January 23, 2002

Mr. Oliver D. Kingsley, President
and Chief Nuclear Officer
Exelon Nuclear
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: OYSTER CREEK NUCLEAR GENERATING STATION - REQUEST FOR ADDITIONAL INFORMATION ON HIGH DENSITY FUEL RACKS WITH BORAFLEX DEGRADATION (TAC NO. MB2106)

Dear Mr. Kingsley:

In reviewing your May 24, 2001, submittal, the U.S. Nuclear Regulatory Commission (NRC) staff has determined that it will need additional information to continue its review. The request for additional information (RAI) is enclosed. Because of the complexity of the issue and lengthy nature of the RAI, the NRC staff will be contacting your staff to schedule a meeting to discuss the issues before you respond to the RAI. The schedule for your response to the RAI also will be discussed at the meeting.

If you have any questions regarding this correspondence, please contact me at (301) 415-1261.

Sincerely,

/RA/

Helen N. Pastis, Senior Project Manager, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-219

Enclosure: As stated

cc w/encl: See next page

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<u>REQUEST FOR ADDITIONAL INFORMATION</u>

<u>HIGH DENSITY FUEL RACKS WITH BORAFLEX DEGRADATION</u>

<u>OYSTER CREEK NUCLEAR GENERATING STATION</u>

<u>FACILITY OPERATING LICENSE NO. DPR-16</u>

<u>DOCKET NO. 50-219</u>

The accuracy of the criticality analysis depends in part on the quality of the assumptions. Your submittal did not include sufficient technical support to provide the staff with reasonable assurance that you have the ability to identify, model and predict appropriate Boron-10 atom densities and geometry from Boraflex thinning, shrinkage and gaps. Confirmatory comparison to experiment or data applicable to Oyster Creek, discussion of confidence through past experience and lessons learned, and specific description of each component of your approach is necessary to provide NRC staff with the reasonable assurance that criticality will be prevented. Please refer to NRC Generic Letter (GL) 96-04 entitled, “Boraflex Degradation in Spent Fuel Pool Storage Racks,” and address all of the requested Information. Please describe the changes from the information contained in GL 96-04.

1. Based on the submittal, it appears that the Boraflex management program is comprised of blackness testing, BADGER testing, spent fuel pool (SFP) silica concentration monitoring, and Boraflex coupon testing. For each of these techniques, provide details on the management of Boraflex degradation; i.e, the parameters monitored, the inspection and/or surveillance techniques, their frequency, and their bases. In addition, provide details on the relationship among all aspects of this program in assuring that the assumptions of Boraflex degradation are appropriate; e.g., latest test results and trends for each test completed. Address the impact of these programs on the Table 1 criticality uncertainties.

2. Provide details on the remaining coupons for future surveillance.

3. Provide details on the validity of the RACKLIFE predictions based on the input provided; e.g. the escape coefficient, and a comparison of the predictions from RACKLIFE with the measurements taken from BADGER. Provide details on the “peak thinning rate predicted by the RACKLIFE program” referenced on page 2 of 3 which supports the conclusion that the Boraflex racks will remain acceptable until December 2002. In addition, how is this program relied on to maintain subcriticality. Provide the experimental data and prediction comparisons which would provide assurance that BADGER and RACKLIFE results, on which you base your B-10 atom density and Boraflex geometry modeling, may be used with confidence.

4. Provide details on the assumptions of the state of Boraflex referenced in pages E1-2 and E1-3; i.e.,
    * 10% uniform thinning
    * areal density = 0.01003 gm-B10/cm2
    * 4.2% shrinkage in length and width
    * number of gaps per panel

Enclosure

* distribution of gaps over upper 75% of the panels
* results of the 100 cases calculated with different random gap distributions

5. The response to GL 96-04 dated October 15, 1996, indicates on page 2 that additives in the SFP which could inhibit silica loss were being considered. Provide details on the status of this action.

6. Provide the dimensions for Figure 1, “cross-section of typical storage cell” on page E-1.

7. The RACKLIFE program has not been submitted for staff review and generic approval for your proposed application. Therefore, describe the RACKLIFE program assumptions, input, output, and uncertainties. Describe how you verify the validity of the Boraflex degradation predictions resulting from the RACKLIFE program. Describe in detail your temporal and spatial treatment of the escape coefficient, how it is determined, the manner in which it is validated, and the sensitivity of the criticality analysis to this parameter. Describe the degree to which RACKLIFE is relied on to maintain subcriticality.

8. Provide and justify the B-10 atom density used in the KENO calculation. Describe how it was determined and why this is appropriate for your plant.

9. Justify the panel length and width shrinkage used in the model geometry. Describe why this is appropriate to your plant. Discuss the significance of axial Boraflex shrinkage coupled with end effects. The submittal does not consistently state how shrinkage and gaps were modeled. Please provide clarification on pages E1-2 and E1-3.

10. Justify the Boraflex gap area chosen. Provide justification for modeling random gap locations by comparison to relevant data. Describe the effects should coplanar gap locations occur, and if these occurred in your random gap location modeling. Clarify whether Boraflex panels exist in the 8 outer locations of the 2x2 cell layout of Figure 2. The last paragraph of Section 2.4 states that gaps were randomly distributed among the 12 Boraflex panels modeled in the 2x2 array. The previous paragraph implied that gaps appeared in 75 percent of the panels. Did gaps appear in 9/12 Boraflex panels with randomly distributed locations within the region of the upper portion of the fuel bundle?

11. Describe surveillance measures which will ensure that your assumptions remain bounding, and actions to be taken if you discover the assumptions will not remain bounding. Include considerations of periodicity and timeliness of your actions to maintain subcriticality. How long do you expect your submittal to remain valid?

12. What have the Boraflex degradation mechanisms been conservatively compared to when accounted for in your criticality analysis (refer to the last sentence in Section 1.0 Introduction)?

13. Describe compliance to Section 50.68.

14. RIS2001-12 identified NUREG/CR-6683 as reporting that reactivity equivalencing results in errors between a few tenths of a percent to nearly 10 percent in k_∞ depending on the application of the equivalencing. Quantify and account for the error associated with your

application. Account for non-uniform enrichment variation in the assembly and uncertainty in the average assembly enrichment.

15. The known nonconservatisms in axial burnup biases as applied in WCAP-14416-NP-A were consolidated by Westinghouse in NSAL-00-0015, Axial Burnup Shape Reactivity Bias, dated December 6, 2000. By letter dated August, 2001, NRC informed Westinghouse that portions of WCAP-14416-NP-A could no longer be referred to in licensing actions. Include a discussion of how CASMO-3 output translated into KENO V.a input, and the uncertainties resulting from that method.

16. Section 2.1 states that CASMO-3 was used to perform fuel bundle depletion analysis and that the values are unchanged from the Reference 2 analysis. However, no references were included. Please provide them.

17. Define the panel conditions under which GDC 62 will no longer be met. How will you know before you have reached that condition and begin impinging on the 5 percent subcriticality margin and what action will you take?

18. Section 2.3 was included to assure consistency with the previous analysis. However, the computing method, the cross sections, and contents were changed. A meaningful comparison between the new analysis and the previous analysis would describe the results of each change, taken in steps.

19. Provide a statistical justification of choosing to perform calculations for 100 cases of random gap distribution.

20. Provide a reference to staff review and acceptance including conditions for use for the USLSTATS code. It appears that there should be parentheses around the terms for the subcriticality margin, calculational bias and uncertainty in the bias which is then subtracted from 1 in your equation for k_{usl}.

21. Include a table of assumptions for each type of calculation.

22. Include accident conditions calculations which account for dropped and misloaded assemblies.

23. Provide the experimental data and prediction comparisons which would provide assurance that BADGER and RACKLIFE results, on which you base your B-10 atom density and Boraflex geometry modeling, may be used with confidence.