Commonwealth Edison
One First National Plaza, Chicago, Illinois
Address Reply to: Post Office Box 767
Chicago, Illinois 60690

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1. [illegible] (NEDO 10859 [illegible])

July 11, 1973

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U.S. ATOMIC ENERGY COMMISSION
Regulatory Mail Section

Mr. D. J. Skovholt
Assistant Director for
Operating Reactors
Directorate of Licensing
U.S. Atomic Energy Commission
Washington, D.C. 20545

Subject: Dresden Units 2 and 3 Torus Ring Header Analyses, AEC Dkts 50-237 and 50-249

Dear Mr. Skovholt:

In response to your letter dated December 13, 1972, concerning this subject, answers to your specific questions are furnished below and Special Report No. 31, describing the ring header inspections and repairs are attached.

Question 1:

Provide a summary of a dynamic analysis of the torus ring header system subjected to blowdown forces resulting from operation of the automatic pressure relief valve. Include information on the mathematical model, natural frequency of the system, and the forcing function of blowdown forces.

Response:

A dynamic analysis of the General Electric Mark I Torus Ring Header has been performed. In addition, experimental verification of the model employed has been accomplished by means of the tests performed on the Quad-Cities Unit 2 Torus during October, 1972. General Electric has issued a report "NEDO - 10859 which covers the theoretical and experimental program. This report describes the parametric models used to perform the analysis, and the response of the torus to the relief valve discharge forcing function. The maximum experimentally determined blowdown loads on the vertical suction ring header hangers recorded was 10,200 pounds and the maximum horizontal load recorded was 3,400 pounds.

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Question 2:

Provide the basis for determination of forcing function as derived from either test data or analytical methods.

Response:

"The forcing function used for the response calculation was derived from the study of an envelope of experimental data..." Quote from G.E. Report NEDO - 10859, see this report for further information.

Question 3:

Provide a summary of (a) the stress analysis of the torus ring header system, including the interaction of torus wall and hanger supports under static and dynamic loads, and (b) fatigue analysis of the ring header, hangers, and component parts that are subjected to cyclic load during blowdown.

Response:

The stress analysis has been performed and can be found in the NEDO - 10859 report. The calculated dynamic loads for Dresden are discussed in Section 5.2 of Special Report No. 31.

The fatigue analysis has been performed and the conclusion as presented in the NEDO - 10859 report is that the torus can accommodate 156 relief valve actuations per year for the forty years lifetime of the plant without fatigue failure occurring in the torus.

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The torus shell region above the vertical ring header attachment was judged to be the most critical area from the standpoint of fatigue life, therefore this region was the only one analyzed for fatigue, due to cyclic loading.

Question 4:

In the event the above analysis demonstrates stresses in excess of code allowable design values, provide your plans and schedules for corrective actions, and confirmatory tests.

Response:

The analysis presented in NEDO - 10859 has shown that no excessive stresses exist or will exist, in the torus structure, during the life of the plant due to combined static, seismic, and electromatic relief valve actuation induced loads.

Question 5:

Describe any provisions that may be available in the plant design which would allow the emergency core and containment cooling systems to function for long-term effectiveness in the event of failure of the suction header.

Response:

This hypothosized situation involves two simultaneous class I failures and therefore is incredible, but if the event is assumed to occur the feedwater system can be used to pump an unlimited amount of river water into the core by means of the standby coolant supply system. (Dresden Unit 2 and 3 FSAR Section 6.3)

This system will pump water into the reactor until the torus room is filled with water. This water is assumed to reach the torus room through the postulated leak in the primary piping which required the use of the emergency core and containment cooling systems. When this room is filled the HPCI and LPCI pumps can again take their suction from this room even though the ring header is assumed to be broken off the torus.

All improvements to the Dresden torus suction ring headers are completed. They were completed on Dresden Unit 2 November 8, 1972 and on Dresden Unit 3 May 25, 1973. These improvements result in systems with a conservatively calculated minimum load carrying capability which is approximately two (2) times the calculated maximum combined (static, seismic, and relief valve induced) load.

One signed original and 39 copies of this letter and Special Report No. 31 are provided for your use.

Very truly yours,

J. S. Abel
Nuclear Licensing Administrator -
Boiling Water Reactors