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

December 31, 2008

Vice President, Operations
Arkansas Nuclear One
Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72802

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT NO. 1 - SUMMARY OF NOVEMBER 8, 2008, CONFERENCE CALL REGARDING 2008 STEAM GENERATOR TUBE INSPECTIONS (TAC NO. MD9729)

Dear Sir or Madam:

On November 8, 2008, the U.S. Nuclear Regulatory Commission (NRC) staff participated in a conference call with representatives of Entergy Operations, Inc., to discuss the 2008 steam generator (SG) tube inspections performed at Arkansas Nuclear One, Unit 1, during their 21st refueling outage (1R21). To facilitate the conference call, the licensee was provided some discussion points, which they were asked to address prior to the conference call. On November 3, 2008, the licensee provided this information including preliminary information regarding the results of the SG tube inspections (Enclosure 2).

Participating in the call from the NRC were Kenneth Karwoski and Alan Wang and from the licensee were Robert Clark, Bill Greeson, and Dale James. Based on the information provided during the conference call, the NRC staff did not identify any issues that warranted additional follow-up at this time. However, the NRC staff requested that the licensee notify the NRC in the event that any unusual conditions were detected during the remainder of the outage.

A summary of the conference call is attached as Enclosure 1.

This completes our review of the preliminary results for the 2008 steam generator tube inspections at Arkansas Nuclear One, Unit 1. If you have any questions regarding this matter, please contact me at (301) 415-1445 or by electronic mail at Alan.Wang@nrc.gov.

Sincerely,

Alan Wang

Alan B. Wang, Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-313

Enclosure: 1. Summary of Conference Call
2. Licensee's Response to NRC SG Tube Inspections Discussion Points

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OFFICE OF NUCLEAR REACTOR REGULATION

SUMMARY OF CONFERENCE CALL WITH ENTERGY OPERATIONS, INC.

REGARDING ARKANSAS NUCLEAR ONE, UNIT NO. 1

2008 STEAM GENERATOR TUBE INSPECTION RESULTS

DOCKET No. 50-313

On November 8, 2008, the U.S. Nuclear Regulatory Commission (NRC) staff participated in a conference call with Entergy Operations, Inc. (Entergy, the licensee) representatives regarding Arkansas Nuclear One, Unit No. 1's (ANO-1) ongoing steam generator (SG) tube inspection activities. To facilitate the conference call, the licensee was provided some discussion points, which Entergy was asked to address prior to the conference call. By email dated November 3, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML083380255), the licensee provided this information including preliminary information regarding the results of the ANO-1 SG tube inspections (Enclosure 2).

The replacement SGs for ANO-1 are Enhanced Once-Through Steam Generators (EOTSG) manufactured by AREVA. The EOTSG is a straight shell and tube type heat exchanger installed in a vertical position. The Alloy 690 thermally treated tubing has a 5/8-inch diameter and a 0.037-inch wall thickness. The tubes were expanded hydraulically for the full depth of the tubesheet. There are 15 tube support plates that are constructed of type 410 stainless steel. These supports have a trefoil-shaped hole design.

Additional information discussed during the call is summarized below:

1. At the time of the call, the inservice inspections for SG A and B were approximately 75 percent and 95 percent complete, respectively.

2. The bobbin probe was used to detect tubes that were in close proximity to other tubes and to tie rods. The X-probe probe was used to help identify which tube support plates were not free to move and the extent of any tube support locking.

3. Tie rod bowing was detected in SG A and the root cause acceptance criteria and operability acceptance criteria based on the previous outage analysis were re-evaluated based on current findings. The licensee reported that the maximum lateral bow has increased from 0.9 to 1.2 inches and that the operability evaluations remain bounding. The operability evaluation is based on 10 thermal cycles. The root cause acceptance criteria was increased (when compared to previous NRC presentations) by 0.1 inch to account for uncertainty in the nondestructive examination (NDE) measurements. If the root cause acceptance criteria had been exceeded, the assumption in the root cause analysis would have been reevaluated to determine if changes in the model/analysis were needed.

   In the last table of the attachment, the first four rows are for tie rods in the first span. The tie rods in rows 66 and row 86 (in the last table) are in the second outermost ring of tie rod.

ENCLOSURE 1

4. There are 3 locations with small dents (0.3 volts). The dents are at the lower end of the first tube support plate. There was no wear observed at these locations.

5. No cracking was observed and no wear was observed in the free span region of the tubes.

6. No Possible Loose Part (PLP) indications were observed in SG A and no loose parts were visually identified. In SG B, 5 PLP indications were detected with the bobbin probe. All five of these indications are in the inner region of the tube bundle (including some in the upper portion of the tube bundle in the 7^{th} and 3^{rd} tube support plate). No wear was associated with these PLP indications, and no change was observed in the PLP indications when compared to the previous outage.

7. A visual inspection of two tie rods (i.e., those with the most significant bending based on eddy current examination) confirmed the eddy current results.

8. The visual inspection of tube support plate 14 and 15 were scheduled for later in the evening. These tube supports have the filler plates.

9. No bowed tie rods were observed in SG B.

10. The maximum reported depth for any of the tube wear indications at the tube support plates was 32 percent through wall. The distribution of sized of the tube support plate wear indications were similar in both SGs. The maximum reported depth of newly identified wear indications (i.e., those not present in prior outage) was 28 percent through wall which is consistent with the results of the previous inspection.

11. During the prior inspection, approximately 690 wear indications were detected in SG A and 550 in SG B. At the time of the call approximately 500 and 850 additional indications were detected in SGs A and B, respectively.

The NRC staff did not identify any issues that required follow-up action at this time; however, the NRC staff asked to be notified in the event that any unusual conditions were detected during the remainder of the outage.

ENCLOSURE 2

Licensee's Response to NRC SG Tube Inspections Discussion Points

ADAMS Accession No. ML083380255

OFFICE OF NUCLEAR REACTOR REGULATION

STEAM GENERATOR TUBE INSPECTION DISCUSSION POINTS

REFUELING OUTAGE 1R21

RENEWED FACILITY OPERATING LICENSE NO. DPR-51

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT NO. 1 (ANO-1)

DOCKET NO. 50-313

The following discussion points have been prepared to facilitate the telephone conference call arranged with the Entergy Operations, Inc. (Entergy, the licensee), to discuss the results of the steam generator tube inspections to be conducted during the upcoming fall 2008, Arkansas Nuclear One, Unit 1 (ANO-1) refueling outage (1 R21). This conference call is scheduled to occur towards the end of the planned SG tube inspections, but before the Entergy completes the inspections and repairs.

The U.S. Nuclear Regulatory Commission staff plans to document a summary of the conference call as well as any material that is provided in support of the call.

1. Discuss any trends in the amount of primary-to-secondary leakage observed during the recently completed cycle.

   No indication of primary-to-secondary leakage present prior to the current refueling outage (1R21). (Ar-41 < MDA, H3 ~1.0 gpd)

2. Discuss whether any secondary side pressure tests were performed during the outage and the associated results.

   No secondary side pressure tests have been performed or scheduled for 1R21.

3. Discuss any exceptions taken to the industry guidelines.

   No exceptions were taken to NEI 97-06 and EPRI Steam Generator Guidelines.

4. For each steam generator, provide a description of the inspections performed including the areas examined and the probes used (e.g., dents/dings, sleeves, expansion transition, U-bends with a rotating probe), the scope of the inspection (e.g., 100% of dents/dings greater than 5 volts and a 20% sample between 2 and 5 volts), and the expansion criteria.

Area Inspected	Exam Type	Probe Used	OTSG	# of Inspections	Expansion
Full Length Tubing	100% Full Length	0.510 Bobbin	'A'	15595	None
Full Length Tubing	100% Full Length	0.510 Bobbin	'B'	15596	None
Special Interest Wear	X-Probe at wear location	X-Probe	'A'	689	None
Special Interest Wear	X-Probe at wear location	X-Probe	'B'	541	None

5. a. For each area examined (e.g., tube supports, dent/dings, sleeves, etc), provide a summary of the number of indications identified to-date for each degradation mode (e.g., number of circumferential primary water stress corrosion cracking indications at the expansion transition). For the most significant indications in each area, provide an estimate of the severity of the indication (e.g., provide the voltage, depth, and length of the indication). In particular, address whether tube integrity (structural and accident induced leakage integrity) was maintained during the previous operating cycle. In addition, discuss whether any location exhibited a degradation mode that had not previously been observed at this location at this unit (e.g., observed circumferential primary water stress corrosion cracking at the expansion transition for the first time at this unit).

Mechanical wear is currently the only degradation mechanism in both steam generators and is limited to the tube support plates in both steam generators.

Condition report CR-ANO1-2008-01700 has been initiated due to the significant number of new wear locations in Steam Generator Eddy Current Examination of E24A (SG A)and E24B (SG B) during 1R21. Many of the wear indications are occurring near the eighth tube support. This is true for both Steam Generators.

The 10 largest wear indications for each steam generator are provided in an attached table with location, voltage, depth and length of indication. The total number of wear indications in both steam generators identified to date is listed below:

Wear was previously identified during the last steam generator inspection. The structural integrity limit for mechanical wear is 75% through-wall (TW) based on 1.5" long tapered wear. No wear indication has exceeded the structural wear limit for the last operating cycle or challenged accident induced leakage integrity. Steam generator tube integrity has been maintained during the last operating cycle.

b. Describe in-situ pressure test plans and results (as applicable and if available).

No indications exceeded screening criteria have been identified to date.

6. Discuss the following regarding loose parts:

- What inspections are performed to detect loose parts.

  Periphery exam at the top of tubesheet (TTS) based on visual inspection and 100% full length (FL) Bobbin Exam.

- a description of any loose parts detected and their location within the steam generator (SG), including the source or nature of the loose part, if known,

  None to date; however, bobbin and visual exams are still in progress.

- if the loose parts were removed from the SG

  None to date.

- indications of tube damage associated with the loose parts,

  None to date.

7. Discuss the scope and results of any secondary side inspection and maintenance activities (e.g., in-bundle visual inspections, feed ring inspections, sludge lancing, assessing deposit loading, etc).

SG A Secondary Visual:

- First Span – Annulus for loose parts, Inner Bundle for tie rod bowing, and Orifice Plate
- 15th Span – Use of cart via secondary manway – top side of 15th
- 14th Span – via 14th inspection port – top side of 14th and underside of 15th

  SG B – First span only – annulus for loose parts and orifice plate

8. Discuss any unexpected or unusual results.

None (tie-rod bowing discussed below).

9. Provide the schedule for steam generator-related activities during the remainder of the current outage.

Eddy current inspections should complete 11/6/08 and repairs and visual inspections are in progress and expected to complete by 11/10/08.

10. Discuss the results of the tie-rod bowing identified during the outage. Include the following in the discussion:

- Was bowing identified in one or both SGs
- Was bowing consistent with what was expected -if not explain
- What areas of the SG has bowing
- What is the maximum lateral bow identified
- Is the current operability still bounding
- What repairs if any will be required for startup

Tie rod bowing was detected in SG A and not detected in SG B at 1R21. This is consistent with the 1R20 inspection results. As at 1R20, bowing was detected only on one side of SG A. The locations of bowing are consistent with previous root cause finite element analysis (FEA) calculations. From preliminary observations the maximum lateral bow has increased from 0.9 to 1.2 inches. Preliminary information regarding locations of wear scars relative to the tube support plate (TSP) surfaces in the cold condition suggests that locking on the side of the steam generator without bowing has increased leading to increased bowing on the other side of the steam generator. This possibility was considered in the root cause analysis. To date inspection results are consistent with expectations prior to the outage. Root cause FEA calculations show some degree of bowing of tie rods in the outermost ring at all elevations. Previously bowing was detected at the 1st, 14th and 15th spans. At 1R21 bowing was detected at these locations in addition to one tie rod in the 2nd span and one tie rod in the 13th span. An increase in the number of tubes with proximity signals is consistent with the apparent increase in lateral bowing. A review of 1R20 proximity signals and gap measurements is needed to ensure that the differences in 1R21 results are not simply the result of increased detectability and gap measurement accuracy. A review of the 1R20 data indicates that bowing in the 2nd and 13th spans was at the threshold of detection at 1R20. Approximately 17 proximity signals are new indicating that the increase in bowing magnitude is correct. The inspection also revealed 12 proximity signals that were at the threshold value of detectability in 1R20 and not reported as proximity signals at that time. The operability evaluation remains bounding and no repairs are required prior to start up as of the data available through November 2, 2008.

Condition report CR-ANO-1-2008-01685 was initiated to document the proximity indications in numerous tubes around several tie rods. Eddy current testing of the "A" steam generator (E24A) is being performed during 1R21 as part of the assessment of bowed tie rods found in 1R20 (CR-ANO-1-2007-959). These proximity indications show that some of the tie rods are now bowed in a similar manner as 1R20, and preliminary evaluations suggest that amount of tie rod bow has increased somewhat. These preliminary assessments indicate that the amount of bow is close to that predicted in the root cause analyses, and is bounded by the current operability evaluations. Accordingly, based on the preliminary results, the current operability remains valid.

Below are the preliminary results for the four worst tie rod locations as determined during 1R20, for only the first span. The comparisons show that the amount of bow has increased. These numbers will be verified.

Tie Rod Row (Z-axis)	Bow at 1R20 (per Root Cause Rpt)	Bow at 1R21	Root Cause Acceptance Criteria	Operability Acceptance Criteria
Row 88	0.69" < Bow < 0.75"	1.12 < Bow < 1.17	< 1.2	< 1.5
Row 64	0.83" < Bow < 0.89"	1.17 < Bow < 1.19		
Row 66	0.30" < Bow < 0.37"	~0.5		
Row 86	0.25" < Bow < 0.32"	~0.5		
15th Span		< 0.14"	≤ 0.17"	
14th Span		< 0.14"	≤ 0.17"	

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Sincerely,
/RA/

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