

# APPARENT VIOLATION

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10 CFR 50, Appendix B, Criterion 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.

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Contrary to the above, despite opportunities during 1997 Indian Point 2 refueling outage, Con Edison did not identify and correct a significant condition adverse to quality, the presence of primary water stress corrosion cracking (PWSCC) flaws in four row 2 steam generator (SG) tubes in the small-radius, low-row U-bend apex area. In conducting the 1997 SG inservice inspection, Con Edison did not adequately account for conditions, which adversely affected the detectability of, and increased the susceptibility to, tube flaws. Specifically, during the 1997 outage SG eddy current test (ECT) examination,

- a PWSCC defect was identified for the first time, at the apex of one row 2 tube, signifying the potential for other similar cracks in the low-row tubes. However, Con Edison did not adequately evaluate the susceptibility of low-row tubes to PWSCC and the extent to which this degradation existed.
- indications of tube denting were identified for the first time in low-row tubes at the upper tube support plate (TSP) when restrictions were encountered as ECT probes were inserted into those tubes. Restrictions in 19 low-row tubes signified increased probability of deformed flow slots (hour-glassing) at the upper TSP. Hour-glassing of the upper TSP increases the stresses at the U-bend apex of tubes. These stresses are a prime precursor for PWSCC. However, Con Edison did not adequately evaluate the potential for hourglassing based on the indications of the low-row tube denting.
- significant ECT signal interference (noise) was encountered in the data obtained during the actual ECT of several low-row U-bend tubes. This significant noise level reduced the probability of identifying an existing PWSCC tube defect. However, the 1997 SG inspection program was not adjusted to compensate for the negative effects of the noise in detecting flaws, particularly when conditions that increased susceptibility to PWSCC existed.

As a result, a minimum of four tubes (with PWSCC flaws in their small radius U-bends) were left in service following the 1997 inspection, until the failure of one of these tubes occurred on February 15, 2000 while the reactor was at 100% power.

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## **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. The steam generator inspection program did not ensure that

- known and likely potential degradation mechanisms were accounted for
- conditions that increased the susceptibility of tubes to these degradation mechanisms were accounted for
- conditions that challenged or limited detection capabilities were accounted and compensated for
- inspection methods and analysis during the inspections process to account for the anomalies and other new conditions encountered were adjusted or modified