

December 6, 2002

Mr. Craig G. Anderson
Vice President, Operations ANO
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1448 S. R. 333
Russellville, AR 72801

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT NO. 1 (ANO-1) - SUMMARY OF
CONFERENCE CALLS ON STEAM GENERATOR (SG) INSPECTION
RESULTS DURING 1R17 (TAC NO. MB6339)

Dear Mr. Anderson:

On October 1, 3, 17, and 23, 2002, the Nuclear Regulatory Commission (NRC) staff participated in conference calls with Entergy Operations, Inc. (Entergy) representatives regarding the ongoing SG tube inspection activities at ANO-1. A summary of the conference calls is provided in Enclosure 1. The materials that Entergy provided in support of these calls is provided in Enclosure 2.

The NRC appreciates the resources you provided to support these conference calls. TAC MB6339 is considered closed.

Sincerely,

/RA/

Thomas W. Alexion, Project Manager, Section 1
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-313

Enclosures: As stated

cc w/encls: See next page

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SUMMARY OF CONFERENCE CALLS WITH
ENERGY OPERATIONS, INC. (ENERGY/LICENSEE)
REGARDING 2002 STEAM GENERATOR (SG) INSPECTION RESULTS
ARKANSAS NUCLEAR ONE, UNIT 1 (ANO-1)

The Nuclear Regulatory Commission (NRC) staff participated in conference calls with Entergy representatives on October 1, October 3, October 17, and October 23, 2002, to discuss the SG inspection results from the 17th refueling outage at ANO-1. The calls are summarized below.

Inspection/Plugging Plans to Address the Industry Identified Severed Tube Issue

During the calls prior to and on October 17, 2002, the NRC and the licensee discussed the licensee's actions in response to NRC Information Notice 2002-02 (IN 2002-02), "Recent Experience with Plugged Steam Generator Tubes" (Agencywide Documents Access and Management System Accession Number ML013480327). As discussed in the information notice, certain plugged tubes may be susceptible to severance as a result of tube vibration and other factors (e.g., tube swelling).

The licensee has identified twelve susceptible plugged tubes needing corrective action. These tubes have explosive plugs and will not be unplugged and/or stabilized. Instead, the licensee will "cage" all the susceptible tubes which is consistent with the Babcock & Wilcox Owners Group (BWOG) short term recommendations. The recommendations call for stabilizing and plugging all the tubes surrounding the susceptible tube. Among the adjacent tubes surrounding the susceptible tubes in the ANO-1 SGs, some had already been sleeved or stabilized previously. As a result, the licensee plans to plug and stabilize the rest of the neighboring tubes; a total of 61. The licensee believes that the sleeved tubes (plugged or unplugged) adjacent to susceptible tubes do not need further remedial action (i.e., plugging and stabilization) since the sleeve will act both as a stabilizer and as a pressure boundary. In addition, the licensee stated that plans are under way to replace its SGs during the outage in 2005.

No indications that a tube had severed were identified during this inspection (e.g., no wear scars were found in the tubes adjacent to the 12 susceptible plugged tubes).

Inspection Scope

On October 17, 2002, the NRC and the licensee discussed the SG tube inspection scope, the eddy current data analysis results, tube plugging and repair plans, and in-situ pressure testing. At the time of the call, the licensee had already completed the inspection except some plus-point probe data analysis. Details of the inspection scope and results are contained in the attached inspection summary Entergy provided in support of this call. Additional clarifying information provided during the call is provided below.

The inspection scope included the following:

- 100% of tubes in both SGs by bobbin probes.
- 100% of tubes in the sludge pile region with plus-point probes.
- 100% of all dents over 2 volts above Tube Support Plate (TSP) 8 with plus-point probes.

Inspection Results

Prior to shutdown for the inspection, there were only trace indications of primary-to-secondary leakage. Therefore, no secondary side pressure tests were conducted during the outage.

The licensee indicated that the location and size of indications detected during the outage inspection will be included in the 90-day report issued after the outage. During the phone call, the licensee discussed significant indications found as a result of the inspections.

The licensee detected outside diameter inter-granular attack (OD IGA) flaws in the upper tubesheet. They detected 329 indications in SG A, and 231 in SG B. None of the indications exceed the criteria for plugging. The alternate repair criteria will continue to be applied. The licensee was in a process of evaluating the growth rate at the time of the call but indicated that the indications observed were similar to what had been observed previously.

The licensee also detected 1383 tubes in SG A and 778 tubes in SG B with axial indications at the end of the tube extending outside the tubesheet. The overall number is very similar to the previous inspection. None of the indications extended into the portion of tube in contact with the carbon steel tubesheet (i.e., none had to be repaired by re-rolling).

The licensee also detected TSP wear degradation in both SGs. There were 437 wear indications in SG A and 448 in SG B. The licensee stated that the deepest indication is only 25% through-wall.

The licensee detected 39 axial indications in the upper roll transition region in each of the SGs, and indicated that most of the indications will likely be repaired by re-rolling.

The licensee detected indications in tubes which had been re-rolled. Some of these indications were located inside the pressure boundary but most of them were outside. They found 1469 re-roll crack indications outside the pressure boundary in SG A, and 1077 in SG B. (They detected 1245 in SG A and 951 in SG B in the previous inspection.) The licensee detected 29 re-roll crack indications inside the pressure boundary in SG A and 16 in SG B. The number of tubes with indications this outage is less than the number observed in the previous outage. Of the 45 tubes with indications, 11 were attributed to axial cracks while some were OD volumetric indications such as IGA. The licensee was still determining if any of the indications were circumferential.

An indication was detected in the sludge pile region on the lower tubesheet in SG B. The indication was detected with a bobbin probe and a rotating probe. The licensee stated that it is less than 0.2 inches in axial and circumferential extent and is a shallow OD IGA flaw.

A total of 32 freespan flaws were detected in SG A and 5 in SG B. Most of them were classified as groove IGA. The licensee also detected 2 volumetric indications in the portion of tubes within the tube support plate. One of these indications appeared to initiate from the inside diameter based on bobbin and plus-point probes. This indication has been there for many years and has not changed. The other indication is a single OD-initiated volumetric indication at the lower edge of the 6th TSP. No indications were found at dents, in sleeves, or on the border of the lane/wedge region. No tubes were identified that could be attributed to the leakage observed during operation.

The licensee indicated that they used the Mitsubishi Intelligent probe and high-speed rotating pancake coil probe to examine approximately 100 tubes in SG B. The licensee indicated that the data had not been analyzed and they were only analyzing the flaw region to see if it was detectable with these probes.

Six tubes were in-situ pressure tested during this outage. One of these tubes contained a freespan flaw (discussed above) in SG A, and five tubes contained flaws in the re-roll region. The licensee's in-situ pressure testing criteria used flaw length and voltage to determine whether an indication falls within a "required zone" for testing. During these tests, no tubes leaked when tested up to the 3ΔP pressure limit.

As a result of this inspection, a preliminary estimate indicated that 76 tubes would require plugging in SG A and 43 in SG B.

The licensee requested a follow-up conference call with the staff as a regulatory commitment that the licensee made during the review of the re-roll repair amendment. The commitment requires the licensee to inform the staff if circumferential indications are identified in tubesheets. This conference call took place on October 23, 2002. The licensee stated that two circumferential indications were detected in the original roll in the upper tubesheet of SG B. The licensee indicated that circumferential cracks were not identified in any of the rerolls. The licensee performed a best estimate leakage assessment assuming postulated large break loss-of-coolant accident loads. The licensee stated that the leak rate was determined to be 1.87 gallons-per-minute (gpm), which is less than the allowable leakage limit of 9 gpm. This leak rate incorporated leakage from the two circumferential cracks located in the original roll (1.47 gpm), circumferential indications identified above the roll (0.38 gpm), and leakage from sleeves and plugs (0.02 gpm).

Arkansas Nuclear One

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