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

January 9, 1980

Docket No. 50-285

Mr. W. C. Jones
Division Manager, Production
Operations
Omaha Public Power District
1623 Harney Street
Omaha, Nebraska 68102

Dear Mr. Jones:

During our review of your application for authorization of Cycle 6 operations at Fort Calhoun, we have determined that additional information is required. The enclosed questions refer to the following topical reports:

Reference 1: Fort Calhoun Cycle 6 Reload Plant Transient Analysis Report, Exxon Nuclear Company, Inc., XN-NF-79-79, October 1979.

Reference 2: Fort Calhoun Nuclear Plant Cycle 6 Safety Analysis Report, Exxon Nuclear Company, Inc., XN-NF-79-77, October 1979.

Please respond within 30 days to the enclosed questions and to those questions provided to you at our December 11, 1979 meeting in Omaha, Nebraska (Reference Meeting Minutes dated December 28, 1979).

Sincerely,

Robert W. Reid

Robert W. Reid, Chief
Operating Reactors Branch #4
Division of Operating Reactors

Enclosure: Request for
Additional Information

cc: w/enclosure
See next page

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Omaha Public Power District

cc w/enclosure(s):

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Enclosure

FORT CALHOUN, CYCLE 6
REQUEST FOR ADDITIONAL INFORMATION
January 9, 1980

The following questions refer to Reference 1:

1. How is decay heat calculated for non LOCA Accidents? If this information has already been submitted, please reference.

2. Table 2.4 of XN-NF-79-79 lists a value of -2.3×10^{-4} for the MTC used for accident analysis. However, the proposed Technical Specifications will allow a more negative value. Please clarify.

3. The minimum DNBR value for Cycle 6 is given as 1.70. The FSAR gives a value close to 1.3. Explain the differences in analysis or assumptions which give this difference.

   Provide the initial DNBR (not the minimum) calculated for Cycle 5. If it is significantly different from the Cycle 6 value of 1.87, explain the difference.

4. In performing the DNBR calculations for non LOCA accident analyses, how is the limiting subchannel determined? Please discuss the use of two different fuel designs in providing your answer. (See question 16)

5. Explain how fuel temperature (or gap conductance) is calculated for each event discussed in Reference 1. Are sensitivities done to show whether a high or low value of fuel temperature is conservative? How is fuel burn-up considered?

6. It is hypotehtically possible for a transient to be initiate from anywhere within the acceptable operating range as defined in the Technical Specifications. Describe the method used to assure the conditions chosen for initiation of a transient are the most conservative. Include possible power distributions which may be caused by xenon transients.

7. (Section 3.1)

   (a) Fig 3.13 of XN-NF-79-79 shows that the TM/LP trip is the first trip to operate for the CEA Withdrawal at Full Power over the entire range of reactivity insertions. Explain why this is so. These results do not agree with those of the FSAR analyses. Figures 3.7 to 3.10, which show the results of the Fast CEA Withdrawal, show only a slight increase in coolant temperature or decrease in pressure until after the reactor trip.

   (b) The Cycle 5 maximum reactivity insertion for this transient was $<310 \times 10^{-6}$. For Cycle 6 the value is 100×10^{-6}. Explain the reduction in the reactivity insertion rate. How was each of these reactivity insertion rates calculated?

   (c) What axial power shape and radial power distributions are used in the analysis of the Rod Withdrawal Event?

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(d) In Figure 3.13, explain why the rod withdrawal event gives the same DNBR at BOC and EOC.

(e) Provide copy of PTSPWR and XCOBRA input data used to calculate the fast rod withdrawal event. This information should be provided as soon as possible to give the staff time to perform independent calculations of this event, if necessary.

8. (Figure 3.1) Explain why the coolant flow increases during the CEA with withdrawal event.

9. (Section 3.2) Explain the gradual decay of main steam flow over a period of four seconds for a Loss of External Load transient. If the turbine stop valve has closed, and no credit is being taken for bypass valves or relief valves, how can the steam flow persist for 4 seconds?

10. (Section 3.7)

(a) For the large steamline break, Figure 3.63 shows a return to power reaching a maximum at approximately 125 seconds. At this time the pressure has decreased 1200 psia, making the RCS pressure approximately 900 psia. Demonstrate with a critical heat flux correlation appropriate to this pressure that there is no departure from nucleate boiling or that its effects are adequately considered.

(b) Explain how non-uniform inlet temperature effects are included in the steam line break calculation.

11. (Section 3.6.2, page 74) For the rod drop it is stated that system pressure is assumed constant. But the pressure actually decreases 108 psia. Explain why the decrease in RCS pressure was not included in the DNBR analyses.

12. (Section 3.6.1)

(a) Explain the use of a low flow trip at 92.5% for the two pump coastdown and 93% for the four pump coastdown.

(b) How is the core flow vs. time curve used in the analysis obtained?

(c) Why is a 0.9 multiplier used for Doppler for the Loss of Coolant Flow when a 0.8 is used for other transients?

(d) How are uncertainties in the low flow trip set point accounted for both in the analysis of the Loss of Flow and Seized Rotor events and in the plant instrumentation?

13. (Section 3.7) Discuss assumptions made about the location of the break for a steam line break. Also, discuss the assumptions which were made as to the quality of the steam and the discharge coefficient.

14. Explain how changes in power distribution during an accident are included in the accident analysis. Such changes could be caused for example, by movement of control rods or cooldown or heat up of the reactor coolant. (See question 7c)

15. Explain why there is no analysis of a dropped part length control rod or Loss of AC power.

16. Describe the method used to calculate the results of the CEA Drop Event. What coolant conditions are assumed? What assumptions are made about the peak radial power and the location of the fuel rod with the peak radial power before and after the drop? What was the position of the CEA's? What was the value of the augmentation factor without uncertainties? Specify the uncertainty factors and their values. What value of burnup yeilds the largest augmentation factor? What is the worth of the dropped rod that resulted in the 21% augmentation?

    Describe the model (including rod axial and radial power distributions) used for the Rod Drop Event DNBR calculations. List any hot channel factors included in these rod power distributions.

17. Describe method used to calculate the Loss of Flow Event and the Siezed Rotor Event. Describe how the results of PTSPWR are input into XCOBRA. How is the axial power distribution determined? Are reactivity feedback effects on the axial power distribution considered? How are voids in the hot channel considered for both heat transfer and reactivity effects. Is collapsing of the voids due to the increase in pressure modeled? The answers to questions 1, 4, 5, 12, and 14 are relevant to this question.

The following questions refer to Reference 2:

18. Discuss in detail how Exxon analyses include the Combustion Engineering and Exxon fuel rods. Statements are made in the topical reports submitted by OPPD which state that the analyses are done only for Exxon fuel. For example, page 13 of XN-NF-79-77 (Steam Line Break), page 43 of XN-NF-79-77 (LOCA blowdown analysis). For LOCA heatup analysis the core is analyzed as if it contained all CE and all Exxon fuel. What power histories are used for the exposure analyses? Do they conservatively bound fuel movements in which the CE fuel was in a low power peripheral position and is now possibly in a higher power position where it might possibly still be limiting even though it now has more burnup?

19. Explain the basis and purpose of the fourth criterion for thermal hydraulic performance in Section 6.1 dealing with cladding temperatures.

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20. (Table 7.1) Explain the factors (1.07) and (1.08) used as multipliers on the final energy deposition at HFP and the (1.33) and (1.10) used at HZP.

21. (Section A.2.3) For the limiting large break the Fq value must be reduced above a core height of 70%. This is shown in Figure A.2. Explain why this curve does not have to appear in the Ft. Calhoun Technical Specifications. Is the conclusion likely to change from cycle to cycle?

22. (Section 8.3.2) It is our understanding that the TM/LP equation to be used is not the equation given on page 30. Justify the validity of the analysis presented in References 1 and 2 in view of the changed equation.

23. Describe how delays in the TM/LP trip circuitry (including the initial delays in power and inlet temperature) are modeled in PTSPWR for the Ft. Calhoun safety analyses.

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