



# Union of Concerned Scientists

Citizens and Scientists for Environmental Solutions

November 18, 2004

Mr. A. Christopher Bakken  
President & Chief Nuclear Officer  
PSEG Nuclear LLC  
P.O. Box 236  
Hancocks Bridge, NJ 08038-0236

**SUBJECT: RECIRCULATION SYSTEM VIBRATION PROBLEMS AT THE HOPE CREEK GENERATING STATION**

Dear Mr. Bakken:

I appreciate your providing me a copy of the report<sup>1</sup> by Sargent & Lundy on their independent assessment of the recirculation system vibration problems at the Hope Creek Generating Station. The bottom line of this report is that Hope Creek can run for one more operating cycle before replacing the shaft on the "B" recirculation pump and two more operating cycles before replacing the shaft on the "A" recirculation pump. I carefully read this report several times and do not find it convincing. In fact, it makes me even more convinced that restarting Hope Creek without replacing the "B" recirculation pump shaft would be a gamble far larger than any wagered in Atlantic City.

There are two serious problems with the "B" recirculation pump, either of which alone would prompt a prudent person to call for immediate replacement of its shaft. The first problem is a bent shaft resulting in vibrations that have damaged safety-related components at Hope Creek and will continue to do so until corrected. The second problem is a broken shaft that could someday trigger a very serious accident. These two serious safety problems are discussed in the following sections.

### **Bent Shaft on the "B" Recirculation Pump**

The Sargent & Lundy report contains many facts about the bent shaft on the "B" recirculation pump and the vibrations it is causing. For example:

*Prior to RF09 and after RF11 the 'B' RR pump vibrations are generally 9-11 mils with no apparent trend up or down. (page 10)*

*The predominant "B" RR pump shaft displacements occur at the pump running speed. This is consistent with unbalance or a bent shaft. (page 3)*

*Flowsolve inspected a seal that failed in February 2003 in the "B" pump. Examination of the wear patterns led Flowsolve to conclude the pump shaft is bowed. (page 13)*

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<sup>1</sup> Sargent & Lundy LLC, "Independent Assessment of Hope Creek Reactor Recirculation System and Pump Vibration Issues," November 12, 2004.

*During RF12 (2004), the station conducted two tests with the rotor still in the pump to determine if the shaft is actually bowed. ... While the tests are not conclusive, they indicate that shaft distortion, such as bowing, may exist. (page 13)*

*The "B" pump vibrations have historically been about twice as high as the "A" pump but both are in the range of vibration levels that are within industry experience. (page 3)*

*The "B" pump seals have approximately 1/4 the life expectancy of the "A" pump seals. The industry expects a six year life for seals, which the "A" pump generally meets. (page 3)*

Sargent & Lundy documented ample evidence that the shaft on the "B" recirculation pump is bent, or bowed, and that this condition is causing increased vibration levels. Sargent & Lundy concluded that Hope Creek could operate for one more cycle before replacing the bent shaft. Their justification:

*The vibrations for both "A" and "B" pumps have been stable over the past operating cycle. (page 17)*

*There is no indication that the current vibration levels are impacting the pump performance other than short seal life in "B" RRP. (page 17)*

*There is no trend of increasing vibrations for either RR pumps. (page 3)*

*A vibration monitoring effort was implemented following the March 2004 outage. The piping vibrations measured following the March 2004 outage were acceptable and indicated, based on comparisons with previous vibration monitoring results, which vibrations have not changed significantly over time. (page 4)*

Sargent & Lundy contended that the "B" recirculation pump vibrations are high but not getting any worse and that the measured vibrations are acceptable and have not changed significantly over time. Yet other facts recorded in the report undermine both of these positions. The "not getting any worse" position is contradicted by a long list of safety-related components damaged by excessive vibration in recent years, including the following:

*A plant walk down conducted 10/21/04, supported by photographs, documents additional failures of limit switch hardware [for valves F060A and F060B] (page 30)*

*Repetitive failures of yoke nuts have been established. ... This write up identifies that a similar yoke nut failure was encounter on the F077 valve in the April 2003 outage. (page 32)*

*Based on discussions with PSEG Civil/Structural personnel, prior to Notification 20182397 (03/2004), there were no previously identified issues related to the integrity of the actuator tube assembly up until this failure being reported in 03/2004. (page 33)*

*Detachment of the F050A (V111) Actuator  
Notification 20182397 (03/2004)  
Notification 20208119 (10/2004) (page 33)*

*Detachment of the F060B (V074) Valve Hand Wheel  
Notification (03/2004) (page 34)*

*Limit Switch Failures of the F060A (V183) Valve  
Notification 20182396 (03/2004)  
Notification 20208116 (10/2004) (page 34)*

*Limit Switch Failures of the F060B (V074) Valve  
Notification 20182395 (03/2004)  
Notification 20208117 (10/2004) (page 34)*

*Gear Box Cover Plate Deformation for the F077 (V078) Valve  
Notification 20208118 (10/2004) (page 34)*

*Broken Yoke Sleeve Nut on the F060A (V183) Valve  
Notification 20208920 (10/2004) (page 34)*

*Broken Yoke Sleeve Nut on the F077 (V078) Valve  
Notification 20141040 (03/2003)  
Notification 20141176 (03/2003) (page 34)*

This long list of components recently damaged by excessive vibrations strongly contradicts the notion that the problem is not getting worse. Conditions are getting worse as reflected by the growing list of broken things. This fact also lessens the significance of the fact that the “B” recirculation pump vibrations are “within industry experience.” The long list of components with vibration-induced failures is not “within industry experience.”

Sargent & Lundy explicitly contradicted their position that “A vibration monitoring effort was implemented following the March 2004 outage. The piping vibrations measured following the March 2004 outage were acceptable.” Sargent & Lundy stated:

*Vibration monitoring of the RR and RHR piping was performed following the March 2004 forced outage (Refs. 6.2, 6.3). Based on the discussions presented in Refs. 6.1 and 6.2, the objectives of the monitoring were to verify that pipe stresses were below acceptable limits and to obtain information to better understand the vibrations causing the valve component damage. [emphasis added] (page 22)*

*Generally, a more extensive effort would be required to satisfy the March 2004 vibration monitoring objectives. The reviewed documents do not provide the complete thought process of PSEG at the time the vibration monitoring scope was established.* [emphasis added] (page 23)

Sargent & Lundy reported that vibration monitoring conducted following the March 2004 forced outage was insufficient to satisfy the objective of verifying that pipe stresses were below acceptable limits. The results do not prove that the pipe stresses caused by the vibrations are unacceptable, but it is abundantly clear that insufficient information was collected to issue a clean bill of health.

What is known for certain is that the “B” recirculation pump has elevated vibration levels caused in all likelihood by a bent shaft and that safety-related valves have recently been damaged by excessive vibrations. While it is true that other things, such as those associated with the recirculation pump vane passing frequency, it is also true that these factors complement each other such that eliminating or reducing one factor alleviates the overall problem. It is shortsighted for PSEG not to correct one known problem because PSEG cannot identify all other sources of recirculation system vibration.

Sargent & Lundy reported yet another reason why PSEG should not postpone replacement of the “B” recirculation pump shaft:

*It is evident that there were opportunities prior to March 2004 to address the overall RR [reactor recirculation] system vibration issues, which could have allowed them to be resolved earlier in the plant life. (page 22)*

The PSEG stockholders and the people living around Hope Creek should not be forced to bear unnecessary financial and safety risk because PSEG shirked its responsibilities in the past. That PSEG failed to obtain data in the past so as to better define the recirculation system vibration issues today is simply the wrong reason to allow Hope Creek to restart tomorrow with a bent shaft on the “B” recirculation pump.

### **Broken Shaft on the “B” Recirculation Pump**

In addition to being bent, the shaft on the “B” recirculation pump is also broken. General Electric, the manufacturer of the reactor at Hope Creek, recommended that PSEG replace the broken shaft, but PSEG has failed to do so as Sargent and Lundy recorded:

*GE issued SIL [Service Information Letter] No. 459 S2 (Ref. 5.21) which states that RR pumps with more than 80,000 hours of operation should be inspected, because shaft cracks were detected at all GE BWRs at which shafts were removed and inspected, although some were still operating after more than 100,000 hours of service. Hope Creek RR pumps have exceeded this and are at approximately 130,000 to 140,000 hours. (page 14)*

PSEG wants to operate Hope Creek for another 18-month cycle before replacing the “B” recirculation pump shaft, adding about another 10,000 hours of operation for the pumps. This scheme would put the Hope Creek recirculation pump shafts at nearly DOUBLE the inspection interval recommended by General Electric. Yet PSEG has not yet heeded General Electric’s recommendation to inspect the pump shafts. All other General Electric reactors that have inspected the pump shafts have found cracks requiring the shafts to be replaced. According to Sargent & Lundy:

*However, both "A" and "B" RRP's have operated over 130,000 hours and are approaching a perceived end of useful life. **Reliability can be expected to decline with time in service if not upgraded.** [emphasis added] (page 17)*

How close to the “end of useful life” are the recirculation pump shafts at Hope Creek. Sargent & Lundy is so doubtful that the pumps will survive one more operating cycle that they recommend PSEG have a “crash cart” prepped and ready:

*The Hope Creek RR pumps most likely have some degree of shaft cracks and therefore should be monitored closely. A rapid rise in vibration amplitude would be sufficient reason to shut the pump down immediately for an internal inspection and rotor replacement, as the window between the rise and potential shaft failure is expected to be small. (page 17)*

**Considering the age and time in service of the RR pumps, and the potential for shaft failure (Ref. 5.21), the Station should be ready to rebuild the RR pumps. In order to minimize down time, a plan should be in place for access and rigging.** [emphasis added] (page 17)

The recommendation to pre-stage access and rigging to cope with shaft failure can hardly be construed as a ringing endorsement for operating Hope Creek one more cycle with broken recirculation pump shafts.

### **Summary**

Two events in recent years have vividly illustrated the right way and the wrong way to deal with nuclear safety issues. In March 2002, workers at the Davis-Besse nuclear plant in Ohio discovered a football-sized hole in the reactor vessel head. Years of unbelievable neglect by FirstEnergy, the plant’s owner, allowed a small water leak to reduce safety margins to the point where this event ranks fifth highest on the NRC’s list of near-misses and cost the company over \$600 million to remedy. The following year, workers at the South Texas Project in Texas discovered evidence of an even smaller water leak. STP Nuclear Operating Company, the plant’s owner, responded with a comprehensive repair plan that has drawn universal praise from all that have reviewed it, including the Union of Concerned Scientists. South Texas Project restarted after repairs costly a mere fraction of the Davis-Besse price tag.

PSEG's response to the recirculation system vibration problems at Hope Creek are more closely aligned with FirstEnergy's example than with South Texas Project's example. It's the entirely wrong role model to be following from both a safety and financial perspective. The high cost and low safety destination of the pathway FirstEnergy blazed at Davis-Besse makes us wonder why they ventured along it and why PSEG would contemplate following along.

Overwhelming evidence points to the shaft on the "B" recirculation pump at Hope Creek being both bent and broken. Either condition should, by itself, be sufficient justification for replacing the shaft. Collectively, they provide zero reasons not to do so now.

PSEG is at a crossroads. PSEG could opt now to replace the "B" recirculation pump shaft because it is bent and broken and to also inspect the "A" recirculation pump shaft because it is 60 percent over the recommended inspection interval. That course of action would make the plant safer and more reliable and could make people forget about South Texas Project's shining example.

Or PSEG could gamble and experiment for another operating cycle with the "B" recirculation pump shaft bent and broken. That course of action, should the experiment fail as it likely will, would make people forget about Davis-Besse's infamy.

It is undeniably a difficult decision, but I appeal to you to chart the course that ensures Hope Creek is safer and more reliable and supplants South Texas Project as the epitome of "safety first."

Sincerely,

A handwritten signature in black ink that reads "David O. Lochbaum". The signature is written in a cursive, flowing style.

David Lochbaum  
Nuclear Safety Engineer  
Washington Office