December 13, 2004

MEMORANDUM TO: Darrell J. Roberts, Chief, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

FROM: Daniel S. Collins, Senior Project Manager ***/RA/***
Project Directorate I, Section 2
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

SUBJECT: HOPE CREEK GENERATING STATION, QUESTIONS REGARDING 'B' RECIRCULATION PUMP HIGH VIBRATIONS AND HIGH PRESSURE COOLANT INJECTION SYSTEM EXHAUST DAMAGE

The attached questions were developed during the Nuclear Regulatory Commission (NRC) staff's review of PSEG's actions taken in response to high vibrations experienced on the 'B' recirculation pump and identified damage to the high pressure coolant injection system turbine exhaust. The questions were communicated verbally to PSEG Nuclear, LLC (PSEG). The purpose of this memorandum is to make the questions available for public inspection prior to a public meeting between the NRC and PSEG. This memorandum and the attachment do not represent an NRC staff position.

Docket No. 50-354

Enclosure: Questions

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VERBALLY COMMUNICATED QUESTIONS TO

PSEG NUCLEAR, LLC

HOPE CREEK GENERATING STATION

DOCKET NO. 50-354

The following questions were communicated verbally to PSEG Nuclear, LLC:

1. The S&L report does not contain a conclusive statement that it is acceptable to start-up without implementation of the GE SIL 459 recommendation regarding the need to inspect the RR shafts after 80,000 hours of operation. Did S&L reach a conclusion on whether the postulated shaft cracking issues at HC could lead to a shaft failure? The statements seem to support a strong need for contingency planning versus continued reliability to the next refueling outage.

2. What is the technical basis for the requirement to inspect the shafts at 80,000 hours? Have fatigue crack growth calculations been performed to simulate the observed cracking of the RR pump shafts? Discuss the applicability of these calculations to the Hope Creek RR pumps, if these calculations exist. What actions contained within GE SIL 459 have been implemented? Has your RR pump seal cooling system been modified (as discussed in the GE SIL) to mitigate the thermal stresses on the pump shaft? Page 15 of the S&L report provides an apparent incomplete assessment of the GE SIL recommendations (i.e. only addresses the SIL item related to vibration monitoring).

3. Does the known shaft bow worsen the potential for shaft cracking? If so where is this addressed in your review and what is the impact? Similarly, is the vibration issue related to the potential shaft cracking issue? Could potential shaft cracking be worsened by the recirc pump vibrations?

4. What is the risk significance associated with shaft cracking? Has it been evaluated by the PRA group? What is the risk of shaft failure based upon its current condition - bowed and potentially cracked?

5. What is the plant response to a rapid failure of the pump shaft? Are vibration levels indicated and alarmed in the control room. Can you reliably detect initiation and/or growth of a crack in the pump shaft during operation with your current instrumentation? Has the ability to detect shaft cracking, using vibration monitoring been demonstrated at any other facility that uses the same RR pump design as Hope Creek? How much time would operators have to recognize (based on vibration change) and respond to a rapid pump shaft failure?

6. If a shaft were to fail what would be the consequences (i.e. would it damage the associated recirculation piping or result in a LOCA due to loss of the shaft from the stuffing box area)?

7. Is end of useful life modeled for a Flowserve generation 2 pump?

8. On page 21 of the S&L report it is stated that Hope Creek RR pumps likely have some degree of shaft cracking. Has PSEG evaluated this non-conformance? What were your conclusions?

9. Since thermal stress, not bowing, is the predominate mechanism cited for the shaft cracks then provide the basis for why S&L does not recommend replacement of both the A&B RR pump shafts at the next refueling outage.

10. Describe the pump vibration monitoring program that will be implemented during the operating cycle.

Recirculation pump and system vibration

11. Will vibrations continue to damage safety-related components? (Example discussed in Table 6.1, page 49 of 71 of the HC Recirc/RHR Pipe Vibration Common Cause Analysis). Were any safety-related components rendered inoperable or unavailable due to recirculation system vibrations during the last operating cycle?

12. What was the reason for the anomalous RR pump vibration levels observed during RF 11? The reason for step change in B RR pump vibrations after RF11 is apparently NOT known yet S&L concluded that "vibration data does not indicate signs of degrading condition for either pump (p. 10)." Is this statement adequately supported?

13. What was the effect of swapping the vibration probes on the pump shaft on the reliability of collected data?

14. The evaluation did not address the apparent accelerated rate of vibration related problems. The operating cycle between RFO9 and RF10 actually had the highest pump vibrations. Why have symptomatic problems become more apparent within the last operating cycle and what conclusions can be determined wrt to the next operating cycle?

15. Did S&L review the current outage (RF12) small bore ISI weld exams or did they only review data from previous outages?

16. Provide a copy of references 6.2 and 6.3 cited in the S&L report section which evaluates the large bore piping vibrations. The S&L report provides several critique comments regarding the March 2004 testing and references 6.2/6.3 but does not provide any justification as to why the these references provide acceptable results with the documented deficiencies.

17. On page 12 the S&L report states that other Mark 1 plants do not have a recirculation pump rigid thermal restraint. Is Hope Creek's rigid thermal restraint inducing unnecessary or damaging stresses? Page 12 of the S&L report also states that the HC pump snubber support are less than other plants and recommends that HC investigate to ensure that this is not the cause for the high vibration. How is PSEG addressing this recommendation?

18. Should S&L's report be so conclusive without displacement data? See pages 23 and 24.

Core Flow Degradation

1. PSEG has not yet determined the cause of a 3% degradation in core flow. Note, this is within technical specification requirements. When will instrumentation issues be ruled out? If it is not instrumentation, what are the other likely sources of the degradation and what are the next steps to resolve?

Other/General

1. Please provide a copy of PSEG's responses to the concerns raised by UCS following their review of the S&L report.

2. Provide the status of implementing all the recommendations contained within the S&L report. If not complete indicate which items will be completed prior to start-up and which items are planned to be completed following start-up.

3. The S&L report (page 3) states that the "A" and "B" RR pumps should be monitored for capacity and vibration and the pump shutdown following a rapid rise in vibration. Provide a copy of your operating procedure which will implement this recommendation along with the basis for the procedure action levels.