



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

September 16, 2010

Mr. Mark J. Ajluni  
Manager, Nuclear Licensing  
Southern Nuclear Operating Company, Inc.  
40 Inverness Center Parkway  
P.O. Box 1295 – Bin - 038  
Birmingham, Alabama 35201

SUBJECT: VOGTLE ELECTRIC GENERATING PLANT, UNIT 1 – REVIEW OF STEAM  
GENERATOR TUBE INSPECTIONS PERFORMED DURING FALL 2009  
OUTAGE AND DESTRUCTIVE EXAMINATION OF 2008 PULLED TUBES  
(TAC NO. ME3825)

Dear Mr. Ajluni:

By letter dated April 13, 2010 (Agencywide Documents Access and Management System (ADAMS), Accession No. ML101040084) and August 6, 2010 (ADAMS Accession No. ML102210415), Southern Nuclear Operating Company, Inc. (SNC), submitted information summarizing the results of the 2009 steam generator (SG) tube inspections at Vogtle Unit 1. The U.S. Nuclear Regulatory Commission (NRC) staff summarized additional information concerning the 2009 SG tube inspections at Vogtle, Unit 1, in a letter dated November 5, 2009 (ADAMS Accession No. ML093070375). In addition, by letter dated February 1, 2010 (ADAMS Accession No. ML100560265), SNC submitted the results of the destructive examination of two tubes removed from Vogtle, Unit 1, during the 2008 outage.

The NRC has reviewed the documents referenced above and concludes that the licensee provided the information required by the technical specifications and that no additional follow-up is required at this time. The NRC staff's review of the reports is enclosed.

Sincerely,

A handwritten signature in cursive script that reads "Robert E. Martin".

Robert E. Martin, Senior Project Manager  
Plant Licensing Branch II-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-424

Enclosure: As stated

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VOGTLE ELECTRIC GENERATING PLANT, UNIT 1,  
2009 STEAM GENERATOR TUBE INSPECTIONS  
DESTRUCTIVE EXAMINATION OF 2008 PULLED TUBES  
TAC NO. ME3825  
DOCKET NO. 50-424

By letters dated April 13, 2010 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML101040084), and August 6, 2010 (ADAMS Accession No. ML102210415), Southern Nuclear Operating Company, Inc. (the licensee), submitted information summarizing the results of the 2009 steam generator (SG) tube inspections at Vogtle Electric Generating Plant, Unit 1. The U.S. Nuclear Regulatory Commission (NRC) staff summarized additional information concerning the 2009 SG tube inspections at Vogtle, Unit 1, in a letter dated November 5, 2009 (ADAMS Accession No. ML093070375).

In addition, by letter dated February 1, 2010 (ADAMS Accession No. ML100560265), the licensee submitted the results of the destructive examination of two tubes removed from Vogtle, Unit 1, during their 2008 outage.

The four SGs at Vogtle Unit 1, are Westinghouse model F SGs. Each SG contains 5,626 thermally treated Alloy 600 SG tubes. Each tube has a nominal outside diameter of 0.688-inch and a nominal wall thickness of 0.040-inch. The tubes were hydraulically expanded for the full depth of the tubesheet at each end and are supported by a number of stainless steel tube supports. In the U-bend region, the tubes are supported by anti-vibration bars. The U-bend region of the tubes in rows 1 through 10 was thermally stress relieved after bending. The tubes are arranged in a square pitch.

The licensee provided the scope, extent, methods, and results of their SG tube inspections in the document 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 reports submitted, the NRC staff has the following observations and comments:

At the time of the 2009 outage, the steam generators had been operated for approximately 19.8 effective full power years.

While shutting down the unit for the 2009 outage, a very small primary-to-secondary leak was detected. The leak was attributed to an axially oriented primary water stress corrosion crack in the U-bend region of the tube in row 1, column 20 in steam generator 3. The crack-like indication was near (slightly above) the hot-leg tangent point. The tube was in-situ pressure tested. No leakage was observed at the normal operating differential pressure (after adjustments to account for the difference between

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the in-situ testing temperature and the normal operating temperature). A small amount of leakage was detected at the differential pressures associated with a steam line break and three times the normal operating differential pressure.

An upper-bundle, in-bundle inspection was performed at the 7<sup>th</sup> tube support plate in steam generator 1. No anomalous conditions were identified.

The 7<sup>th</sup> tube support plate in steam generator 4 was inspected near the region damaged during the tube pull operation during the 2008 outage (refueling outage 14). No visual changes were evident from a comparison of the 2008 and 2009 images.

The upper internals in all four steam generators were inspected revealing mild erosion/corrosion on the swirl vanes and mild flow-accelerated corrosion on the feed ring. All locations were evaluated by the licensee as acceptable.

Circumferentially oriented outside diameter stress corrosion cracking indications were observed in twenty tubes. These indications were located at the bottom of the hydraulic expansion transition.

The NRC staff reviewed the eddy current inspection data for the tube located in row 1, column 20 in steam generator 3 (i.e., the tube with the axially oriented primary water stress corrosion cracking indication). In addition to reviewing the 2009 data, the staff also reviewed the 2003 inspection data. The NRC staff concluded the defect is visible in the 2003 rotating probe data (from the +Point™ coil). The staff observed some noise in the data, but not enough to hide the indication. The length of the indication was approximately 0.29-inches. This indication was near a manufacturing mark referred to as a Blairsville bump (described below).

On April 29, 2010, the licensee clarified the following concerning the axially oriented primary water stress corrosion cracking indication in row 1, column 20 in steam generator 3:

The prior inspections of this tube indicated the presence of a manufacturing indication, referred to as a Blairsville bump (since the bump was most likely introduced during bending of the tube at a facility in Blairsville, Pennsylvania). This bump is located where the tube starts to enter the bent region of the tube (i.e., the start of the U-bend region). During the review of the bobbin coil data obtained in 2000, one of the analysts reviewing the data (typically two analysts review all eddy current data) identified a non-quantifiable indication at the location where the crack-like indication was eventually discovered. This indication was eventually dismissed by the resolution analyst (an analyst who oversees the review of the primary and secondary data analysts) since the 1997 rotating probe examination indicated no flaws were present at this location, the bobbin coil data indicated the signal had not changed since the 1986 inspection, and the general absence of any cracking in tubes fabricated from thermally treated Alloy 600 tubing at the time of the inspection. During the review of the 2003 rotating probe data, an axial indication was reported by one of the analysts at the location where the crack-like indication was eventually discovered. This indication was also dismissed by the resolution analyst since the indication from the rotating probe did not change appreciably from 1997 (1.75 volts as measured from the 300 kHz channel) to 2003 (1.83 volts as measured from the 300 kHz channel).

Based on a review of the information provided, the NRC staff concludes that the licensee provided the information required by their technical specifications. In addition, the 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.

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Robert E. Martin, Senior Project Manager  
Plant Licensing Branch II-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

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