



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

December 8, 2010

Mr. Thomas Joyce
President and Chief Nuclear Officer
PSEG Nuclear LLC
P.O. Box 236, N09
Hancocks Bridge, NJ 08038

SUBJECT: REVIEW OF STEAM GENERATOR TUBE INSPECTION REPORT FOR
FALL 2009 REFUELING OUTAGE - SALEM NUCLEAR GENERATING
STATION, UNIT NO. 2 (TAC NO. ME3884)

Dear Mr. Joyce:

By letter dated April 30, 2010 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML101250176), PSEG Nuclear LLC (PSEG) submitted a report summarizing the steam generator tube inspections performed at Salem Nuclear Generating Station, Unit No. 2 (Salem Unit 2) during the fall 2009 refueling outage (2R17). This information was submitted in accordance with Salem Unit 2 Technical Specification (TS) 6.9.1.10. Additional information concerning these inspections was provided in PSEG's letter dated August 18, 2010 (ADAMS Accession No. ML102440037).

The Nuclear Regulatory Commission staff has completed its review of your submittals as documented in the enclosed evaluation. The staff concludes that PSEG has provided the information required by the TSs and that no additional follow-up is required at this time. This completes the NRC staff efforts for TAC No. ME3884.

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

Sincerely,

A handwritten signature in black ink, appearing to read "R B Ennis".

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: As stated

cc w/encl: Distribution via Listserv



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EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

STEAM GENERATOR TUBE INSPECTION REPORT FOR FALL 2009

SALEM NUCLEAR GENERATING STATION, UNIT NO. 2

DOCKET NO. 50-311

1.0 INTRODUCTION

By letter dated April 30, 2010 (Agencywide Documents Access and Management System (ADAMS) Accession Number ML101250176), PSEG Nuclear LLC (PSEG or the licensee) submitted information summarizing the results of the 2009 steam generator (SG) tube inspections performed at Salem Nuclear Generating Station, Unit No. 2 (Salem Unit 2) during the fall 2009 refueling outage (2R17). This information was submitted in accordance with Salem Unit 2 Technical Specification (TS) 6.9.1.10. Additional information concerning these inspections was provided in PSEG's letter dated August 18, 2010 (ADAMS Accession No. ML102440037).

2.0 BACKGROUND

Salem Unit 2 has four AREVA Model 61/19T replacement SGs, each of which contains 5,048 U-bend thermally-treated Alloy 690 tubes. Each tube has a nominal outside diameter of 0.750 inches and a nominal wall thickness of 0.043 inches. During SG fabrication, the tubes were hydraulically expanded at both ends, over the full depth of the tubesheet. The tubesheet was drilled on a triangular pitch. The U-bends in rows 1 through 16 were stress-relieved after bending. Eight stainless steel (Type 410) support plates, which have broached trefoil holes, provide lateral tube support to the vertical section of the tubes and three sets of stainless steel (Type 405M) anti-vibration bars support the U-bend section of the tubes.

The original Salem Unit 2 SGs were replaced during 2R16 and the first in-service inspections of the replacement SGs were conducted in 2R17.

3.0 EVALUATION

The licensee provided the scope, extent, methods, and results of their SG tube inspections in the letters referenced above. In addition, the licensee described corrective actions (e.g., tube plugging) taken in response to the inspection findings. Based on its review of the information submitted, the Nuclear Regulatory Commission (NRC) staff has the following observations and comments:

- 1) The only service-induced indications detected were wear at the anti-vibration bars, tube support plates and the support/positioning device. The support/positioning device that supports the anti-vibration bar structure is located on the outer periphery of the tube

bundle and it contacts numerous tubes on the extrados. A similar support/positioning device is used in the SGs at St. Lucie Unit 2.

- 2) Approximately 1550 indications of wear at the anti-vibration bars were detected. These indications were identified in approximately 580 tubes. Only approximately 30% of these indications were inspected with a rotating probe (thereby confirming the nature of the indication).
- 3) Approximately eight indications of wear at the tube support plates (in six tubes) were detected. Three indications of wear at the support positioning device (one tube) were detected; this tube was plugged and stabilized.
- 4) Secondary side inspections were performed in each of the SGs. Loose nuts were identified on the various hatches and camera ports installed internal to the SGs. In addition, 5 of the 10 camera inspection ports also had 1 nut per cover that was inaccessible to tooling. All nuts (loose and not loose) were tightened with a higher torque based on information supplied by the component designer. Modified tooling is being evaluated to access the inaccessible nuts in future outages. Two feeding inspection port covers had one slightly loose bolt per cover. Another feeding inspection port cover had a loose lock washer (but the bolt was secure). All feeding inspection port hardware (cover, gasket, bolts, and locking washers) were replaced with an improved design. These results were communicated to the industry.
- 5) The licensee indicated that the most limiting condition monitoring limit for wear was 46% through-wall. All tubes with wear at the anti-vibration bars that exceeded 30% through-wall were plugged and stabilized. This plugging limit was established based on a probabilistic approach for ensuring tube integrity. The NRC staff did not review this analysis.

4.0 CONCLUSION

Based on a review of the information provided by the licensee, the NRC staff concludes that the licensee provided the information required by the Salem Unit 2 TSs and that no additional follow-up is required. The SG tube inspections at Salem Unit 2 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: A. Johnson

Date: December 8, 2010

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Sincerely,
/ra/

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

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