November 15, 2000

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

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

Dear Mr. Klapproth:

By letter dated September 1, 2000, the General Electric Company submitted, for NRC staff's review, Licensing Topical Report NEDC-32983P, "General Electric Methodology for Reactor Pressure Vessel Fast Neutron Flux Evaluations." The staff has completed its preliminary review and identified a number of items in the enclosed request for additional information that are needed to continue its review. The staff requests that the information be provided promptly so that the review can be completed in a timely manner. The staff would welcome partial submittals to minimize the delay.

If there are any questions, please call me at (301) 415-3016.

Sincerely,

/RA/

Robert Pulsifer, Project Manager, Section 1
Project Directorate I
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

NEDC-32983P, "GENERAL ELECTRIC METHODOLOGY FOR REACTOR PRESSURE VESSEL FAST NEUTRON FLUENCE EVALUATIONS"

1. The report does not identify nor describe the method to be utilized in the computation of BWR vessel (or reactor internals) fluence. The method(s) to be used should be the same to that described and benchmarked in the topical report.

   Please describe the proposed method(s) to be used, the proposed range of application (types of BWRs) and the intended applications.

2. The report refers frequently to conservatisms in the calculations. Conservatisms are desired and welcomed in some applications, as for example, the calculation of the vessel fluence. However, there are applications, as for example, multiplant and cross plant dosimetry analysis where only an accurate value should be used.

   Please specify whether the methodology will be geared toward a conservative or an accurate solution.

3. The applicant should address the question: are the energy groups adopted in the report adequate with respect to the energy spectrum and the resulting accuracy associated with the conversion of dosimeter activation measurements to flux with E > 1.0 MeV? Spectrum accuracy is particularly important if Fe-54, Cu-63, etc. dosimeters with threshold energies E > 1.0 MeV are to be analyzed, which were irradiated in the shadow (or penumbra) of the jet pumps or pump risers.

   Please demonstrate that the chosen number of energy groups (compared to the 47 groups in the standard BUGLE cross sections) is adequate for activation conversion in the shadow, the vicinity or away from jet pumps or pump risers.

4. The differences to the vessel and downcomer azimuthal fluxes between the GE and the BNL MCNP models are very high (e.g., see Tables 4-1 and 4-2, etc.).

   Please provide a physically based explanation and understanding of these differences. The report should also establish and justify a threshold of acceptability of the differences.

5. In Section 5.1, it is stated that: "The methods used to determine the plant specific data and to calculate the benchmark solutions must be consistent to the extent possible with those used to calculate the vessel fluence."

   Please state the differences between the benchmarked and the methods used and if necessary, evaluate and justify.

6. In Section 5.1, it is stated: "...when the measurement data are of sufficient quality and quantity that they allow a reliable estimate of the calculated biases...."

The adequacy of the quality and the quantity of the data base should be supported by appropriate statistical analysis.

7. In Section 5.3, S_{12} and P_3 approximations are proposed. However, the BWR depth of penetration is considerable.

   Should you consider using a P_5 approximation to better represent the sharply forward component of the flux?

8. In Section 5.3.1, a BWR with a relatively small vessel was chosen to perform measurements for the benchmarking.

   The report should discuss the applicability of the data to the newer BWRs (BWR4-6) with larger vessel diameters, larger number of fuel assemblies and different core and downcomer configurations. Likewise for earlier BWRs.

9. In view of the proposed BWR ISP (integrated surveillance program), it is almost certain that the methodology will be applied to plants without recent credible dosimetry.

   The report should assure that the benchmarking is based on all available dosimetry data and data from all types of reactors for which the methodology is intended and are included in the ISP. Any such justification should be based on acceptable statistical arguments.

10. In Section 5.3.6, the data used are limited to the Fe-54 and Nb-93. The available data are much broader, however, the exclusion of the remaining data has not been justified.

    Please justify data exclusion with appropriate statistical arguments.

11. Section 5.4.2 states that: "The uncertainties associated with each C/M ratio is of the order of 10 percent including statistical uncertainties."

    Please justify this statement with respect to the magnitude of the uncertainty, the uncertainty components and method of analysis.

12. Section 5.4.2 states that the gamma induced fissions in the actinides has been ignored.

    Please discuss why photofission can be ignored using acceptable technical or statistical arguments.

13. Section 5.4.2 finds large differences in the axial direction as acceptable because the trend is "consistent" for all azimuths leading to the conclusion that the dosimeter locations may be wrong.

    The report should justify why consistency is an adequate justification for acceptance. Statistical arguments should be used along with appropriate acceptance criteria for inclusion or rejection of specific data points in the data base.

14. Section 5.5 concludes that: ".. good C/M can be obtained."

    Please justify the above statement based on acceptable statistical arguments and stated acceptance criteria.

15. Section 5.5, Tables 5.4a, b and c, include specific dosimetry measurements with very large deviations from C/M = 1.0.

    Please provide justification for the acceptability of these values and the corresponding acceptability criteria.

16. In Section 5.3.1, there seems to be a misdesignation (or a typo) for the I=9, J=3 bundle.

    Please clarify.

17. In Section 6, the available data (from the plants to which the methodology has been applied) was sampled. All of the available data should be used.

    Please justify why selected data are acceptable. In Table 6-1 C/M values from plants A, B, G, J and K show large deviations from C/M = 1.0. Why are these values acceptable? The report should also state what methodology was used for the calculated flux, what kinds of dosimetry is represented in the measured values, what adjustements (if any) were made on the measured values and what spectra were used for the conversion of activation to flux (fluence).

18. In Section 7.0, the uncertainties listed are by no means exhaustive and important uncertainty components are not recognized. The same holds true for the calculated bias values.

    The report should present and justify the method of uncertainty and bias calculation and the qualified data base which these estimates are based on.

19. In Section 8 (or other suitable section), the report should define the proposed method, acceptance criteria for the data base, should state the uncertainty and bias to be applied to the calculated values (if any) and spell out the intended applications and the reactor population to which is considered applicable.