February 12, 2001

Mr. James F. Klapproth, Manager
Engineering & Technology
GE Nuclear Energy
175 Curtner Ave
San Jose, CA 95125

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION (RAI) - NEDC-32983P, "GENERAL ELECTRIC METHODOLOGY FOR REACTOR PRESSURE VESSEL FAST NEUTRON FLUX EVALUATIONS" (TAC NO. MA9891)

Dear Mr. Klapproth:

By letter dated September 1, 2000, GE Nuclear Energy (GE) submitted Topical Report NEDC-32983P, "General Electric Methodology for Reactor Pressure Vessel Fast Neutron Flux Evaluations" to the NRC for review. The staff completed its preliminary review and identified a number of items for which additional information was needed to complete its review. GE submitted responses to previous NRC RAIs on December 19, 2000, January 5, 2001, and January 17, 2001. However, the staff finds that these submittals were not fully responsive to the previous RAIs. Therefore, additional information is needed in order for the staff to complete its review. Please provide your response to the enclosed RAI promptly to enable us to complete the review in a timely manner. We would welcome partial submittals to minimize the delay.

Sincerely,

/RA/

Girija S. Shukla, Project Manager, Section 2
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Project No. 710

Enclosure: Request for Additional Information

cc w/encl: See next page

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REQUEST FOR ADDITIONAL INFORMATION

FOR THE REVIEW OF TOPICAL REPORT NEDC-32983P,

"GENERAL ELECTRIC METHODOLOGY FOR REACTOR PRESSURE VESSEL

FAST NEUTRON FLUX EVALUATIONS"

GE NUCLEAR ENERGY

PROJECT NO. 710

1. The synthesis equation of Section 2.1 does not account for the axial dependence of the fluence when the fluence is calculated at z = z' (as appears to be the case in the Chapter-3 calculations). Please discuss this approximation and its effect on: (1) the calculations of the Chapter-3 benchmark problem, (2) the Chapter-5 dosimetry benchmark measurements, and (3) the BWR licensing calculations.

2. Is the conservatism resulting from the use of bundle power in determining the core neutron source identified in Table 3-6 (Case-3 vs. Case-4) applicable to all core designs? For example, are there core designs where the peripheral bundle pin power distribution is relatively flat and the bias is significantly less (e.g., in fuel bundles at higher elevations where the void fraction is maximum) or even non-conservative?

   The recent trend toward thermal power uprates has led to flatter radial power distributions which complicates the reactor core calculations. In light of this fact, describe the methods used to calculate the source for the transport solution and justify its use for this application including reference to low power range monitor (LPRM) data as near to the core periphery as possible.

3. Regarding the methods used to analyze the surveillance dosimetry measurements of Table 6-1, how does this analysis account for the effects of power history, isotopic buildup and decay that contribute to the activity measurement? Is the methodology consistent with the applicable American Society for Testing and Materials (ASTM) dosimetry standards (e.g., ASTM E263-93, "Standard Test Method for Measuring Fast-Neutron Reaction Rates by Radioactivation of Iron," ASTM E1297-96, "Standard Test Method for Measuring Fast-Neutron Reaction Rates by Radioactivation of Niobium," etc.). If not, provide justification for the method used.

   Do each of the measurements shown in Table 6-1, represent several dosimeter measurements? If so, how were the individual measurements combined to yield the reported value?

4. The determination of the semi-empirical cross sections used to relate the flux (E > 1.0 MeV) to the count rate measurements should be described. Also, please describe the spectrum unfolding method used to relate the measured reaction rate to the flux (E > 1.0 MeV) and its validation. Please provide and justify the definition and describe the application of: (1) the cross section as a function of the Fe-54/Cu-63 reaction rate ratio, (2) the Fe-54/Cu-63 reaction rate ratio as a function of the size of the water gap, and

(3) the semiempirical cross section method in the analysis of nickel dosimetry measurements. Please provide the validation of these cross sections and the determination of the cross section uncertainty.

5. In the response to the previous RAIs, several corrections to the original NEDC-32983 analysis have been identified. For example, in response to RAI-10, it is stated that the "original analysis" was corrected for a calculational error and, in response to RAI–17, several of the C/M values in Table 6-1 have been changed (e.g., plants C and D) or deleted (e.g., plant I). Please provide the specific reason for these changes.

6. The fluence calculation uncertainty analysis of Section 7.1 should be updated to include the effect of the uncertainty in the bundle and pin power distributions on the calculated fluence.

7. The C/M comparisons of Table 6-1 indicate a substantial systematic underprediction of the BWR 3/6 fluence by the proposed current method. This underprediction is substantially larger than the increase being applied for BWR 4/5s. In view of the magnitude of this bias and the much smaller bias being applied for BWR 4/5s, provide: (1) an explanation for this bias, and (2) justification for using the smaller bias being applied to BWR 4/5s fluence calculations as an initial estimate of the bias for BWR 3/6s. (Are the two operating BWR 2s left out of your proposed methodology?)

8. It is stated in Section-8 that for BWR 3/6s the initial flux estimate will assume the bias based on the BWR 4/5 surveillance data, and the flux "may be benchmarked against actual measurements to justify whether it is necessary to re-adjust the bias." In view of the substantial differences observed between the BWR 4/5 and BWR 3/6 benchmarking comparisons, provide the criteria and basis that will be used to determine (what?) when the benchmarking against actual measurements will be performed.

9. In your response to RAI-10 the actinide measurements were excluded "..due to unavailability of photofission data.." The fact that the photo-fission calculations have not been performed, when they can be performed with existing models, is not an acceptable reason for the exclusion of this data. Also the 71-degree azimuth wire data has been excluded "..in order to simplify the analysis..." Simplification of the analysis is not an acceptable reason for excluding this data. These exclusions amount to selective data rejection. Please provide the M/C comparisons for the excluded data or justify the exclusions with valid statistical arguments.

10. Is the "statistical" argument presented in R9-1 valid in view of your finding in response to RAI-17 that separate subsets of the data base yields two different biases?