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

December 21, 1978

Mr. G. F. Owsley, Manager
Reload Licensing
Exxon Nuclear Company, Inc.
Box 130
Richland, Washington 99352

Dear Mr. Owsley:

We are reviewing Topical Report XN-NF-77-75, "Exxon Nuclear Power Distribution Control for Pressurized Water Reactors - Phase II" January 1978. This report describes an improved power distribution control procedure that will support lower power peaking limits than previously allowed by PDC-I.

From our review of this Topical Report to date, several items of additional information are required to complete our review. These items are described in the enclosure to this letter.

Please provide the requested information described in the enclosure to this letter within 45 days of your receipt so that we may complete our review for the Prairie Island reload.

Sincerely,

Thomas A. Ippolito, Chief
Operating Reactors Branch #3
Division of Operating Reactors

Enclosure:
Questions on Exxon Topical
Report XN-NF-77-57

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Questions on Exxon Topical Report XN-NF-77-57

1. Provide a sample Technical Specification indicating how Power Distribution Control Phase II (PDCII) would be implemented in a reactor.
2. Provide the detailed procedure for measuring $F_Q^T(z)$ at HFP equilibrium conditions. How does the requirement for equilibrium relate to power history and control rod bank movements allowed prior to measurement? What happens if the $F_Q(z)$ measurement is not all full power? What happens to the measurement uncertainty as a function of the number of incore detectors available for mapping? Relate these responses to Technical Specification requirements.
3. You have not justified the use of the 1.05 measurement uncertainty factor and the 1.03 engineering uncertainty factor you apply to $F_Q^T(z)$. Provide this justification or an indication of conservatism to cover the use of these factors until they are justified. This could take the form of an extra penalty factor applied to $F_Q^T(z)$ until the uncertainty factors have been justified.
4. Provide an evaluation and allowance for any potential increase in $F_Q^T(z)$ as a result of x-y plane xenon oscillations following control rod insertions and removals.
5. Provide an evaluation and allowance (if necessary) for potential increase in $F_Q^T(z)$ as a result of increase in the radial peaking factor through burnable poison depletion between measurements of $F_Q^T(z)$.

6. We are concerned that there may be a bias in modeling of xenon used for PDC analyses. This arises from our understanding that the model has been tailored to fit only Cook Unit 1 load follow tests, so that the degree of universality of the model is not known. Indicate your position on this matter. Do you have any plans for further verification, such as comparisons with other load follow test measurements, or measurements during ex-core detector calibrations?
7. Because of uncertainty in the accuracy of the XTG model, or in knowing that bounding transients have been selected for analysis, or that a sufficiently extensive number of different plant-cycle configurations have been analyzed, justify why an uncertainty factor should not be included in your V(z) function to ensure that is is bounding.
8. The bank position sensitivity study you report does not address the sensitivity of the V(z) function to the ratio of the x-y peaking factor with control rods to that without control rods. Provide analyses showing this sensitivity for different D bank strengths. Show how a limiting V(z) can be determined.
9. Provide a more detailed analysis of why the axial offset limits allowed during one hour violations of the ΔI control band are acceptable. What happens to the limits if full power capability without APDMS cannot be demonstrated?

10. Provide a discussion of what DNBR correlation, $F_{\Delta H}$ values, core thermal conditions, densification power spike, etc. are employed in the accident analyses. For example, how is the impact of control rod insertion limit violations on $F_{\Delta H}$ treated?

11. Provide an analysis of DNB under loss of flow accident conditions. This accident is sensitive to the power shape during normal operation.

12. In your evaluation of accidents have you allowed for degradation of thermal conditions during the transient or accident? For example, in both the rod withdrawal at power and boron dilution (manual rod control) accident, the primary system produces more power than the secondary system. This results in increase in the primary coolant temperature and alteration of the pressure so that DNB is adversely affected. Have you determined the DNBR at limiting thermal conditions, thus confirming the validity of the overtemperature ΔT trip setpoints? Do you edit Kw/ft throughout the transient so as to obtain the maximum, rather than the value at the end of the transient?

13. You have initiated the boron dilution (manual rod control) accident from only 50% power. Determine if more limiting values of DNB occur if the transient is initiated from higher power levels. Have you used a maximum charging rate appropriate to a four loop plant with all charging pumps running?

14. What is the sensitivity of your accident analysis to reactivity coefficients, bank worths, accident preconditions, etc. These require examination to support a generic conclusion of applicability of PDCII to all Westinghouse reactors.