

September 29, 2005

Mr. Jeffrey S. Forbes
Site Vice President
Arkansas Nuclear One
Entergy Operations, Inc.
1448 S. R. 333
Russellville, AR 72801

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT NO. 1 - RE: THE NUCLEAR REGULATORY
COMMISSION STAFF ASSESSMENT OF THE SPRING 2004 ONCE-
THROUGH STEAM GENERATORS TUBE INSPECTIONS (TAC NO. MC4068)

Dear Mr. Forbes:

By letters dated May 10, 2004 (Agencywide Documents and Access Management System (ADAMS) Accession No. ML041340444), and August 3, 2004 (ADAMS Accession No. ML042240207), Entergy Operations, Inc. (Entergy), licensee for Arkansas Nuclear One Unit 1 (ANO-1), provided its spring 2004 (1R18) C-3 and 90-day once-through steam generator (OTSG) tube inspection reports. By letters dated March 9, 2005 (ADAMS Accession No. ML051450296), June 27, 2005 (ADAMS Accession No. ML051790353), and August 8, 2005 (ADAMS Accession No. ML052230276), the licensee provided responses to the staff's requests for additional information on these submittals. Additional information concerning the 2004 steam generator tube inspections was summarized by the NRC staff in a letter dated July 1, 2004 (ADAMS Accession No. ML041830595).

As discussed in the enclosed evaluation summary, the NRC staff concludes that the licensee provided the information required by the Technical Specifications. In addition, the staff did not identify any technical issues that warranted follow up action at this time, with the exception of an issue that is being addressed by the Babcock and Wilcox (B&W) Owner's Group (B&WOG), separately, as noted below.

Our review did not address Entergy's determination of the acceptability of its best-estimate, primary-to-secondary leakage expected for a large-break, loss-of-coolant accident (LBLOCA). This best-estimate determination was performed to satisfy a commitment that Entergy made in support of License Amendment 212, dated March 28, 2001, to permit the use of a re-roll repair process for the ANO-1 OTSGs.

Jeffrey S. Forbes

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The B&WOG is addressing the LBLOCA of concern on a generic basis in a topical report that will be applicable to ANO-1. A meeting between the NRC staff and the B&WOG was held on February 24, 2005 (ADAMS Accession No. ML050880313), and a follow-up telephone conference call was held on April 26, 2005. The NRC staff understands that the B&WOG plans to submit its topical report during the next year. The NRC staff believes that the generic B&WOG program is the proper place to address the LBLOCA issue since the technical nature of this issue is complex, and the issue is generic to B&W plants.

Sincerely,

/RA/

Mohan C. Thadani, Senior Project Manager, Section 1
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-313

Enclosure: Safety Evaluation

cc w/encl: See next page

Jeffrey S. Forbes

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Sincerely,

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Mohan C. Thadani, Senior Project Manager, Section 1
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-313

Enclosure: Summary of Evaluation

cc w/encl: See next page

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SUMMARY OF EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO RENEWED FACILITY OPERATING LICENSE NO. DPR-51

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT NO. 1

DOCKET NO. 50-313

(TAC NO. MC4068)

By letters dated May 10, 2004 (Agencywide Documents and Access Management System (ADAMS) Accession No. ML041340444), and August 3, 2004 (ADAMS Accession No. ML042240207), Entergy Operations, Inc., the licensee for Arkansas Nuclear One Unit 1 (ANO-1), provided the spring 2004 (1R18) C-3 and 90-day once-through steam generator (OTSG) tube inspection reports. By letters dated March 9, 2005 (ADAMS Accession No. ML051450296), June 27, 2005 (ADAMS Accession No. ML051790353), and August 8, 2005 (ADAMS Accession No. ML052230276), the licensee provided responses to the staff's requests for additional information on the submittals. Additional information concerning the 2004 steam generator tube inspections was summarized by the NRC staff in a letter dated July 1, 2004 (ADAMS Accession No. ML041830595).

ANO-1 has two Babcock and Wilcox (B&W) OTSGs. Each OTSG contains approximately 15,500 mill-annealed (sensitized) Alloy 600 tubes. Each tube has an outside diameter (OD) of 5/8-inch. The tubes are straight and supported by 15 carbon steel tube support plates (TSPs). The tubes are roll expanded into both the lower (cold-leg) and upper (hot-leg) tubesheet. The Technical Specifications (TS) include: (1) provision for sleeve repairs, (2) provision for re-roll repairs, (3) alternate repair criteria (ARC) applicable to axial tube-end cracks that do not extend beyond the cladding interface and into the carbon steel portion of the tubesheet, and (4) ARC applicable to OD intergranular attack (IGA) occurring within the thickness of the upper tubesheet (UTS) in both steam generators. The latter ARC allow the tubes with IGA indications to remain in service, provided certain growth and leakage criteria are satisfied.

The licensee provided the scope, extent, methods, and results of the OTSG 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 significant aspects of the inspection is provided below.

The number of tubes identified as having axially-aligned IGA indications on the tube OD in the freespan regions increased significantly during 1R18 and exceeded the estimate in the operational assessment. The increase in the number of tubes was attributed to a broadening of the eddy current inspection criteria for identifying freespan indications based on industry

Enclosure

experience, and included identifying indications that had high phase signals (i.e., very low to zero percent throughwall indications). This practice, put into place during 1R18, resulted in a significant number of additional indications being identified.

As planned, a 20% sample of dents with voltages (as measured by bobbin coil) greater than 2.0 volts in the superheated region (i.e., the region above the 8th TSP) were to be examined using a motorized rotating pancake coil (MRPC). The result of finding an indication in the initial sample, and the results of subsequent sample examinations, led the licensee to eventually expand the MRPC inspection to include a 100% review of the dents from the 7th TSP to three inches above the secondary face of the UTS in OTSG "B." A total of eight axial indications were detected in OTSG "B." A similar inspection scope expansion in OTSG "A" was not performed.

The licensee noted a 30% increase in tube-end cracking in both OTSGs since the previous outage. The staff notes that the probability of detection factor accounts for an increase in tube-end cracking of approximately 20%. Given the margins in the accident-induced leakage estimates for the increase in the number of indications, and the planned OTSG replacement in the fall of 2005, the NRC staff determined that no followup was necessary on this issue. Also, the NRC staff notes that 1R18 is scheduled to be the last outage before OTSG replacement.

The licensee's response to Generic Letter 2004-01, "Requirements for Steam Generator Tube Inspections," is being reviewed separately. As a result, this review does not address the specific issues raised in the generic letter.

Based on a review of the information provided, the staff concludes that the licensee provided the information required by the TS. The staff also concludes that there are no technical issues that warrant followup 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, with the exception of the issue of best-estimate, primary-to-secondary leakage expected for a large-break, loss-of-coolant accident. That issue is being addressed separately with the B&W Owners Group on a generic basis for all B&W plants.

Principal Contributor: J. Terrell

Date: September 29, 2005

Arkansas Nuclear One

cc:

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September 2005