

May 28, 2003

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

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT NO. 2 - ISSUANCE OF AMENDMENT
RE: ONE-TIME CHANGE OF STEAM GENERATOR TUBE INSPECTION
FREQUENCY (TAC NO. MB6808)

Dear Mr. Anderson:

The Commission has issued the enclosed Amendment No. 247 to Facility Operating License No. NPF-6 for Arkansas Nuclear One, Unit No. 2 (ANO-2). This amendment consists of changes to the Technical Specifications (TSs) in response to your application dated November 22, 2002, as supplemented by letter dated March 13, 2003.

The amendment allows for a one-time change to revise the steam generator inservice inspection frequency requirements in TS 4.4.5.3.a to allow a 40-month inspection interval after one inspection, rather than after two consecutive inspections, based on the results falling into the C-1 classification.

A copy of our related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,

/RA/

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

Docket No. 50-368

Enclosures:

1. Amendment No. 247 to NPF-6
2. Safety Evaluation

cc w/encls: See next page

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**No legal objection

*no substantive change to SE input

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ENERGY OPERATIONS, INC.

DOCKET NO. 50-368

ARKANSAS NUCLEAR ONE, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 247
License No. NPF-6

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Entergy Operations, Inc. (the licensee), dated November 22, 2002, as supplemented by letter dated March 13, 2003, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this license amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-6 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 247, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. The license amendment is effective as of its date of issuance and shall be implemented within 60 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Robert A. Gramm, Chief, Section 1
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical
Specifications

Date of Issuance: May 28, 2003

ATTACHMENT TO LICENSE AMENDMENT NO. 247

FACILITY OPERATING LICENSE NO. NPF-6

DOCKET NO. 50-368

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove

3/4 4-8

Insert

3/4 4-8

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 247 TO

FACILITY OPERATING LICENSE NO. NPF-6

ENERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT NO. 2

DOCKET NO. 50-368

1.0 INTRODUCTION

By application dated November 22, 2002, as supplemented by letter dated March 13, 2003, Entergy Operations, Inc. (the licensee), requested changes to the Technical Specifications (TSs) for Arkansas Nuclear One, Unit No. 2 (ANO-2). The supplemental letter dated March 13, 2003, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on December 24, 2002 (67 FR 78520).

The requested changes would revise the steam generator (SG) inservice inspection frequency requirements in TS 4.4.5.3.a. Specifically, the proposed changes would allow a one-time 40-month inspection interval after the first (post replacement) inservice inspection resulting in a C-1 classification, rather than after two consecutive inspections resulting in a C-1 classification.

2.0 REGULATORY EVALUATION

General Design Criterion 32 (Inspection of Reactor Coolant Pressure Boundary) of Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50 states, in part, that components which are part of the reactor coolant pressure boundary shall be designed to permit periodic inspection and testing of important areas and features to assess their structural and leaktight integrity. The TS surveillance requirements for inspection of the SGs ensure that the structural integrity of the SG portion of the reactor coolant system will be maintained. The proposed change only impacts the frequency of inspection of the SG pressure boundary and does not affect the ability of the boundary to be inspected.

The licensee replaced the SGs at ANO-2 during the refueling outage in the Fall of 2000 (2R14). The replacement SGs were the Westinghouse Electric Company (Westinghouse) Delta 109 SG design with thermally treated Alloy 690 tubes. The first inservice inspection of the SG was performed during the refueling outage in the Spring of 2002 (2R15). Very minor service-induced degradation of the SG tubes was identified during this inspection. The licensee stated

that the 2R15 inspection results, in conjunction with the improved Westinghouse replacement SG design, provide the basis for the proposed TS amendment.

The current TS (4.4.5.3.a) requires that, following the initial inspection of the SG tubes, "Subsequent inservice inspections shall be performed at intervals of not less than 12 nor more than 24 calendar months...." In accordance with the extension criteria in TS 4.4.5.3.a, "If two consecutive inspections following service under AVT [all-volatile-treatment] conditions, not including the preservice inspection, result in all inspection results falling into the C-1 category or if two consecutive inspections demonstrate that previously observed degradation has not continued and no additional degradation has occurred, the inspection interval may be extended to a maximum of once per 40 months." The C-1 category is defined as less than 5 percent of the total tubes inspected are degraded (i.e., contain defects greater than or equal to 20 percent throughwall) and none of the inspected tubes are defective (i.e., contain defects greater than or equal to 40 percent throughwall).

The proposed TS amendment requests a one-time exception to the extension criteria. The licensee proposed the following addition to its TS: "A one-time inspection interval of a maximum of once per 40 months is allowed for the inspection performed immediately following the 2R15 outage. This is an exception to 4.4.5.3.a in that the interval extension is based on all of the results of one inspection falling into the C-1 category." Approval of this TS change request would allow the licensee to omit the inspection of the SGs during the next scheduled refueling outage, 2R16. The licensee wishes to eliminate the 2R16 inspection because of the time, dosage, and cost that is associated with it.

3.0 TECHNICAL EVALUATION

3.1 SG Design Improvements

The replacement SGs incorporate a number of design and material improvements to address problems with the original SG design as determined by industry experience. Examples of these improvements are listed below.

- The replacement SG tubing is made of thermally-treated Alloy 690 material which has an increased resistance to stress corrosion cracking (SCC) over the original mill annealed Alloy 600 SG tubing. The thermally-treated Alloy 690 material has a 13 percent higher chromium content and a corresponding reduced nickel content when compared to the original mill annealed Alloy 600 SG tubing. The higher chromium content reduces the degree of sensitization of the material, thus increasing resistance to corrosion attack. In addition, heat treatment of the Alloy 690 material was optimized for SCC resistance. Industry has conducted extensive laboratory tests that demonstrate Alloy 690's superior ability to resist primary and secondary SCC, pitting, and general corrosion when compared to mill annealed Alloy 600.
- The replacement SG employs five sets of Type 405 stainless steel anti-vibration bars (AVBs) in the U-bend region of the tubes to provide support in regions that are potentially susceptible to vibration and wear. These AVBs are inserted to different depths in adjacent columns in order to minimize the pressure drop across the U-bend region and discourage the stagnation of flow.

- The replacement SG tubes are supported by eight tube support plates constructed of Type 405 ferritic stainless steel. This material prevents tube denting due to tube support plate corrosion.
- The replacement SG tube support plate design is flat contact broached trifoil. The broached trifoil design reduces tube-to-tube support plate crevice area while providing for maximum steam and water flow in the open areas adjacent to the tube.
- The replacement SG tubes are hydraulically expanded at the tube-to-tubesheet joint, which minimizes the tube-to-tubesheet crevice. Hydraulic expansion provides tight dimension control and minimal residual stress, thus minimizing the potential for corrosion.
- The replacement SG has a larger sludge lancing lane than the original SG. This was made possible by reducing tube diameter and pitch. A larger sludge lancing lane allows for greater sludge removal capabilities.

The NRC staff finds that the replacement SG's design and material improvements should enhance the SG tubing's resistance to service-induced degradation of the type experienced with the original SGs. The SGs should be particularly resistant to degradation during the initial cycles of operation.

3.2 First Inservice SG Inspection, Spring 2002

The licensee stated that during refueling outage 2R15, following the first cycle of operation since the SG replacement, 100 percent of the tubes in both SGs were inspected full-length with an eddy current probe containing a bobbin coil. In addition, any indication that was given an I-Code during the bobbin inspection was further inspected with a +Point™ coil. An I-Code was given to any indication that could potentially be a result of tube degradation. Inspections with a +Point™ coil were also performed on 100 percent of the row 1 and 2 tubes in the U-bend region.

A total of 26 bobbin I-Code indications were further investigated with a +Point™ coil. These inspections revealed that three of the indications were due to inservice degradation. Two of the indications were attributed to a loose part that was located and removed during the outage. The loose part was a corkscrew shaped piece of metal that was likely the result of SG replacement activities during the previous outage. The two tubes affected by the loose part were further analyzed, and it was determined that the depth of the wear was well below the limits for leakage and burst. The third indication attributed to inservice degradation was an AVB wear scar. This indication was also determined to be well below the limits for leakage and burst. The licensee determined that the depth of these three indications was less than or equal to 18 percent throughwall.

The licensee performed a condition monitoring assessment to evaluate the as found condition of the SG tubes based on eddy current inspection results. The licensee concluded that all performance criteria had been met.

The licensee also performed an operational assessment to evaluate the predicted condition of the SG tubing after the proposed extended inspection interval. They concluded that all structural and accidental leakage performance criteria are predicted to be met through the 2R17 inspection scheduled for the Spring of 2005.

The staff finds that the eddy current inspection scope, the inspection results, the condition monitoring assessment, and the operational assessment performed by the licensee were comprehensive and provide assurance that unexpected degradation of SG tubing has not occurred and is not expected to occur over the proposed inspection interval extension.

3.3 Related Industry Operating Experience

The only existing damage mechanism in the ANO-2 SGs is wear. Based on industry operating experience, the licensee expects that the number of wear indications in the SGs will increase over time; however, they do not believe that the severity of the wear will increase. The licensee stated that other replacement SGs, similar to the replacement SGs at ANO-2, have not experienced large degrees of wear to date. Specific plants cited include D.C. Cook Unit 2, Farley Units 1 and 2, and South Texas Unit 1. The staff agrees with this assessment.

The licensee stated that relevant operating experience is gathered and communicated by ANO's industry events department. ANO also participates in the Electric Power Research Institute's Technical Advisory Group. This group meets three times each year to discuss relevant industry information. Through these channels, the licensee will remain cognizant of and act accordingly in response to any issues that may arise pertaining to their replacement SGs in ANO-2.

In view of the above, the NRC staff finds that the industry operating experience with replacement SGs supports the licensee's proposal for an extended inspection interval.

3.4 Evaluation Summary

The staff finds that the improved design features and the material improvements incorporated in ANO-2's replacement SGs are expected to improve the SG tubing's resistance to all forms of service induced degradation. The inspection performed in refueling outage 2R15 indicates that the tubing is experiencing very minor service-induced degradation and can safely be operated during the proposed extension. Additionally, industry operating experience with thermally treated Alloy 690 tubing provides further assurance that the SGs can be safely operated until the 2R17 inspection in the Spring of 2005 without an inspection. For these reasons, the staff finds that the proposed TS changes are acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Arkansas State official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes surveillance requirements. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (67 FR 78520, dated December 24, 2002). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: M. Yoder

Date: May 28, 2003

Arkansas Nuclear One

cc:

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