March 22, 2006

Mr. Christopher M. Crane, President
and Chief Nuclear Officer
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: BYRON STATION, UNIT 2 - SUMMARY OF CONFERENCE TELEPHONE CALL REGARDING STEAM GENERATOR INSPECTIONS FROM THE FALL 2005 OUTAGE (TAC NO. MC8527)

Dear Mr. Crane:

On October 4, 2005, a conference call was held between representatives of Exelon Generation Company, LLC (Exelon) and the Nuclear Regulatory Commission (NRC) staffs to discuss the results of the steam generator tube inspections conducted during the fall 2005 refueling outage for Byron Station, Unit 2. The NRC follows the results of the industry's steam generator inspections in order to maintain an awareness of the condition of the steam generators and the types of tube degradation mechanisms that are active.

The enclosed documentation of the phone call is provided to Exelon for information. If there are any questions, please contact me at (301) 415-8371.

Sincerely,

/RA/

Mahesh L. Chawla, Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. STN 50-455

Enclosure:
Conference Call Summary

cc w/encl: See next page

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CONFERENCE CALL SUMMARY

2005 STEAM GENERATOR TUBE INSPECTIONS

BYRON STATION, UNIT 2

DOCKET NO. STN 50-455

On October 4, 2005, the Nuclear Regulatory Commission (NRC) staff participated in a conference call with Byron Station, Unit 2 representatives to discuss their steam generator (SG) tube inspections during refueling outage 12 (RFO 12). The discussion included the inspection scope, findings, and repairs in the four SG, as well as the inspection and repairs of the waterbox cap plate region in SG "2A". Degradation of the waterbox cap plate region was discovered during the spring 2004 inspection. This condition was described in a summary of the 2004 SG inspection phone call (Agencywide Documents Access and Management System Accession No. ML042260202). A summary of the information discussed during the 2005 call is provided below.

Byron, Unit 2 has four Westinghouse Model D5 SGs, which the plant designates 2A, 2B, 2C, and 2D. Each steam generator contains 4,570 thermally treated Alloy 600 tubes with a nominal outside diameter of 0.750 inch and a nominal wall thickness of 0.043 inch. The tubes were hydraulically expanded at both ends throughout the full thickness of the tubesheet and are supported by a number of Type 405 stainless steel tube support plates with quatrefoil-shaped holes. The U-bend region of the tubes installed in rows 1 through 9 was thermally treated after bending in order to reduce stress. The hot-leg temperature has been 611EF since May 1999.

At the start of the RFO the approximate operating time was 15.7 effective full power years (EFPY) and the total number of plugged tubes was 332 (144 in 2A, 113 in 2B, 53 in 2C, 22 in 2D). Prior to the outage the NRC approved an amendment for limiting the inspection of the tubes within the hot-leg side of the tubesheet to the top 17 inches within the tubesheet. There was no evidence of primary-to-secondary leakage during Cycle 12 (spring 2004 to fall 2005). As a result, no secondary side pressure tests were performed. No exceptions were taken to the industry guidelines for SG tube inspections.

During the 2005 RFO, the licensee performed the following tube inspections in each SG:

- Bobbin probe inspection of 100 percent of the active tubes from tube-end to tube-end,
- Rotating probe inspection (+Point™ coil) of 20 percent of the tubes on the hot leg from 3 inches above to 17 inches below the top of the tubesheet,
- Rotating probe inspection (+Point™ coil) of all tubes (40 tubes) with high residual stress (as evidenced by an eddy current offset) from 3 inches above to 17 inches below the top of the tubesheet on the hot-leg side of the SG,
- Rotating probe inspection (+Point™ coil) of 20 percent of the hot-leg tubesheet bulges greater than or equal to 18 volts within 17 inches of the top of the tubesheet,
- Rotating probe inspection (+Point™ coil) of 20 percent of the hot-leg tubesheet over-expansions greater than or equal to 1.5 mils within 17 inches of the top of the tubesheet,
- Visual inspection of 100 percent of the previously installed mechanical and welded tube plugs,

- In addition to the tube examinations performed in all SGs, a rotating probe(+Point™ coil) was used to inspect 20 percent of the pre-heater baffle-plate expansions in one SG,
- Foreign object search and retrieval (FOSAR) at the top of the tubesheet after sludge lancing complete in 3 SGs, ongoing in SG 2A at the time of the call,
- Visual inspection of the steam drum/moisture separator region in SG 2B (scheduled but not yet performed at the time of the call),
- Visual inspection of the waterbox cap plate region in SG 2A,
- FOSAR of the SG 2A pre-heater.

At the time of the conference call the eddy current testing was about 85 percent complete. The tubesheet inspections in SGs 2B, 2C, and 2D were complete and no flaws were detected. No indications of crack-like degradation were found at any location during the inspection. SGs 2B and 2C were each found to have one tube with a bulge in or slightly above the tubesheet on the cold-leg side of the SG. These bulges existed previously and were traceable to the baseline inspection data. The tubes were preventively plugged and stabilized because the voltage of the bulges was considerably larger than the voltage from the hydraulic expansion. One tube in SG 2D was plugged and stabilized because it had not been hydraulically expanded into the tubesheet. This condition was present in previous inspections. The hydraulic expansion was verified to be present in all of the other tubes in each SG.

A total of 774 indications of anti-vibration bar (AVB) wear had been found on tubes in the four SGs. This number of indications is comparable to that found in previous inspections. The through-wall penetration of these indications ranged from 15 to 40 percent of the tube wall thickness. Only one of these indications reached 40 percent through-wall. A total of 21 indications of preheater wear had been found. The depth of these ranged from 5 to 49 percent of the tube wall thickness, with 4 indications greater than 40 percent through-wall. The licensee explained that a new technique from the Electric Power Research Institute (EPRI) was being used to size wear caused by quatrefoil-shaped openings in tube support plates. The new technique results in deeper calculated wear scar depth, which caused a corresponding increase in the apparent growth rate of the wear scars. Using the previous technique for sizing the wear indications resulted in growth rates comparable to those observed in prior cycles.

The eddy current inspections found foreign object wear on six tubes in SG 2B. Four of these tubes were at the fifth hot-leg support plate. The eddy current data indicated the presence of a loose part; however, this location is not accessible for visual inspection to confirm or remove the part. The depth of penetration for these four tubes was 33 percent, 13 percent, and 10 percent (two tubes). The eddy current data contained evidence of wear, but not of a loose part during RFO 5. The first indication of the loose part was observed during RFO 8. During RFO 9 the eddy current data indicated the part had moved and affected two additional tubes. There were no indications of the loose part or additional wear in this region during RFO 11. In 2005, indications of wear were also found in two additional tubes in SG 2B at the seventh hot-leg support plate. These locations are not accessible for visual confirmation or removal of a loose part. The depth of penetration for these scars was 22 and 12 percent. There were no previous indications of objects or wear at these locations. These six tubes met the structural integrity performance criteria, and all were plugged and stabilized.

At the time of the conference call, FOSAR was in progress in SG 2A, and a total of 12 foreign objects had been found in all SGs. Retrieval of these parts was in progress. In SG 2B, four objects were found and retrieved. One foreign object was found and retrieved in SG 2C and in SG 2D. These objects included small wires, gasket material, and other small, unidentified metal objects. Pieces of hard sludge and scale were also found during FOSAR, but these were not counted as foreign objects. There was no tube damage associated with any of the confirmed foreign objects.

A repair to the waterbox cap plate in SG 2A was performed by attaching a clamping device made from stainless steel plates above and below the original cap plate. The new plates were held in place with stainless steel studs inserted through the existing 0.5-inch flow holes. This repair required a new 2.5-inch diameter access penetration through the SG shell and wrapper. The newly installed plates are slightly larger than the original plate (trapezoid-shaped, 10 inches long, 2 to 4 inches wide). The visual inspection detected no change in the appearance of the cut-out region or on the backing bars. The piece of backing bar discovered missing in the spring 2004 RFO was not found in the 2005 inspection (despite looking for the part in all high-flow areas), but the licensee reported Westinghouse had analyzed the condition and determined it would not affect tube integrity for at least another cycle of operation.

The table below summarizes the tube plugging during RFO 12. The total SG tube plugged to date is 347 tubes, which is approximately 1.9 percent of the total.

Steam Generator	**Number Plugged**	**Reason for Plugging**
2A	No tubes	N/A
2B	10 tubes	Foreign object wear (6 tubes) (stabilized) Preheater wear (2 tubes) (stabilized) Anti-vibration bar wear (1 tube) Top of tubesheet cold-leg bulge (1 tube) (stabilized)
2C	4 tubes	Preheater wear (3 tubes) Tubesheet cold-leg bulge (1 tube) (stabilized)
2D	1 tube	Missing hot-leg hydraulic expansion (stabilized)

The conference call included a discussion of an in-situ pressure test performed during the previous RFO (spring 2004) on a tube with 57 percent through-wall degradation caused by a loose part. The test pressure for this tube was 4500 pounds per square inch, which was determined by multiplying the normal operating pressure by three and applying a correction factor based on the highest (most conservative) temperature for the tube (650 EF). This topic was discussed in the 2005 call because the licensee had learned between RFOs that the temperature correction used in the 2004 pressure test was lower than that required due to an error in the EPRI guidelines. The test pressure for this tube should have been 4613 pounds per square inch. However, since the degradation was on the cold leg of the tube, which operates at about 552 EF, the pressure test performed at 4500 pounds per square inch was sufficient to demonstrate the structural integrity of the tube. The test pressure corresponding to 552EF

is 4332 pounds per square inch. The licensee contacted EPRI after the spring 2004 RFO to notify them of the error and EPRI issued interim guidance in May 2004.

At the time of the conference call, no indications of new degradation forms had been observed, and all tubes had adequate integrity. No in-situ pressure tests had been performed or were planned.