16% for a 20% increase in steam flow. On the basis of previous EPU calculations, the activity of N^{16} in steam leaving the reactor pressure vessel is expected to increase in proportion to the power level increase (15% for Hope Creek). Since the steam flow also increases in proportion to the power level increase (i.e., by 15%), the transit time for the N^{16} to reach the major source components that contribute significantly to the skyshine dose in the turbine building is reduced. Therefore, the N^{16} activity in the steam in those areas of the turbine building which contribute to skyshine should increase both in proportion to the power level increase and due to the reduced decay time between the reactor pressure vessel and the turbine building components.

a) Justify your reasoning for stating that the N^{16} activity in turbine components will increase by 16% instead of a higher percentage.

b) Justify your reasoning for stating that the steam flow will increase by 20% for a 15% power uprate.

11.2 In the Hope Creek PUSAR, Section 8.4.1 (page 8-5) you state that the N^{16} levels are expected to increase in the turbine components due to EPU. Verify that the expected increase in dose rates from N^{16} does not create new radiation, or high radiation areas around condensate systems and components in the turbine building.

11.3. In the Hope Creek PUSAR, Section 8.4.2 (page 8-6) you state that, although activated corrosion products and fission products are expected to increase as a result of EPU, their post-EPU concentrations will not exceed the design basis concentrations. Provide the expected percentage increases in the concentrations of activated corrosion products and fission products in both the steam and in the water and compare this with the design basis concentration levels.

11.4. In the Hope Creek PUSAR, Section 8.5 (page 8-7) you state that the post-EPU occupational radiation levels in most of the affected plant areas are expected to increase by less than 20%.

a) Justify your statement that radiation levels would increase by approximately 20% when the proposed power uprate is for 15%.

b) List any plant areas where you would expect the dose rates to increase by greater than the percentage of the proposed power uprate.

c) Describe what measures you plan to take (e.g., changes to permanent and or temporary shielding, changes to access controls, change to work packages) in areas where dose rates are expected to increase following EPU to maintain worker doses ALARA and within the occupational dose limits of 10 CFR Part 20.

11.5. Describe what impact you expect the proposed power uprate will have on the annual collective doses at Hope Creek and provide an estimate of the occupational dose that will result from the plant modifications that will be needed to support the implementation of the proposed power uprate.

11.6. In the Hope Creek PUSAR, Section 8.5 (page 8-6) you state that a post-EPU radiation assessment in the turbine building complex to evaluate the effects of the proposed EPU on area dose rates was completed.

a) Discuss how you plan to verify post-EPU dose rates throughout the plant. Will you be conducting radiation surveys of selected plant areas as part of the EPU startup and test plan?

b) Have you identified plant areas that may require changes in radiation shielding or zone designations?

c) Please provide a listing of plant areas where you will conduct radiation surveys following the proposed EPU implementation and describe your criteria for selecting these areas.

11.7. Provide the following clarifying information regarding the information contained in Table 8-1 (page 8-9) of the Hope Creek PUSAR:

a) Table 8-1 has a column which shows allowable occupancy times for each of the vital areas listed. The title “allowable occupancy” can imply that this is the maximum time that a person can be in the area before exceeding the 5 REM, in Title 10 of the *Code of Federal Regulation* (10 CFR) Part 50, Appendix A, General

Design Criterial for Nuclear Power Plants (GDC) 19, dose limit. Verify that the times listed in this column are the estimated times needed to complete the mission in each of the vital areas listed.

b) Verify that the whole body and total effective-dose equivalent (TEDE) dose rates shown in table 8-1 are the maximum post-accident dose rates reached in each of the vital areas listed and may not necessary be the dose rates in the vital area when the area needs to be accessed to perform post-accident vital area functions.

c) For each of the vital areas listed in Table 8-1, provide a brief description of why the area is classified as a vital area (i.e., what is the vital area function which needs to be performed in the area) and provide plant layout maps indicating the location of each of the vital areas listed in Table 8-1

d) Verify that the vital area missions for each of the vital areas listed in Table 8-1 can be accomplished following an accident post-CPPU without exceeding the 5 person-REM criteria specified in 10 CFR Part 50, Appendix A, GDC 19. In calculating the mission doses for each of the vital areas, the doses received to access and exit from the area should be included in the total vital area mission dose estimate.

11.8. Section 6.3.3 (pages 6-4,5) of your submittal states that the post-EPU radiation exposures in accessible areas adjacent to the sides or bottom of the spent fuel pool (SFP) are expected to be within the allowable dose rate limit of the existing radiation zone designation. Discuss any plans that you may have (such as shuffling of spent fuel assemblies in the SFP so that the older assemblies are located at the perimeter of the SFP) to minimize the effects of the storage of the higher irradiated spent fuel assemblies in the SFP on dose rates in areas surrounding the SFP.

11.9. Discuss what affects the proposed EPU will have on the whole body dose to the public with respect to the 25 mrem per year dose limits of 40 CFR 190.

12) Component and Performance and Testing Branch (CPTB)

12.1. PSEG is requested to discuss the plans to implement the Inservice Testing (IST) Program for Hope Creek that incorporates appropriate changes in light of applicable EPU operating conditions. In particular, the licensee is requested to discuss with three examples of each type, if applicable, the evaluation of the impact of EPU conditions on the performance of safety-related pumps, power-operated valves, check valves, safety or relief valves, including consideration of changes in ambient conditions and power supplies (as applicable), and dynamic restraints; and to indicate any resulting component or support modifications, or adjustments to the IST Program, resulting from that evaluation.

12.2. In the Hope Creek PUSAR, Section 8.5 (page 8-6) you state that process parameters of temperature, pressure, and flow for motor-operated valves (MOVs) within the scope of Generic Letter (GL) 89-10, “Safety-Related Motor-Operated Valve Testing and Surveillance,” were reviewed; and minor changes were identified as a result of EPU

conditions. You also state that MOV calculations will be revised as necessary. PSEG is requested to discuss with examples its evaluation of safety-related MOVs within the programs established in response to GL 89-10 and GL 96-05, "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves," at Hope Creek for the potential impact from EPU operation, including the impact of increased process flows on operating requirements and increased ambient temperature on motor output.

12.3. In the Hope Creek PUSAR, Section 4.1.4 you state that the effect of the EPU on the potential for pressure locking and thermal binding under GL 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves," was reviewed. The licensee is requested to discuss with examples its evaluation of safety-related power-operated gate valves in light of any changes in ambient temperature on the potential for pressure locking or thermal binding resulting from EPU operation.

12.4. In the Hope Creek PUSAR, Section 4.1.4 you state the process parameters of temperature, pressure, and flow for air-operated valves (AOVs) were reviewed, and no changes to the functional requirements of any AOVs were identified. PSEG is requested to summarize the approach used and provide three examples of the methodology for evaluation of safety-related AOVs (and solenoid-operated valves, as applicable) for potential impact from EPU operation.

12.5. In the Hope Creek PUSAR, Section 10.3, Environmental Qualification, you indicate that safety-related components are to be qualified for the environment in which they are required to operate. In Section 10.3.2, Mechanical Equipment with Non-Metallic Components, you state that the reevaluation of safety-related mechanical equipment with non-metallic components identified some equipment potentially affected by EPU conditions that were resolved by reanalysis. PSEG is requested to provide examples of the range of the non-metallic components in safety-related mechanical equipment effected by the EPU. These examples should include a discussion on the following topics:

a) applicable environmental conditions;

b) required operating life;

c) capabilities of the non-metallic components;

d) basis for the environmental qualification of mechanical equipment; and the

e) surveillance and maintenance program to be developed to ensure functionality during their design life.

12.6. In the Hope Creek PUSAR, Section 10.3.3, Mechanical Component Design Qualification, you state that mechanical design of equipment and components in certain systems is affected by operation at EPU conditions due to slightly increased temperatures and, in some cases, flow. Also, you state that the revised operating conditions do not significantly affect the cumulative usage fatigue factors of mechanical components that the increased fluid induced loads on safety-related components and supports are insignificant. PSEG is requested to:

a) Discuss the environmental qualification methods and approaches applied to mechanical equipment (including pumps, power-operated valves, safety-related valves, and check valves) and their supports.

b) Provide at least three examples of equipment and components that will experience increased temperatures, flows, and loads resulting from EPU conditions to demonstrate that the impact is insignificant.

c) Describe the surveillance and maintenance program for mechanical equipment to ensure functionality during their design life.

13) Containment and Ventilation Branch (SCVB)

13.1 In the Hope Creek EPU application request, Section 4 of Attachment 1, Request for Change to Technical Specifications Extended power Uprate addressed Ultimate Heat Sink (UHS) and the design calculation for UHS temperature limits. It was stated that the Emergency Core Cooling System (ECCS) cooler loads in the UHS temperature limit calculation are based on an updated reactor building GOTHIC model analysis. Describe the GOTHIC model, and sources of heat input (e.g. pump motors, piping, electrical). Did the ECCS cooler loads increase, stay the same or decrease? Response to this question, at least in part, can be included in response to question 13.6.

13.2 In the Hope Creek PUSAR, Section 4.4, you addressed the Main Control Room (MCR) Atmosphere Control System. It was stated that "there are no changes to the MCR envelope and there are no significant changes to the temperatures in the adjacent walls and ceilings." Describe the areas surrounding the Control Room and what was considered in those areas to conclude that there are no significant changes to the temperatures in the adjacent walls and ceilings of the Control Room.

13.3 Discuss and confirm that the Filtration, Recirculation, and Ventilation System's (FRVS) ability on achieving a negative draw down pressure in the secondary containment is not impacted by the EPU. Also, identify the maximum FRVS inlet temperature under EPU operating conditions and its relationship to any design inlet temperature limitations.

13.4 In the Hope Creek EPU application request, Section 6.6 of Attachment 6, you addressed Diesel Generator Room (SDG) temperature. It was stated that the SDG remains below rated capacity. Confirm that the design basis heat loads are based on rated capacity (not actual loading) and assure that the ability of the safety-related SDG Room Recirculation System coolers to maintain the room within the required temperature is not impacted by the EPU.

13.5 In the Hope Creek EPU application request Section 6.6 of Attachment 6 states that there is no increase in the design basis heat loads in the SFP area. Discuss and confirm that the effects on the SFP area Heating Ventillation and Air Conditioning (HVAC) system due to higher burnup fuel in the spent fuel pool are fully considered. Also, address whether there are any effects due to EPU on the ventilation system that could result from loss of SFP cooling.

13.6 Are there any modifications planned to the HVAC systems (including atmospheric cleanup systems) as a result of the EPU? Clearly define the areas that will see higher heat loads due to EPU, magnitude of the increase, and the basis for determining that the existing systems are adequate under post EPU conditions (with or without modifications).

13.7 In the Hope Creek PUSAR, Section 4.1, explain why the choice of the Residual Heat Removal (RHR) heat exchanger "K" value is conservative. Describe the program to ensure that the actual value is not less than this value.

13.8 In the Hope Creek PUSAR, Section 4.1, verify that all input parameters to the containment peak pressure and temperature, environmental qualification and subcompartment analyses remain the same as those in the updated final safety analysis report except for those affected by the power uprate. For example, containment volume, heat sink descriptions, heat exchanger performance, equipment flow rates and flow temperatures, initial relative humidity, ultimate heat sink temperature, etc. justify any changes made for the power uprate analyses.

13.9 In the Hope Creek PUSAR, Section 4.1, what is the temperature limit for piping attached to the torus? What is the calculated peak temperature of this piping?

13.10 In the Hope Creek PUSAR, Section 4.1.1.2, containment structural design basis temperature is stated to be 340 ºF. This is higher than that of some other BWRs and is usually the temperature limit for Environmental Qualification (EQ). Verify that 340 ºF is the correct value.

13.11 In the Hope Creek PUSAR, Section 4.1.2.3, provide the value of pressure differential calculated for the EPU and the Hope Creek pressure difference limit.

13.12 In the Hope Creek PUSAR, Table 1-1 shows that both the "STEMP" and the "SHEX" codes are used for the Anticipated Transient Without Scram (ATWS) event. Describe the function of each code in this calculation.

13.13 In reference to the Hope Creek PUSAR, Section 4.1, is the metal-water reaction increased by the EPU? What is the effect on containment response?

13.14 In reference to the Hope Creek PUSAR, Section 4.1.1.1(a), please provide the peak suppression pool temperatures resulting from the postulated ATWS, Station Blackout and 10 CFR Part 50, Appendix R Fire events.

13.15 In reference to the Hope Creek PUSAR, Section 4.7, what, if any, changes are necessary to Containment Atmosphere Deluge System, CADS operation or nitrogen storage due to the power uprate?

Revised Questions from (SBWB):

3.2 The NRC staff review of previous EPU applications included evaluation of the dynamic effects and missiles that might result from plant equipment failures at EPU operating conditions, as well as the effects of a loss-of-coolant accident (LOCA). In the Hope Creek EPU application request, Section 2.8.6.2 of Attachment 11, does not address this specific concern, please justify why similar criteria does not apply to the Hope Creek spent fuel storage.

3.5 In NEDC-33172P, “SAFER/GESTR-LOCA for HCGS at Power Uprate,” it was reported that the Licensing Basis PCTs are 1380 F for GE14 and 1540 F for SVEA-96+. Please provide the following additional information:

a) What is the corresponding break size for above Licensing Basis PCTs, and is it classified as small-break or large-break LOCA? Is the current Licensing Basis PCT is based on small-break or large-break LOCA? If they are different, explain why.

b) Was top-peaked and mid-peaked axial power shape included in establishing the MAPLHGR and determining the limiting PCT?

c) In previous EPU LOCA analyses, the NRC staff has noted that the fuel types did not significantly impact the value of PCT, provided that the limiting LOCA event was a small break. The explanation for this was based on the fact that the affect of fuel stored energy was insignificant for small-break LOCA. Explain why a relatively large difference in PCT values (160 ºF) between GE14 and SVEA-96+ exists.

d) The PUSAR indicates that the limiting PCT for GE14 increases 10 ºF from 1370 ºF to 1380 ºF before and after EPU. Please provide the limiting PCT for SVEA before and after EPU. The PCT changes due to EPU were typically within 20 ºF. Please confirm if it is also true for SVEA fuel. If not, then please explain why.

New Question from (SBWB):

3.57 Section 1.2.2 Computer Codes, Table 1-2 of the PUSAR lists all the nuclear steam system codes used for the EPU request. This section indicates that the HCGS application of these codes complies with the limitations, restrictions, and conditions specified in the applicable NRC safety evaluation report that approved each code, with exceptions as noted in Table 1-2. The NRC staff has noted that in Section 2.0 of Attachment 15 to the submittal, a limited number of those codes (TGBLA, PANACEA, ISCOR, ODYN, TASC, SAFER and GESTR), and their methods and range of applications were discussed. However, the report did not include all the codes listed in Table 1-2 of the PUSAR.

Please review the fuel vendor's analytical methods and code systems (neutronic, LOCA, transient, and accidents, etc.) used to perform the safety analyses supporting the HCGS EPU application and provide the following information:

a) Confirm that the steady state and transient neutronic and thermal-hydraulic analytical methods and code systems used to perform the safety analyses supporting the EPU conditions are being applied within the NRC-approved applicability ranges.

b) Confirm that for the EPU conditions, the calculational and measurement uncertainties applied to the thermal limits analyses are valid for the predicted neutronic and thermal-hydraulic core and fuel conditions.

c) Confirm that the assessment database and the assessed uncertainty of models used in all licensing codes that interface with or are used to simulate the response of HCGS during steady state, transient or accident conditions remain valid and applicable for the EPU conditions.