Septemb 14, 1999

Mr. C. Randy Hutchinson
Vice President, Operations ANO
Entergy Operations, Inc.
1448 S. R. 333
Russellville, AR 72801

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT NO. 1 - ISSUANCE OF AMENDMENT RE: ALTERNATE REPAIR CRITERIA FOR AXIAL TUBE END CRACKING (TAC NO. MA5557)

Dear Mr. Hutchinson:

The Commission has issued the enclosed Amendment No. 201 to Facility Operating License No. DPR-51 for Arkansas Nuclear One, Unit No. 1. The amendment consists of changes to the Technical Specifications (TSs) in response to your application dated June 1, 1999, as supplemented by letters dated July 29 and August 19, 1999.

The amendment implements alternate repair criteria to allow steam generator tubes having axial tube end crack indications in the upper and lower tubesheet to remain in service. The staff concluded that the proposed alternate repair criteria for axial tube end crack indications in the upper and lower tubesheets are acceptable.

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,

/s/

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

Docket No. 50-313
Enclosures: 1. Amendment No. 201 to DPR-51
2. Safety Evaluation
cc w/encls: See next page

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cc:
Executive Vice President
& Chief Operating Officer
Entergy Operations, Inc.
P. O. Box 31995
Jackson, MS 39286-1995

Director, Division of Radiation
Control and Emergency Management
Arkansas Department of Health
4815 West Markham Street, Slot 30
Little Rock, AR 72205-3867

Winston & Strawn
1400 L Street, N.W.
Washington, DC 20005-3502

Manager, Rockville Nuclear Licensing
Framatone Technologies
1700 Rockville Pike, Suite 525
Rockville, MD 20852

Senior Resident Inspector
U.S. Nuclear Regulatory Commission
P. O. Box 310
London, AR 72847

Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

County Judge of Pope County
Pope County Courthouse
Russellville, AR 72801

Vice President, Operations Support
Entergy Operations, Inc.
P. O. Box 31995
Jackson, MS 39286-1995

Wise, Carter, Child & Caraway
P. O. Box 651
Jackson, MS 39205

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

ENTERGY OPERATIONS INC.

DOCKET NO. 50-313

ARKANSAS NUCLEAR ONE, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 201
License No. DPR-51

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Entergy Operations, Inc. (the licensee) dated June 1, 1999, as supplemented by letters dated July 29 and August 19, 1999, 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.

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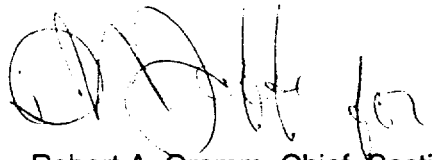
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. DPR-51 is hereby amended to read as follows:

   2. Technical Specifications

      The Technical Specifications contained in Appendix A, as revised through Amendment No. 201 , 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 prior to reactor startup after refueling outage 1R15.

FOR THE NUCLEAR REGULATORY COMMISSION



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

Attachment: Changes to the Technical Specifications

Date of Issuance: September 14, 1999

ATTACHMENT TO LICENSE AMENDMENT NO. 201

FACILITY OPERATING LICENSE NO. DPR-51

DOCKET NO. 50-313

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 | Insert |
|---|---|
| 110k | 110k |
| 110m | 110m |
| 110m1 | 110m1 |
| -- | 110m2 |
| 110n | 110n |

A t\ inspection (pursuant to Speci .tion 4.18.5.a.9) shall be performed on each selected tube. If any selected tube does not permit the passage of the eddy current probe for a tube inspection, this shall be recorded and an adjacent tube shall be selected and subjected to a tube inspection.

3. Tubes in the following groups may be excluded from the first random sample if all tubes in a group in both steam generators are inspected. The inspection may be concentrated on those portions of the tubes where imperfections were previously found. No credit will be taken for these tubes in meeting minimum sample size requirements. Where only a portion of the tube is inspected, the remainder of the tube will be subjected to the random inspection.

   (1) Group A-1: Tubes within one, two or three rows of the open inspection lane.

   (2) Group A-2: Unplugged tubes with sleeves installed.

   (3) Group A-3: Tubes in the wedge-shaped group on either side of the lane region (Group A-1) as defined by Figure 4.18.1.

4. Tubes with axially-oriented tube end cracks (TEC) which have been left inservice for the previous cycle shall be inspected with a rotating coil eddy current technique in the area of the TEC and characterized in accordance with topical report BAW-2346P, Rev.0, during all subsequent SG inspection intervals pursuant to 4.18.4. The results of this examination may be excluded from the first random sample. Tubes with axial TECs identified during previous inspections which meet the criteria to remain in service will not be included when calculating the inspection category of the OTSG.

b. All tubes which have been repaired using the reroll process will have the new roll area inspected during the inservice inspection.

c. The second and third sample inspections during each inservice inspection as required by Table 4.18-2 may be less than a full tube inspection by concentrating the inspection on those areas of the tube sheet array and on those portions of the tubes where tubes with imperfections were previously found.

The results of each sample inspection shall be classified into one of the following three categories:

| Category | Inspection Results |
|---|---|
| C-1 | Less than 5% of the total tubes inspected are degraded tubes and none of the inspected tubes are defective. |
| C-2 | One or more tubes, but not more than 1% of the total tubes inspected, are defective, or between 5% and 10% of the total tubes inspected are degraded tubes. |
| C-3 | More than 10% of the total tubes inspected are degraded tubes or more than 1% of the inspected tubes are defective. |

the first sample inspection specified in Table 4.18-2. If the degradation mechanism which caused the leak is limited to a specific portion of the tube length, the inspection per this paragraph may be limited to the affected portion of the tube length. If the results of this inspection fall into the C-3 category, all of the tubes in the same group in the other steam generator will also be similarly inspected.

If the leaking tube has been repaired by the reroll process and is leaking in the new roll area, all of the tubes in the steam generator that have been repaired by the reroll process will have the new roll area inspected. If the results of this inspection fall into the C-3 category, all of the tubes with rerolled areas in the other steam generator will also be similarly inspected. This inspection will be in lieu of the first sample inspection specified in Table 4.18-2.

2. A seismic occurrence greater than the Operating Basis Earthquake,

3. A loss-of-coolant accident requiring actuation of the engineered safeguards, or

4. A main steam line or feedwater line break.

4.18.5 Acceptance Criteria

a. As used in this specification:

1. Tubing or Tube means that portion of the tube or sleeve which forms the primary system to secondary system pressure boundary.

2. Imperfection means an exception to the dimensions, finish or contour of a tube from that required by fabrication drawings or specifications. Eddy current testing indications below 20% of the nominal tube wall thickness, if detectable, may be considered as imperfections.

3. Degradation means a service-induced cracking, wastage, wear or general corrosion occurring on either the inside or outside of a tube.

4. Degraded Tube means a tube containing imperfections $\leq$ 20% of the nominal wall thickness caused by degradation, except where all degradation has been spanned by the installation of a sleeve.

5. % Degradation means the percentage of the tube wall thickness affected or removed by degradation.

6. Defect means an imperfection of such severity that it exceeds the plugging limit except where the imperfection has been spanned by the installation of a sleeve. A tube containing a defect in its pressure boundary is defective.

7. Plugging Limit means the imperfection depth at or beyond which the tube shall be restored to serviceability by the installation of a sleeve, rerolled, or removed from service because it may become unserviceable prior to the next inspection; it is equal to 40% of the nominal tube wall thickness. Axially-oriented TEC indications in the tube that do not extend beyond the adjacent cladding portion of the tube sheet into the carbon steel portion are not included in this definition. These indications shall be assessed for continued plant operation in accordance with topical report BAW-2346P, Rev. 0.

The reroll repair process will only be used to repair tubes with defects in the upper tubesheet area. The reroll repair process will be performed only once per steam generator tube using a 1 inch roll length. The new roll area must be free of detectable degradation in order for the repair to be considered acceptable. The reroll repair process is described in the topical report, BAW-10232P, Revision 00.

8. Unserviceable describes the condition of a tube if it leaks or contains a defect large enough to affect its structural integrity in the event of an Operating Basis Earthquake, a loss-of-coolant accident, or a steam line or feedwater line break as specified in Specification 4.18.4.c.

9. Tube Inspection means an inspection of the steam generator tube from the point of entry completely to the point of exit. For tubes that have been repaired by the reroll process within the upper tubesheet, that portion of the tube above 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.

b. The steam generator shall be determined operable after completing the corresponding actions (plug, reroll, or sleeve all tubes exceeding the plugging limit and all tubes containing non-TEC through-wall cracks) required by Table 4.18-2 with the following exception:

Tubes with outer diameter intergranular attack indications within the upper tubesheet with potential of through-wall depths greater than the plugging limit, located by eddy current between 2.75 inches above the secondary face and below the roll transition, may remain in service for Cycle 15 contingent upon the following conditions:

1. One hundred percent of the unsleeved tubes are examined by bobbin coil eddy current in the upper tubesheet region during the fourteenth refueling outage,

2. Bobbin coil indications in the upper tubesheet region are examined by rotating pancake coil eddy current and confirmed to be volumetric,

3. A comparison shall be made between the bobbin coil voltage measured during the thirteenth refueling outage for the confirmed indications and the bobbin coil voltage for the same indications measured during the fourteenth refueling outage. The comparison shall confirm essentially no increase in voltage on average,

4. Tubes containing indications with bobbin coil voltage amplitudes > 0.7 volt and having growth > 0.3 volt since the last inspection shall be plugged or repaired, and

5. In-situ pressure testing in the "A" steam generator during the fourteenth refueling outage confirms, at a 95% confidence level, that the bounding accident leakage due to volumetric ODIGA flaws within the upper tubesheet region will be less than 0.5 gallon per minute due to a main steam line break.

4.18.6 Reports

Following each inservice inspection of steam generator tubes, the complete results of the inspection shall be reported to the NRC. This report, to be submitted within 90 days of inspection completion, shall include:

a. Number and extent of tubes inspected;

b. Location and percent of wall-thickness penetration for each indication of an imperfection;

c. Identification of tubes plugged and tubes sleeved;

d. Number of tubes repaired by rerolling and number of indications detected in the new roll area of the repaired tubes; and

e. Summary of the condition monitoring and operational assessment results when applying TEC alternate repair criteria.

This report shall be in addition to a Special Report (per Specification 6.12.5.d) required for the results of steam generator tube inspections which fall into Category C-3 as denoted in Table 4.18-2. The Commission shall be notified of the results of steam generator tube inspections which fall into Category C-3 prior to resumption of plant operation. The written Special Report shall provide a description of investigations conducted to determine cause of the tube degradation and corrective measures taken to prevent recurrence.

Bases

The surveillance requirements for inspection of the steam generator tubes ensure that the structural integrity of this portion of the RCS will be maintained. The program for inservice inspection of steam generator tubes is based on a modification of Regulatory Guide 1.83, Revision 1. Inservice inspection of steam generator tubing is essential in order to maintain surveillance of the conditions of the tubes in the event that there is evidence of mechanical damage or progressive degradation due to design, manufacturing errors, or inservice conditions that lead to corrosion. Inservice inspection of steam generator tubing also provides a means of characterizing the nature and cause of any tube degradation so that corrective measures can be taken.

In general, steam generator tubes that are degraded beyond the repair limit can either be plugged, sleeved, or rerolled. The steam generator tubes that are plugged are removed from service by the installation of plugs at both ends of the associated tube and thus completely removing the tube from service. When the tube end cracking (TEC) alternate repair criteria is applied, axially-oriented indications found not to extend from the tube sheet cladding region into the carbon steel region may be left in service under the guidelines of topical report BAW-2346P, Rev. 0. Following a SG inspection, an operational assessment is performed to ensure primary-to-secondary leaks rates will be maintained within the assumptions of the accident analysis.

Degraded steam generator tubes can also be repaired by the installation of sleeves which span the area of degradation and serve as a replacement pressure boundary for the degraded portion of the tube, thus permitting the tube to remain in service.

Degraded steam generator tubes can also be repaired by the rerolling of the tube in the upper tubesheet to create a new roll area and pressure boundary for the tube. The rerolling methodology establishes a new pressure boundary below the degradation, thus permitting the tube to remain in service. The degraded tube above the new roll area can be excluded from future periodic inspection requirements because it is no longer part of the pressure boundary once the repair roll is installed in the upper tubesheet. The rerolling repair process will only be used to repair defects in the upper tubesheet in accordance with BAW-10232P, Revision 00.

All tubes which have been repaired using the reroll process will have the new roll area inspected during future inservice inspections. Defective or degraded tube indications found in the new roll and any indications found in the original roll need not be included in determining the Inspection Results Category for the generator inspection.

The reroll repair process will only be used to repair tubes with defects in the upper tubesheet area. The reroll repair process will be performed only once per steam generator tube using a 1 inch roll length. Thus, multiple applications of the reroll process to any individual tube is not acceptable. The new roll area must be free of detectable degradation in order for the repair to be considered acceptable. After the new roll area is initially deemed acceptable, future degradation in the new roll area will be analyzed to determine if the tube is defective and needs to be removed from service. The reroll repair process is described in the topical report, BAW-10232P, Revision 00.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 201 TO

FACILITY OPERATING LICENSE NO. DPR-51

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT NO. 1

DOCKET NO. 50-313

## 1.0 INTRODUCTION

By letter dated June 1, 1999, as supplemented by letters dated July 29 and August 19, 1999, Entergy Operations, Inc. (the licensee), submitted a request for changes to the Arkansas Nuclear One, Unit No. 1 (ANO-1), Technical Specifications (TSs). The requested changes would implement an alternate repair criteria that would allow steam generator tubes having axial tube end crack (TEC) indications in the upper and lower tubesheet to remain in service.

The technical basis for the alternate repair criteria is contained in the Babcock & Wilcox Owners Group Topical Report, BAW-2346, "Alternate Repair Criteria for Tube End Cracking in the Tube-to-Tubesheet Roll Joint of Once Through Steam Generators," Revision 0 (proprietary). Framatome performed analysis and testing for the alternate repair criteria and prepared the topical report for the owners group.

The July 29 and August 19, 1999, letters provided clarifying information that did not change the scope of the June 1, 1999, application and the initial proposed no significant hazards consideration determination.

## 2.0 BACKGROUND

In recent years, licensees have detected eddy current indications in the steam generator tubes near the upper tube end in once through steam generators (OTSGs) at some Babcock & Wilcox nuclear plants. The indications were characterized initially as tube end anomalies instead of cracking at the time of discovery because they were located above the primary face of the upper tubesheet and were considered outside of the portion of the tubes forming the primary system pressure boundary. Subsequent inspections have shown that some tube end anomalies have grown into the cladding region and, therefore, have been considered as inside the primary system pressure boundary. Subsequently, the tube end anomalies have been referred to as TEC indications.

The steam generator inspection data from various Babcock & Wilcox nuclear units have shown that TEC indications are initiated on the inside surface of the tubes and are typically short and axially oriented. They are usually located in the rolled portion of the tube near the heat affected zone created by the tube-to-tubesheet seal weld. The degradation mechanism has been

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identified as primary water stress corrosion cracking, which is caused by residual stresses from the rolling of the joints in the tubesheet and from the seal weld.

The topical report delineates the following requirements and limitations for application of the proposed alternate repair criteria:

1. Under the alternate repair criteria, axially oriented indications in tube ends located adjacent to the cladding region of the tube-to-tubesheet rolled joint, or in the portion of the tube protruding from the cladding will be allowed to remain in service without repair. "Adjacent to the cladding" refers to the portion of the tube that was rolled into the tubesheet cladding, as opposed to the portion of the tube that was rolled into the carbon steel portion of the tubesheet.

2. The alternate repair criteria does not apply to tube ends with circumferential, mixed mode, or volumetric indications.

3. The alternate repair criteria does not apply to tubes with any portion of an axial TEC indication that extends into the carbon steel region of the tubesheet.

4. The alternate repair criteria will only apply to those tubesheets whose cladding thickness is less than 0.625 inch. The cladding at ANO-1 has been measured to be about 0.25 inch.

5. The combined total leakage from all primary-to-secondary sources, including TEC indications left in service shall not exceed the main steamline break accident leakage limit (1 gallon per minute (gpm) for ANO-1) minus operational leakage (150 gallons per day per steam generator for ANO-1). For tubes with multiple indications, a separate leak rate for each indication must be used.

6. A plant-specific analysis for detected TEC indications must be performed to establish a plant-specific growth rate or to verify the applicability of the generic growth rate in BAW-2346P.

7. The total number of detected TEC indications must be increased to account for the probability of detection when projecting TEC indications for the next operating cycle. This increase is specified to assess the population of undetected flaws.

8. Site-specific inspections of rolled joints are required to identify locations and orientation of TEC indications. The identification of the TEC indications shall include tube location within the bundle and crack location with respect to the clad-to-carbon steel interface.

## 3.0 EVALUATION

To determine the acceptability of the proposed alternate repair criteria, the staff evaluated structural and leakage integrity of the tubes with TEC indications, inspection methods, the proposed operational assessment, and TS wording.

3.1 Structural Integrity

Each end of the tube in OTSGs is hard rolled into the upper and lower tubesheets, respectively. The roll joint is about 1 inch long inside the tubesheet and the tube end is protruded about 0.2 inch beyond the primary face of the tubesheet. Of the 1 inch length of the roll joint, the cladding region of the tubesheet spans about 0.25 inch of that length and the rest of that roll length is spanned by the carbon steel region of the tubesheet. The upper and lower tubesheets provide a radial restraint to the hard roll portion of tubing, which precludes the possibility of tube burst at TEC locations. The tubesheet also limits the affected tubes from bending in the vicinity of the TEC indications. The potential failure mode, therefore, would only be associated with the tensile (axial) loads, which may cause the tube to fail within the rolled joint. The structural integrity is therefore dependent on the axial load carrying capability of the rolled joint and/or welds.

The structural integrity of the tube is maintained if the weld can be demonstrated to resist the axial tube loads without assistance from any frictional forces that may be available from the hard roll joint. Framatome has used a finite element analysis to qualify the structural integrity of the original fabrication fillet weld and the flush weld used to repair tube end damage at Crystal River 3 and Oconee Unit 1. The analysis assumes that the hard roll joint does not carry any portion of the tube loads. The analysis evaluated the welds using loads from normal operating transient conditions and accident conditions. It also considered all loading mechanisms including primary and secondary pressures, tube axial loads, and weld dilations. The analysis showed that the original fillet weld and the flush repair weld satisfy the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section III, for Class I components.

Based on Framatome's testing and the analysis performed, the staff finds the structural integrity of the TEC tubes acceptable.

3.2 Leakage Integrity

Framatome demonstrated the leakage integrity by leak testing. Framatome performed leak testing to determine leak rates for rolled joints with through-wall axial cracks of various lengths for both steady-state power and bounding accident transient conditions. Leak rates at steady-state power conditions were determined to compare with the allowable primary-to-secondary leakage limit. The leakage at accident conditions was determined to compare with allowable off-site dose leak limits.

Before leak testing, Framatome used a finite element model to analyze the structural behavior of the tubes to determine test parameters that would produce a weaker test roll joint, which in turn, would give maximum possible leak rates in the leakage test. The analyzed conditions included heatup, normal operating conditions, main steamline break, and small break loss-of-coolant accident. Framatome found that maximizing tube thickness, yield strength of the test tube and tubesheet bore diameter and minimizing the yield strength of the tested tubesheet, cladding thickness and roll joint torque would give the worst case leak rates in the leakage test.

Framatome fabricated 15 mockups to perform leakage tests. Each mockup included the simulated tubesheet with actual tubes rolled into the mockup block to form roll joints. The end of the test tubes is sealed with a fillet weld. Each test tube had a through-wall notch to

represent a TEC indication. The mockups were subjected to dilation to simulate steam generator conditions followed by axial load cycling to simulate the 40 years of plant operation.

The leakage rates for normal power operation and accident conditions were evaluated to determine the leakage integrity of TEC tubes. Framatome established the leak rates based on radial position of the tube in the tubesheet, axial tube loading, and tubesheet hole dilation in order to compensate for the tubesheet bowing. The leak rates that will be applied to TEC indications to calculate the total leakage were established based on the statistical analysis of leak rates obtained in the leak tests. In the statistical analysis, Framatome applied a 95/50 confidence limit (95 percent confidence level for 50 percent of the leakage population) to the leak rates obtained in the leak tests. The leak rates in the tests were very small compared to the leakage limits of 150 gallons per day for normal operation and the limit under accident conditions of 1 gpm.

Based on the Framatome's leakage testing, the staff finds that tubes with TEC indications have adequate leakage integrity.

3.3 Inspection Methods

The licensee stated that during each future inspection a rotating pancake coil will be used to inspect all hard roll expansions with known TEC indications, which were identified in inspections before the proposed amendment. The objective of inspecting previously known TEC indications is to monitor their growth from cycle to cycle. The growth is measured in terms of the distance between the tip of the TEC indication and the cladding-to-carbon steel tubesheet interface. The depth of the indications will not be measured because the licensee assumes that any detected axial TEC indication is 100 percent through-wall.

In future steam generator tube inspections, the licensee will inspect, on a sampling basis, those hard roll expansions in tube ends that have no previously known TEC indications using a rotating pancake coil. The inspection of these hard roll expansions will be based on EPRI [Electric Power Research Institute] Steam Generator Examination Guidelines, Revision 5. EPRI specifies a 20 percent sample of the tubes to be inspected during each of the subsequent inspections. The objective of inspecting these hard roll expansions is to identify new TEC indications. New TEC indications will be included in the surveillance list and will be inspected in subsequent inspections.

An inspection technique has been developed and qualified to locate axial TEC indications relative to the cladding-to-carbon steel interface. The licensee will use existing qualified techniques for flaw detection and orientation determinations. Framatome has qualified the inspection technique consistent with the intent and protocol of the EPRI Steam Generator Examination Guidelines, Revision 5. In addition, the rotating pancake coil (e.g., plus point coil) has been qualified in accordance with Appendix H of the EPRI Steam Generator Examination Guidelines, Revision 5, for detecting axial primary water stress corrosion cracking.

The staff finds that the licensee's proposed inspection methods and scope are acceptable.

3.4 Operational Assessment

The alternate repair criteria specify that at the end of each inspection, the licensee will perform an operational assessment to ensure that the estimated leakage from projected TEC indications at the end of the next operating cycle will not exceed the leakage limit under accident conditions. To project the TEC indications at the end of next cycle, the licensee will apply a probability of detection to the identified TEC indications from the current inspection. The application of the probability of detection will increase the total TEC indications to account for non-detected indications. The projected number of the TEC indications is calculated by dividing the number of detected TEC indications by the probability of detection and subtracting those TEC indications that have been plugged or repaired.

To project the total tube leakage, a leak rate is applied to each TEC indication according to its radial position within the tubesheet. The leak rates from all TEC indications are summed to obtain the total TEC leak rate, which is combined with all other known sources of primary-to-secondary leakage. The total projected leakage is compared to the accident leakage limit of 1 gpm. If the projected leakage exceeds the limit, the alternate repair criteria requires the licensee to repair TEC tubes until the leakage limit is satisfied.

During its review, the staff questioned the conservatism of Framatome's use of the 95/50 confidence limit in calculating the leak rate and in calculating a probability of detection that is derived based on a 90 percent confidence level. The 95/50 approach differs from the 95/95 confidence limit used in the Generic Letter (GL) 95-05 methodology for a total steam generator leak rate. The staff requested that the licensee address the conservatism of its total leakage calculation relative to a total leakage calculated at a probability of 0.95 to be an upper bound evaluated at the 95 percent confidence level.

The licensee stated that its leakage calculation methodology is conservative relative to the methodology in GL 95-05 because leakage tests were conducted conservatively in that (1) the testing parameters were used in the leakage tests to give the maximum leak rate, (2) the simulated flaws in the test are all 100 percent through-wall, which is conservative compared to the actual TECs in the field, and (3) in the leakage calculations, all TEC indications are assumed to be leaking, which is more conservative than actual field conditions.

Based on the staff's suggestion, the licensee did perform a total leakage calculation to obtain a 95/95 estimate using the methodology in GL 95-05. The results showed that the GL 95-05 methodology estimated a lower total leak rate of a steam generator than the total leak rate estimated by the methodology in the topical report. The staff believes that the methodology in GL 95-05 is a realistic bounding approach to leakage calculation. The methodology in the topical report provides even more conservative results than the GL 95-05 calculation and, therefore, is acceptable.

The licensee will evaluate and monitor the growth rate of TEC indications during each inspection to confirm that growth of TEC indications is insignificant. The length of the indication in the cladding is not of concern as long as the identified TEC indication does not grow and extend into the carbon steel region of the tubesheet. Current inspection data indicates that the growth rate of TEC is insignificant.

The staff believes that the inservice TEC indications do not significantly increase the risk associated with steam generator tube failure because the upper and lower tubesheets provide sufficient restraint to preclude tube burst under normal and postulated accident conditions, and tube leakage will be limited to the limit of 1 gpm in accordance with methodology specified in the topical report.

The staff finds the licensee's proposed operational assessment acceptable.

3.5 Technical Specification (TS) Changes

TS 4.18.3.a.4: The licensee proposed to add the following requirements to this TS section: "Tubes with axially-oriented tube end cracks (TEC) which have been left inservice for the previous cycle shall be inspected with a rotating coil eddy current technique in the area of the TEC and characterized in accordance with topical report BAW-2346P, Rev.0, during all subsequent SG [steam generator] inspection intervals pursuant to [TS] 4.18.4. The results of this examination may be excluded from the first random sample. Tubes with axial TECs identified during previous inspections which meet the criteria to remain in service will not be included when calculating the inspection category of the OTSG."

TS 4.18.5.a.7: This section defines the plugging limit. The licensee proposed the following requirements: "Axially-oriented TEC indications in the tube that do not extend beyond the adjacent cladding portion of the tube sheet into the carbon steel portion are not included in this definition. These indications shall be assessed for continued plant operation in accordance with topical report BAW-2346P, Rev. 0."

TS 4.18.5.b: The licensee proposed to specify that through-wall TEC indications meeting the alternate repair criteria may be remain in service.

TS 4.18.6: This section specifies the reporting requirements for results of steam generator tube inspections. The licensee proposed the following additional item to be included in the inspection report: "Summary of the condition monitoring and operational assessment results when applying TEC alternate repair criteria." The licensee also proposed to change the current 45 days to 90 days for submitting steam generator inspection reports.

Bases: The following paragraph is added to the Bases section: "When the tube end cracking (TEC) alternate repair criteria is applied, axially-oriented indications found not to extend from the tube sheet cladding region into the carbon steel region may be left in service under the guidelines of topical report BAW-2346P, Rev. 0. Following a SG inspection, an operational assessment is performed to ensure primary-to-secondary leak rates will be maintained within the assumptions of the accident analysis."

The staff finds that the proposed changes are acceptable based on the review of the information submitted. The staff finds the 90-day reporting period acceptable because the extended period of time would accommodate the preparation of condition monitoring and operational assessment reports describing TEC indications.

3.6 Evaluation Conclusion

The licensee demonstrated that the steam generator tubes having TEC indications that remain in service in accordance with the proposed alternate repair criteria will maintain adequate structural and leakage integrity. The staff concludes that the proposed changes to the technical specifications to implement the proposed alternate repair criteria 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 (64 FR 35205 dated June 30, 1999). 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 amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: John Tsao

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