Indian Point 2 (IP2) Steam Generator (SG) Tube Failure
Lessons-Learned Task Group
(TAC No. MA9163)

Task Group Notes - Discussion with Joe Muscara, RES on 6/20/00

Attendees: Alan Rubin, Louise Lund, Jimi Yerokun

Background

Joe Muscara did the independent technical review of NRR's Safety Evaluation in response to a user need dated 2/28/00 from Sam Collins, NRR, to Ashok Thadani, RES. RES provided the results of their independent review to NRR in a memo dated 3/16/00.

Discussion

Joe talked about how the RES independent review of the NRR safety evaluations on IP2 Steam Generator Inspection Extension and the F* alternate repair criteria came into play. He indicated that NRR had asked RES to review the staff evaluation for the extension, and they asked for the review by the end of the day. Both he and his Acting Branch Chief, Ed Hackett, made a quick initial review of the SE and didn't find any obvious problems with the SE. However, because of his limited opportunity to look at the SE that day, Joe asked his Section Chief to delay responding to NRR until Monday to give him more time to review the supporting documentation (i.e., the licensee's submittal and licensee's response to a request for additional information). RES was also asked to look at the amendment granting the F* alternate criteria.

RES (Ed Hackett) found no issues with the F*repair criteria. Joe also did not find any issues with regard to the licensee's lay up procedures for the steam generators when the plant was shut down for an extended period of time. However, Joe did identify issues with the licensee's assessment of SG tube degradation mechanisms and the staff's SE. This is discussed further below.

When Joe reviewed the licensee submittal and RAI response, he had some concerns that he shared with his management. These concerns were listed in the RES review that was transmitted to NRR on March 16, 2000. He said that IP2's technical basis for adequacy of the operating cycle based on previous inspection results was not appropriate, especially for the stress corrosion cracking found at the row 2 U-bend and at the top of tube sheet under the sludge pile. He characterized the licensee's response to the staff's RAI for all forms or degradation to be both weak and incomplete. The RES review focused on the most important forms of degradation (i.e., SCC in free span areas). Joe had concerns about the SE, specifically that it indicated that the licensee conducted more thorough operational assessments than were described in the response to the RAI. For example, the case presented on crack growth rate was technically inaccurate and should have been addressed by NRR. He discussed the fallacy of the licensee statement "[A]s this represented the first detected U-bend indication after approximately 23 years of operation, any growth rates associated with this indication would be considered minimal." He believed that the presence of the row 2 U-bend indication should have raised a red flag because this meant that the long incubation (i.e., initiation) phase had passed, the crack growth rates would not be minimal, and more cracks would be likely to occur. There should have been a much closer look at other row 2 U-bend data. (The number of cracks resulting from stress corrosion cracking and the crack

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growth rate both increase significantly after the initiation phase has passed. Therefore, the number and size of cracks identified during cycle 13 should not have been expected to be the same as at the end of cycle 14.) Joe questioned why IP2 didn't preventively plug row 2 based on industry experience.

He further stated that IP2's operational assessment in response to the RAI was inadequate, especially in terms of the outside diameter stress corrosion cracking in the sludge pile region and the primary water stress corrosion cracking in the U-bends.

Some RES contractors at ANL went to IP-2 during the 2000 steam generator inspection and took some of the 1997 eddy current data back to ANL for analysis. The ANL eddy current analysts believed that although the data were noisy, there were flaw indications in the U-bends that should have been found during the 1997 inspection. Some of the ANL staff also reviewed the handout from the licensee's presentation on their root cause analysis and had some concerns about a slide that showed a comparison between an indication from 1997 and 2000 data. They asked if the licensee had presented these two scans as being at the same location, because it was apparent to the ANL staff that the two scans were taken from different positions on the tube. Joe did not know what the slides were intended to represent, so he passed this information along to the steam generator staff in NRR.

Conclusion

Joe felt very strongly that the flaw that was found at the apex of a row 2 U-bend should have been a "red flag" to anyone experienced in the field, especially since this was the first time such a flaw had been found at IP2. This should have led to a very careful examination of data for the other row 2 U-bends. Also, there was no basis for the licensee's RAI response stating that since this was the first time in 23 years that a row 2 U-bend PWSSC indication was found, growth rates would be minimal. NRR should have caught these points and pursued these technical concerns further with Con Ed. One of Joe's main lesson learned from this event is that if you find a problem for the first time, do not ignore it - pursue it further.