September 4, 2008

Mr. Robert E. Brown
Senior Vice President, Regulatory Affairs
GE Hitachi Nuclear Energy
3901 Castle Hayne Road MC A-50
Wilmington, NC 28401

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 243 RELATED TO DESIGN CONTROL DOCUMENT (DCD) REVISION 5

Dear Mr. Brown:

By letter dated August 24, 2005, GE Hitachi Nuclear Energy (GEH) 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 enclosure to this letter.

Pursuant to 10 CFR 2.390, we have determined that the enclosed RAIs contain proprietary information. We have prepared a non-proprietary version of the RAIs (Enclosure 1) that does not contain proprietary information. The proprietary information is indicated in brackets and underlined in Enclosure 2. 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.

If you have any questions or comments concerning this matter, you may contact me at 301-415-6715 or Bruce.Bavol@nrc.gov or you may contact Amy Cubbage at 301-415-2875 or Amy.Cubbage@nrc.gov.

Sincerely,

/RA/

Bruce M. Bavol, Project Manager
ESBWR/ABWR Projects Branch 1
Division of New Reactor Licensing
Office of New Reactors

Docket No. 52-010

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

cc: See next page (w/o enclosure 2)

If you have any questions or comments concerning this matter, you may contact me at 301-415-6715 or Bruce.Bavol@nrc.gov or you may contact Amy Cubbage at 301-415-2875 or Amy.Cubbage@nrc.gov.

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Docket No. 52-010

Enclosure: 1. Request for Additional Information (Non-Proprietary)
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cc: See next page (w/o enclosure 2)

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Requests for Additional Information (RAIs): ESBWR Design Control Document (DCD) Revision 5

RAI Number	Reviewer	Question Summary	Full Text
15.2-14, Supplement No. 1, (MFN 08-618, August 8, 2008)	Yarsky P Wang W Lois L	Provide the results of a bounding sensitivity analysis	Provide the results of a bounding sensitivity analysis whereby the load rejection with bypass valve (LRWBP) event analysis is run from the limiting state point in the operating domain for the initial core using a constant feedwater temperature (FWT) boundary condition. The results provided should include the sequence of events and transient plots similar to those provided for the analysis documented in NEDO-33338. Background: For the LRWBP event the select rod insertion (SRI) mitigates the event by inserting rods in SRI groups to maintain low reactor power. The staff notes that the analysis accounts for the reduction in FWT. GEH's response to the RAI states that feedwater temperature control (FWTC) would respond by maintaining or slowing the rate of reduction in FWT thus mitigating the event. However, the staff is concerned about the transient varying axial power shape (TVAPS) effect. The TVAPS phenomenon is a flow reduction effect. As the SRI groups insert, power is suppressed in the bottom portions of the core resulting in a reduction in the flow as the liquid water occupies the collapsed regions. As the flow traverses the reactor core it gains enthalpy and may result in critical heat flux conditions at the top of the core. While the staff agrees that the higher FWT (postulated under conditions where the FWTC is maintaining the FWT) may aid in the effectiveness of the reduction in gross core power during the SRI, the staff is concerned that the TVAPS effect may be exacerbated during the SRI if the FWT is maintained at a higher temperature during the transient (thus a higher predicted flow quality during the SRI group insertions on a bundle basis). TRACG04 has the capability to explicitly model the TVAPS phenomenon. The staff expects that the results of this sensitivity analysis would be bounding as the extraction is not

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			modeled, thus maintaining the maximum pressurization and the FWT is held constant, thus treating the FWTC as instantaneous and the 7FWH/FWH bypass system as having an infinite capacity.
15.2-41	Lois L	Turbine Trip with a Single Failure in the Turbine Bypass System	DCD Rev. 5, Section 15.2.2.5, discusses the transient, Turbine Trip with a Single Failure in the Turbine Bypass System. Fig. 15.2-7 is terminated at 10 seconds into the transient. At this time the feedwater flow is about 150% of normal, while the reactor vessel water level keeps going down. Table 15.2-11 notes (long term - unspecified time) CRD activation to recover level. At this time the vessel void has collapsed (as indicated by the reactivity change Fig. 15.2-7e) and feedwater flow should return to normal. Vessel steam flow reduces to zero at 10 seconds, Fig. 15.2-7d. Section 15.2.2.5.2 states that no operator action is required to mitigate the transient. If the above condition continues in a very short amount of time the water level will reach the main steam line level but the operator is instructed not to take any action. Request GEH extend this transient until the feedwater flow and the vessel water level have been stabilized. Then, consider instructions to the operator.
4.2-24, Supplement No.1, (MFN 08-464, June 6, 2008)	Van Wert C	Z-axis thickness	GEH's response focused on changes to the end cap radial dimensions. Staff was looking for an explanation as to why the end cap did not change in the z-axis but the capsule walls were modified to be thicker, in order to preclude excessive swelling. Provide a response focused on the z-axis thickness.

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4.2-25, Supplement No. 1, (MFN 08-464, June 6, 2008)	Van Wert C	Supply capsule impact testing results	The response provided in Part (d) indicates that capsule impact testing was not yet performed by GEH and will instead be left for a future unspecified date. Provide an analysis demonstrating that testing of the ESBWR capsules is not necessary due to the bounding nature of the currently existing tests or perform ESBWR capsule tests and supply the results.
4.2-26, Supplement No. 1, (MFN 08-464, June 6, 2008)	Van Wert C	ESBWR Control Rod Assembly surveillance program	GEH's response indicates a new Marathon surveillance program has been submitted to the NRC via MFN 08-355 for the operating fleet. Please update the ESBWR surveillance program to provide a similar explanation as to how the sampling will occur, the type of testing to be employed, etc. The ESBWR surveillance program should contain similar details related to the Marathon-5S surveillance program.
4.2-30	Van Wert C	MCNP confirmatory analyses	NEDE-33243P, Section 2.2, the heating rate is calculated with the assumption that the average energy deposited is based solely on the (n,α) reaction. NRC staff has conducted simplified MCNP confirmatory analyses that show the (n,α) reaction contributes only 60% to the total heating rate. In particular, there is a sizable carbon scattering cross section which leads to a significant energy deposition contribution. Explain how scattering and gamma contributions to the heating rate are either accounted for or bounded by the method used in Section 2.2. If the method used for calculating the heating rate is determined to be non-conservative, provide a further discussion on the subsequent effects on related analyses (e.g. swelling rates, FEA inputs, etc.).
4.2-31	Clifford P	ESBWR Marathon control blade structural analyses	NEDE-33244P, the ESBWR Marathon control blade structural analyses employ a mixture of worst case dimensions and nominal dimensions. An example includes the combined (external pressure + channel bow) lateral load calculation assumed nominal

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			dimensions. Please provide results for these design assessments based upon worst case dimensions, for both irradiated and un-irradiated material conditions. For completeness, tabulate the inputs and assumptions, design criteria, and results for the control blade calculations.
4.2-32	Clifford P	Provide mechanical and material properties used in the Marathon design analyses	NEDE-33244P, please provide the un-irradiated and irradiated mechanical and material properties (e.g. stress-strain curves) used in the Marathon design analyses. Please provide stress-strain plots of the as-modeled 304S material compared against experimentally determined 304S stress-strain data. Ensure that every version of the 304S material used in all the difference finite element models of the design analyses is represented in a comparison plot.
4.2-33	Clifford P	GE14E water rod capable of withstanding design handling loads	NEDE-33240P, Please demonstrate that the GE14E water rod is capable of withstanding design handling loads with proper consideration of the two sets of water holes at the upper and lower end of the rod. The current assessment, which did not specifically address the water holes, calculated a combined handling load (e.g. axial compression + bending moment) of [[ ]] ksi which is approximately [[ ]]% of the reported yield stress.

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