EDO Principal Correspondence Control

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FINAL REPLY:

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TO:

Travers, EDO

FOR SIGNATURE OF : ** GRN ** CRC NO:

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DESC: ROUTING:

Apparent Flaw in Davis-Besse Root Cause Analysis

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SPECIAL INSTRUCTIONS OR REMARKS:

Template: EDO-001

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Union of Concerned Scientists
Citizens and Scientists for Environmental Solutions

December 18, 2003

William D. Travers
Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: APPARENT FLAW IN DAVIS-BESSE ROOT CAUSE ANALYSIS

Dear Dr. Travers:

It appears to the Union of Concerned Scientists that the root cause analysis submitted by FirstEnergy for the control rod drive mechanism (CRDM) nozzle cracking is deficient. Specifically, the root cause analysis does not adequately examine the potential role played by the reactor vessel head vent through nozzle #14 and may underestimate the operating temperature used in related calculations.

It is our understanding that nozzle #14 is piped to the steam generator #2 upper primary hand hole and provides a continuous vent pathway. Its function is to remove non-condensible gases from the reactor vessel dome during an accident. Nozzle #14 is in very close proximity to Nozzle #2 and in close proximity to Nozzles #1 and #3. Nozzle #2 had the greatest number of cracks (nine axial and one circumferential cracks). Nozzle #1 had nine axial cracks. Nozzle #3 had four axial cracks. Nozzles further away from Nozzle #14 had little or no crack indications.

This information may be relevant to the question of why Davis-Besse was so extensively degraded. It is our understanding that this vent configuration is unique to Davis-Besse – in other words, the other Babcock & Wilcox pressurized water reactors do not have this arrangement.

The cracked CRDM nozzles at other reactors appear almost randomly distributed. The worst nozzle cracking at Davis-Besse appears "clustered" close to nozzle #14. It could very well be a coincidence. Or, it could be attributed to thermal effects resulting from the 6.9 pounds mass per hour flow rate predicted through nozzle #14 in B&W design calculation 86-1142171-00.

The root cause analysis casually dismisses the potential impact of this unique configuration. It stated, "There is no evidence of thermal fatigue on this penetration [nozzle #14]." This is insufficient basis for dismissing the matter. Nozzle #14 was manufactured by B&W Tubular Products with heat no M4437. Nozzle Nos. 1, 2, and 3 came from heat No. M3935 and are more vulnerable to cracking. Heat No. M4437 had a higher annealing temperature (1850 to 1950°F) compared to heat No. M3935 (1600 to 1700°F) making it more resistant to stress corrosion cracking. Thus, the fact that no evidence of thermal fatigue was identified on Nozzle #14 does not, in itself, eliminate this vent line configuration as being a contributing factor to damage experienced at nearby, less resistant nozzles.

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In addition, the root cause analysis appears to have non-conservatively characterized the temperature used in calculations such as the time-at-temperature estimate. The root cause analysis used 605°F. I have actual operating data for Davis-Besse from June 29, 1999, through August 18, 1999, and am told that this data reflects that from periods before and after this snapshot. According to process computer points T719 and T720 for reactor coolant system loop 1 and computer points T728 and T729 for reactor coolant system loop 2, the indicated loop 1 temperatures were consistently about 607.5°F at full power while the indicated loop 2 temperatures were about 604.1°F. I do not have the calibration information for these instruments and their computer points, but if the actual operating temperature was higher than the 605°F value assumed in the time-at-temperature calculations, it would increase the effective degradation years (EDY) for Davis-Besse and move it towards, if not ahead, of Oconee.

Our concern is that the root cause analysis submitted by FirstEnergy casually dismissed the potential contribution of nozzle #14 to CRDM nozzle cracking and may have underestimated the temperature conditions. This concern has more than historical significance. If the unique vent line arrangement at Davis-Besse makes its CRDM nozzles more vulnerable to cracking than other B&W reactors, then the inspection scope and frequency for the CRDM nozzles on the replacement head may be inadequate to prevent future problems.

We request the NRC to reconsider the root cause analysis with this unique vent line configuration concern in mind. At this stage, we do not feel that our concern fits into allegation space or 2.206 petition space, although we could easily recraft the concern if necessary to fit into either of these processes. We would hope that the NRC staff will look into this concern absent that effort.

If after doing so the NRC agrees with our contention that FirstEnergy has not adequately addressed this factor, we would expect that the NRC would take appropriate measures to cause the company to fix this deficiency. As a minimum, the company's root case analysis and responses to NRC bulletins on CRDM nozzle cracking supplemented.

Sincerely,

David A. Lochbaum

David Lochbaum
Nuclear Safety Engineer