February 11, 2009

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. 298 RELATED TO ESBWR DESIGN CERTIFICATION APPLICATION

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 U.S. 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.

Enclosure 2 contains GEH proprietary information and is being withheld from public disclosure. Enclosure 1 is the non-proprietary version, which does not contain proprietary information and is suitable for public disclosure.

If you have any questions or comments concerning this matter, you may contact me at 301-415-6256 or Dennis.Galvin@nrc.gov or you may contact Amy Cubbage at 301-415-2875 or Amy.Cubbage@nrc.gov.

Sincerely,

/RA/

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

Docket No. 52-010

Enclosure:
Request for Additional Information
cc: See next page

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Dennis Galvin, Project Manager
ESBWR/ABWR Projects Branch 1
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Docket No. 52-010
Enclosure:
Request for Additional Information
cc: See next page
Distribution: See next page
ACCESSION NO.: ML090410155-Package NRO-002

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SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 298 RELATED TO ESBWR DESIGN CERTIFICATION APPLICATION DATED FEBRUARY 11, 2009

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Requests for Additional Information (RAIs):
ESBWR Design Control Document (DCD) Revision 5 and NEDE-33373P, Revision 1

RAI Number	Reviewer	Question Summary	Full Text
9.1-60 S01 (MFN 08-882, November 10, 2008)	Xu J	Perform seismic analysis of FSR for SSE loads based on 4 percent damping.	Regulatory Guide (RG) 1.61, rev. 1 prescribes damping values in Table 1 for structural components that are acceptable to NRC staff. For welded steel structures such the fuel racks, the damping value for safe-shutdown earthquake (SSE) loads is prescribed as 4 percent, while NEDE-33373P, Revision 1, utilized [[ ]] for fuel storage rack (FSR) analysis for SSE loads. In the GEH response to the staff's RAI 9.1-60, GEH cited RG 1.61, Paragraph C.2 and SRP 3.8.4, Appendix D, as well as Report UCRL-52342 as justifications for applying higher damping than the prescribed damping value for welded steel structures. RG 1.61, rev. 0 allows the use of higher damping values than the ones prescribed in Table 1, provided that documented test data are provided to support the higher damping values. The staff has reviewed Report UCRL-52342 and concluded that the test data included in Tables 13 through 25 of Report UCRL-52342 indicate generally less than 1 percent added damping due to hydrodynamic effect, which do not support an added [[ ]] value GEH has used. Based on the above discussion, the staff concludes that Report UCRL-52342 does not contain adequate test data that support the use of [[ ]] value in the seismic analysis of FSRs; therefore, GEH's seismic analysis with [[ ]] may be un-conservative. The staff requests that GEH either provides adequate test data that justify the use of [[ ]] value or re-perform the FSR seismic analysis with 4 percent damping value as prescribed in Table 1 of RG 1.61.

9.1-116	Xu J	Provide justification for the damping used in the non-linear seismic analysis.	NEDE-33373P, Revision 1, Section 1.6.5 describes the non-linear analysis methodology used to assess the seismic response of the free-standing FSRs in the spent fuel pool located in the Fuel Building. The model used the [[ ]] relation with the mass term dropped out. Therefore, the system damping becomes essentially proportional to the system frequencies, that is, the system damping increases as the frequency get larger. Since the [[ ]], the system vibration modes with higher frequencies will be effectively damped out by the higher damping induced by use of the [[ ]]. To this end, unless it can be established that only the first two horizontal fundamental modes are responsible for the FSR seismic response, the analysis results could conceivably be un-conservative. The staff requests that GEH address the impact of using [[ ]] on the FSR seismic responses.
9.1-117	Xu J	Address 3-D effect that may not be captured by the 2-D model.	GEH's non-linear models in NEDE-33373P, Revision 1, are developed, one for an N-S row of FSR array and another for an E-W row of FSR array. Both models were built with 2-D beams and point masses, which are adequate for capturing vibrations in both E-W and N-S directions. However, the 2-D models will not be able to simulate 3-D effect of vibrations where FSRs may be supported by only one foot and pivot about that point. Past studies (NUREG/CR-5912) showed the pivotal effect may induce large horizontal displacements of the racks. The staff requests that either GEH show the 2-D analyses envelop the pivotal vibration or provide an assessment of pivotal effect on the seismic responses.
9.1-118	Xu J	Clarify the local stress results in Table 1-18.	NEDE-33373P, Revision 1, Table 1-18 presents the local stress results FSR due to impacts of fuels to cells and rack to rack. The staff requests that GEH define the terms for local membrane and mean membrane stresses for 7mm top cell plates. The staff also requests that GEH describe why the 10mm enveloping plates were not included in the Table.
RAI 9.4-31 S02	Forrest E	Clarify the design of auxiliary CRHA coolers	In the response to RAI 9.4-31 S01, GEH provided information on the Auxiliary control room habitability area (CRHA) cooling capability that would be available after 72 hours. Please provide additional information on the following:

			A. Is there a provision to use some of the chilled water being supplied to the CRHA by the Auxiliary CRHA cooling capability to cool the safety-related distributed control and information system (DCIS) equipment rooms located below the main control room outside of the CRHA? If so, please include appropriate description in the DCD. B. The auxiliary CRHA cooling water is provided by air cooled chiller units located in the mechanical equipment room of the Control Building. This room has no conditioned air provided for the first 72 hours and could be quite hot thermally. Considering the outdoor design conditions of 117 degree F, would an air cooled chiller be sufficiently capable of producing cooling water that would maintain the CRHA temperature in an acceptable range? Is a refrigeration cycle unit to be employed? Please include a description of the air cooled chiller unit and associated pumps and valves in the DCD in both text and in tabular form for major components. Are the auxiliary CRHA cooling water isolation valves classified as safety-related and designed to safety-related requirements? Have the energy requirements for both the pumps and fans (if forced air cooling is used) been considered in the sizing of the ancillary diesels?
9.5-93 Supplement 1 (MFN 08-945)	Vettori R	Clarify the fire brigade communications systems.	The NRC staff has reviewed GEH's letter dated December 8, 2008, concerning GEH's response to RAI 9.5-93 on fire brigade communication systems. After reviewing this letter and the ESBWR DCD Revision 5, the NRC staff has determined that GEH's proposal to direct the COL applicants to describe in full the fire brigade communication systems, including portable radio/wireless and fixed emergency communication systems, is acceptable. The NRC staff accepts the revised COL information item 9.5.2-5-5-A requiring the COL applicants to provide this information. However, the NRC staff believes that the current information provided in the DCD and that which was provided in GEH's letter dated December 8, 2008 is inconsistent and falls short of meeting the requirements of RG 1.189 Position 4.1.7. In response, the staff requests that GEH remove all descriptions and details concerning the fire brigade communication systems except to state that these systems will meet RG 1.189 Position 4.1.7. In addition, the newly proposed COL information item 9.5.2-5-5-A must remain in the DCD. This is to ensure no inconsistencies or confusion between the DCD and COLAs.

			Section 9.5.2 lists the subsystems that make up the plant's communication system. Section 9.5.2.2 gives a description of each of these subsystems. The last subsystem described in Section 9.5.2.2 has the heading "Emergency Communications System". In the Section 9.5.2 list of subsystems it is titled "Emergency Offsite Communication Subsystem". Since the Fire Brigade radio system is described in this section and is not considered an offsite communications system remove the word "offsite" from the sixth bulleted item in Section 9.5.2.

cc:

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