

From: David Lew
To: Brian Holian
Date: Fri, Jul 14, 2000 3:51 PM
Subject: IP2 File

Brian, Here's the file. Please send it back to Wayne and myself. Wayne is taking a cut at it on Saturday and I'll take another on Sunday. I'll have it back on your email and Hub's emailed first thing Monday morning. If it good to go, we'll get to HQs. Dave

CC: Wayne Schmidt

ITEM #

4/13

46-

(3)

PREDECISIONAL INSPECTION INFORMATION
INTERNAL NRC STAFF USE ONLY

Indian Point 2 Steam Generator Special Inspection Exit Summary

The NRC conducted a special team inspection to review the causes of the failure of a steam generator tube on February 15, 2000. The NRC team members included personnel from the Office of Nuclear Reactor Regulation and Region I, and NRC-contracted specialists in steam generator eddy current testing. The team assessed the adequacy of Con Edison's performance during the 1997 steam generator inspections and Con Edison's root cause evaluation, date April 14, 2000.

The team conducted an exit with Con Edison on July 18, 2000. This summary provides the preliminary team findings, which were still being finalized and were subject to NRC management review. The overall significance determination for this event were still being developed. These findings and the significance determination of the event will be documented in NRC inspection report No. 50-247/2000-010.

Con Edison's 1997 steam generator inspection program did not adequately account for factors that caused significant limitations and uncertainties in data collection and analyses, and gave rise to the increased likelihood of steam generator tubes with detectable flaws being left in service. In the low radius U-bend areas, Con Edison did not focus attention and adjust efforts to compensate for steam generator conditions and eddy current technique challenges, such as high signal noise, that negatively affected flaw detection capability. Also Con Edison did not integrate steam generator condition information to assess the significance of the newly discovered degradation mechanism, i.e., inside diameter (ID) primary water stress corrosion cracking (PWSCC) at the apex of a U-bend in a row 2 tube, that increased the likelihood of tube integrity problems.

Deficiencies in recognizing the significance of and fully addressing these performance issues resulted from Con Edison's weak technical oversight of this program and the lack of an integrated technical understanding of the steam generator (SG) conditions. As an overall result, during the 1997 inspection, Con Edison did not identify detectable flaws in six small radius U-bend SG tubes, including tube R2C5 in SG 24, which failed in February 2000.

Con Edison's root cause determination did not adequately address the failure to identify the tube flaws in the low radius U-bend region during the 1997 outage. While the root cause analysis attributed the tube failure to a flaw that was obscured by eddy current signal noise, the adequacy in Con Edison's technical oversight of the 1997 steam generator inspections was not addressed. The root cause analysis also did not address the adequacy of the corrective actions taken in response to a new SG degradation mechanism.

The team identified the following significant performance issues:

1. Based on an independent NRC review of the eight U-bend PWSCC indications that were identified in 2000 through review of existing 1997 inspection data, the NRC determined

July 13, 2000

1

EX-5

~~PREDECISIONAL INSPECTION INFORMATION~~
~~INTERNAL NRC STAFF USE ONLY~~

that Con Edison should have identified six of these defects and removed the associated tubes from service in 1997. This tubes included SG 24, tube R2C5, which leaked on February 15, 2000. The following issues decreased the probability of defect detection and increased the likelihood of apex flaws in the small radius U-bend steam generator tubes.

1. Con Edison did not recognize the significance of and evaluate the flaw masking effects of the high noise encountered in the eddy current signal (low signal to noise ratios). In the case of SG 24, tube R2C5, the magnitude of the signal noise was estimated to equate to a 70-100% through-wall tube defect. The data analysis techniques were not adjusted to compensate for the noise to allow identification of flaw signal and ensure the appropriate probability of detection.
2. Con Edison did not adequately responded to a PWSCC indication in the U-bend area of tube R2C67 in SG 24. This indication, which was located in the apex of this small radius tube, was a new and significant degradation mechanism at Indian Point 2. Apex cracking is more likely to burst than other u-bend cracks. Con Edison did not enter this significant issue into the corrective action program to ensure that this new degradation mechanism and the associated root cause were fully understood.
3. Con Edison did not sufficiently assess eddy current probe restrictions in the upper support plate with respect to flow slot hourglassing that increased the likelihood of increased apex stresses and PWSCC.
2. Con Edison did not properly set-up the U-bend plus-point eddy current probe, which negatively affected the probability of detection of U-bend indications. The probe was not set-up with the proper calibration standard or with the phase rotation specified by the EPRI qualified technique sheet.
3. Con Edison did not have an accurate method of measuring nor some criteria for determining when significant hourglassing of the upper tube support plates had taken

July 13, 2000