April 20, 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. ML063110163), February 14, 2007 (Accession No. ML070530099), February 16, 2007 (Accession No. ML070590178) and February 28, 2007 (Accession No. ML070680314), PSEG Nuclear, LLC (PSEG or licensee) submitted an amendment request for an extended power uprate (EPU) for Hope Creek Nuclear Generating Station (Hope Creek). 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. The specific questions are found in the enclosed request for additional information. The questions were sent by e-mail to you on March 1 (ML070750403), March 7 (ML070750404), and March 13, 2007 (ML070750404), 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 deleted or revised for further clarification. Mr. Paul Duke of your staff agreed to respond by April 30, 2007, for the enclosed questions except for questions 3.58 through 3.65, 3.8 and question 13.16 which your staff agreed to respond to by May 10, 2007.

In letters dated September 30, 2006 (ML062690044) and January 31, 2007 (ML070680315) you made requests to withhold proprietary information. The NRC has yet to make a final determination on these requests. These questions may potentially contain proprietary information, thus proprietary (non-public) and non-proprietary (public) versions of these questions are enclosed.

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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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. ML063110163), February 14, 2007 (Accession No. ML070530099), February 16, 2007 (Accession No. ML070590178) and February 28, 2007 (Accession No. ML070680314), PSEG Nuclear, LLC (PSEG or licensee) submitted an amendment request for an extended power uprate (EPU) for Hope Creek Nuclear Generating Station (Hope Creek). 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.

14) Mechnical & Civil Engineering Br (EMCB)

14.1 Question Superceded by new Steam Dryer Data.

14.2 Please submit bias errors and uncertainties for:

a) The Steam Dryer finite element model (FEM) as to how accurate are the stress/force transfer function amplitudes (note this does not question the damping assumed by PSEG, but is related to the accuracy of the modal masses computed by the model, which dictates the mean transfer function amplitude), and

b) the lack of rigorous analyses at time/frequency shifts of +/-2.5%, +/-5%, and +/-7.5%.

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14.4 Your assertion that the Hope Creek ACM accuracy is negatively (conservatively) biased does not appear to address significant ACM underpredictions of the Quad Cities Unit 2 (QC2) 156Hz dryer loading peak. Since the largest load in the Hope Creek interim EPU dryer analysis is a safety relief valve (SRV) singing peak (based on the scale model test (SMT), provide an ACM bias error based on the tones observed in QC2 during the instrumented dryer ACM validation studies.

14.5 In the Hope Creek EPU submittal Attachment 7 (Steam Dryer Evaluation), you determined a net dryer loading uncertainty of 27.2%, this uncertainty is not applied to the interim EPU dryer stress estimates. Explain how the estimated 27.2% uncertainty is applied to the Hope Creek dryer stress assessment.

14.6 Confirm whether PSEG has planned for any dryer or reactor pressure vessel (RPV) dynamic measurements which would quantify the low frequency (less than 50 Hz) loads acting on the Hope Creek dryer. If so, please specify.

14.7 Please provide the computational fluid dynamics (CFD) analyses results for the Hope Creek steam dryer at current licensed thermal power (CLTP) and EPU conditions.

14.8 In the Hope Creek EPU submittal Attachment 20 (Continuum Mechanics, Inc. (CDI) Report No. 05-28P, Rev. 1), CDI argues that **[[**

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14.9 Figures A.1 through A.26, of the Hope Creek EPU submittal Attachment 20, **[[**

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14.10 **[[**

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14.11 **[[**

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14.12 Question Superceded by new Steam Dryer Data (February 28, 2007 Supplement).

14.13 **[[**

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14.14 In reference to the geometrical similarity between the SMT and the Hope Creek plant, in Attachment 22 to the Hope Creek EPU submittal, clarify why the measured resonance frequency of SRV standpipes differs substantially from the estimated value.

14.15 Substantiate the use of the load increase factors cited in Page 30 **[[**

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14.16 In reference to Attachment 22 of the Hope Creek EPU submittal, please discuss the effects of the Normalized Maximum Differential pressure on the dryer for the low and high frequency excitations separately. The objective is to produce two figures similar to Fig. 8.8, whereby one figure is for the low and the other for the high frequency excitations.

14.17 In reference to Attachment 22 of the Hope Creek EPU submittal, **[[**

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14.18 In reference to Attachment 22 of the Hope Creek EPU submittal, **[[**

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14.19 In reference to Attachment 22 of the Hope Creek EPU submittal, demonstrate that the safety relief valves will operate properly at EPU conditions. PSEG's response to this request should include the assessment of (a) the acoustic pressure in the standpipes at EPU conditions, and (b) the effect of acoustic pressure at EPU on the structural integrity of the SRVs.

14.20 Question Superceded by new Steam Dryer Data (February 28, 2007 Supplement).

14.21 Question Superceded by new Steam Dryer Data (February 28, 2007 Supplement).

14.22 Question Superceded by new Steam Dryer Data (February 28, 2007 Supplement).

14.23 Question Superceded by new Steam Dryer Data (February 28, 2007 Supplement).

14.24 Question Superceded by new Steam Dryer Data (February 28, 7007 Supplement).

14.25 In the Hope Creek EPU submittal Attachment 18 (CDI Report 06-17, Rev. 2, "Hydrodynamic Loads on Hope Creek Unit 1 Steam Dryer to 200 Hz," September 2006), the results included in this report (e.g., Figures. 3.1 & 3.6) appear to contradict CDI's conclusion that the dryer load determined from SMT is conservative. PSEG is requested to address this apparent contradiction.

14.26 In reference to the spectral peak near 135 Hz which appears at nodes 7 and 99 of Figure 4.6 in Attachment 18 of the Hope Creek EPU submittal, please specify the source generating this 135 Hz peak. If it is the standpipe resonance frequency, then PSEG should explain why it is different from the frequency measured in SMT. PSEG should also explain why this frequency peak is not observed in the strain gage signals.

14.27 Since field experience shows that strain gages do fail during operation, please explain whether PSEG has any plans to provide adequate redundancy so that sufficient amount of strain gage measurements can be made, despite failure of some strain gages, for reliable prediction of stresses in the steam dryer.

14.28 In the Hope Creek EPU submittal Attachment 19 (CDI Report 06-24, Rev. 3, "Stress Analysis of the Hope Creek Unit 1 Steam Dryer for CLTP," September 2006), the prediction of fluctuating pressure loads using a separate acoustic circuit analysis is discussed. The licensee asserts that the 80-Hz signal is not present in the MSL strain gage signals at CLTP but it is fictitiously introduced by ACM. The licensee is requested to explain whether ACM could have fictitiously modified the other peaks that are present in the predicted fluctuating loads. The licensee is also requested to explain the ACM mechanisms responsible for introducing the 80-Hz signal and **[[**

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14.29 In the Hope Creek EPU submittal Attachment 19, the licensee describes the model simplifications made in developing the finite element model of the Hope Creek steam dryer. The report also discusses modeling of certain specific components such as perforated plates and the vane bank model. Then the details of the finite element mesh and the types of elements used are described. Please describe how the finite element model developed preserves the dynamic properties (mode shapes and natural frequencies) of the actual Hope Creek steam dryer.

14.30 The alternating stresses at the welds calculated by the finite element analysis are multiplied by the weld factor to determine the actual fluctuating stresses at the welds. In Hope Creek, steam dryer plates of different thicknesses are welded together. However, the weld factor accounts for the stress concentration introduced by a weld between components of equal thickness. Explain why the stresses at the welds are not modified to include size effects, which account for the welding of the components having different thicknesses.

14.31 In the Hope Creek EPU submittal Attachment 21 (CDI Report No. 06-27, Rev. 0, "Stress Analysis of the Hope Creek Unit 1 Steam Dryer at CLTP and EPU Conditions Using 1/8th Scale Model Pressure Measurement Data," September 2006), it is questionable that a 50-step time history analysis can identify the frequency shift for the fluctuating loads that would impose the highest loads on the dryer under EPU conditions. For example, the lower Figure 6b, page 11, (one without the 80 Hz signal) shows that for 0% frequency shift the maximum fluctuating load occurs at about 700 steps (1 second) into the time history analysis. The NRC staff requests the licensee to explain whether any frequency shift other than ± 10% would impose higher loads and generate higher stresses in the steam dryer under EPU conditions for a longer time duration (i.e., 2 or 3 seconds).

14.32 There is an assumed damping ratio of 1% with anchor points at 10 and 150 Hz for the transient pressure loading without any frequency shift described in section 3.5 of Attachment 21 page 13. Explain whether the anchor points were changed when considering ± 10% frequency shift in the loading.

14.33 In section 5, Attachment 21 of the Hope Creek EPU submittal, the licensee reports that the minimum stress ratios, which correspond to alternating stresses, are less than 1.0 when ±10% frequency shifts are considered. These stress ratios are calculated without accounting for ± 27.2% uncertainty, which is reported in Attachment 7 of the Hope Creek EPU submittal. The licensee is requested to explain the effect of this uncertainty on the minimum stress ratios and identify the corresponding steam dryer components having stress ratio less than 1.0. Also, the licensee is requested to explain whether it plans to make any structural modifications to these components.

14.34 Several dryer resonances are apparent in the stress power spectrum densities (PSDs) shown in Figures 23-26, Attachment 21 of the Hope Creek EPU submittal. Please provide images and frequencies of the dryer resonances that respond significantly to the dryer loading.

14.35 The stresses based on Hope Creek in-plant MSL data show strong low frequency peaks (Figure 6.1 Attachment 19 of the Hope Creek EPU submittal), whereas the stresses based on SMT data are dominated by the SRV singing near 120 Hz (Figures 23-26 Attachment 21 of the Hope Creek EPU submittal). Please provide graphs which compare directly the dryer stress PSDs computed using in-plant Hope Creek data and SMT data at CLTP at the locations of maximum stress. These locations are given in Table 5.1 Attachment 19, and the nodes listed on page 78 of Attachment 21.

14.36 Question Superceded by new Steam Dryer Data (February 28, 2007 Supplement).

14.37 Attachment 8 (Flow Induced Vibration) of the Hope Creek EPU submittal, describes an assessment of flow induced vibration of systems and components in support of the EPU amendment request for Hope Creek. You indicate that some analyses remain underway for vibration susceptibility. Please provide the results or the progress of those analyses and discuss any resulting modifications or procedure changes.

14.38 Attachment 23 (Power Ascention Test Plan Overview) of the Hope Creek EPU submittal, states that a detailed Power Ascension Test Plan will be provided to the NRC Staff before increasing power above CLTP. Please provide the draft or completed test plan along with the limit curves for power ascension, including the margin available from the fatigue stress limit if the curve is reached during power ascension.

14.39 In reference to Attachment 8 of the Hope Creek EPU submittal, provide (a) applicable types of accelerometers/instruments for each of Vibration Monitoring Groups, and (b) locations of instruments and technical basis for selection of the monitoring locations.

14.40 In Attachment 8 of the Hope Creek EPU submittal, it is indicated that the Hope Creek acceptance criteria for vibration level of the main steam, feedwater, and other piping systems are based on the guidance of ASME OM S/G Part 3 Code where it requires that the calculated stresses due to steady state vibration shall not exceed the allowable stress limit as specified by the Code. However, Tables 3 to 5 show that the acceptance criteria are based on the root-mean-square (RMS) of acceleration for each piping. The licensee is requested to demonstrate how the piping vibration level will be within the OM Code stress limit using the RMS acceleration value in place of the peak response spectrum used in the classical piping analysis.

14.41 In the Hope Creek Power Uprate Safety analysis Report (PUSAR), Attachment 4 of the Hope Creek EPU submittal, Section 3.5.2, “Balance of plant piping”, page 3-23, “Pipe Stresses” states that “Operation at the constant pressure power uprate (CPPU) conditions increases stresses on piping and piping system components due to slightly higher operating temperatures and flow rates internal to the pipes. For all systems, the maximum stress levels and fatigue analysis results were reviewed based on specific increases in temperature, pressure, and flow rate (see Tables 3-9 and 3-10). These piping systems have been evaluated and found to meet the appropriate code criteria for the CPPU conditions, based on the design margins between actual stresses and code limits in the original design. All piping is [also] below the code allowables of the [current] plant code of record, American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (B&PV Code), Div. 1, Section III, 1977 Edition through Summer 1979 Addenda for Class 1 piping and ASME B&PV Code -Section III, Division I, 1974 Edition, through winter 1974 Addenda for Class 2 and 3 piping.” Page 3-22 contains a list of 20 Balance-Of-Plant (BOP) piping systems and states that “The effects of the CPPU conditions have been evaluated for these piping systems.”

a) Provide a quantitative summary of the evaluation for each of the BOP piping systems listed on page 3-22. The evaluation should include maximum calculated stresses and fatigue usage factors for both the original and the EPU conditions, and the code allowables. Include data at critical locations (i.e. nozzles, penetrations, etc). If the data were estimated, show method of estimation.

b) Provide a summary of the evaluation for pipe supports for each of the evaluated BOP systems.

c) Provide similar information as in Item (A) above for inside containment piping systems discussed in PUSAR Section 3.5.1, “Reactor Coolant Pressure Boundary Piping.”

d) Provide similar information as in Item (B) above for inside containment piping systems discussed in PUSAR Section 3.5.1, “Reactor Coolant Pressure Boundary Piping.”

e) Identify newly added pipe supports and/or existing supports, if any, which required modifications for the EPU operation at Hope Creek.

14.42 In the PUSAR Section 3.5.2, “Balance of plant piping,” page 3-23, “Pipe Stresses” states that “No new postulated pipe break locations were identified.” Provide a justification for this statement. Confirm whether and how the determination of line break locations is based on SRP Section 3.6.2, MEB 3-1 criteria.

14.43 In the PUSAR Section 10.1.2, Liquid Line Breaks, states that “Only the mass and energy releases for HELBs in the Reactor Water Cleanup (RWCU) and FW systems may be affected by CPPU and were re-evaluated at CPPU conditions.” Provide summaries of the evaluations for RWCU and FW line breaks.

14.44 In the PUSAR Section 3.5.1, “Reactor Coolant Pressure Boundary Piping,” page 3-19 “Feedwater Evaluation”, states that the “CPPU does not have an adverse effect on the FW piping design. A review of postulated pipe break criteria concluded that at three locations, cumulative fatigue usage exceeds postulated pipe break criteria limit. (question was revised following conference call)

a) If the CPPU does not have an adverse effect on the FW piping, why is it necessary to perform structural modifications to ensure ASME code compliance prior to the implementation of the CPPU? Please clarify.

b) Provide the summary of the piping reanalysis results and the schedule that structural modifications will be completed where required to ensure that ASME Code stresses and fatigue usage factors will not exceed the criteria limit, prior to the implementation of CPPU. If structural modifications are required, confirm that the structural analysis model (piping and/or pipe support) reflects any required structural modifications.

14.45 In the PUSAR Section 10.1.2, “Liquid Line Breaks,” page 10-3 “pipe whip and jet impingement,” it is indicated that the FW piping was evaluated for temperature increases associated with CPPU conditions but it did not result in pipe stress levels above the thresholds required for postulating HELBs, except at locations already evaluated for breaks. Provide a summary of this evaluation for the NRC staff’s review.

14.46 The increased main steam flow results in increased forces and moments from the Turbine Stop Valve (TSV) closure transient at CPPU conditions. The TSV load was used in the design of MS piping system. Provide a quantitative summary of the main steam and associated piping system evaluation (inside and outside containment), including pipe supports, that contains the increased loading associated with the TSV closure transient at CPPU conditions along with a comparison to the code allowable limits. Include data at critical locations (i.e. nozzles, penetrations, etc). For nonconforming piping and pipe supports, provide a summary of modifications required to ensure that piping and pipe supports are structurally adequate to perform their intended design function and the schedule for completion of these modification.

14.47 In the PUSAR Section 3.2.2 through 3.2.2.3, “Reactor Vessel Structural Evaluation,” states that “The effect of CPPU was evaluated to ensure that the reactor vessel components continue to comply with the existing structural requirements of the ASME B&PV Code. For the components under consideration, the 1968 code with addenda to and including winter 1969, which is the code of construction, is used as the governing code. However, if a component's design has been modified, the governing code for that component is the code used in the stress analysis of the modified component. The Hope Creek CPPU utilizes the original code of construction as the governing code for all components for CPPU conditions. New stresses are determined by scaling the "original" stresses based on the CPPU conditions (temperature and flow). The analyses were performed for the design, the normal and upset, and the emergency and faulted conditions. If there is an increase in annulus pressurization, jet reaction, pipe restraint or fuel lift loads, the changes are considered in the analysis of the components affected for normal, upset, emergency and faulted conditions.”

a) Provide a summary of the analyses stated above which justify that loading changes due to CPPU in the analysis of the components affected at the normal, upset, emergency and faulted conditions do not affect the structural integrity of these components.

b) Provide a list of components that have their design modified along with a description of the design modifications, governing code, and maximum stress summary versus allowable stress limits at critical locations.

c) Provide the procedural tensioning method of Main Closure Studs that includes loads due to CPPU conditions. Show that the tensioning stud load including tolerances is within code allowables when including the higher CPPU conditions.

14.48 Pipe in-line components such as thermowells and sample probes experience increased vibrations due to flow past or through that component. In the PUSAR Section 3.4.1, “FIV Influence on Piping,” states that “The safety-related thermowells and sample probes in the MS and FW piping systems have been identified and are being evaluated for the increased main steam and feedwater flow conditions, respectively, as a result of CPPU. Any thermowell or sample probe that is found to be unacceptable will be modified as necessary. Evaluation of non-safety related thermowells and sample probes is described separately.” Attachment 8 further discusses the effects of FIV on thermowells and sample probes. For FW and Condensate, Attachment 8 of the Hope Creek EPU submittal states that “Based on a review of existing calculations, the frequency ratio (excitation frequency/natural frequency) at 115% CLTP remains well below the original design criteria of < 0.80. Quantify “well below” in the summary requested below. For FW and Condensate thermowells, Attachment 8 also states that the protrusion length “is 2.5-inches, and it is tapered from 1.5-inches to 1.0 inch. Due to their short protrusion, they are not considered susceptible." Provide basis and justification of this statement. Provide a quantitative summary of the evaluation that supports the acceptability of the thermowells and sample probes in the MS, FW and related piping systems. Identify nonconforming component(s) and provide description of their modification(s).

14.49 In the PUSAR Section 3.4.2, "FIV Influence on Reactor Internal Components," states that "The increase in power may increase the level of reactor internals vibration. Analyses were performed to evaluate the effects of flow-induced vibration on the reactor internals at CPPU conditions. This evaluation used a reactor power of 3952 MWt and 105% of rated core flow. This assessment was based on vibration data obtained during startup testing of the prototype plant (Browns Ferry Unit 1). For components requiring an evaluation but not instrumented in the prototype plant, vibration data acquired during the startup testing from similar plants or acquired outside the RPV is used. The expected vibration levels for CPPU region were estimated by extrapolating the vibration data recorded in the prototype plant or similar plants and from General Electric (GE) Nuclear Energy BWR operating experience. These expected vibration levels were then compared with the established vibration acceptance limits. The following components were evaluated:

a) Shroud

b) Shroud head and moisture separator

c) Jet pumps

d) Feedwater sparger

e) Steam dryer

f) Jet pump sensing lines

The results of the vibration evaluation show that continuous operation at a reactor power of up to 3952 MWt and 105% of rated core flow will not result in any detrimental effects on the evaluated reactor internal components (except the steam dryer)." Provide a summary of the evaluation results for each of the above components except the steam dryer and the technical basis that supports the rational that reactor power of up to 3952 MWt and 105% of rated core flow will not result in any detrimental effects on the reactor internal components (based on the evaluated prototype plant).

14.50 Question Deleted following Conference Call

14.51 In the past, small bore pipe failures due to high cyclic fatigue attributed to vibration have led to forced outages and plant shutdowns.

a) Attachment 8 of the Hope Creek EPU submittal, Section 4.2.3, "FW Component Susceptibility", states that "Small bore lines attached to the FW headers were reviewed by experienced piping design engineers during RF13 (spring 2006)."

Provide a summary of the review and a technical basis that justifies your conclusion that none of the FW small bore branch lines is susceptible to higher EPU vibration.

b) Attachment 8 of the Hope Creek EPU submittal, Section 4.1.3, “MS System Component Review,” indicates that similar review effort as in the FW small bore lines was performed for the small bore MS lines. Provide a summary of this review that qualifies the small bore MS lines for the higher EPU vibration.

c) Attachment 8 of the Hope Creek EPU submittal, Section 4.1.3 states that “MS small bore connections in the vicinity of the TSV and TCVs will receive further evaluations to justify as-is, or alternatively, they will be modified to improve vibration resistance. Modifications may include strengthening of the sockolet welds or improvements in the supports. This includes the Electro Hydraulic Control (EHC) unit connections.” Provide a summary of the evaluation for these small bore piping systems at the higher CPPU conditions. Also provide a description of any required structural modifications, as applicable.

14.52 Steam flow and feedwater flow will increase as a result of the CPPU implementation. Flow velocities affect pipe wall thinning due to flow accelerated corrosion (FAC). In the PUSAR Section Section 10.7 page 10-35 states that “Based on experience at CLTP operating conditions and previous FAC modeling results, it is anticipated that the CPPU operating conditions may result in the need for additional FAC monitoring points. The CHECWORKSTM FAC modeling techniques allow for the identification of additional monitoring points required for CPPU.” Identify additional FAC inspection points that will result due to higher CPPU operating conditions.

14.53 Question Deleted following Conference Call (previously addressed).

14.54 Discuss in detail how the verification and validation of the ACM computer code was performed to satisfy the provisions of ASME NQA-1, “Quality Assurance Requirements for Nuclear Facility Applications,” Subpart 2.7, “Quality Assurance Requirements for Computer Software for Nuclear Facility Applications,” which has been accepted by the NRC in satisfying the requirements in 10 CFR Part 50, Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants.” Your discussion should include how the bench-marking of the ACM computer code was accomplished.

14.55 Provide the validation documentation of 1/8th SMT, as well as the uncertainty and bias error associated with the use of SMT. The validation should include the benchmarking of the scale model by using the Quad cities 2 in-plant test data. This validation should consider the low and the high frequency loading separately (e.g. comparison of the total RMS amplitude without considering the frequency content is not recommended).

14.56 The licensee indicated in the public meeting that the Mach number used for the SMT data were re-evaluated and revised in Revision 2 of the CDI 06-27 stress report. Discuss how you measure, calculate and validate the Mach number used in scale model testing for both 1/5th and 1/8th scales, including uncertainty. Please submit this report to the NRC for staff review.

14.57 Discuss how you monitor loading on the steam dryer due to vibration at the re-circulation pump bypass frequency.

14.58 Discuss how you monitor the low-frequency pressure loading.

14.59 The data presented in the public meeting did not include the bias and uncertainty that are involved in the Strain Gage measurement, ACM analysis and Finite Element analysis. The licensee is requested to provide final stresses and fatigue margins in the steam dryer after all the structural modifications, uncertainties and bias errors are taken into account.

14.60 The licensee indicated in the March 2, 2007, public meeting, that the conservatism factor was derived based on the pressure loads on the dryer resulting from the ACM analyses. The licensee is requested to discuss in detail how these conservative factors were determined. The information should include the effects of frequency content that are significant in the dynamic analysis and structural response. Also describe the accuracy of the ACM analysis for Hope Creek for low frequency pressure loading.

14.61 Based on the Public Meeting with Hope Creek on Friday, March 2, 2006, the NRC staff requests that the licensee provide the following two documents for review.

a) Report on RPV dome dynamic pressure data recently collected by PSEG (Structural Integrity Report).

b) Stress report based on new in-plant strain gage data at CLTP with all gages working.

14.62 In the conference call on March 12, 2007, CDI indicated that the errors in flow rate were due to high friction in the piping in the subscale model. The licensee is request to provide

a) Validation of Mach number of SMT for CLTP and EPU condition. The validation should be performed for the 1/8th and 1/5th subscale models.

b) **[[**
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c) Revision or additional information to clearly indicate all the changes required in the earlier submittal (i.e., Attachment 7 to the September 18, 2006, EPU amendment request, Attachment 1 to the October 10, 2006 supplement, CDI reports 06-16, 06-17, and 06-26) which result from the new measurement and Mach number revision.

14.63 With regard to the 80 Hz the licensee indicated that RPV level sensor measurements show no strong acoustic mode existing at or near 80 Hz. It is requested to submit a report that documents these measurement data to the NRC for review as it uses these data to justify filtering 80 Hz peaks from their ACM model of the Hope Creek plant.

14.64 In a March 12 conference call, the licensee indicated that new measurements show that the dryer load estimated from the first (May 2006) measurements at CLTP is conservative, in comparison to that determined from the new measurements. The licensee is requested to provide the frequency spectra of the new vs. old loads at CLTP conditions.

3) BWR Systems Branch (SBWB) (question delayed for LTR draft SER)

Applicability of GE Interim Methods LTR (NEDC-33173P) on HCGS EPU

3.8. The NRC staff requests the licensee to provide the following additional information in regards to applicability of the GE Licensing Topical Report (LTR) (NEDC-33173P) (referenced in your submittal) for the Hope Creek EPU core design for Cycle 15:

a) Section 9 of the NRC staff draft safety evaluation report (SER) (Accession No. ML070390406) for NEDC-33173P provides the plant-specific application process and the required information when referencing the generic LTR. Please provide that information for HCGS Cycle 15 EPU operation, as required by the draft SER.

b) Section 10 of the draft SER lists certain restrictions and limitations for plant-specific EPU applications. The NRC staff requests the licensee to fully address each of these restriction and limitation, and provide justification as to why it is acceptable for HCGS to operate at EPU condition in light of the draft SER restrictions and limitations. If the licensee believes that any information which may already have been submitted to the NRC can be used to justify a response to part (a) & (b), as applicable to Cycle 15 (1st EPU Cycle), then the staff requests the licensee to clearly identify the specific information in the submittal, including the relevant pages of attachments and supplements to the submittal.

3) BWR Systems Branch (SBWB) (additional questions)

3.58 Please provide Hope Creek plant configuration information for the ECCS systems including drawings or diagrams showing the injection points in the reactor vessel for LPCI, HPCI, and core spray (Revised after conference call).

3.59 In PUSAR 5.3.4, the Rod Worth Minimizer LPSP in the plant Technical Specifications is kept the same value in terms of absolute power as the current set point for EPU operation. This approach is considered less conservative compared to maintaining same percentage of rated power. Please justify this approach.

3.60 For rod withdraw error events in subcritical / low power startup or power operation, please provide analyzed reactivity addition (CPR or peak fuel enthalpy) for CLTP and EPU conditions and justify specified acceptable fuel design limits were not exceeded for EPU conditions.

3.61 For CRDA analysis documented in PUSAR 9.2, only radiological consequences were presented. Please provide the analyzed reactivity addition (CPR or peak fuel enthalpy) for CLTP and EPU conditions and justify the specified acceptable fuel design limits were not exceeded for EPU conditions.

3.62 Question Deleted following Conference Call

3.63 For response of 3.26 of LCR H05-01, Rev. 1, please provide the justification that the "CPPU core inventory" used in the analysis (GE 14 equilibrium) bounds SVEA fuel.

3.64 For response 3.27, equal initial CPR for anticipated transient without scram (ATWS) analysis was used as starting point and you concluded that EPU hot channel had a less limiting initial power to flow ratio and thus it resulted in lower PCT. Please provide numerical illustration of your reasoning process. However, in real operation, the ATWS for EPU condition could start with a different initial CPR. Using same percentage of rated power as starting point seems to be more reasonable and conclusive. Please justify your assumption - using equal initial CPR. Also what causes more top-peaked axial power profile in CLTP condition than EPU condition?

3.65 In the sequence of events for the pressure regulator failed open (PRFO)-ATWS event listed in response 3.28, why was the boron transportation delay time (104.4 seconds) picked differently than others (86 seconds)? What are the criteria to decide PRFO is most limiting? Does the boron transportation delay time affect the results?

7) Balance-of-Plant Branch (SBPB) (additional questions)

7.9 PUSAR Section 10.1.2, states that the mass and energy releases for high energy line breaks (HELB) in the feedwater(FW) system were evaluated for CPPU and that the energy release from the FW line break at CPPU conditions is bounded by the energy release from a main steam line break at current licensed conditions. However, the PUSAR does not address the increased mass release from an HELB in the feedwater system and its effect upon internal flooding. The Updated Final Safety Analysis Report (UFSAR) does address the mass release and its effect upon internal flooding for CLTP in Section 3.6.2.1.1.1.

a) Explain the effects of increased feedwater flow from a feedwater break at CPPU upon internal flooding including the effects stated in Section 3.6.2.1.1.1 of the UFSAR.

7.10 Section 6.4.1.1.1 of the PUSAR states in reference to the Station Service Water System (SSWS), that the CPPU effect is bounded by the loss-of-coolant accident (LOCA) analysis. Section 6.4.1.1.2 considers only a Safety Auxiliary Cooling System (SACS) LOCA heat load calculation when determining the adequacy of SACS for CPPU. Table 9.2-4 of the UFSAR for current licensed thermal power (CLTP) shows loss of offsite power (LOOP) as a greater heat load on SACS than LOCA in 3 of the 4 scenarios listed. The one scenario where Table 9.2-4 shows LOCA as a greater heat load than LOOP is for the one loop long-term scenario (greater that 30 minutes for LOOP and greater than 10 minutes for LOCA). Considering this information, please explain the following:

a) Explain in greater detail why the SACS is sufficient for recovery from a LOCA and from a LOOP for CPPU. To facilitates the staff's review, provide an updated Table 9.2-4 for CPPU.

b) Why is the heat load on the residual heat removal (RHR) heat exchangers for long-term recovery from a LOOP the same as for recovery from a LOCA for the One Loop case in Table 9.2-4?

c) Why are both SACS loops required for LOCA recovery as stated in the third to last paragraph in Section 9.2.2.2 of the UFSAR and does this affect the explanation requested above.

d) Why is the LOCA the bounding analysis for the SACS heat load when Section 5.4.7.2.2 of the UFSAR states that in effect the shutdown cooling mode is the largest duty for the RHR heat exchangers?

e) Does Technical Specification Limiting Condition for Operation (LCO) 3.7.1.3 for the ultimate heat sink require revision for CPPU. Explain.

8) SG Tube Integrity & Chem. Eng Br (CSGB) (additional questions)

Protective Coating Systems (Paints) - Organic Materials

8.7 Based on the UFSAR, it is the NRC staff's understanding that, (1) Service Level I coatings were not procured and applied according to RG 1.54 because it was not yet issued at the time most plant NSSS equipment was ordered, (2) most NSSS equipment is coated with inorganic zinc qualified to ANSI N101.2, (3) the amount of unqualified coatings on NSSS equipment is less than about 26 lb (12 Kg), (4) the drywell and exposed metal in the drywell and torus are coated with phenolic epoxy qualified to ANSI N101.2, (5) the suppression chamber is coated with phenolic epoxy qualified to ANSI N101.2, and (6) the total amount of unqualified coatings for non-NSSS equipment is less than about 242 lb (110 Kg).

a) Please provide a discussion on the qualification requirements for original and repair coatings to confirm or correct the staff's understanding.

8.8 In the PUSAR Section 4.2.6 provides an estimate for qualified containment coating debris of 85 lb (39 Kg) from "paint chips." The staff infers that this quantity corresponds to the highest value from NEDO-32686, Rev. 1 for combinations of inorganic zinc and epoxy (the predominant coating systems in the Hope Creek containment). Please confirm the staff's understanding or describe the methodology used for determining this value.

8.9 Section 4.2.6 provides an estimate for unqualified containment coating debris of 270 lb (122 Kg) following a design-basis LOCA. Because this value is equivalent to the sum of the amounts stated in Section 6.1.2 of the UFSAR for unqualified coatings on NSSS and non-NSSS equipment, the staff infers that the analysis assumes all unqualified coatings in primary containment will become debris following a LOCA. Please confirm the staff's understanding, or discuss the methodology for determining the amount of debris from unqualified coatings.

8.10 Please discuss the conditions (temperature, pressure, radiological dose) used to qualify Service Level I protective coatings in containment for current operating conditions and whether they remain bounding for DBA conditions following the extended power uprate. If the original qualification conditions were not bounding for any coatings, please discuss your plans to qualify those coatings.

8.11 Section 4.2.6 of the PUSAR states that CPPU conditions do not affect the methods for calculating the amount of debris generated, but it does not discuss the results of the calculations. Section 4.2.6 also states that the existing calculations for zones of influence remain valid because the pipe break locations do not change. These statements do not directly address the effects of the change to CPPU conditions, such as the size of the zone of influence (ZOI) at pipe break locations already postulated, or a comparison of the amount of coatings debris generated under current and CPPU conditions. Please discuss your evaluation of the effects of changing to CPPU conditions on the ZOI, the amount of coatings debris generated, and the operation of emergency cooling systems.

8.12 Please discuss your requirements for inspecting, removing, and replacing degraded containment coatings, and the effects of CPPU conditions on these activities.

8.13 Table 6.1-3 of the Hope Creek UFSAR lists organic materials other than paint in the primary containment, including Kerite and Hypalon electrical insulation. Please describe the evaluations you performed, and discuss the results of those evaluations, to determine the effects of CPPU conditions on the generation of hydrogen and organic gases from paints and other organic materials in containment (e.g., cable insulation).

Flow-Accelerated Corrosion (FAC)

8.14 According to the PUSAR, page 10-34, your FAC inspection program is based on guidelines from the EPRI and American Society of Mechanical Engineers. Please describe in more detail your criteria for scoping and prioritizing components in your FAC program, including how your criteria compare to the guidance in EPRI NSAC-202L-R2, “Recommendations for an Effective Flow-Accelerated Corrosion Program.”

8.15 Please describe your most recent repair or replacement performed as a result of FAC. Include in your description the component replaced, the extent of degradation, actions to prevent recurrence, and how this experience was used to update the FAC program for existing and EPU conditions.

8.16 Please discuss how components are inspected and evaluated with respect to the guidance in EPRI NSAC-202L-R2, in which suitability for continued service is based on current wall thickness, acceptable wall thickness, and predicted wall thickness at the time of the next inspection. Discuss how your acceptance criteria for minimum wall thickness are consistent with maintaining structural integrity.

8.17 The PUSAR states on page 10-35 that the temperature of selected portions is predicted to increase a maximum of 13 ^{0}F. However, PUSAR Table 10-12 indicates the temperature of some components is predicted to increase by up to 19 ^{0}F(e.g., condensate piping temperature changing from 154 - 365 ^{0}F at the current power level to 153 - 384 ^{0}F at higher power). Please clarify this apparent discrepancy between your statement about the maximum temperature change and the values shown in the table.

8.18 Table 10-12 in the PUSAR describes changes in the variables that affect FAC rates. However, because the FAC rate is determined by the interactions of these variables, comparing the parameters may not indicate how they affect the FAC rate. Please discuss the effect of the CPPU conditions on the FAC rates as predicted by your CHECWORKS model, for example by providing the FAC rates for several (e.g., 5 to 10) components representing the highest predicted FAC rates before the uprate and the highest rates after the uprate (i.e., two potentially different sets of components). Include the calculated corrosion rates for comparison.

8.19 Please discuss your FAC program for small bore piping, including how it compares to the guidance in Appendix A of NSAC-202L-R2.

8.20 Please discuss how your program addresses flow-related thinning other than FAC, such as erosion-corrosion due to high velocity fluids or suspended particles.

13) Containment and Ventilation Branch (SCVB) (additional question)

13.16 In response to the NRC staff request for additional information question 13.3 from the Containment and Ventillation Branch (SCVB), you stated that the Filtration, Recirculation, and Ventilation System's (FRVS) limiting component design temperature is 175 ^{0}F. The maximum calculated area temperature of 131 ^{0}F is below the 175 ^{0}F FRVS temperature limit and well below the charcoal ignition temperature of 625 ^{0}F.

In the Hope Creek Power Uprate Safety Analysis Report (PUSAR), Attachment 4 to the Hope Creek Extended Power Uprate application, it was stated that the maximum component temperature is approximately 168 ^{0}F with normal flow conditions and, under conditions of a failed fan, charcoal temperature is maintained below the 625 ^{0}F charcoal ignition temperature by water deluge.

Explain the relation between the calculated temperature of 131 ^{0}F and the maximum component temperature of 168 ^{0}F. Based on your analysis performed for conditions of a failed fan, is it correct to assume that charcoal temperature would exceed 625 ^{0}F without activation of water deluge system?