

APR 4 2005

LR-N05-0199



U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555-0001

**RESPONSE TO REQUEST FOR INFORMATION REGARDING "B" REACTOR  
RECIRCULATION DECONTAMINATION CONNECTION LEAKAGE  
HOPE CREEK GENERATING STATION  
DOCKET NO. 50-354  
FACILITY OPERATING LICENSE NO. NPF-57**

During a teleconference on April 1, 2005, between representatives of the NRC and PSEG Nuclear, LLC (PSEG), the NRC requested information concerning leakage from the "B" reactor recirculation decontamination connection at Hope Creek Generating Station (Hope Creek) that was identified on March 27, 2005. This letter is in response to that request and provides information related to the cause of the event, failure analysis, and corrective actions. The information requested by the NRC and summary responses are provided in the Attachment. The enclosed "B" Reactor Recirculation Decontamination Connection Leak Cause Determination Report addresses the cause of the event, failure analysis, and corrective actions.

The leakage from the "B" reactor recirculation decontamination connection (i.e., port) resulted from a crack on the decontamination port weld of the reactor recirculation system piping. The decontamination port is a short length, 4-inch nominal diameter pipe welded to the reactor coolant system (RCS) piping on the suction side of the "B" reactor recirculation pump. The port is located within the isolable section of RCS piping for the "B" reactor recirculation pump.

PSEG has determined that this issue is not related to the vibration issues of the "B" recirculation pump discussed in PSEG's letters of December 3, 2004, (LR-N04-0563) and December 29, 2004 (LR-N04-0599). The cause of the weld crack has been determined, the piping for both the "A" and "B" reactor recirculation decontamination connection lines has been reconfigured to prevent similar occurrences, and the extent of condition review has determined that the welds on similar recirculation system piping connections are acceptable. Should you have any questions regarding this response, please contact Brian Thomas at (856) 339-2022.

Sincerely,

A handwritten signature in cursive script that reads "George P. Barnes".

George P. Barnes  
Site Vice President – Hope Creek

Attachment  
Enclosure

C: Mr. Samuel Collins, Administrator - Region I  
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USNRC Senior Resident Inspectors (Hope Creek - X24)

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## ATTACHMENT

(1) PSEG Submittal

Response To "B" Reactor Recirculation Decontamination  
Connection Leakage

~~(2) CD#1~~ (Hope Creek)

Natural Frequency Calc - Signed Rev 1.  
Harmonic Analysis Calc - Signed Rev 1.  
H-1-BB-CDC - 2 065.Revision  
Fracture Mechanic Calc.  
Acceleration Estimate Calc.  
Open Crack 12X Montage Reduced

~~(3) CD#2~~ (Hope Creek - 2)

Natural Frequency Calc - Signed Rev 1.1  
Harmonic Analysis Calc - Signed 1.  
H-1-BB-CDC - 2 065. Revision 0 - 1  
Fracture Mechanics Calc - 1  
Acceleration Estimate Cal 11808-0002 - RC T-01-1  
Open Crack 12X Montage Reduced - 1

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**NRC Requested Information: Adequacy of Root Cause / Failure Analysis**

- **Review the vendor failure analysis report. Review the enhanced fabrication RT to determine whether the weld discontinuity was present during initial construction.**

Summary Response: Original construction radiographs have been reviewed, including the "reader sheets." The weld discontinuity was not identified on the radiographs or on the "reader sheets." This was confirmed by a review of the enhanced radiographs. The Hope Creek "B" Loop Decontamination Port Cracking Preliminary Results Report (Vendor Failure Analysis Report) is included in the enclosure.

- **Review Hope Creek's Root Cause Analysis Report to determine:  
-Whether the recirculation pump shaft vibration problem contributed to this failure (i.e., review Hope Creek's basis that the 5X vibration levels were the cause for the fatigue failure).  
-Whether the "sudden" nature (i.e. the crack arrested and then subsequently propagated to failure) for the failure can be attributed to a specific plant event or cause.**

Summary Response: The "B" Reactor Recirculation Decontamination Connection Leak Cause Determination Report is included in the enclosure and provides additional detail addressing these issues.

This report discusses that the pump shaft vibration did not contribute to the cracking. Further, the "sudden nature" of the crack propagation appears to correlate with a specific plant condition in which the reactor recirculation pump speed was such that the 5X vane passing vibration coincided with a resonant frequency of the "B" reactor recirculation decontamination connection and acoustic resonance of the "A" and "B" reactor recirculation systems. The laboratory analysis of the cracked weld shows that the recent leakage was the last event in a series of cracking events. The most recent instance of this plant condition likely occurred on February 8, 2005.

**NRC Requested Information: Adequacy of Corrective Actions Prior to Re-Start**

- **Review the repair of the "B" RR loop decontamination line stub tube and the modifications to the "A" RR loop decontamination line.**  
Summary Response: Both the "A" and "B" reactor recirculation decontamination connections have been shortened in order to change their resonant frequencies to be non-coincident with the vane passing frequencies of the reactor recirculation pumps.

The enclosed analysis shows that the natural frequencies for the modified reactor recirculation decontamination connections have been changed to be outside of the 5X vane passing frequencies during reactor recirculation pump operation.

Further, the report shows that the original reactor recirculation decontamination connections would resonate at the 5X vane passing frequencies when the recirculation pumps were operated in the region near 1500 rpm.

- **Review the adequacy of the expanded NDE samples performed in response to the failure (extent of condition).**

Summary Response: The basis for the extent-of-condition review is discussed in detail in the enclosed "B" Reactor Recirculation Decontamination Connection Leak Cause Determination Report. The extent-of-condition review addressed similar configurations in other locations.

- **Review the MPR vibration analysis report to ensure that appropriate issues are addressed such as the impact of the stub tube modifications on the system frequency response and assumptions regarding defects in the analysis (i.e. – provide the calculation showing what the fundamental frequency of the original stub pipe/flange was versus the new fundamental frequency with the shortened pipe length and comparing these frequencies with the 5X vane passing frequency).**

Summary Response: The enclosed analysis shows that the natural frequencies for the modified reactor recirculation decontamination connections have been changed to be outside of the 5X vane passing frequencies during reactor recirculation pump operation. Further, the report shows that the original reactor recirculation decontamination connections would resonate at the 5X vane passing frequencies when the recirculation pumps were operated in the region near 1500 rpm.

- **Review Hope Creek's engineering report that demonstrates that the recirculation piping and all attached systems are within their design vibration limits. This report should include an explanation for why the GE vibration analysis/testing failed to predict this failure (i.e. were the stub tubes and other small diameter attachments not modeled or was there some other error in the report (extent of condition)).**

Summary Response: As discussed in the enclosed report, the reactor recirculation decontamination connections were not modeled in the original analysis and therefore, were not monitored in the vibration analysis testing. The enclosed report also documents that the recirculation piping vibration is within design limits.

- **Review the correlation between the vibration data collected by the enhanced monitoring system during the early part of the operating system with the predicted values.**

Summary Response: As described in the enclosed "B" Reactor Recirculation Decontamination Connection Leakage Cause Determination Report, the vibration data collected by the enhanced monitoring system was compared to acceptance criteria established by General Electric. Based upon analysis and reviews of the

pipings vibration data collected, the reactor recirculation piping system and connected residual heat removal (RHR) piping in the drywell meet the piping system acceptance criteria.

- **Review Hope Creek's quality assurance report which shows that the recirculation piping and attached system isometric drawings conform with the "as built" condition. Ensure that this includes any system modifications or changes made subsequent to the isometric drawing development.**

Summary Response: As described in the enclosed "B" Reactor Recirculation Decontamination Connection Leakage Cause Determination Report, the isometric drawings for the recirculation piping and attached systems conform to the as-built condition. A review was done to confirm that the recirculation loop piping drawing referenced in the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Section III design stress report is still the current version. The dimensions of the decontamination connection in the field matched the recirculation piping loop drawings.

- **Review Hope Creek's response to the comment on the Sargent and Lundy report (page 5), which states that one small bore pipe had a fabrication anomaly.**

Summary Response: The weld that was noted in the Sargent and Lundy report was a one-inch socket weld instrument line connection located on the 28-inch recirculation piping suction elbow.

Based upon an independent review of the radiographs, it was determined that the indication on the one-inch socket weld instrument line connection was a volumetric weld anomaly from the repair/fabrication process conducted in 2001. There was no evidence of any planar defects, which would indicate that cracking was present. Therefore, the indication was neither service-induced nor was it aggravated by service conditions such as fatigue. Further, based on the radiographs, this fabrication anomaly was not a non-conforming condition, nor was it an ASME Section XI acceptance criteria failure.

- **Review Hope Creek's response to why this outage was not of sufficient duration to replace the "B" recirculation pump as described in the January 2005 CAL.**

Response: The original schedule for the Hope Creek outage was to take the unit offline and maintain reactor power at less than 10% to support the investigation into the source of the drywell unidentified leakage. A three-day outage was planned since the most likely source of the leakage was a valve packing leak. Upon identification of the leak on the "B" reactor recirculation suction piping decontamination port, the plant was placed in Cold Shutdown, and the forced outage schedule was extended to six days to facilitate the required repair activities. Additional outage activities and extent-of-condition reviews then

extended the outage an additional five days, for a total of 11 days. This is not a sufficient duration to replace the "B" recirculation pump shaft.

- **Review Hope Creek's response to questions regarding whether this leakage should have been classified as pressure boundary leakage.**  
Response: PSEG did not consider the leakage to be pressure boundary leakage, since it could be isolated. However, the actions taken at the time of discovery were consistent with the requirements for pressure boundary leakage described in Technical Specification 3.4.3.2, Action a, placing the unit in Hot Shutdown within 12 hours and in Cold Shutdown within the next 24 hours.