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

September 24, 1992

Docket No. 50-287

MEMORANDUM FOR: Ellis Merschoff, Director
Division of Reactor Projects, Region II

FROM: Gus Lainas, Assistant Director
for Region II Reactors
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

SUBJECT: TASK INTERFACE AGREEMENT (TIA 92-03) CONCERNING CRACK IN OCONEE DECAY HEAT REMOVAL (DHR) DROP LINE (TAC NO. M83247)

TIA 92-03 was issued to document the various NRC staff actions performed in relation to the crack which was identified by the licensee in the Oconee Unit 3 DHR drop line. The remaining open item was a review by the Materials and Engineering Branch (EMCB) of NRR of the failure analysis performed by B&W to determine if additional action was appropriate at Oconee or other facilities as a result of this failure.

EMCB has completed its review of the B&W failure analysis. As discussed in the enclosed memorandum, they agree with the conclusions reached by B&W in the failure analysis report. Since the analysis was limited to the cause of the specific event, there was insufficient information in the report to make a meaningful determination if additional action would be appropriate at Oconee or other facilities. However, Duke Power Company (DPC) completed a generic evaluation in their Problem Investigation Report (PIR). The DPC PIR indicated that the natural resonant frequency of the piping configuration was a dominant contributor to the failure. The piping configuration of the other Oconee units was sufficiently different to have natural resonant frequencies outside the range of concern. In addition, since the exact configuration is significant in determining the natural resonant frequency, no basis for a generic concern appears to exist.

This completes our efforts under TIA 92-03.

Gus Lainas, Assistant Director
for Region II Reactors
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosure:
EMCB Evaluation of Failure
Analysis

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Docket No. 50-287

MEMORANDUM: Leonard A. Wiens, Project Manager
Project Directorate II-3
Division of Reactor Projects I/II

FROM: William Bateman, Acting Chief
Materials and Chemical Engineering Branch
Division of Engineering Technology

SUBJECT: EVALUATION OF B&W FINAL REPORT OF CRACKED LPI PIPE AT OCONEE-3 (TAC NO. M83247)

The staff has reviewed the Babcock & Wilcox's (B&W) final report," Cracked LPI Pipe at Oconee-3," dated January 1992. B&W performed for the Duke Power Company (DPC) a failure analysis of a cracked pipe section which was removed from the low pressure injection (LPI) system at Oconee-3. The subject piping (a twelve inch Schedule 10 pipe) in the LPI system was found to be leaking during a recent Oconee-3 start up. The throughwall crack was located at a half coupling weld joint, connecting a one inch Schedule 40 pipe to the twelve inch pipe. The one inch pipe consisted of a vertical run of seven inches to a relief valve (3LP-25) that weighed about 14 pounds. All piping was made of austenitic stainless steel. The length of the throughwall crack was about 2.5 inches on the outside diameter (OD) surface and about 1.5 inch on the inside diameter (ID) surface. Another shorter, partially throughwall crack was located adjacent to the throughwall crack. Various metallurgical examinations including liquid penetrant (PT), metallography, and scanning electron microscopy were performed on the pipe sections containing the throughwall crack. Based on the results of the failure analysis, B&W concluded that the root cause of the LPI pipe failure was due to mechanical fatigue. The loading on the joint is expected to be high cycle/low amplitude and the most likely source of such loading would be mechanical vibration of the LPI system piping. The staff agrees with B&W's conclusion because the reported characteristics of the failure mode as described below are typical of fatigue failure: (1) transgranular cracking, (2) no crack branching, (3) the presence of fatigue striations with micron size spacings on the fracture surface and (4) the initiation of cracks from the OD surface along the toe of the half coupling weld.

You requested the staff to determine if additional action would be appropriate for Oconee Unit 3 or other facilities. The staff cannot make a meaningful determination because there is not enough information in the failure analysis report, which only identified the failure mode and discussed the root cause of the failure. As a minimum, the licensee's submittal should provide a detailed discussion of the following issues pertaining to the referenced pipe failure event: (1) safety consequences of the failure event, (2) adequacy of the fix including plans for long term mitigation, and (3) generic nature of the failure event. Regarding the question of additional action at other

facilities, it is apparent that inadequately supported geometries can lead to fatigue type failures.

This memorandum completes the work effort under TAC No. M83247.

William H. Bateman

William Bateman, Acting Chief
Materials and Chemical Engineering Branch
Division of Engineering Technology

cc: B. D. Liaw
G. C. Lainas
D. B. Mathews