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2CAN099503

U. S. Nuclear Regulatory Commission  
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Mail Station P1-137  
Washington, DC 20555

Subject: Arkansas Nuclear One - Unit 2  
Docket No. 50-368  
License No. NPF-6  
Proposed Technical Specification Change Adding a Repair Limit for  
Circumferential Cracks In Steam Generator Tubing

Gentlemen:

Attached for your review and approval is a proposed Arkansas Nuclear One, Unit 2 (ANO-2), technical specification (TS) change adding a repair limit specifically for circumferential cracks in the expansion transition region of the ANO-2 steam generators. Inspection and reporting requirements specific to the use of the new repair limit are also added. This change deletes the requirement to repair through-wall cracks which are within the repair limit and also reduces the primary-to-secondary leak rate limit through each steam generator.

On August 28, 1995, Entergy Operations submitted for the NRC staff's review and approval an evaluation justifying use of a 40% degraded area repair limit for circumferential cracks in the expansion transition region of the ANO-2 steam generators (2CAN089507). It was determined in the submittal that no changes to the current wording of the ANO-2 TSs were necessary to implement the proposed repair limit for circumferential cracks. Based upon subsequent discussions with the staff, Entergy Operations proposes to add clarifying wording to the TSs in order to specifically address the repair limit for circumferential cracks. The proposed change to the ANO-2 TSs reflects, to the maximum extent practical, the staff's model TSs included as an attachment to Generic Letter (GL) 95-05, "Voltage-Based Criteria for Westinghouse Steam Generator Tubes Affected by Outside Diameter Stress Corrosion Cracking."

Entergy Operations has previously submitted a proposed TS change adding special interest groups for steam generator inspections (2CAN059508, dated May 19, 1995). The special interest group created for the hot leg expansion transition area, as well as the corresponding revision to the expansion criteria, included in this previous submittal are related and complementary to the changes included in this new submittal. Therefore, review and approval of the May 19, 1995 submittal should be completed prior to, or concurrent with, the review of this submittal.

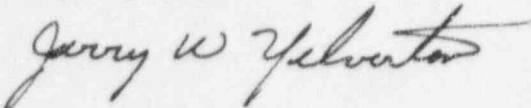
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The proposed change has been evaluated in accordance with 10CFR50.91(a)(1) using criteria in 10CFR50.92(c) and it has been determined that this change involves no significant hazards considerations. The bases for these determinations are included in the attached submittal.

Entergy Operations requests that the effective date for this change be within 30 days of NRC issuance of the amendment to allow for distribution and procedural revisions necessary to implement this change. Although this request is neither exigent nor emergency, your prompt review is requested.

Very truly yours,



JWY/jjd  
Attachments

To the best of my knowledge and belief, the statements contained in this submittal are true.

SUBSCRIBED AND SWORN TO before me, a Notary Public in and for Johnson County and the State of Arkansas, this 25 day of September, 1995.

Juana M. Tapp  
Notary Public  
My Commission Expires 11-8-2000



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ATTACHMENT

TO

2CAN099503

PROPOSED TECHNICAL SPECIFICATION

AND

RESPECTIVE SAFETY ANALYSES

IN THE MATTER OF AMENDING

LICENSE NO. NPF-6

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT TWO

DOCKET NO. 50-368

## DESCRIPTION OF PROPOSED CHANGES

The Arkansas Nuclear One, Unit 2 (ANO-2), Technical Specification (TS) Section 3.4.5 has been revised to add requirements for the use of a repair limit for circumferential cracks in steam generator (SG) tubing as follows:

- A new TS 4.4.5.2.b.4 has been added which specifies the probe type (plus point or equivalent) and inspection frequency (refueling outage) for all circumferential cracks left in service.
- A new TS 4.4.5.2.d has been added which specifies a minimum inspection for circumferential cracks as 100% of the hot-leg sludge pile region.
- The definition of Plugging or Repair Limit in TS 4.4.5.4.a.7 has been revised to clarify that this definition does not apply to circumferential cracks in the expansion transition region.
- A new TS 4.4.5.4.a.11, which defines the Expansion Transition Region Circumferential Crack Plugging or Repair Limit, has been added. This definition allows circumferential cracks at the expansion transition region at the top of the tubesheet to be left in service after inspection if the degraded area of the tube wall cross sectional area is less than 40%.
- TS 4.4.5.4.b has been modified to delete the requirement to plug or repair all tubes containing through-wall cracks.
- A new TS 4.4.5.5.d has been added to specify reporting requirements for implementation of the circumferential crack repair limit. Notification to the NRC will be provided prior to returning the steam generators to service after an inspection if leakage or conditional probability of burst calculations exceed established limits or if primary water stress corrosion cracking has been identified.
- Bases Section 3/4.4.5 has been revised by adding a discussion of the basis for the 40% repair limit for circumferential cracks, a definition of the sludge pile region, a discussion of reporting requirements, and a list of potential alternatives to be taken after restart should the results of the leakage or conditional burst probability calculations exceed established limits. The TS pages that contain the Bases have also been reformatted to increase available space for addition of the new discussion.

TS 4.4.5.2 and Bases Section 3/4.4.5 are also modified by the proposed ANO-2 TS amendment concerning SG special interest groups submitted on May 19, 1995 (2CAN059508). Upon approval of one of the requested TS changes, the affected TS sections in the remaining TS change will be updated with the approved information and resubmitted to the staff.

The ANO-2 TS Section 3.4.6 has been revised as follows:

- TS 3.4.6.2.c has been modified to reduce the primary-to-secondary leakage through any one steam generator to 150 gallons per day.
- Bases Section 3/4.4.6.2 has been revised to reflect the reduced primary-to-secondary leakage limit through each steam generator and to discuss the margin added by reducing the limit.

### **BACKGROUND**

On August 28, 1995, Entergy Operations submitted for the NRC staff's review and approval an evaluation justifying use of a 40% degraded area repair limit for circumferential cracks in the expansion transition region of the ANO-2 steam generators (2CAN089507). It was determined in the submittal that no changes to the current wording of the ANO-2 Technical Specifications were necessary to implement the proposed repair limit for circumferential cracks. Based upon subsequent discussions with the staff, Entergy Operations proposes to add clarifying wording to the TSs in order to specifically address the repair limit for circumferential cracks. The proposed changes to the ANO-2 TSs reflect, to the maximum extent practical, the staff's model TSs included as an attachment to Generic Letter (GL) 95-05, "Voltage-Based Criteria for Westinghouse Steam Generator Tubes Affected by Outside Diameter Stress Corrosion Cracking."

### **DISCUSSION OF CHANGE**

The technical justification for utilizing a 40% degraded area repair limit for circumferential cracks was included in Entergy Operation's August 28, 1995, submittal and will not be repeated in the discussion included with this submittal.

Two technical changes have been made in this submittal that were not included in the August 28, 1995, submittal. Previously, in order to be able to utilize the existing TSs for circumferential cracks, all through-wall cracks were to be repaired. Since the TSs are now being modified to specifically address circumferential cracking, this limitation has been removed from TS 4.4.5.4.b. The evaluations included in the August 28, 1995, submittal consider the possibility of leaving through-wall cracks in service. The existing maximum depth based repair limit is not affected by this change since all non-circumferential cracks will continue to be repaired if found to have a 40% or greater maximum depth during inservice inspections.

The second technical change from the earlier submittal involves a reduction in the allowable primary-to-secondary leak rate through each steam generator. The reduction from a maximum of 0.5 gallon per minute to 150 gallons per day through any one steam generator is a defense in depth approach to accommodate the possibility of leaving through-wall cracks in service and to accommodate the possibility of a larger than expected crack growth rate. The reduction is consistent with the GL 95-05 model TSs. An administrative primary-to-

secondary leak rate limit of 0.1 gallon per minute for each steam generator is currently utilized at ANO-2.

The inspection scope for circumferential cracks in the expansion transition region and the equipment to be used are added to the TSs. Implementation of the circumferential crack repair limit will require a 100% inspection of the expansion transition region of the hot-leg sludge pile region with a plus point or equivalent probe each refueling outage. Entergy Operations has previously committed (in TS Bases 3/4.4.5) to appropriately implement upgraded testing methods as they are developed and validated for commercial use.

Reporting requirements for use of the circumferential cracking repair limit, similar to those included in the model TSs from GL 95-05, have been added to TS 4.4.5.5.d. The reports need only be submitted to the staff prior to returning the steam generators to service if either the estimated leakage or conditional burst probability (based on the projected end-of-cycle distribution, or if not practical within the time constraints, the actual measured distribution from the previous cycle) exceed established limits, or if circumferential cracks due to primary water stress corrosion cracking have been found.

Additionally Entergy Operations commits to submit the following information (similar to that described in GL 95-05) to the staff within 90 days of restart following each SG inspection if circumferential cracks are left in service:

1. The following distributions will be provided in both tabular and graphical forms:
  - a) End-of-Cycle (EOC) distribution - all indications found during the inspection,
  - b) Cycle growth rate distribution (i.e., from Beginning of Cycle [BOC] to EOC) including the length of the operating interval. The planned length of the next operating interval should also be provided (in EFPYs),
  - c) Distribution for EOC repaired indications - distribution of indications presented in a) above that were repaired (i.e., plugged or sleeved),
  - d) Distribution for indications left in service at the beginning of the next operating cycle,
  - e) Non-destructive examination uncertainty distribution used in predicting the EOC (for the next cycle of operation) distribution.
2. The results of the tube integrity evaluation (calculated accident leakage and conditional burst probability). If the leakage and conditional burst probability were calculated using the measured EOC distribution for the purposes of addressing the TS 4.4.5.5.d reporting criteria, then the results of the projected EOC distribution will be given in this report. However, if the results of the evaluation, using the projected

EOC distribution, were submitted to the staff prior to placing the steam generators in service per TS 4.4.5.5.d, the results need not be repeated in the 90 day report.

3. The results of any metallurgical examinations performed for tubes with circumferential cracks removed from the SGs. If it is not practical to provide all the results within 90 days, as a minimum, the burst test, leakage test and morphology conclusions will be provided within 90 days. The remaining information will be submitted at a later date when it becomes available.

#### **DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATION**

An evaluation of the proposed change has been performed in accordance with 10CFR50.91(a)(1) regarding no significant hazards considerations using the standards in 10CFR50.92(c). A discussion of these standards as they relate to this amendment request follows:

##### **Criterion 1 - Does Not Involve a Significant Increase in the Probability or Consequences of an Accident Previously Evaluated.**

Consistent with draft Regulatory Guide (RG) 1.121, "Basis for Plugging Degraded PWR Steam Generator Tubes," the traditional maximum depth based criteria for steam generator tube repair implicitly ensures that tubes accepted for continued service will retain adequate structural and leakage integrity during normal operating, transient, and postulated accident conditions. It is recognized that defects in tubes permitted to remain in service occasionally grow through-wall and develop small leaks. Limits on allowable primary-to-secondary leakage established in the technical specifications ensure timely plant shutdown before the structural and leakage integrity of the affected tube is challenged.

The proposed change to implement a circumferential crack repair limit in the expansion transition region for ANO-2 meets the criteria of RG 1.121. The 40% degraded area repair limit was determined by performing a structural analysis per the recommendations of the RG and applying the following uncertainties: 95% lower bound material properties, 95% lower bound burst curve, 95% lower bound eddy current measurement uncertainties, and 95% upper bound crack growth rate. The analysis demonstrates that tube leakage and conditional probability of burst are acceptably low during either normal operation or the most limiting accident condition, a postulated main steam line break (MSLB) event.

As part of the implementation of the circumferential crack repair limit, the distribution of End-of-Cycle (EOC) circumferential indications in the expansion transition region will be used to calculate the primary-to-secondary leakage. The allowable leakage is bounded by the maximum leakage which results in doses within the applicable dose limits (10CFR100 and General Design Criteria 19). This limit is calculated using the technical specification reactor coolant system (RCS) iodine activity. Application of the circumferential crack repair limit requires the projection of the postulated MSLB leakage based on the projected EOC



distribution for the next cycle. The projected EOC distribution is developed using the most recent EOC eddy current results based on crack arc length.

The reduction in the leak rate limit reduces the possibility that a defect in a leaking tube will grow to a size that is not structurally acceptable.

Therefore, this change does not involve a significant increase in the probability or consequences of any accident previously evaluated.

**Criterion 2 - Does Not Create the Possibility of a New or Different Kind of Accident from any Previously Evaluated.**

Implementation of the proposed circumferential crack repair limit does not introduce any significant changes to the plant design basis. The only accident possible from implementation of this limit is a tube rupture, which has already been evaluated in the ANO-2 Safety Analysis Report.

The maximum primary-to-secondary leakage rate has been reduced to 150 gallons per day through any one steam generator to help preclude the potential for excessive leakage during all plant conditions. The RG 1.121 criterion for establishing the operational leak rate limit considers: 1) the detection of a crack before potential tube rupture as a result of faulted plant conditions; 2) the maintenance of a margin to tube rupture of not less than three for normal operating conditions; and 3) that any leakage rate increase will be gradual to provide time for corrective action. The 150 gallon per day limit is intended to provide for leakage detection and plant shutdown in the event of an unexpected crack propagation resulting in excessive leakage.

Steam generator tube integrity is maintained through inservice inspection and primary-to-secondary leakage monitoring. Any tubes exceeding the circumferential crack repair limit are removed from service.

Therefore, this change does not create the possibility of a new or different kind of accident from any previously evaluated.

**Criterion 3 - Does Not Involve a Significant Reduction in the Margin of Safety.**

The use of the circumferential crack repair limit will maintain steam generator tube integrity commensurate with the criteria of RG 1.121. Upon implementation of the limit, even under worst case conditions, the occurrence of circumferential cracking in the expansion transition region is not expected to lead to a steam generator tube rupture event during normal or faulted plant conditions. The distribution of crack indications left in service will result in acceptable primary-to-secondary leakage and conditional tube burst probability during all plant conditions.

The installation of steam generator tube plugs and sleeves reduces RCS flow margin. Implementation of the circumferential crack repair limit will decrease the number of tubes which must be repaired by plugging or sleeving, thereby retaining additional flow margin that would otherwise be reduced.

Therefore, this change does not involve a significant reduction in the margin of safety.

Based upon the reasoning presented above, the previous discussions of the amendment request, and the justification provided in our August 28, 1995, submittal (2CAN089507), Entergy Operations has determined that the requested change does not involve a significant hazards consideration.

PROPOSED TECHNICAL SPECIFICATION CHANGES