May 15, 2001

LICENSEE: South Texas Project Nuclear Operating Company (STPNOC)

FACILITY: South Texas Project Unit 2

SUBJECT: SUMMARY OF MEETING WITH STPNOC/WESTINGHOUSE REGARDING RESULTS OF STEAM GENERATOR TUBE INSPECTIONS AND IN SITU TUBE PRESSURE TESTS CONDUCTED DURING END-OF-CYCLE 8 REFUELING OUTAGE FOR SOUTH TEXAS PROJECT UNIT 2.

REFERENCE: Electric Power Research Institute Report, "Steam Generator In Situ Pressure Test Guidelines, Revision 1," April 1999: Appendix B (Tables B-2, B-4, B-6, and B-8)

On April 19, 2001, the staff of the U. S. Nuclear Regulatory Commission (NRC) and the STPNOC (the licensee) and its contractor, Westinghouse, met at the NRC Headquarters to discuss the results of steam generator (SG) tube inspections, and in situ tube pressure tests conducted during end-of-Cycle 8 refueling outage for South Texas Project (STP), Unit 2. In a letter dated April 5, 2001, from the NRC's Senior Project Manager, Mr. Mohan C. Thadani to President and Chief Executive Officer, Mr. William T. Cottle, of STPNOC, the NRC staff requested that the licensee address the NRC staff's concerns regarding SG tube structural and leakage integrity during the STP, Unit 2, Cycle 9 operation. Enclosure 1 is the list of meeting attendees.

In its letter of April 5, 2001, the NRC staff expressed the following concerns regarding the integrity of the STP, Unit 2, SG tubes:

1) Tubes in STP, Unit 2, SGs have experienced unexpectedly high degradation growth rate. The NRC staff needs to understand how the licensee assessed the root cause of the high growth rates and the impact of high growth rate trend on the outside diameter stress corrosion cracking (ODSCC) indications left in service for Cycle 9;

2) The adequacy of the scope of the STP in situ pressure test samples compared to the Electric Power Research Institute's (EPRI's) SG in situ pressure test guidelines (reference 1), which recommend that all known leaking tubes be tested; and

3) At the end-of-Cycle 8 the operating leak rate for SG 2D of 9 gallons per day may correspond to the steam-line-break-accident leakage of 2.8 gallons per minute (gpm); if operating leakage occurs and escalates during Cycle 9 operations, accident-induced leakage may exceed the licensing basis assumption of 15.4 gpm. The increased leakage would also indicate the preventive plugging measures taken in response to high growth rates were not effective. In view of the potential of operating leakage in Cycle 9, the NRC staff requested that the licensee discuss the need for operational leakage restrictions for Cycle 9 operation.

Also, during a subsequent telephone call, the NRC staff requested that the licensee provide at the meeting histogram data of bobbin voltage distributions (for up to 3 volts) for indications at the tube support plates (TSPs).

The information summarizing the bobbin voltage distribution data and histograms was provided by the licensee at the subject meeting as Enclosure 2.

Viewgraphs of the licensee's presentation in response to the NRC staff's request and concerns outlined above are provided as Enclosure 3.

During its presentation the licensee stated that during Cycle 8 refueling outage it plugged 106 tubes in accordance with voltage-based repair criteria in effect, conservatively plugged all tubes (105) with indications > 1.5 volts (although the licensee had the NRC approval to not plug tubes for indications up to 3.0 volts for TSPs C, F, and J), and preventively plugged 524 tubes with indications between 0.6-1.5 volts.

In response to the NRC questions, the licensee stated that it does not know why the highest degradation occurred and what is driving the crack growth rates, and is continuing the evaluation of possible root causes such as Cycle chemistry, Cycle shut-down frequency, and support-plate crevice blockage. The licensee stated that STP, Unit 2, is the only U.S. reactor with stainless steel drilled hole support plates. The stainless steel is highly resistant to corrosion, but there is not much operational data available, other than the Belgian data for Doel-4 and Tihange-3 plants. The licensee presented the results of the Belgian study and compared them to the STP results.

The licensee concluded that the STP, Unit 2, SGs currently meet all structural and leakage criteria for a full cycle operation consistent with the Regulatory Guide 1.121 and the performance criteria of Nuclear Energy Institute 97-06.

The NRC staff summarized its understanding of the licensee's presentation, stated some concerns, and asked for further licensee actions as follows.

1) Root Cause - As stated above the licensee indicated that there are some potential causes for the high degradation voltage growth rates that are being evaluated; however, at this point the root cause is not understood. Notwithstanding the uncertainty, the licensee indicated that the high growth rates are bounded by other industry experience. The licensee provided its rationale for its belief that crack growth rates are not increasing and explained the basic strategy for the preventive tube plugging. The NRC staff requested that the licensee provide a more complete explanation of its preventive tube plugging strategy in its 90-day report.

2) Operational Leakage - The licensee presented information on operational leakage from STP, Unit 2, Cycle 8 operation as well as STP, Unit 2 projections for accident-induced leakage for the end-of-Cycle 9. The licensee stated that it will have controls in place to monitor the leakage during Cycle-9 operations. Also, the licensee presented the results of its thinking on why it believes a reduction in the operational leakage limit is not necessary. The NRC staff indicated that the subject of a reduced operational leakage limit was a key area of interest and that based on the information presented, it is still concerned that high operational leakage may occur and have important implications for accident-induced leakage and accident risks.

3) In Situ Tube Testing - The licensee presented the results of its in situ testing of 12 tubes and provided a discussion of the basis for the selection of these tubes. The NRC staff indicated that it believes that the EPRI guidelines, as written, do not address the design of the SGs at STP, Unit 2. The STP, Unit 2 SGs have stainless steel support plates, corrosion products do not form in the tube-to-TSP crevice which, in plants with carbon steel support plates, inhibits leakage from through wall cracks. In such plants in situ testing of tubes with ODSCC at the TSP intersections is of less value than at STP Unit 2. In the case of STP, Unit 2 testing of tubes with ODSCC at the TSPs provided meaningful information, as evidenced by the results of the in situ testing. The NRC staff indicated that it was interested in a larger (than 12 tubes) sample to provide higher confidence that the results of the tubes tested were bounding and the accident-induced leakage was well understood.

4) Condition Monitoring and Operational Assessment (CM/OA) - As noted above, the licensee presented results for in situ tube pressure testing. Also, the licensee presented the results of calculations for accident-induced leakage calculations for Cycle 8 and current Cycle 9. Although the licensee will be providing the complete results of its CM/OA in a 90-day report, the NRC staff requested that certain information be provided sooner, if possible. The specific information requested for each SG was the probability of tube burst and the accident-induced leakage at main steam line break conditions at the end of Cycle 8. The accident-induced leakage values were requested as mean values and 95/95 values from the Monte Carlo analyses, with and without consideration of restriction against burst by the support plates.

5) Conclusions - The NRC staff indicated that the licensee has taken reasonable steps to understand the increases in voltage associated with ODSCC indications and to mitigate future increases by a preventive plugging strategy. The NRC staff made a number of observations during the meeting on the licensee's program, as reflected in this meeting summary. At the time of the meeting operational leakage was not being experienced at STP, Unit 2. However, should operational leakage occur during Cycle 9, the NRC staff intends to closely monitor the conditions and continue to hold discussions with STP regarding its evaluation of the leakage.

/RA/

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Office of Nuclear Reactor Regulation

Docket No. 50-499

Enclosures: As stated (3)

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Meeting Notice: ML010950055
Enclosure Two: ML011380339 Enclosure Three: ML011380322
ACCESSION NUMBER: ML011410165 Package: ML011410178

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