

January 27, 2008

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SUBJECT: THREE MILE ISLAND NUCLEAR STATION, UNIT 1 – SUMMARY OF
CONFERENCE CALLS WITH AMERGEN ENERGY COMPANY, LLC TO
DISCUSS 2007 STEAM GENERATOR TUBE INSPECTIONS
(TAC NO. MD6686)

Dear Mr. Pardee:

On November 1 and November 5, 2007, the Nuclear Regulatory Commission (NRC) staff participated in a conference call with AmerGen personnel to discuss the steam generator inspection activities taking place at Three Mile Island, Unit 1 during the 2007 refueling outage. The calls were conducted in response to an NRC letter dated September 27, 2007 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML072540033). Enclosed is a summary of the conference calls prepared by the NRC staff.

Please contact me at 301-415-2833, if you have any questions.

Sincerely,

/ra/

Peter J. Bamford, Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-289

Enclosure: As stated

cc w/encl: See next page

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SUMMARY OF CONFERENCE CALL WITH THREE MILE ISLAND UNIT 1
REGARDING THE FALL 2007 STEAM GENERATOR
TUBE INSPECTION RESULTS

On November 1 and November 5, 2007, the U.S. Nuclear Regulatory Commission (NRC) staff participated in conference calls with representatives of Three Mile Island Nuclear Station, Unit 1 (TMI-1) regarding their ongoing steam generator (SG) tube inspection activities. TMI-1 has two Babcock and Wilcox once-through SGs. There are 15,531 mill-annealed Alloy 600 tubes in each SG. The tubes have an outside diameter of 0.625 inches and a wall thickness of 0.034 inches. The tubes are supported at various locations by carbon steel, broached, tube support plates (TSPs) with trefoil-shaped holes. The tubes were mechanically roll-expanded for approximately one inch in both the upper (UTS) and lower tubesheets (LTS), both of which are 24 inches thick. The tubes were kinetically expanded to varying extents (17 or 22 inches) in the UTS in the mid-1980s.

Prior to the call, the licensee was provided with discussion points to help facilitate the conference call (refer to Agencywide Documents Access and Management System (ADAMS) Accession No. ML072540033).

At the time of the November 1, 2007, conference call, SG tube inspections were in progress and approximately 50 percent complete. The conference call is summarized below.

Primary-to-Secondary Leakage: The primary-to-secondary leak rate during Cycle 17 (i.e., the most recently completed cycle) was less than one gallon per day; except during the first few weeks of the cycle. During the first few weeks of the cycle, the measured leak rate was slightly greater than one gallon per day, but it was not considered a true indication of the leak rate, since the system was not in equilibrium.

Secondary-Side Pressure Tests: TMI-1 did not perform any secondary-side pressure tests since there was no appreciable primary-to-secondary leakage during Cycle 17.

Electric Power Research Institute (EPRI) Guideline Exceptions: TMI-1 indicated that they took seven exceptions to the EPRI SG Examination Guidelines, Revision 6, during the end-of-cycle (EOC) 17 refueling outage (RFO). The seven exceptions are similar to exceptions taken in prior outages and are listed below.

1. Although the tube ends in the UTS are susceptible to degradation, no inspections were performed since there is an alternate repair criteria approved for this region. This alternate repair criterion indicated that flaws in this region are acceptable provided there is a sufficient length of non-degraded tube-to-tubesheet joint below the upper tube end.
2. Inspection expansions are not performed when small indications attributed to inside diameter (ID) initiated intergranular attack (IDIGA) are detected with a rotating probe since this degradation is the result of previous residual thiosulfate damage and is not growing. These small IDIGA flaws are not significant from a structural or leakage integrity standpoint, and the bobbin probe is capable of detecting all significant IDIGA flaws.

3. Categorization (C-1, C-2, and C-3) of the inspection results is not performed in accordance with EPRI SG Examination Guidelines, Section 3.5.
4. The licensee does not meet the ten percent root mean square error sizing guidance in the EPRI SG Examination guidelines since their flaws are significantly smaller than those discussed in the guidelines. Their size estimates are conservative.
5. Dual independent data analysis is not performed for sludge height profiling and for identifying other parameters that do not affect tube integrity.
6. TMI-1 is using some probes that were purchased prior to the EPRI SG Examination Guidelines, Revision 6 requirement for probes to have certificates of conformance. All probes are tested to ensure data quality is sufficient.
7. There are 63 thimble plugs in the lower tube sheet in SG A that are inspected using a rotating probe. This technique is not fully qualified in accordance with Appendix H of the EPRI SG Examination Guidelines. These thimble plugs are 23-inches long and are unique to TMI-1 (although one of the Oconee Units had thimble plug tubes in its original SG).

TMI-1 also indicated that they take one exception to the EPRI Water Chemistry Guidelines in their SG inspection program. TMI-1 does continuously monitor the SG blowdown for sodium; however, they do perform periodic grab samples to measure the sodium content. Once-through SGs do not continuously blowdown the SG above 15 percent power.

Inspection Scope: TMI's SG inspection scope for the EOC 17 RFO consisted of the following:

1. 100-percent visual inspection of all in-service tube plugs.
2. 100-percent bobbin probe inspection (using a 0.510-inch or 0.540-inch diameter probe) of in-service unexpanded tubing between the kinetic expansion (KE) transition in the UTS and the roll expansion transition in the LTS.
3. 33-percent bobbin probe inspection of the installed sleeves in the unexpanded portion of the sleeve.
4. 100-percent rotating probe inspection of the KE inspection zone, including the crevice region in the UTS.
5. 100-percent rotating probe inspection of the roll expansions, roll transitions, and tube ends in the LTS.
6. Rotating probe inspection of the LTS crevice region for 20-percent of the tubes (including 33-percent of the kidney region, which is a region of higher deposit loading).
7. 33-percent rotating probe inspection of the sleeve upper roll expansions.
8. 100-percent rotating probe inspection of the sleeve lower roll expansions.
9. 100-percent rotating probe inspection of the in-service unsleeved tubes adjacent to sleeved tubes at the 15th tube support plate and the UTS secondary face.
10. 33-percent rotating probe inspection of the UTS thermally treated Alloy 600 Westinghouse rolled plugs.
11. 33-percent rotating probe inspection of thimble plugs.

12. 33-percent rotating probe inspection of dents greater than or equal to 2.5-volts at the LTS secondary face and below (including any new dents not previously inspected).
13. 100-percent rotating probe inspection of all dents from the LTS secondary face to the 15th TSP with voltages greater than or equal to 2.5-volts.
14. 100-percent rotating probe inspection of all dents at the 15th TSP and above with voltages greater than or equal to 1-volt.
15. 100-percent rotating probe inspection of all TSP wear indications from the 10th TSP to the 15th TSP.
16. 100-percent rotating probe inspection of all manufacturing burnish marks (less than 20).

Preliminary Inspection Results: At the time of the call, the licensee was performing inspections in both SGs. Bobbin probe exams of the tubes were nearing 50-percent completion (approximately 7336 tubes complete in SG A with 39 non-quantifiable indications (NQIs) found; approximately 6470 tubes complete in SG B with 59 NQIs found). There were approximately 84 indications of wear identified in SG A and 116 indications of wear in SG B. These indications were present in the prior outage. Some of the wear indications are not inspected with a rotating probe if there is no significant change in the bobbin coil data.

Examinations had found 489 dents in SG A, of which approximately 20 were new. In SG B, 663 dents were found, again with approximately 20 of them being new. The majority of all dents were located in the LTS.

Inspections of the 499 sleeves had not yet started.

TMI-1 indicated that the examination of UTS KE transitions in SG A was 90 percent complete and four tubes were found that would require plugging for indications in the KE. Of the four tubes that would be plugged for indications at the KE, one tube had a newly identified ID-initiated volumetric indication, two tubes had circumferential flaws, and one tube had multiple volumetric flaws with an unacceptable circumferential extent. The examination of the UTS KE transitions in SG B was 91 percent complete and no tubes that would require plugging had been identified.

In the UTS crevice, the examinations were approximately 90-percent complete in both SGs. In SG A, seven indications had been identified, and in SG B, no indications had been identified. Of the seven indications in SG A, three were ID-initiated volumetric indications, two were outside diameter (OD) initiated volumetric indications, and two were ID-initiated circumferential indications. The three ID-initiated volumetric indications exceeded the 0.25-inch axial extent criteria for the IDIGA alternate repair criteria. The two OD-initiated volumetric indications were small. There is no prior rotating probe data for these indications. The bobbin probe data for one of these indications shows no change since the 1995 data. The two locations with circumferential indications at the upper tubesheet secondary face were not previously inspected with a rotating probe. One of the indications had a voltage of 2.95 volts, a circumferential extent of 0.32 inches, and a depth of 99-percent throughwall. The other circumferential indication had a voltage of 1.2 volts, a circumferential extent of 0.21 inches, and a depth of 99-percent throughwall. These locations had not been inspected with a bobbin probe at the time of the call. At the time of the call, the licensee was evaluating the need to in-situ pressure test these indications.

Inspections in the free span have identified seven tubes with outside diameter initiated axial indications (commonly referred to as groove IGA tubes since the indications tend to initiate in

grooves and are attributed to IGA). Only one of these tubes had been inspected with a rotating probe at the time of the call.

No indications were found in the lower tubesheet crevice region in either SG at the time of the call. Examination of the LTS tube ends had revealed one circumferential indication in SG B. The indication was approximately 0.22 inches from the tube end. Only 20 percent of the LTS crevice and tube end examinations were completed at the time of the call.

No eddy current examinations of plugs were complete at the time of the first conference call. However, fifty-five percent of the plug visual exams were complete in SG A and ninety-five percent of the plug visual exams were complete in SG B. No adverse indications were found during these visual inspections.

Very few of the special interest inspections had been completed at the time of the call.

Except for sleeved tubes, all defective tubes will be plugged and stabilized in the upper span. Sleeved tubes will only be plugged because the sleeve serves as a stabilizer.

At the time of the conference call, the licensee was still evaluating the need for in-situ pressure testing. The two circumferential indications at the upper tubesheet secondary face were potential candidates for in-situ pressure testing (although similar indications had been pressure tested in prior outages with no leakage or bursts).

The inspections were approximately 50 percent complete, and the licensee was projecting to be complete with the remaining inspections by November 5, 2007, at which point plugging would commence.

No potential loose part indications had been found at the time of the phone call. The bobbin and rotating probe data are reviewed for indications of possible loose parts.

No secondary side inspections were planned.

At the time of the call, there were no unexpected or unusual results.

All welded plugs were visually examined and no fatigue damage was found. The most limiting plug at TMI-1 is qualified for 35 heat-up and cool-down cycles, and as of this cycle, that plug has only seen seven heat-up and cool-down cycles.

To address the potential that a plugged tube could sever and possibly affect active tubes, TMI -1 was planning to inspect 100-percent of the tubes with a bobbin probe. In addition, portions of many tubes were examined with a rotating probe. The inspection data was reviewed to find indications similar to those identified during the outage in which a severed tube was discovered.

On November 5, 2007, NRC staff participated in a follow-up conference call with TMI-1 representatives for additional discussion regarding the results of the SG tube inspections.

At the time of the follow-up call, the bobbin probe exams of the tubes were 98-percent complete, and findings were typical to those of previous outages. The bobbin NQIs at the TSPs were thought to likely be wear indications and rotating probe inspections of these locations were

approximately 30-percent complete. None of the wear indications found at the time of the follow-up call required plugging.

Examinations had found 1009 dents in SG A and 1734 in SG B. Most of these dents were in the LTS region and less than 100 of these dents were new. These results were similar to previous outages. No cracks were found in any dents.

Bobbin inspections of the 499 sleeves were complete except for one tube. Rotating probe inspections of the sleeves had not yet commenced in SG B. In SG A, 63 out of 83 sleeves upper roll expansions had been inspected. Nothing unexpected was found during these inspections. The 2007 inspection data of the upper sleeve roll expansions were compared to previous inspection data. The extent of the flaws in the parent tube showed no changes. The parent tubing at the upper sleeve joint typically had none or two to three flaws. Most of the indications in the parent tubes were circumferentially oriented rather than axially oriented. Some of the circumferential indications reviewed prior to the outage extended 360 degrees around the tube's circumference.

The examination of the UTS KE transitions found two tubes with new indications, and three circumferential indications and one area of multiple volumetric indications that exceeded the circumferential extent criteria. The results from these inspections were similar to prior outages in terms of growth and the amount of postulated primary-to-secondary leakage.

The inspection of the upper crevice region was complete in SG B and no indications were found. The inspection of the upper crevice region in SG A was complete and three volumetric indications whose axial extent was slightly greater than 0.25 inches were found. In addition, two ID-initiated circumferential indications at the UTS secondary face were also found, as well as two OD-initiated volumetric indications that had not changed since being found in 1995 (as discussed previously in the November 1st conference call). Since a conservative estimate of the leakage from the circumferential indication was low, no in-situ pressure testing of these indications was performed.

Freespan rotating probe inspection results showed eight tubes with groove IGA. The indications were axial ODIGA in the upper portion of the SG. All eight were detected by bobbin probe and all measured less than 0.25 inches by the +Point™ probe.

No indications were found during the inspections of the LTS crevice in either SG. In SG A, 2,774 tubes were examined and in SG B, 2,945 tubes were examined. A 100-percent inspection of all tubes at the lower tube end was in process and nearly complete: 10,828 of 11,096 tubes had been inspected in SG A, 9,860 of 11,728 tubes had been inspected in SG B. At the time of the call, approximately 25 tubes in SG A and 30 tubes in SG B were to be plugged for indications in the lower tube end region.

Eddy current examinations of the Westinghouse roll plugs was complete with no indications found. Thimble plug inspections had not yet commenced. Plug visual examinations were 96 percent complete in SG A (out of 3,300 plugs) and 98 percent complete in SG B (out of 1,750 plugs).

There were still a few hundred special interest exams to be completed.

Approximately eighty-five tubes were identified as requiring plugging, which was similar to the previous two outages.

There were no tubes scheduled to be in-situ pressure tested at the time of the conference call.

The NRC staff did not identify any issues that warranted follow-up action at this time; however, the NRC staff asked to be notified in the event that any in-situ pressure testing was performed or if any unusual conditions were detected during the remainder of the outage.