December 7, 2006

Mr. David H. Hinds, Manager, ESBWR
General Electric Company
P.O. Box 780, M/C J70
Wilmington, NC 28402-0780

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 82 RELATED TO ESBWR DESIGN CERTIFICATION APPLICATION

Dear Mr. Hinds:

By letter dated August 24, 2005, General Electric Company (GE) submitted an application for final design approval and standard design certification of the economic simplified boiling water reactor (ESBWR) standard plant design pursuant to 10 CFR Part 52. The Nuclear Regulatory Commission (NRC) staff is performing a detailed review of this application to enable the staff to reach a conclusion on the safety of the proposed design.

The NRC staff has identified that additional information is needed to continue portions of the review. The staff's request for additional information (RAI) is contained in the enclosures to this letter. Pursuant to 10 CFR 2.390, we have determined that the enclosed RAI contains proprietary information. The proprietary information is indicated in brackets and underlines in Enclosure 1. We have prepared a non-proprietary version of the RAI (Enclosure 2) that does not contain proprietary information. We will delay placing this document in the public document room for a period of ten (10) working days from the date of this letter to provide you with the opportunity to comment on the proprietary aspects only. If you believe that any additional information in the enclosure is proprietary, please identify such information line by line and define the basis pursuant to the criteria of 10 CFR 2.390 before the public release date of December 21, 2006.

The RAI questions are related to NEDE-33243P, "ESBWR Marathon Control Rod Nuclear Design Report" and NEDE-33244P, "ESBWR Marathon Control Rod Mechanical Design Report." In addition, RAI question 21.6-93 related to NEDE-32176P, Rev. 3, "TRACG Model Description" is included.

To support the review schedule, you are requested to respond to these RAI questions by January 22, 2007.

If you have any questions or comments concerning this matter, you may contact me at (301) 415-4115 or mcb@nrc.gov or you may contact Amy Cubbage at (301) 415-2875 or aec@nrc.gov.

Sincerely,

/RA/

Martha Barillas, Project Manager
ESBWR/ABWR Projects Branch 1
Division of New Reactor Licensing
Office of New Reactors

Docket No. 52-010

Enclosures: 1. Request for Additional Information (Proprietary)
2. Request for Additional Information (Non-Proprietary)

cc: See next page (w/o enclosure 1)

If you have any questions or comments concerning this matter, you may contact me at (301) 415-4115 or mcb@nrc.gov or you may contact Amy Cubbage at (301) 415-2875 or aec@nrc.gov.

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Martha Barillas, Project Manager
ESBWR/ABWR Projects Branch 1
Division of New Reactor Licensing
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Docket No. 52-010

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cc: See next page (w/o enclosure 1)

ACCESSION NO. ML063350136-Package

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Requests for Additional Information (RAIs)
ESBWR Marathon Control Rod Design
Nuclear Design NEDE-33243P & Mechanical Design NEDE-33244P

RAI Number	Reviewer	Question Summary	Full Text
4.9-1	Clifford P	Definition of nuclear lifetime.	Section 2 of NEDE-33243P states that blade lifetime is defined as a 10 percent reduction in the cold worth of a quarter segment of the blade. a) Please discuss the overall reduction in total blade worth at the point where a quarter segment has been reduced by 10 percent. b) Please discuss how the EOL reduction in blade worth is accounted for in safety analysis and shutdown margin calculations.
4.9-2	Clifford P	Monitoring blade lifetime.	Section 2 of NEDE-33243P states, “depletion fractions are converted to EOL fluence to facilitate plant monitoring”. a) Please discuss the methods and accuracy of monitoring control blade fluence over several cycles. b) Please discuss any surveillance, control blade worth measurements, and inspections programs to validate blade lifetime predictions.

RAI Number	Reviewer	Question Summary	Full Text
4.9-3	Clifford P	Sensitivity of EOL fluence prediction.	Section 2 of NEDE-33243P describes the blade worth depletion methodology. Please discuss the sensitivity of the end-of-life fluence prediction to the following parameters: (1) coolant conditions (e.g., void fraction) (2) variations in axial power distribution with burnup (3) Cycle 1 fuel management (4) reload, non-equilibrium fuel management (5) U^{235} enrichment (6) fuel assembly design (e.g. part-length fuel rods) (7) control blade insertion patterns (e.g. fluence history)
4.9-4	Clifford P	Comparison of ESBWR to current fleet.	Section 3 of NEDE-33243P describes the EOL depletion calculations. Please discuss how these depletions (e.g., B10 depletion versus blade worth) compare with similar calculations performed for the Marathon control blades employed in the current BWR fleet.
4.9-5	Clifford P	Empirical database for B4C swelling and helium release.	Section 4.7.4 of NEDE-33244P refers to empirically-based B_4C swelling and helium release fractions. Please provide the source of this experimental data.
4.9-6	Clifford P	Stress analyses for lower operating temperatures.	Table 2.1 of NEDE-33244P summarizes the stress analyses. Please justify the lack of cold stress analyses for certain loads (e.g., internal pressure, seismic combination, etc.).

RAI Number	Reviewer	Question Summary	Full Text
4.9-7	Clifford P	Inputs to the absorber tube internal pressure analysis.	Section 13.2 of NEDE-33244P describes the internal pressure analysis performed on the absorber tube. a) Please justify the ultimate strain used in the analysis. b) Please discuss the impact of (1) irradiated material properties and (2) the cited irradiated assisted stress corrosion cracking strain limit on the analysis. c) Results from burst testing are briefly mentioned. Please discuss in further detail these burst test results and their applicability to the ESBWR Marathon design.
4.9-8	Clifford P	Absorber capsule structural support and failure.	Section 1 of NEDE-33244P briefly describes the physical design of the ESBWR Marathon control blade. According to Section 1, the [[ ]]. a) Please discuss the [[ ]]. b) Please discuss the impact of [[ ]]. c) Please discuss the capabilities to detect [[ ]].

RAI Number	Reviewer	Question Summary	Full Text
4.9-9	Clifford P	EOL predictions versus in-reactor service.	Section 2 of NEDE-33244P states that the [[ ]]. Please discuss how EOL predictions for the current Marathon design compared with in-reactor service (e.g., premature blade failures, reduced blade worth). As part of this response, please discuss the results of the surveillance program on the current generation Marathon control blade (part of NRC SE, 1991).
4.9-10	Clifford P	Stress corrosion cracking.	Table 2.1 of NEDE-33244P summarizes the various loadings and stress analysis results. Stress corrosion cracking (SCC) in the control blade components and relaxation of residual weld stresses are more difficult to model and/or predict compared with the loads identified in Table 2.1. a) Please discuss in more detail in-reactor experience of the current Marathon control blades with respect to SCC and relaxation of weld stresses. b) Please discuss the sensitivity of SCC to plant operating chemistry. c) Please discuss any surveillance programs (e.g., pool-side PIEs) aimed at detecting SCCs and weld relaxation. d) Please discuss the capabilities available to detect control blade failure (e.g., B_4C leakage) and blade distortion during operation. e) Please discuss the results of the surveillance program on the current generation Marathon control blade (part of NRC SE, 1991).
4.9-11	Clifford P	ESBWR DCD control blade design criteria.	Section 2 of NEDE-33244P states, “All control rod components are found to be acceptable in accordance with Reference 2 [ESBWR DCD Tier 2 Section 4C] criteria when analyzed due to internal and external loads”. Please clearly disposition each of the design criteria GE plans to include in the ESBWR DCD.

Request for Additional Information (RAI)
ESBWR Design Control Document (DCD) Chapter 21.6

RAI Number	Reviewer	Question Summary	Full Text
21.6-93	Klein V	State whether GSTRM or PRIME thermal conductivity models were used for TRACG04 analyses.	NEDE-32176P, Rev. 3 “TRACG Model Description,” states that “The default correlation for thermal conductivity (k) for unmolten UO2 has been updated to be compatible with the model used in PRIME03.” For DCD Tier 2 Revision 2 Chapter 4, 6, and 15 TRACG04 analyses of LOCA, Stability, AOOs, and ATWS, please state if you used the GSTRM or PRIME03 model for fuel thermal conductivity. In addition, how does a TRACG04 user specify the use of either model in a TRACG04 input deck? Provide the staff the location in the TRACG04A,P User’s Manual (NEDC-32956P, Rev. 0 UM-0149, Rev. 0) that provides this guidance.

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