

**From:** David Lew  
**To:** Wayne Schmidt  
**Date:** Mon, Aug 7, 2000 7:47 AM  
**Subject:** NOV and Cover Letter Message

Wayne, Let me know what you think. Dave

**CC:** Brian Holian, Daniel Holody

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## APPARENT VIOLATION

10 CFR 50, Appendix B, Criteria XVI, requires that measures shall be established to assure that conditions adverse to quality are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude recurrence.

Contrary to the above, during the 1997 refueling outage, a significant condition adverse to quality existed at Indian Point 2, namely, primary water stress corrosion cracking (PWSCC) flaws in the small radius u-bends of four tubes in steam generators; however, as of February 15, 2000, when one of those tubes failed while the plant was at 100% power, measures were not established to ensure that the condition adverse to quality had been identified and corrected, despite opportunities that existed to do so. Those prior opportunities involved other significant conditions adverse to quality for which the causes had not been determined. Specifically, during eddy current testing of steam generators during the 1997 outage,

1. a PWSCC crack was identified at the apex of one of the small radius u-bend tubes. Since this was the first time in the facility's history that a crack had been identified at the apex of any tube, it signified the potential for other similar cracks in the low row tubes.
2. indications of tube denting were discovered for the first time in the uppermost support plate of steam generator tubes when restrictions were encountered as eddy current probes were inserted into those tubes. These restrictions in 20 tubes signified the susceptibility to deform the flow slots (hour-glassing) in the uppermost support plate, which, in turn, indicates additional PWSCC stresses on the small radius u-bend tubes.
3. significant electrical interference (noise) was encountered in the data obtained during the actual eddy current testing of several other small radius u-bend tubes, which could impede the detection of similar indications that may have existed in other tubes.

Although the indications of tube denting at the 20 locations, and the identification of the apex crack in one of the small radius tubes, collectively increased the potential for similar steam generator tube flaws existing in other locations, the licensee (1) did not evaluate nor take action to correct and account for these impediments (to detection of any other flaws) that the noise created at the time; and, (2) did not adjust or modify inspection methods and analysis during the inspections process to account for the anomalies and other new conditions encountered. As a result, four indications were not promptly identified in the 1997 outage and were left in service until the failure of one of these tubes occurred on February 15, 2000.

## **PERFORMANCE ISSUES FOR THE COVER LETTER**

The team concluded that the overall technical direction and execution of the 1997 steam generator inspection were deficient in several respects. In 1997, the steam generator inspection program did not appropriately account for known and likely degradation mechanisms, and for conditions that increased the susceptibility of tubes to these degradation mechanisms. The program did not appropriately account for and compensate for conditions that challenged or limited detection capabilities. The program did not appropriately adjust or modified the inspection methods or analyses for such anomalies and conditions as they were encountered during the inspections.

These deficiencies were indicated by the licensee's performance in 1997 steam generator inspection. A new and significant degradation mechanism, PWSCC in the apex of a small radius u-bend tube, and restriction at the upper support plate locations were identified and indicated increased susceptibility to this degradation mechanism. While the PWSCC indication, which was identified in 1997, was in an area of relatively low noise, the noise in similar areas was much higher and limited detection capability. However, the inspection program was not adjust or modified to ensure that the extent of condition was understood and that similar indications would be identified in the u-bend area of small radius u-bend tubes with high noise. As a result, four indications which should have been identified in 1997 was missed and left in service until the failure of one of these tubes occurred on February 15, 2000.