**From:** Michael Modes
**To:** David Lew
**Date:** Fri, Jul 14, 2000 9:39 AM
**Subject:** Re: IP2 SG Special Inspection Exit Summary

I hope the comments I added to your document are of help.

>>> David Lew 07/14 8:24 AM >>>
Here's the attachment.

Attached is a summary of the NRC findings that we intend to deliver to Con Ed at the Tuesday exit meeting. This summary is a proposed attachment to NRR's letter to Con Edison on the status of the SE. Plan to send this the HQ pending incorporation of any comments you may have.

**CC:** Wayne Schmidt

4/12

ITEM 45

(H)

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**Indian Point 2 Steam Generator Special Inspection Exit Summary**

The NRC conducted a special team inspection **in order** to review ~~the~~ **possible** causes **for** ~~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 **Consolidated** Edison's performance during the 1997 steam generator inspections and **Consolidated** Edison's root cause evaluation, dated April 14, 2000. **(Question: Does this mean Consolidated Edison's performance during the '97 inspection is the only cause for the failure? It appears that way because it is the only thing listed in this paragraph that could be a cause. I suggest you say something like: "two key areas inspected by the team were", or "some of the things the team looked at were". )**

The team conducted an exit **(meeting or interview?)** with **Consolidated** 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 second part of this sentence is redundant .. preliminary means it is not finalized and subject to review. Also does this mean the preliminary findings in this summary are the same as the exit meeting?)** The overall significance determination for this event ~~were~~ **is** still being developed **while this summary is being written**. These findings and the significance determination of the event will **be** documented in NRC inspection report No. 50-247/2000-010.

**The team concluded that** Consolidated Edison's 1997 steam generator inspection program did not adequately **take into** account ~~for~~ factors that **can** caused significant limitations and uncertainties in data collection and analyses, and **can** ~~gave rise to the increased~~ **increase the** likelihood ~~of~~ **that** steam generator tubes with detectable flaws ~~being left in~~ **are returned to** service. In the low radius U-bend areas, **Consolidated** Edison ~~did not focus attention and adjust efforts to~~ **inadequately** compensated for steam generator conditions and eddy current ~~technique~~ challenges, such as high signal noise, that negatively affect~~ed~~ flaw detection capability. **(You use the words condition and challenge in the plural ... yet you list only one condition and one challenge. What were the other conditions? What were the other challenges? Or are they not important enough to list?)** Also **Consolidated** Edison did not integrate **(integrate into what?)** steam generator condition information **in order** to assess the significance of ~~the~~ newly discovered degradation mechanisms. ~~, i.e.,~~ **For example information available to Consolidated Edison about** ~~inside diameter (ID)~~ primary water stress corrosion cracking (PWSCC) **(this is redundant ... PWSCC can only occur in the ID of the tube. It is also why the same phenomenon outside is called ODSCC)** at the apex of a U-bend in a row 2 tube **was not integrated into the steam generator analysis guidelines.** ~~, that~~ **This omission** increased the likelihood of tube integrity problems.

Deficiencies in recognizing the significance of and fully addressing these ~~performance~~ **(PWSCC is not a performance issue ... the performance issue is their failure to recognize it)** issues ~~resulted from~~ **was a result of** **Consolidated** Edison's weak technical oversight of thi~~s~~ **Steam**

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**Generator inspection** program and ~~the~~ **their** lack of an integrated technical understanding of the steam generator (SG) conditions. As ~~an overall~~ **a** result, ~~during the 1997 inspection~~, **Consolidated** Edison did not identify detectable flaws in six small radius U-bend SG tubes **during the 1997 inspection;** including **the** tube (R2C5 in SG 24) which failed in February 2000.

**Consolidated** 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. **Additionally** 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 **the 1997 inspection date of** eight U-bend PWSCC indications ~~that were~~ identified in 2000 ~~through review of existing 1997 inspection data~~, the NRC determined that **Consolidated** Edison should have identified six of these defects and removed the associated tubes from service in 1997. Th~~is~~**ese** tubes included SG 24, tube R2C5, which leaked on February 15, 2000. The following issues **contributed to the** decreased ~~the~~ probability of defect detection and **the** increased ~~the~~ likelihood of apex flaws in the small radius U-bend steam generator tubes.

   a. **Consolidated** 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.

   b. **Consolidated** Edison did not adequately respond~~ed~~ 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.

   c. **Consolidated** 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.

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2. Con Edison did not properly **(the word proper needs to be defined)** set-up **(more importantly the probe was not calibrated in conformance with previously qualified parameters ... that is a lot more egregious then not being set up properly)** 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 place. As such, no meaningful visual examination of the flow slots was conducted.

**(There is no concluding paragraph that says the likelihood of a tube rupture was increased because of the poor performance by Consolidated Edison during their '97 steam generator inspection)**