

From: Stephanie Coffin
To: Brian Holian, David Lew, Wayne Schmidt
Date: Tue, Jul 18, 2000 8:37 AM
Subject: NRR comments

I've attached two redline/strikeout versions of the inspection summary. Jack has seen Bill's version, commented that it maybe didn't have enough on quality in it, but thought it close enough to send to you for comments.

I've attached also my version, which Jack hasn't seen, but I attach it because I think it has more of the quality aspect and includes more of your own wording which I wanted to keep.

The most fundamental changes are made to deleting references to ConEd's failure to identify flaws (because as you know, Wayne especially,) that is a very subjective call to make. Instead, the focus is on ConEd's failure to get a good quality inspection.

Please take a look at these and see what portions work for you all and i will get back to Bill and Jack with your feedback. Give me a call if you want to discuss.

And Wayne, if you want to talk about missed flaws, give me a call. I think Ian gave you a pretty good discussion in his email, but if you want to hear some more philosophy, I'll be glad to talk. Welcome to the world of steam generators.

Stephanie

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

Indian Point 2 Steam Generator Special Inspection Summary

Following the failure of a steam generator tube on February 15, 2000, the NRC conducted a special team inspection, ~~following the failure of a steam generator tube on February 15, 2000,~~ to assessed the adequacy of Con Edison's 1997 steam generator inspections. The NRC team members included personnel from the Office of Nuclear Reactor Regulation and Region I, as well as ~~and~~ NRC-contracted specialists in steam generator eddy current testing.

The team conducted an exit with Con Edison on July 18, 2000. This summary provides the preliminary team findings, which are still being finalized and are subject to NRC management review. The overall significance determination for this event is also still under evaluation ~~being developed~~. 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 in 1997 Indian Point 2 management failed have in place an effective steam generator tube inspection program. In addition to the failure of steam generator tube R2C5, inspection results indicated several key program weaknesses that provide further evidence to support this conclusion. These include weaknesses in contractor oversight, failure to assure adequate follow up of a new degradation mechanism, failure to address the impact on the ability to detect flaws due to noisy eddy current signals, and failure to establish a mechanism to monitor flow slot hourglassing as required by plant technical specifications.

~~The team concluded that during the 1997 steam generator inspection, Con Edison did not recognize and take corrective actions for significant conditions adverse to quality relating to eddy current data collection and analysis and specific steam generator conditions. These missed opportunities to identify problems and implement corrective actions caused significant limitations and uncertainties, resulting in tubes with detectable flaws being left in service. Collectively, these opportunities, along with a new active degradation mechanism, increased the likelihood of tube integrity problems during the subsequent operating cycle.~~

~~In particular Con Edison did not:~~

- ~~-1)- identify, assess, and compensate for high signal noise in the low radius U-bend areas; that negatively affected flaw detection capability;~~
- ~~-2)- take adequate corrective actions following identification of a new tube degradation mechanism, i.e., inside diameter (ID) primary water stress corrosion cracking (PWSCC) at the apex of a low radius U-bend tube; and~~
- ~~-3)- sufficiently assess the potential for flow slot hourglassing following eddy current probe restrictions in the upper support plate.~~

~~As an overall result, Con Edison did not identify detectable flaws in six low radius U-bend tubes, including tube R2C5 in SG 24, which failed due to PWSCC on February 15, 2000.~~

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Additionally, the team identified several other ~~less significant~~ performance issues:

- * Con Edison did not have an accurate method of measuring, nor 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, sufficiently~~ assess the potential for flow slot hourglassing following the identification in 1997 of eddy current probe restrictions in the upper support plate.
- * Con Edison did not properly set-up the U-bend plus-point eddy current probe, which 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.
- * Con Edison's root cause analysis, dated June 14, 2000, did not adequately address their failure to identify deficiencies and limitations related to the 1997 inspection of the ~~the tube flaws in the~~ low radius U-bend regions ~~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 of ~~in~~ Con Edison's management ~~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.~~

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Indian Point 2 Steam Generator Special Inspection Summary

Following the failure of a steam generator tube on February 15, 2000, the NRC conducted a special team inspection, ~~following the failure of a steam generator tube on February 15, 2000,~~ to assessed the adequacy of Con Edison's 1997 steam generator inspections. The NRC team members included personnel from the Office of Nuclear Reactor Regulation and Region I, as well as ~~and~~ NRC-contracted specialists in steam generator eddy current testing.

The team conducted an exit with Con Edison on July 18, 2000. This summary provides the preliminary team findings, which are still being finalized and are subject to NRC management review. The overall significance determination for this event is also still under evaluation ~~being developed~~. 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 during the 1997 steam generator inspection, Con Edison failed to obtain a quality inspection of the steam generator tubes. Con Edison did not recognize and take corrective actions for significant conditions adverse to quality relating to eddy current data collection and analysis and specific steam generator conditions. Con Edison ~~These~~ missed several opportunities to identify problems and implement corrective actions to correct ~~caused~~ significant limitations and uncertainties in the 1997 inspection. ~~resulting in tubes with detectable flaws being left in service.~~ Con Edison's failure to identify and correct conditions adverse to quality directly contributed to the February 15, 2000 tube failure. ~~Collectively, these opportunities, along with a new active degradation mechanism, increased the likelihood of tube integrity problems during the subsequent operating cycle.~~

More specifically ~~In particular~~ Con Edison did not:

- 1) ~~identify, assess, and~~ compensate for high noise signal ~~noise~~ in the low radius U-bend areas; these high noise signals ~~that~~ negatively affected flaw detection capability;
- 2) take adequate corrective actions following identification of a new tube degradation mechanism, i.e., inside diameter (ID) primary water stress corrosion cracking (PWSCC) at the apex of a low radius U-bend tube; and
- 3) sufficiently assess the potential for flow slot hourglassing following eddy current probe restrictions in the upper support plate especially in conjunction with the identification of a PWSCC flaw located in the apex region of a low row U-bend tube.

~~As an overall result, Con Edison did not identify detectable flaws in six low radius U-bend tubes, including tube R2C5 in SG 24, which failed due to PWSCC on February 15, 2000.~~

Additionally, the team identified several other ~~less significant~~ performance issues:

- * Con Edison did not ~~have an accurate method of measuring, nor criteria for determining,~~ when significant hourglassing of the upper tube support plates had taken place. ~~As~~

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~~such, no meaningful visual examination of the flow slots was conducted, sufficiently~~ assess the potential for flow slot hourglassing following the identification in 1997 of eddy current probe restrictions in the upper support plate.

- * Con Edison did not properly set-up the U-bend plus-point eddy current probe, which 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.
- * Con Edison's root cause analysis, dated June 14, 2000, did not adequately address their failure to identify deficiencies and limitations related to the 1997 inspection of the ~~the tube flaws in the low radius U-bend regions 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 of ~~in~~ Con Edison's management ~~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.~~

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