

June 2, 2005

Mr. D. E. Grissette
Vice President
Southern Nuclear Operating
Company, Inc.
P.O. Box 1295
Birmingham, AL 35201-1295

SUBJECT: VOGTLE ELECTRIC GENERATING STATION, UNIT 2 - REVIEW OF STEAM
GENERATOR TUBE ACTIVITIES FOR THE SPRING 2004 (2R10) OUTAGE
(TAC NOS. MC4377, MC3046, AND MC3047)

Dear Mr. Grissette:

By letters dated May 20 and August 13, 2004, Southern Nuclear Operating Company (SNC), submitted the report of the number of steam generator tubes plugged during the spring 2004 refueling outage (2R10) at the Vogtle Electric Generating Plant, Unit 2, and a summary of the inservice inspection activities during 2R10, respectively.

The Nuclear Regulatory Commission (NRC) staff has reviewed the subject reports. Based on its review, the NRC staff concludes that SNC provided sufficient information and there are no issues that warrant additional follow-up at this time. The NRC staff's review is Enclosed.

Sincerely,

/RA/

Christopher Gratton, Sr. Project Manager, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-425

Enclosure: Review of Steam Generator Activity

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REVIEW OF STEAM GENERATOR ACTIVITY
SPRING 2004 REFUELING OUTAGE
SOUTHERN NUCLEAR OPERATING COMPANY
VOGTLE ELECTRIC GENERATING PLANT, UNIT 2
DOCKET NO. 50-425

By letters dated May 20, 2004 (Agencywide Documents Access and Management Systems (ADAMS) Accession No. ML041450232) and August 13, 2004 (ADAMS Accession No. ML042330493), Southern Nuclear Operating Company Inc. (SNC, the licensee), submitted steam generator (SG) tube inspection summary reports for the Vogtle Electric Generating Plant, Unit 2 (Vogtle 2) for their Spring 2004 refueling outage (2R10), in accordance with the plant's technical specifications.

On May 4, 2004, the Nuclear Regulatory Commission (NRC) staff participated in a phone call with the licensee to discuss the results of their SG tube inspections, with an emphasis on the detection of circumferential indications at the expansion transitions. The summary of this phone call can be found in an NRC staff letter dated May 13, 2004 (ADAMS Accession No. ML041430003). Two tubes were pulled for destructive examination due to the detection of circumferential indications during the 2R10 outage. By letter dated August 9, 2004 (ADAMS Accession No. ML050680467), SNC submitted inspection data for all tubes with circumferential indications from the 2R10 outage. By letter dated December 21, 2004 (ADAMS Accession No. ML050060198), SNC submitted a report summarizing the examination of two pulled tubes from Vogtle 2. On December 22, 2004, SNC provided clarifying information (by electronic mail, ADAMS Accession No. ML051360242) regarding their SG tube inspection summaries, and on January 27, 2005, the licensee clarified (by conference call) some of the information in their December 22, 2004, email. The clarifying information is included in the following evaluation.

Vogtle 2 has four Westinghouse Model F SGs (denoted SG1 through SG4). Each SG contains 5626 thermally treated Alloy 600 tubes with an outside diameter of 11/16 inches and a wall thickness of 0.040 inches. The tubes are supported by seven stainless steel tube support plates with quatrefoil-shaped holes and a flow distribution baffle. The U-bend region of the tubes in rows 1 through 10 were stress relieved after bending. At the time of the 2R10 outage, Vogtle 2 had operated for approximately 13.4 effective full power years.

The licensee provided the scope, extent, methods, and results of their SG tube inspections in the documents referenced above. In addition, the licensee described corrective actions (e.g., tube plugging or repair) taken in response to the inspection findings. A summary of some of the more significant inspection findings is provided below.

Prior to the 2R10 data collection, the licensee reviewed all 2R08 low frequency bobbin eddy current data for SG2 and SG3 to look for an eddy current offset in the tubes from rows 1 through 10 (i.e., the Seabrook artifact) and a diminished eddy current offset in the tubes from rows 11 through 59 (i.e., the Braidwood artifact). The presence of these artifacts may indicate susceptibility to stress corrosion cracking (SCC). At Seabrook Nuclear Power Station, several

Enclosure

tubes with this artifact had crack-like indications at tube support plate elevations (refer to NRC Information Notice 2002-21, "Axial Outside Diameter Cracking Affecting Thermally Treated Alloy 600 Steam Generator Tubing" dated June 25, 2002, and its Supplement dated April 1, 2003, for additional details). At Vogtle 2, the licensee found no tubes with the Seabrook artifact and one tube with the Braidwood artifact. No signals representative of outside diameter (OD) SCC were found in the tube with the Braidwood artifact, and the tube was left in service. In the December 22, 2004, response to a request for clarifying information, the licensee stated that the tube with the Braidwood artifact was in Row 40, Column 48 in SG2. The artifact in SG2-R40-C48 was called by the eddy current analyst due to a lack of U-bend offset in the bobbin data.

During 2R10, flaw-like circumferential signals were observed in nine tubes at the top-of-tubesheet expansion transitions on the hot-leg side in all four SGs. As a result, two tubes (Row 12, Column 59 and Row 11, Column 60) were pulled from SG2 for laboratory examination. Eddy current and ultrasonic examinations performed in the laboratory on these two tubes were not able to reproduce the flaw-like indications found during the inservice inspection, and destructive examination of tube SG2-R12-C59 found no evidence of tube degradation. In the report dated December 21, 2004, the licensee concluded that the laboratory examination showed that the flaw-like circumferential signals detected during 2R10 were not representative of circumferential OD SCC in the tube expansion transitions. Although the root cause for the false-positive signals could not be determined, the licensee concluded that the cause was likely related to the non-uniformity of scale and deposits on the tubes at the expansion transitions.

In the January 27, 2005, conference call, the licensee discussed ongoing activities directed toward improving the ability to differentiate flaw-like signals from deposits using eddy current tests. By applying a conductive material to the outside surface of a tube sample, the licensee was able to replicate a +Point™ probe signal response similar to that obtained during the inservice inspection (i.e., a low voltage flaw-like signal from deposits). Laboratory trials with the Ghent (a probe with two transmit coils and one receive coil) and delta (i.e., 3-coil) probes showed that tube deposits could be identified without mis-characterization of these deposits as degradation within the tube wall. At the time of the call, the licensee planned to conduct additional testing with the Ghent and delta probes to ensure that cracks would not be misinterpreted as deposits, based on these techniques. The licensee stated that inspection techniques and procedures with the capability to discriminate between tube deposits and actual tube degradation should be available at the time of the next scheduled inservice inspection at Vogtle Electric Generating Plant, Unit 1. These techniques would be utilized to diagnose indeterminate +Point™ probe signals. The licensee also stated that the inspection scope for upcoming tube inspection activities will focus on the sludge pile region.

In the January 27, 2005, conference call, the licensee also discussed whether there was any evidence that the tubes were "locked-in" at tube support plates due to deposits associated with the quatrefoil lands. During the tube pulling operation, the licensee measured the "breakaway" force necessary to initiate simultaneous movement of the tube through the tubesheet and the first tube support plate. These results can be found in Table 3-1 of the December 21, 2004, report. The forces noted in Table 3-1 do not reflect just the forces required to free the portion of the tube at the first tube support plate from the tube support plate. However, based on the

tube pull force measurements and the visual observation of light deposits on the tube in the tube support plate region, the licensee concluded that there was no evidence to suggest that the two pulled tubes were locked-in at the first tube support plate.

In response to a request by the NRC staff, the licensee provided by letter dated August 9, 2004, the 2R10 tube inservice inspection eddy current data for the nine tubes with circumferential indications at the expansion transition. Based on a review of this data, the NRC staff noted that detection and sizing of the circumferential signals would be very difficult due to their small size, the presence of tube deposits, and the high levels of noise and extraneous signals commonly associated with the expansion transition region. The NRC staff also observed that the licensee utilized a particular +Point™ coil size and test frequency for the inspection of the Vogtle 2 SG tubes. Considering the diameter and wall thickness of the SG tubes at Vogtle 2, the NRC staff observed that different inspection parameters (e.g., smaller coil size, higher test frequency) may better resolve tube degradation in the expansion transition region.

Based on a review of the information provided, the NRC staff concludes that the licensee provided the information required by their technical specifications. The NRC staff also 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, except as noted above.

Vogtle Electric Generating Plant, Units 1 & 2

cc:

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