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November 2, 1979

United States Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Office of Nuclear Reactor Regulation
Mr. Darrell Eisenhut
Acting Director

Reference: (1) License No. DPR-3 (Docket No. 50-29).
(2) "Cladding Swelling and Rupture Models," draft dated 10/31/79 by D. A. Powers and R. O. Meyer.
(3) YAEC letter to USNRC, Re: "Increased Core XIV Initial Fuel Pin Fill Pressure," dated August 21, 1979.

Dear Sir:

Subject: Evaluation of Cladding, Swelling and Rupture Models

This letter is in response to concerns raised by your staff during a meeting on November 1, 1979 in which a draft report was presented which contained correlations relating to cladding behavior under LOCA conditions, Reference (2). At that time, suggestions were made by the NRC staff that existing correlations used in LOCA analyses may not envelope new data relating to clad deformation and rupture. These correlations include: (1) cladding burst temperature/stress, (2) cladding burst temperature/strain, and (3) reduction in flow area/stress. In this letter, these concerns are discussed with reference to the LOCA calculations YAEC has performed to support operation of Yankee Rowe during the current cycle.

YAEC at present performs a burnup sensitivity study for LOCA calculations for the Yankee Rowe reactor to define a linear heat generation rate limit as a function of core burnup. The method employed and the points analyzed for the present operating cycle (Cycle 14) are documented in Reference 3.

(1) Cladding Burst Temperature Versus Engineering Hoop Stress

The LOCA analysis for Yankee Rowe utilizes the WREM burst temperature curve to predict incidence of rupture. In all analyses performed, no rupture is calculated to occur. The specific analyses as described in Reference 3 for the current fuel in the Yankee Rowe reactor have been examined to determine the actual calculated cladding stress-temperature points. Of sixteen cases examined, only one case lies above the 0°C/sec curve of Reference (2) and all cases are in the range of hoop stress below 4 kpsi. The single case above the 0°C/sec curve lies within the 14°C/sec curve.

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This examinataion demonstrates that application of ramp rate dependent curves presented in the draft report, Reference (2), will not affect the results of our calculations for Yankee Rowe with respect to burst temperature/pressure.

(2) Cladding Burst Strain versus Temperature

To evaluate the implication of this correlation in the draft report, Reference (2), the burst strain curve for slow ramp rates (that which is applicable to Yankee Rowe) was substituted for the YAEC correlation. Calculations were redone for the fresh fuel assembly case at about 6000 MWd/Te burnup to represent our current operating condition. The results show that peak cladding temperature does not change significantly ($<20^{o}F$) and remains well below $2200^{o}F$.

(3) Local Flow Blockage versus Engineering Hoop Stress

To evaluate the implication of this correlation in the draft report, Reference (2), the Composite Assembly Flow Blockage curve was substituted for the YAEC correlation. Calculations were redone for the fresh fuel assembly case at about 6000 MWd/Te burnup to represent the most limiting bundle in our current operating condition. No rupture was predicted to occur in either the original calculation or in this revised analysis. It was established that this parameter had no influence on the peak clad temperature in the case analyzed.

In the time period available YAEC has reviewed its LOCA analysis and results for the Yankee Rowe plant in light of the information presented in Reference (2). Specific calculations have been performed at a core burnup considered to be representative of the current operating condition of the reactor. The results support continued operation and ensure safety and health of the public. We will continue to review the data, correlations, and analysis in the draft report and their implications with respect to the Yankee Rowe reactor.

Yankee is concerned at the nature of the process involved in elevating this issue to the status of mandated instant response under the implication of immediate plant shutdown.

YNSD was provided a copy of the draft report, Reference (2), on Thursday, November 1 during the meeting in Bethesda. (Incidently, invitation to this was extended informally via telephone late in the afternoon on Wednesday, October 31.) The draft report was admitted, by the staff, to lack any peer comment, but was presented as the basis of immediate concern. Although evaluation of the report was in progress, YNSD was not advised until

approximately 11:00 a.m. on Friday, November 2 that a response in writing was expected by this afternoon. Development of a written response in this time frame placed a severe burden on the organization and precluded investigation of several relevant issues including assessment of the appropriateness of the experimental data base and its application.

The fact is there are areas of phenomenological uncertainty in accident analyses. This is presumably why conservative analyses are required. As our understanding of such phenomena increases, we shall constantly be faced with evaluating existing approaches and modifying them; quite possibly to remove unwarranted conservatisms. In any case, it is Yankee Atomic's position that this process of evaluation and method improvement must proceed carefully and prudently. This should not be a process of immediate implementation of the NRC's latest viewpoint without reasoned technical review. If we accept such a process, it is Yankee's opinion that continued safe operation of nuclear power plants will be jeopardized.

If you have any questions regarding the technical content of this letter, please feel free to contact Dr. Ausaf Husain or Dr. Stephen Schultz of our Nuclear Engineering and Development Department.

Very truly yours,

YANKEE ATOMIC ELECTRIC COMPANY

D E. Vandenburgh

D. E. Vandenburgh
Senior Vice President

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