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

February 1, 1999

MEMORANDUM TO: Herbert N. Berkow, Director
Project Directorate II-2
Division of Reactor Projects I/II

FROM: John R. Fair, Acting Chief
Component Integrity Section
Mechanical Engineering Branch

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING A SUPPLEMENT TO THE OCONEE NUCLEAR SITE RESPONSE TO NRC BULLETIN 88-08 (TAC NOS. MA1059, MA1060, MA1061)

References:
1. Letter of February 26, 1998, from Duke Power Company (DPC) to the NRC Document Control Desk, with enclosure
2. Work Request from D. E. LaBarge, PD II-2, to EMEB/DE, dated March 3, 1998

In Reference 1, DPC submitted an update on Oconee's activities related to the investigation of thermal stratification and other thermal phenomena discovered in the 2A1 HPI/NMU line at Oconee Unit 2.

Per Work Request dated February 26, 1998, (Reference 2) the Mechanical Engineering Branch has reviewed the DPC submittal, and has determined that the additional information stated in the attachment will be required to complete the evaluation of the Oconee activities with regard to NRC Bulletin 88-08.

Docket Nos.: 50-269
50-270
50-287

Attachment: As stated

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REQUEST FOR ADDITIONAL INFORMATION
OCONEE NUCLEAR STATION UNITS 1, 2, 3
DUKE POWER COMPANY (DPC)
SUPPLEMENT 1 TO OCONEE RESPONSE TO NRC BULLETIN 88-08

Page 4 (Page numbers correspond to those in the DPC submittal of February 26, 1998)

1. Provide DPC calculation OSC-3681 (Reference 2 of the submittal), showing that the temperature data collected from the Unit 1 High Pressure Injection/Emergency Injection (HPI/EI) lines and the representative thermal load on the piping, determined from these data, reflected the thermal cycling conditions which formed the basis for Bulletin 88-08.

2. Provide a summary of the HPI piping reanalyses OSC-1304-06, OSC-1323-06 and OSC-1342-06 (Reference 3 of the submittal), showing that the thermal loading from OSC-3681 was considered as an additional load set in confirming the integrity of the HPI/EI lines for 40 years plant life using the methodology of ASME Section III, Paragraph NB-3653.

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3. Justify the applicability to Units 2 and 3 of the conclusion, based on Unit 1 thermal monitoring data (in Reference 5 of the submittal), that "the cause of the stratification is back flow through a leaking check valve while the unit is in start-up mode with one Reactor Coolant Pump off in that loop."

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4. Provide the results of the DPC review which was completed on May 1, 1998, of the Structural Integrity Associates (SIA) analyses, received on February 24, 1998.

5. A. Justify the applicability to Units 2 and 3 of the SIA analyses and conclusions, based on the 1990 Unit 1 thermocouple data.

   B. Indicate when the "fatigue usage due to the self cycling of the stratification will be added to the fatigue usage resulting from the other design transients".

   C. Indicate whether this "self cycling of the stratification" will be considered as an additional load set for calculating the overall fatigue usage of the pipe-to-safe-end welds in the HPI/NMU lines in the three units.

6. Indicate how the load set due to the "self cycling" of the stratification load set in the fatigue analysis will reflect the thermal flow conditions which existed in the 2A1 High Pressure Injection /Normal make Up (HPI/NMU) nozzle/safe end/pipe welds and base metal at the time the leaking crack in the weld was discovered.

ATTACHMENT

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7. The acceptance limits for the currently recorded thermocouple data are based on a limited cycle Class 1 fatigue analysis of the Unit 1 HPI/NMU nozzles provided by SIA in late May of 1997.

   A. State the definition of "a limited cycle Class 1 fatigue analysis."

   B. Provide the SIA calculations Duke-16Q-302 and Duke-16Q-303 (References 8 and 9 of the submittal).

   C. State the acceptance limits for the currently recorded thermocouple data.

   D. Justify the applicability of these acceptance limits to the HPI/NMU piping in Units 2 and 3, in view of the April 21, 1997 through-wall cracking event in the Unit 2 HPI/NMU safe end weld.

8. The cumulative usage factor of .028 per fuel cycle was based on the 1990 Unit 1 HPI/NMU thermocouple data, for all postulated transients that could occur during a fuel cycle. State whether these postulated transients included thermal stratification cycling.

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9. DPC concludes, in Section 5.0, that the solution to the back flow/stratification problem is rooted in solving the HPI flow perturbations noted during plant heat ups and cool downs. This implies that back flow and leakage through a potential gap between the thermal sleeve and the nozzle safe end occurs only during plant heat up and cool down. Justify the validity of this assumption. State why other mechanisms, such as turbulent penetration, which occur during normal operation, should not be included in the solution.

10. Provide a detailed summary of the objectives of the Framatome computational fluid dynamics (CFD) calculations. Indicate if these calculations will form the basis for determining the root cause of the thermal cycling which led to the through-wall cracking of the 2A1 HPI/NMU nozzle safe end-to-pipe weld. Also indicate if these calculations will provide an insight into the thermohydraulic phenomena which caused the thermal cycling in the safe end weld, and an estimate of the time interval for crack initiation in the weld and the surrounding base metal.

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11. Section 5.0, Conclusions, states that a completed limited cycle thermal fatigue analysis indicates that there is insignificant fatigue usage due to back flow/thermal stratification. Justify this conclusion in light of the through wall cracking event in the 2A1 HPI/NMU nozzle safe end-to-pipe weld that occurred after, at most, 23 years of plant operation.

12. Provide justification why temperature monitoring of the HPI/NMU and HPI/EI lines should not continue beyond the stated outages for Units 1, 2 and 3.

13. The stress analysis to Class 1 rules for design transients, including the effects of back flow/thermal stratification, was scheduled for completion by May 1, 1998. State whether this analysis was completed. If it was, provide a detailed description and the results of this analysis. If it wasn't, provide the new schedule for completion.