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

February 26, 2001

LICENSEE: Entergy Operations, Inc.

FACILITY: Arkansas Nuclear One, Unit 1

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 1 (ANO-1), MEETING SUMMARY REGARDING MEETING ON JANUARY 23, 2001, TO DISCUSS REPAIR OF STEAM GENERATOR TUBES USING THE REROLL METHODOLOGY (TAC NO. MB0097)

On January 23, 2001, representatives of the Nuclear Regulatory Commission (NRC) met with Entergy Operations, Inc. (the licensee) to discuss a proposed amendment to allow the repair of steam generator tubes using a reroll process for tube sections within the steam generator tube sheets. The license amendment request is available in the NRC's Agencywide Documents Access and Management System (ADAMS), Accession No. ML003756836. Enclosure 1 provides a list of the participants.

The staff provided the licensee with preliminary questions (via e-mail) prior to the meeting. The questions are provided as Enclosure 2. The participants discussed the questions and related issues associated with the reroll methodology and the condition of steam generator tubes at ANO-1. The licensee will respond to the staff's questions in a future submittal.

William D. Reckley, Project Manager, Section 1
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-313

Enclosures: As stated

cc w/encls: See next page

NRC 001

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ATTENDANCE LIST

PUBLIC MEETING HELD ON JANUARY 23, 2001

REROLL REPAIR METHODOLOGY FOR STEAM GENERATOR TUBES AT ANO-1

Name	Organization
Edmund Sullivan	Nuclear Regulatory Commission
John Tsao	Nuclear Regulatory Commission
Louise Lund	Nuclear Regulatory Commission
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Enclosure 1

REQUEST FOR ADDITIONAL INFORMATION
STEAM GENERATOR TUBE REPAIR BY REROLL
ARKANSAS NUCLEAR ONE, UNIT 1

By letter dated September 28, 2000, Entergy submitted for staff review and approval a proposed amendment to the Arkansas Nuclear One Unit 1 (ANO-1) Technical Specifications (TS), Section 4.18. The proposed amendment would modify the existing reroll repair process for degraded tubes within the tubesheet region of the ANO-1 steam generators. To complete our review, the staff requests the following information:

I. Specific Questions for ANO-1

1. In a letter to Duke Energy Corporation dated December 15, 2000, the NRC staff approved a reroll amendment for the Oconee Units 1, 2, and 3 steam generators. Several issues were raised in the review of the Oconee reroll amendment. The reroll design is affected by design basis conditions (e.g., small break LOCA [loss of coolant accident] and MSLB [main steamline break] transients) which were analyzed in BAW-2374, "Justification for Not Including Postulated Breaks in Large-Bore Reactor Coolant System Piping in the Licensing Basis for Existing and Replacement Once-Through Steam Generators." In addition, the NRC staff was concerned about potential circumferential indications in the tubesheet expansion transition regions. The NRC staff imposed certain license conditions on the Oconee reroll amendment related to assuring that adequate safety margins continue to be satisfied as discussed in the December 15, 2000, letter. The license conditions are intended to ensure that the an evaluation will be performed to demonstrate that gross structural failure and leakage of the roll expansion joints will not occur in the event of a large break LOCA. In light of these license conditions, the NRC staff requests Entergy to provide the same commitments for this amendment.

2. In a letter to the NRC dated January 3, 2000, Entergy submitted the steam generator inservice inspection report for the inspection conducted in 1999 for refueling outage 1R15 (cycle 15). The licensee identified flaws in rerolled joints which were installed in 1R14. The flaws were identified as volumetric and axial/mixed mode. (A) In the report, the licensee stated that a root cause was being performed at the time. Discuss the findings in the root cause study, including corrective actions taken to prevent or minimize future flaws in rerolled joints. (B) Provide information since the issuance of the report on the detected indications in the upper and lower tubesheets including crack orientation (axial or circumferential), crack location relative to the reroll, degradation mechanism (PWSCC, ODSCC, crack-like, or volumetric), and estimated crack size (length, average depth, maximum depth, percentage degraded area). In the discussion, include data from pulled tubes, as applicable. (C) On Page 18 of the report, Entergy reported that its preliminary study indicates that the tooling and rolling process may have contributed to the detected flaws in the rerolled joints. Discuss any changes that have been made or are anticipated in the reroll installation process that deviate from the process specified in BAW-2303P, Revision 4. Discuss the impact of these changes on the applicability of the tests supporting the reroll design in BAW-2303P, Revision 4, "OTSG Repair Roll Qualification Report."

3. The current TS 4.18.3.b specifies that all tubes which have been repaired using the reroll process will have the new roll area inspected during the inservice inspection. The inspection plan is discussed in Section 8.0 of BAW-2303P, but in general terms. (A) Discuss, in detail, the inspection scope, inspection expansion criteria, and inspection technique for the reroll at ANO-1 for pre-service inspection and inservice inspection. (B) Discuss the acceptance criteria for reroll joints for pre-service inspection (during the installation process) and inservice inspection. (C) Discuss disposition of the reroll joint that does not satisfy the acceptance criteria during pre-service inspection and inservice inspection.

4. For completeness, the revision number, 4, must be included in the reference of the topical report, BAW-2303P, in the proposed Technical Specificaiton (TS) 4.18.5.a.4. The NRC staff has required licensees to include the revision number of technical reports that are referenced in the TS.

5. The licensee proposed that in TS 4.18.5.a.9., the portion of the tube outboard of the new roll can be excluded from future periodic inspection requirements because it is no longer part of the pressure boundary once the repair roll is installed. Provide a clear definition of the word "outboard" in this TS section. Also, discuss this inspection requirement as it relates to the information needed to satisfy the license conditions discussed in Question 1 above.

The NRC staff forwarded the following questions to Duke Energy Corporation as a part of the NRC staff review of the reroll license amendment for steam generator tubes at Oconee Units 1, 2, and 3. Duke Energy has responded to the following questions satisfactorily in various supplements to the NRC staff (in letters dated September 12, October 4, October 26, November 10, and December 8, 2000). These questions are generic and are applicable to proposed ANO-1 reroll amendment. Entergy needs to respond to the following questions by either confirming that Duke Energy's responses to these questions are applicable to the ANO-1 reroll amendment or providing additional information if Duke Energy's responses are not applicable to ANO-1. These questions do not include the NRC staff's questions related to thermal hydraulics and structural analysis in BAW-2303P, Revision 4.

II Generic Questions on BAW-2303P, Revision 4

1. On page 1-2, Framatome states that volumetric indications attributed to Intergranular Attack (IGA) have been identified in the unexpanded portion of the tube within the tubesheet crevice. Discuss the impact of IGA on the rerolling operation and exclusion zones.

2. On page 2-1, Framatome states that: "There are three overlapping roll configurations that may be installed. The compressive load is minimized by installing an inboard roll followed by an overlapping outboard roll for a total addition compressive load of 21 lbs. Installing an outboard roll, followed by an overlapping inboard roll results in a total additional compressive load of 50 lbs." Provide an explanation as to why the sequence of rolling, i.e., inboard roll followed by overlapping outboard roll vis-a-vis outboard roll followed by overlapping inboard roll, would result in doubling the compressive load from 21 to 50 lbs.

3. Comparing Table 3-1 "B&W OTSG Performance Characteristics" in BAW-2303P, Rev. 4 with Table 4.1 "B&W OTSG Performance Characteristics" in BAW-2303P, Rev. 3, discuss the deletion of 25 psia secondary side pressure for main steam line break (MSLB) and 15 psia for primary side pressure for small break LOCA (SBLOCA).

4. On page 4-13, Framatome states: "Differential dilation is a term that is used to refer to the interface between the tube outer diameter (OD) and the tubesheet bore diameter, which allows a comparison of the relative interface of the joint for any transient condition. The differential dilation is equal to the tubesheet bore dilation (due to tubesheet bowing and free thermal growth) minus the tube dilation (due to internal pressure and free thermal growth). A positive value indicates that the increase in bore diameter is greater than the increase in the tube OD with a reduced interference within the rolled joint. A negative value indicates that the tube free expansion would be greater than the bore expansion resulting in an increase in the interference pressure of the rolled joint. The differential dilations are expressed as diametrical changes along two perpendicular axes. "Radial" refers to the dilation along the radius from OTSG center to the tube centerline and "circumferential" refers to the dilation perpendicular to the radial dilation."

   In Tables 5-3 to 5-8, clarify the physical representation of both the major and minor differential dilations having positive values. Clarify if there is a reduced (or no) contact between the tube and tubesheet. Clarify the relationship between the "major and minor" differential dilations (Tables 5-1, 5-2, 5-3, 5-4, and 5-6) and "radial and circumferential" differential dilations (Tables 4-1 and 4-2).

5. On page 5-1, Framatome states that: "However, the lower tubesheet crevice is known to contain solid particles in the sludge that collect in this region. Previous testing had demonstrated that leak rates are much higher for repair rolls without crevice deposits. Therefore, leak tests performed without crevice deposits provided conservative leak rates for upper tubesheet and lower tubesheet repair rolls. In addition, previous testing has shown that the joint strength is higher for rolled joints with deposits. Therefore, testing without crevice deposits is conservative for both leakage and structural integrity." This license amendment request seeks to remove the restriction on lower tube sheet area rerolling. The operating experience with rerolled tubes in some PWRs indicates that crevice deposits may be a significant contributor to a reduction in the leakage integrity of rerolled tubes. Discuss the basis for the assumption of superior leakage integrity and joint strength for repair rolls with crevice deposits. Provide the results of the previous testing cited in the above discussion.

6. On page 5-1, Framatome states that: "Previous testing has shown that cyclic loading associated with normal operating and steam generator transient conditions does not degrade the integrity of the repair roll. Cyclic loading has been shown to result in higher joint strength for both high yield and low yield tubing. Previous repair roll leak tests resulted in higher leakage for test samples without deposits that were not subjected to cyclic loading prior to testing than for samples with deposits that were subjected to cyclic loading prior to testing. Therefore, all leak and load testing to support this qualification of the repair was conservatively performed on samples that were not subjected to cyclic

loading." Discuss the basis for the assumption of superior leakage integrity and joint strength for repair rolls subjected to cyclic loading. Provide the results of previous testing cited in the above discussion.

7. On page 9-1, Framatome states that: "Two single 1-inch repair rolls or any overlapping repair roll that results in a maximum of 50 lbs additional compressive load may be installed at a qualified location in any one tube. Additional repair rolls may be installed on a case-by-case basis by evaluating for acceptable compressive tube loads." The license amendment request seeks to remove the limitation of only one reroll per SG tube. Discuss how to evaluate acceptable maximum compressive tube loads to determine how may additional repair rolls may be installed in a single tube. It should be noted that Oconee has committed to a maximum of 50 pounds additional compressive load per tube as a result of the reroll process.

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/RA/

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