Mr. Jerry W. Yelverton
Vice President, Operations ANO
Entergy Operations, Inc.
1448 S. R. 333
Russellville, AR 72801

January 31, 1996

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION - ARKANSAS NUCLEAR ONE, UNIT 2 (TAC NO. 93385)

Dear Mr. Yelverton:

By letter dated August 28, 1995, Entergy Operations, Inc. (EOI) expressed intent to leave steam generator tubes in service at Arkansas Nuclear One, Unit 2 with circumferential crack indications that do not exceed 40 percent degraded area at the crack location. During, subsequent discussions with the NRC staff it was concluded that operation with circumferential tube cracks as proposed by EOI is not consistent with the Unit 2 Technical Specifications. Accordingly, EOI submitted a Technical Specification Amendment request on September 25, 1995, to remove restrictions related to operation with circumferential tube cracks that do not exceed 40 percent degraded area.

Numerous discussions on this issue have taken place between the NRC staff and EOI since your August 28, 1995, correspondence was received. The enclosure to this letter includes a compilation of NRC staff comments and questions that were developed during these discussions. Please provide a written response to the issues addressed in the attachment to enable our staff to formally reference your responses in our safety evaluation. Contact your NRC Project Manager if additional discussions are required with the NRC technical staff. This requirement affects nine or fewer respondents and, therefore, is not subject to the Office of Management and Budget review under P. L. 96-511.

Sincerely,

ORIGINAL SIGNED BY:

George Kalman, Senior Project Manager
Project Directorate IV-1
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Docket No. 50-368

Enclosure: Request for Additional Information

cc w/encl: See next page

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

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cc:

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Jackson, MS 39205

COMMENTS/QUESTIONS PERTAINING TO CIRCUMFERENTIAL CRACKS IN STEAM GENERATOR TUBES

1. Your Safety Assessment includes the statement "severe accidents are important because, although extremely unlikely, they have the potential of releasing large quantities of fission products to the environment." However, your submittal only addresses certain probability aspects of severe accident risk. Please provide a discussion of impact on severe accident consequences of leaving tubes with known defects (consistent with the proposed criteria) in service. The response should include a discussion of assumptions regarding tube response to the temperatures and pressures expected during severe accident sequences for your plant, and the bases for these assumptions.

2. Discuss any severe accident management guidelines specifically associated with steam generator tube rupture, and the potential for containment bypass.

3. Provide the procedures to be used for sizing the circumferential indications (length and depth). Provide the raw eddy current data on optical disks for the specimens used to assess this technique.

Discuss the extent to which the circumferential crack profiles provided in Appendix B, "NDE Profile Examples" of your August 28, 1995 letter, were developed under "blind" test conditions. Discuss the extent to which the data provided in Appendix B are from specimens totally representative of data typically observed in the field.

Discuss if the results provided in Appendix B were developed from the standard field analysts or were experts used to analyze this data. If experts were used, discuss the restrictions to be implemented in the analysis of the field data at ANO-2.

Provide any other additional data that has been obtained since your report was prepared (e.g., Electric Power Research Institute data and laboratory crack data).

Discuss how the eddy current data is aligned with the metallography data.

4. An important aspect of any alternate repair criteria is the confirmation of the morphology of the cracking mechanism and the verification of the abilities of non-destructive examination. Provide your short-term and long-term plan with respect to accomplishing these goals. The answer should address the tube pull program that will be implemented at ANO-2.

5. Provide the data used in the growth rate analysis including any data analyzed since the report was prepared.

6. Provide the references supporting your leak rate analysis including any benchmarking of the analytical results to actual data.

Enclosure

Discuss how the testing performed addressed any transverse loads that may be applied to these circumferential cracks (symmetric and asymmetric cracks) under postulated accident conditions.

The growth rate analysis appears to rely primarily on the arc length of the indications since the depth is assumed to be 100%. Provide the data to support the length sizing of circumferential cracks. Address how this data has been accounted for in the determination of the end-of-cycle (EOC) crack lengths.

7. Provide the statistical details of your methodology for predicting the EOC distribution of indications (arc length and degraded area). Provide the statistical details of your methodology for calculating the probability of burst and for calculating the leakage under postulated accident conditions. Provide all supporting data. The submittal should be complete enough to permit the staff to repeat your calculations and to assess the data first hand, if necessary.

Provide a discussion of how the development of new indications will be accounted for in your analysis and how the probability of detection will be accounted for (e.g., will a single probability of detection adjustment be made). Provide the technical basis for the methodology that will be employed.

8. Provide a discussion of how the empirical and analytic determinations of the structural limit address all types of crack morphologies that could occur at the expansion transition. This should include a discussion of symmetric and asymmetric morphologies.

Provide a discussion of the need to account for transverse loads in the determination of the structural limit.

Provide the basis for using the ultimate and/or flow stress in the determination of the structural limit.

9. Provide a clear discussion of where the alternate repair criteria will be applied. It appears that application of this criteria should not be permitted in certain regions where tubes are subject to high local flow velocities (e.g., tubes adjacent to the tube lane and in the corner at the entrance to the tube lane). Provide the supporting technical documentation for determining which tubes are subject to the effects of flow induced vibration.

10. Discuss the source of the data for the ANO-2 site specific material properties database. Compare this to other industry data from pulled tubes. Discuss any discrepancies. Provide the data.

If ANO-2 CMTR data was used in determining the material properties database, compare the CMTR material properties to the material properties observed in any pulled tubes. Discuss any discrepancies.

11. Figure 2-1 in the attachment to your August 28, 1995 letter, showed burst pressure as a function of degraded area. Provide the data used in Figure 2-1. Provide the data and the data exclusion criteria used to eliminate "non-representative data". Provide a discussion of the morphology of each indication per question 2 above.

Provide your basis for performing the regression analysis on only the data which have degraded areas greater than 50%.

12. Provide a description of the finite element model which augments the analytical Regulatory Guide 1.121 evaluation.

13. Provide the pulled tube data that were used to support the statement that UT has been successfully utilized by others to evaluate the presence of ligaments for the purpose of performing structural evaluations. Describe the UT technique(s) to which this statement applies and the critical parameters for the qualification of this technique.

14. Figures 3-1 and 3-2 in the attachment to your August 28, 1995 letter, were plots of eddy current determined degraded area versus metallurgically determined degraded area. Provide the data used in these figures.

Discuss the basis for using the 95% lower bound evaluated at 40% degraded area for determination of the non-destructive examination uncertainty.

15. Provide a summary of the data to be submitted to the NRC prior to restart and after restart to support your alternate repair criteria (e.g., EOC predictions, pulled tube results, leakage and burst assessments, etc.).