August 18, 1992

Docket Nos. 50-348
and 50-364

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Mr. W. G. Hairston, III
Executive Vice President
Southern Nuclear Operating
Company, Inc.
Post Office Box 1295
Birmingham, Alabama 35201-1295

Dear Mr. Hairston:

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION CONCERNING THE STEAM GENERATOR TUBE ALTERNATE PLUGGING CRITERIA AMENDMENTS FOR JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2 (TAC NOS. M79818 AND M79819)

By letter dated February 26, 1991, as supplemented by letters dated November 13, 1991, and February 21, April 10, June 4 and 16, and July 10, 1992, you requested amendments to the Joseph M. Farley Nuclear Plant, Units 1 and 2, Technical Specifications to utilize alternate plugging criteria for steam generator tubes. In reviewing your submittals, we have identified the need for additional information concerning severe accident induced failures of degraded steam generator tubes.

Your response to this request for additional information is required before we can complete our review of the requested amendments. Please inform me of your schedule for submitting a response.

The reporting and/or recordkeeping requirements contained in this letter affect fewer than ten respondents; therefore, OMB clearance is not required under P.L. 96-511.

Sincerely,

Orignal signed by:

Stephen T. Hoffman, Project Manager
Project Directorate II-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

cc: See next page

Enclosure:
Request for Additional Information

OFFICE	LA:PDII-1	PM:PDII-1	D:PDII-1		
NAME	PAnderson	SHoffman:ln	EAdensam		
DATE	8/11/92	8/11/92	8/17/92		

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ENCLOSURE

REQUEST FOR ADDITIONAL INFORMATION CONCERNING SEVERE ACCIDENT-INDUCED FAILURES OF DEGRADED STEAM GENERATOR TUBES

Background

Various utilities have proposed alternate steam generator (SG) tube repair criteria which represent a deviation from the current standard of a flaw depth-based plugging threshold of 40% of initial wall thickness. Under these alternate criteria, tubes with up to 100% through-wall cracks would be permitted to remain in service, subject to certain restrictions. To date, the Nuclear Regulatory Commission staff has granted limited approval for the Trojan Nuclear Plant and Joseph M. Farley Nuclear Plant, Unit 2, for restricted versions of these alternate criteria for up to one operating cycle. It is especially important that the risk associated with increased SG tube degradation be better evaluated and understood before a decision on approving these revised criteria on a permanent basis is made. For purposes of assessing risk, SG tube failures can be placed in three categories: spontaneous failures occurring during normal operation or mild operational transients; failures induced by design basis accidents such as a main steam line break; and failures induced by severe accidents. A recent scoping study performed by the staff indicated that, of these three categories, the third has received the least attention, yet has the greatest risk potential. The set of questions below identifies those technical areas regarding severe accidents for which the staff needs additional information.

Questions

1) What are the severe accident sequences of concern with respect to the potential for high-temperature creep rupture of SG tubes?

2) For the sequences identified above, what are the expected temperature exposures of the SG tubes versus time at various locations within the tube bundle? What are the temperature exposures versus time within the hot leg piping and pressurizer surge line for these sequences? Provide a description of the computational model(s), modeling assumptions, and assumed values of key parameters employed in the determination of these exposure histories.

3) What are the uncertainties in the above exposure histories with regard to each of the following factors: core degradation progression, degree of core blockage; hydrogen production; timing of vessel failure; natural circulation modeling; mixing in SG inlet plenum; fission product transport and deposition (as an additional heat source); reactor coolant system (RCS) loop seal behavior; decay power; conditions at onset of transient; RCS piping insulation effectiveness; reactor coolant pump seal integrity; operator actions; and equipment available for mitigation? Based on these uncertainties, provide upper bound, lower bound, and mean temperature exposure histories.

4) Using the exposure histories determined above, and assuming <u>unflawed</u> SG tubes, what is the nature and timing of creep rupture failure in the SG tubes, hot leg piping, and pressurizer surge line? This information should include failure location(s) and initial failure size(s). Provide a detailed description of the computational model(s), modeling assumptions, and assumed values of key parameters employed in the determination, including the creep rupture data used for the materials in question.

5) What are the sources of uncertainty in the creep rupture computations above? How does each of these sources affect the results of the computations? Uncertainties associated both with the computational model(s) and the creep rupture data should be addressed.

6) Under the proposed alternate repair criteria, indications at the tube support plate (TSP) intersections may be accepted for continued service, provided the voltage amplitude response is sufficiently low. This in effect would permit defects up to 100% through-wall to remain in service. The degradation mechanisms will generally consist of axial cracks; however, these cracks may be accompanied by intergranular attack (IGA) and "cellular" IGA. What is the expected number and distribution of these defects among the different tube support plate locations as a function of time in service? What type of degradation at the TSPs (i.e., axial cracks, IGA, and/or cellular IGA) is expected to have the greatest impact on creep rupture failures?

7) What creep rupture data are currently available regarding flawed SG tubes at the TSPs? If insufficient data exist to assess the impact of SG tube degradation on the failure predictions made in Question 4, describe in detail the testing program that would be necessary to generate this data.

8) What is the potential for growth in failure aperture size as a function of time following failure initiation resulting from mechanisms such as hot gas ablation? What is the potential for failures being produced in adjacent tubes by mechanisms such as direct jet impingement?

9) Based on the information obtained in Questions 6, 7 and 8, what is the impact of SG tube degradation at the TSPs on the failures predicted in Question 4? A detailed discussion should be provided addressing numbers of failures produced, their locations and sizes, and relative timing within the accident sequence.

10) What is the expected total primary-to-secondary leak rate versus time as well as the integrated leakage resulting from the SG tube failures predicted above? Upper and lower bounds should be presented, and a detailed discussion of uncertainties should be provided.

11) Based on the primary-to-secondary leakages estimated above, and using accepted source terms, what are the expected radiological releases to the environment? Possible plateout of radionuclides should be considered and a discussion of uncertainties should be provided.

12) Using the information derived by addressing the above items, provide estimates of the risk associated with severe accident-induced SG tube failures at the TSPs.

13) How do the proposed alternate repair criteria impact risk?