

April 23, 2007

Mr. William Levis
Senior Vice President & Chief Nuclear Officer
PSEG Nuclear LLC - N09
Post Office Box 236
Hancocks Bridge, NJ 08038

SUBJECT: REVIEW OF STEAM GENERATOR TUBE INSPECTION REPORTS FOR 2005,
SALEM NUCLEAR GENERATING STATION, UNIT NO. 2 (TAC NO. MD2048)

Dear Mr. Levis:

By letters dated May 9, 2005, and May 19, 2006 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML051440377 and ML061520351, respectively), PSEG Nuclear LLC (PSEG) submitted reports summarizing the steam generator tube inspections performed at Salem Nuclear Generating Station, Unit No. 2 (Salem Unit 2) during the spring 2005 refueling outage (2R14). This information was submitted in accordance with Salem Unit 2 Technical Specifications (TSs) 4.4.6.5.a and 6.9.1.5. Additional information concerning these inspections was summarized by the Nuclear Regulatory Commission (NRC) staff in a letter dated February 21, 2006 (ADAMS Accession No. ML060270178).

As discussed in the enclosed evaluation, the NRC staff concludes that PSEG provided the information required by the Salem Unit 2 TSs. In addition, the NRC staff did not identify any technical issues that warrant follow-up action at this time. This completes the NRC staff efforts for TAC No. MD2048.

If you have any questions regarding this matter, I may be reached at 301-415-1420.

Sincerely,

/ra/

Richard B. Ennis, Senior Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-311

Enclosure:
Evaluation

cc: See next page

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Salem Nuclear Generating Station, Unit Nos. 1 and 2

cc:

Mr. Dennis Winchester
Vice President - Nuclear Assessment
PSEG Nuclear
P.O. Box 236
Hancocks Bridge, NJ 08038

Mr. Thomas P. Joyce
Site Vice President - Salem
PSEG Nuclear
P.O. Box 236
Hancocks Bridge, NJ 08038

Mr. George H. Gellrich
Plant Support Manager
PSEG Nuclear
P.O. Box 236
Hancocks Bridge, NJ 08038

Mr. Carl J. Fricker
Plant Manager - Salem
PSEG Nuclear - N21
P.O. Box 236
Hancocks Bridge, NJ 08038

Mr. James Mallon
Manager - Licensing
200 Exelon Way, KSA 3-E
Kennett Square, PA 19348

Mr. Steven Mannon
Manager - Regulatory Assurance
P.O. Box 236
Hancocks Bridge, NJ 08038

Jeffrie J. Keenan, Esquire
PSEG Nuclear - N21
P.O. Box 236
Hancocks Bridge, NJ 08038

Township Clerk
Lower Alloways Creek Township
Municipal Building, P.O. Box 157
Hancocks Bridge, NJ 08038

Mr. Paul Bauldauf, P.E., Asst. Director
Radiation Protection Programs
NJ Department of Environmental
Protection and Energy
CN 415
Trenton, NJ 08625-0415

Mr. Brian Beam
Board of Public Utilities
2 Gateway Center, Tenth Floor
Newark, NJ 07102

Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Senior Resident Inspector
Salem Nuclear Generating Station
U.S. Nuclear Regulatory Commission
Drawer 0509
Hancocks Bridge, NJ 08038

EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
STEAM GENERATOR TUBE INSPECTION REPORTS FOR THE 2005 OUTAGE

PSEG NUCLEAR LLC

SALEM NUCLEAR GENERATING STATION, UNIT NO. 2

DOCKET NO. 50-311

1.0 INTRODUCTION

By letters dated May 9, 2005, and May 19, 2006 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML051440377 and ML061520351, respectively), PSEG Nuclear LLC (the licensee) submitted reports summarizing the steam generator (SG) tube inspections performed at Salem Nuclear Generating Station, Unit No. 2 (Salem Unit 2) during the spring 2005 refueling outage (2R14). This information was submitted in accordance with Salem Unit 2 Technical Specifications (TSs) 4.4.6.5.a and 6.9.1.5. Additional information concerning these inspections was summarized by the Nuclear Regulatory Commission (NRC) staff in a letter dated February 21, 2006 (ADAMS Accession No. ML060270178).

2.0 BACKGROUND

Salem Unit 2 has four Westinghouse model 51 SGs. Each SG contains approximately 3400 mill annealed Alloy 600 tubes. Each tube has a nominal outside diameter of 0.875 inch and a nominal wall thickness of 0.050 inch. The tubes were explosively expanded (WEXTEx) at both ends for the full length of the tubesheet and are supported by a number of carbon steel tube supports with round shaped holes. The hot-leg temperature is approximately 595 °F.

3.0 EVALUATION

The licensee provided the scope, extent, methods, and results of their SG tube inspections in the documents referenced above. The licensee also described corrective actions in the form of tube plugging and tube stabilization taken in response to the inspection findings.

As a result of its review of the licensee's inspection report for 2R14, the NRC staff has the following updated observations relative to those discussed in its February 21, 2006, letter:

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1. Degradation activity continues to be relatively moderate (i.e., inspection results meet category C-2 levels as defined in the Salem Unit 2 TSs). Only 3 new indications of circumferential, primary water stress-corrosion cracking (PWSCC) were observed in low row U-bends, compared to 46 found during the previous inspection in 2R13. One of these indications was in row 5 and two were in row 6, well within the zone of 100% +Point inspection extending out to row 10 (encompassing the region of previous activity).

A 100% +Point inspection was performed at the top of the tubesheet (TTS) region in all SGs on the hot leg side, extending from 3 inches above the TTS to 8 inches below.

Thirty-seven PWSCC indications and 7 outer diameter stress-corrosion cracking (ODSCC) indications were found and plugged, most very near the TTS elevation. A small number of PWSCC indications were distributed over the 8-inch inspection distance below the TTS.

The level of cracking in the tubesheet region is somewhat higher than in 2R13, but still moderate. No +Point inspections were performed on the cold leg side.

2. A 100% +Point inspection was performed for all dents exhibiting a bobbin dent voltage ≥ 1 volt at tube support plates 1 through 4 in SG 21 and 1 through 3 in SGs 22, 23, and 24. Nine tubes with PWSCC or ODSCC indications were found with this sample and were plugged. These 9 indications were associated with voltages ranging to as low as 1.3 volts. Only 2 of these indications contained circumferential indications, and these indications were both associated with > 6 volt dents. +Point inspection of dents and dings elsewhere in the SGs revealed no further flaw indications. These included a +Point inspection of a 20% sample of ≥ 1 volt dents for the remaining support plates on the hot leg side, all ≥ 5 volt dents at these remaining support plates, a 25% sample of ≥ 2 volt freespan dings on the hot leg side, all ≥ 1 volt dents at anti-vibration bar (AVB) intersections, and all ≥ 2 volt dings in the U-bend region. Dents and dings on the cold leg side did not undergo +Point examination.
3. +Point inspections of bobbin indications at AVB supports were discussed in the NRC staff's February 21, 2006, letter. The licensee elected to implement a 20% +Point inspection sample of all bobbin indications at AVBs, including new indications and those exhibiting growth since the previous inspection with no finding of crack-like involvement. Three tubes with wear indications at AVB supports exceeding 40% were found and plugged, the same number as the previous inspection in 2R13. The maximum measured wear depth was 43%.
4. Cold leg thinning appears to be moderately active, with most indications exhibiting growth between inspections and a few new indications being observed since 2R13. Five tubes had indications with depths greater than the 40% plugging limit and were plugged. Four additional tubes with indications could not be sized with bobbin and were also plugged. A total of 11 tubes with measurable indications exceeding the 40% plugging limit were plugged during 2R13. Maximum flaw depths measured during 2R13 and 2R14 were 55% and 54%, respectively. Follow-up +Point inspections were performed on the new cold leg thinning indications found by bobbin with no finding of crack-like involvement.

4.0 CONCLUSION

Based on a review of the information provided, the NRC staff concludes that the licensee provided the information required by the Salem Unit 2 TSs. In addition, the NRC staff concludes that there are no technical issues that warrant follow-up action at this time since the

inspections appear to be consistent with the objective of detecting potential tube degradation and the inspection results appear to be consistent with industry operating experience at similarly designed and operated units.

Principal Contributor: E. Murphy

Date: April 23, 2007