November 30, 2001

Mr. Michael R. Kansler
Senior Vice President and
Chief Operating Officer
Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, NY 10601

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING SPENT FUEL STORAGE PIT ANALYSIS WITH SOLUBLE BORON CREDIT, INDIAN POINT NUCLEAR GENERATING UNIT NO. 2 (TAC NO. MB2989)

Dear Mr. Kansler:

In a letter dated September 20, 2001, Entergy Nuclear Operations, Inc. (ENO) submitted a proposed amendment to the Technical Specifications for Indian Point Nuclear Generating Unit No. 2 to allow the credit for soluble boron in the criticality analysis of the spent fuel pit (SFP). The proposed amendment would also incorporate changes to the SFP rack layout by dividing it into sub-regions and specifying requirements for fuel assembly burnup and soluble boron concentration for various loading configurations in these sub-regions.

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing information provided in the September 20 submittal. On November 14, 2001, the staff held a telephone conference call with representatives of your staff to inform them of several areas of concern with the information supporting the request. During the conference call, the NRC staff stated that it would provide ENO with the enclosed request for additional information (RAI). The ENO staff indicated that a response would be provided within 60 days.

If you should have any questions, please do not hesitate to call me.

Sincerely,

/RA/

Patrick D. Milano, Sr. Project Manager, Section 1
Project Directorate 1
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-247

Enclosure: RAI

cc w/encl: See next page

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REQUEST FOR ADDITIONAL INFORMATION

REGARDING SPENT FUEL PIT CRITICALITY ANALYSIS

USING CREDIT FOR SOLUBLE BORON AND FUEL BURNUP

INDIAN POINT NUCLEAR GENERATING UNIT NO. 2 (IP2)

In a letter dated September 20, 2001, Entergy Nuclear Operations, Inc. (the licensee) requested changes to the IP2 Technical Specifications (TSs) to allow credit for soluble boron and fuel burnup in the criticality analysis for the spent fuel pit (SFP). The September 20 letter included, as Attachment 3, the Northeast Technology Corporation Report NET-173-01, "Criticality Analysis for Soluble Boron and Burnup Credit in the Con Edison [the former licensee] Indian Point Unit No. 2 Spent Fuel Storage Racks." The NRC staff has the following questions that relate to the information in NET-173-01.

Benchmarking

1. Appendix A to NET-173-01 describes the benchmarking of computer codes SCALE-PC and CASMO-4 used for performing criticality and safety analysis sequence. In the computation of the mean bias and its standard deviation (Eqs. 3.1 and 3.2) associated with a SCALE - PC estimate of k_{eff}, provide a discussion of where and how are you taking account for the experimental error associated with each critical assembly measurement of k_{eff}. Also, describe how are you propagating that error into the final estimate of the SFP k_{eff} ?

2. In Tables 6-3 and 6-4 what are the reference k_{eff} values that are uncorrected for bias?

3. In both KENO and CASMO, discuss how are you modeling (both geometric representation and compositions) the degraded Boraflex? How do you assure that in the calculation of the same unit cell that the 3-D representation of degraded Boraflex in KENO gives the same neutronic effect as the 2-D representation in CASMO? Are your bias estimates affected by the difference in modeling of the Boraflex?

4. In order to meet the 95/95 $k_{eff} \leq 0.95$ confidence criterion under accident conditions, you are crediting 1495 ppm of boron. In Regulatory Information Summary 2001-12, the NRC identified a concern that the results reported in NUREG/CR-6683 were indicating that reactivity equivalencing in the context of high boron concentrations can lead to non-conservative results. Discuss how you have addressed this concern.

RACKLIFE

1. In the first paragraph of Section 4.2, "Background," there are a list of assumptions (provided as bullets) that were relied upon in the RACKLIFE simulations. Explain in more detail the statement in the third bullet; in particular the statement about "placement of '95th percentile' assemblies...". Give a specific example to illustrate the meaning.

Enclosure

2. Define the “escape coefficient” and whether the staff’s assumption that it means (panel cavity flow)/(bulk pool flow) is correct. Is it an integral parameter valid over the whole pool region; or does each panel have its own escape coefficient?

3. What is meant by “a geometric increase in the escape coefficient over time”? Also, provide the mathematical expression. How are the coefficients in the rate expression determined? Does the value of the coefficient vary from panel to panel for a given point in time? Over what range of the dependent variables is the estimate of the expression valid? What is the uncertainty in the coefficient? Does the uncertainty in the coefficient vary with time?

4. The second paragraph of Section 4.2 reads “If some of these assumptions prove to be invalid ..., it is expected that the RACKLIFE model can be updated to reflect actual operating conditions and will show that the projections remain conservative.” Why do you only “expect” that the projections will remain conservative? How do you plan to determine that the value of the escape coefficient is no longer valid? What statistical model do you employ to determine whether the escape coefficient is still valid? What measurements and at what interval contain this information? Are the measurements following the same Boraflex panels as function of time/dose?

5. What (i.e., “state of the panels”) does RACKLIFE project and how is it done? Define the term “state of a panel.” Explain and give the unit(s) of the degradation measure(s). Given the state of a particular panel at some time t_1, does RACKLIFE give the state of the same panel at some later time t_2, or does it give the mean state of all the panels with an associated variance?

6. How are the RACKLIFE projected results translated into the requisite input values for KENO and CASMO calculations for some future time? What is the sensitivity of the RACKLIFE computed state of a Boraflex panel to a change in the escape coefficient?

Badger Measurements

1. On page 4-3, the second paragraph starting with “Models of the panels ...” is confusing. Rewrite the material and make the relationships (especially statistical) clear and introduce figures, where necessary.

2. In Example 1, “Loss Equivalence,” on page 4-4, what is meant by “a strong bias towards the ‘worst’ panels”? The NRC staff believes that the issue is not the worst degraded panel, but rather the panel with the worst degradation rate. Given that you have measurements only at one time point (February 2000), how can you determine a degradation rate and make projections to which an uncertainty can be associated to eventually compute the 95/95 k_{eff} of the spent fuel pool with degraded Boraflex panels?