May 6, 2008

Mr. Robert E. Brown
Senior Vice President, Regulatory Affairs
GE Hitachi Nuclear Energy
3901 Castle Hayne Road MC A-45
Wilmington, NC 28401

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 178 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 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.

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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Enclosure:
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cc: See next page
Distribution: See next page

ACCESSION NO.: ML081260122 NRO-002

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SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 178 RELATED TO ESBWR DESIGN CERTIFICATION APPLICATION DATED MAY 6, 2008

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Requests for Additional Information (RAIs):
ESBWR Design Control Document (DCD) Revision 4

RAI Number	Reviewer	Question Summary	Full Text
7.1-65 Supplement 1 (MFN 08-319, April 11, 2008)	Beacom R	Clarify the use of communications interfaces modules in the DCD	The RAI response states that the safety-related fiber optic communications interfaces modules (CIMs) provide safety-related isolation. The staff does not consider the use of safety related fiber optic communication transmitter or receiver modules, where the electrical signal is first converted to light, as sole and adequate communication isolation. The staff has provided in DI&C-ISG-04 an acceptable method for implementing communications between a safety and non-safety equipment. Please identify whether the communication isolation will conform to DI&C-ISG-04 and clarify any departures from DI&C-ISG-04. The RAI response does not identify whether any DAC are applicable to isolation function of the CIMs. If so, this should be explicitly identified in DCD Tier 1, Section 2.2.15. If DAC are not applicable to the CIMs, the DCD needs to provide design information on the CIMs; in particular, how communication isolation is implemented in or with the CIMs. This discussion should address the criteria in DI&C-ISG-04 or an alternative method identified and justified by GEH. DCD Tier 2, Revision 4, Section 7.1.6.6.1.7 appears to be inconsistent with the response provided to RAI 7.1-65. For example the fourth paragraph of this section states, “Communication from safety-related systems to nonsafety-related systems is carried out with proper signal isolation devices, such as CIMs and fiber optic cable wired network, and data path gateway.” This statements implies that CIMs are one possible means of communication isolation and not necessarily safety-related. Please clarify the discussion of CIMs in the DCD.

RAI Number	Reviewer	Question Summary	Full Text
7.1-80 Supplement 1 (MFN 08-169, March 13, 2008)	Hardin R	Clarify use of remote access	In the original RAI, the staff requested that GEH specifically verify that there will be no remote access to any safety systems. This part of the RAI was not addressed in the GEH response. Subsequently, by teleconference, GEH clarified that there will be no remote access to any safety systems. Please include this clarification in NEDO-33295P.
9.2-23 Supplement 1 (MFN 08-342, April 11, 2008)	Li C	Clarify that the NPSH for the PSWS pumps is within the scope of CDI	The response to RAI 9.2-23 indicates that the requested information on the Plant service Water System (PSWS) pump net positive suction head (NPSH) is considered as Conceptual Design Information (CDI). However, the staff finds that the description of the CDI in DCD Tier 2, Revision 4, Section 9.2.1.2 under "Detailed System Description" is not clear what information is conceptual and what information is part of the standard plant as related to PSWS pump NPSH. As discussed during a conference call on April 30, 2008, the staff understood that the pumps are in the design certification scope and the basin is part of the CDI. The pump NPSH information may need the information of basin level and the choice of system design to be determined by the COL applicants. Therefore, the DCD description for the CDI should clarify that the NPSH for the PSWS pumps is within the scope of the conceptual design information.

RAI Number	Reviewer	Question Summary	Full Text
9.4-5 Supplement 2 (MFN 08-198, March 8, 2008)	Forrest E	Codes and Standards for HVAC components	The RAI response does not address the staff request to clarify which components are designed to which codes and standards. Even though a list of codes and standards is provided as a table at the end of the 9.4 section that applies to all HVAC components in the section, and does not specify which code or standard applies to which component. 10 CFR 52.47, "Contents of application; technical information," states: "The application must contain a level of design information sufficient to enable the Commission to judge the applicant's proposed means of assuring that the construction conforms to the design and to reach a final conclusion on all safety questions associated with the design before the certification is granted. The information submitted for a design certification must include performance requirements and design information sufficiently detailed to permit the preparation of acceptance and inspections requirements by the NRC, and procurement specifications and construction and installation specifications by an applicant." The staff position is that the DCD should contain a degree of specificity that defines which code or standard is applicable to each major HVAC component and that it would be best done by creating a table in each section identifying the appropriate code or standard as an attribute of the specific component. This would facilitate the preparation of acceptance and inspections requirements and is certainly necessary for the preparation of the procurement specification.
9.4-39 Supplement 1 (MFN 07-592 Supplement 3, November 28, 2007)	Forrest E	RTNSS HVAC Systems	The GEH response to RAI 9.4-39 identified a number of HVAC systems that have RTNSS functions. Please provide the following information for each these systems to allow the staff to complete its evaluation. A. General Comment: HVAC systems may depend on instrument air to position dampers. Cooling functions may also depend on chilled water systems and chiller operation. Please state clearly in the DCD that supporting systems, such as instrument air, are also RTNSS systems, if they are required to

RAI Number	Reviewer	Question Summary	Full Text
			assure that the RTNSS HVAC systems are capable of meeting their RTNSS functions. This should be stated in the appropriate HVAC system descriptions in DCD Tier 2 Section 9.4 and in DCD Section 19A. B. RTNSS HVAC systems that are required to operate after 72 hours to fulfill a long-term safety function should be identified in the appropriate HVAC system descriptions in DCD Tier 2 Section 9.4 and in DCD Section 19A along with the safety function and any key parameters that system operation should meet (such as temperature limits, air flow rates, filtration efficiencies, etc.) C. RTNSS HVAC systems that have safety function post 72 hours should be addressed in the Availability Controls Manual in DCD Tier 2, Section 19A, with appropriate Actions and Surveillances and the basis for these Actions and Surveillances. D. Consistent with the ITAAC selection criteria provided in DCD Tier 2, Section 14.3, RTNSS HVAC systems should have ITAAC established in Tier 1, Section 2.16.2, to assure that the system has been installed in accordance with the design requirements and that it is capable of meeting its post-72-hour safety functions. For example, in the GEH response to RAI 14.3-61 S01 and in RAI 9.4-39 item B, it was stated that the Electrical Building HVAC System (EBVS) has RTNSS functions to provide cooling for the standby diesel generators and their applicable electric and electronic equipment. Please provide an ITAAC that demonstrates that the EBVS (and specifically, the Electric and Electronic Rooms HVAC Subsystem (EERVS) and the Diesel Generators HVAC Subsystem (DGVS)) are capable of meeting the design flow rates and cooling capacity to meet the RTNSS functions in post 72-hour service.

RAI Number	Reviewer	Question Summary	Full Text
18.7-7 Supplement 3 (MFN 08-154, April 1, 2008)	Bongarra J	Clarify details on the PRA/HRA	The RAI response includes markups to NEDO-33267 that provide additional detail on the probabilistic risk assessment/human reliability analysis (PRA/HRA). There are some aspects of the RAI response that need additional clarification. • The question regarding Table 19.1-3 was answered by deleting the Table and moving information into Tables 19.2-2 and -3. But the same problems remain. The tables are not adequately explained in the text. It is not clear how the items were selected for the tables. What are the criteria and thresholds? Are the human interactions (HIs) in the table risk-important? Are they the only risk-important HIs? • In the RAI response to Comment 2 on p. 20, explain what was meant by "the quantitative PRA risk importance identification values." • In the RAI response to Comment 9 on p. 21, sentence 2 is not clear. The staff was not able to find the information in Table 19.2-3 as described.

RAI Number	Reviewer	Question Summary	Full Text
18.7-8 Supplement 3 (MFN 08-298, March 27, 2008)	Bongarra J	Clarify details on risk-important human actions	MFN 08-298 provides responses to RAIs 18.7-8 S02 and 18.7-9 S03. Both of these address the methodology and criteria by which the risk-important human actions will be identified. These responses provide markups to the NEDO-33267 which add more detail including six revised pages for the topical report. There are some aspects of the RAI responses that need additional clarification. • Clarify the use of three thresholds for rick achievement worth (RAW) (2.0, 5.0 and 50) and two thresholds for Fussell-Vesely importance measure (FV) (0.01 and 0.1). • The terminology used for risk-important actions is not the same in NEDO-33267 and the other human factors engineering implementation plans (e.g., task analysis and training). The other plans all use risk-important human actions, but the latest markup for NEDO-33267 does not. Please clarify specifically what values in NEDO-33267 define the risk-important actions and ensure that the terminology is consistent. • Confirm that the intent of the method at the end of NEDO-33267, Section 3.2.1.1, is to define a risk-important action if either RAW or FV meets the criteria. The markup pages submitted use “and” rather than “or.” • The top of page 31 uses the words “such as the shutdown PRA analysis.” What are the others? • The end of NEDO-33267, Section 3.2.1.1, discusses “ensuring that risk impact is reduced to below cutoffs.” Is this truly the intent; what if this cannot be reasonably accomplished?

RAI Number	Reviewer	Question Summary	Full Text
18.8-2 Part B Supplement 2 (MFN 08-050, March 11, 2008)	Bongarra J	Clarify the level of style guide specificity	GEH's response partially clarified Part B of the staff's question regarding the level of style guide specificity. GEH indicated that the guide will consist of a compilation of requirements from NUREG-0700 and -0711 that are entered into an industry-standard software requirements tracking/traceability tool. GEH's response provided general information about the contents of the guide. However, NUREG-0700 guidance is often presented at a high-level (since it is used to review many different design implantations). The staff expects the style guide to be specific to the ESBWR design; i.e., described at a level to ensure consistency in application across users of the guide. As an example, NUREG-0700 Guideline 4.1.4.2-1 indicates that "General HSI features (e.g., a data display zone, control zone, or message zone) should be displayed in consistent locations from one display to another." A design specific implementation of this guideline would be "Each screen will be divided onto four zones: the upper zone provides a label and identifying information, a left zone providing navigation controls, a lower zone providing alarms and status messages, and a large center zone displaying user selected information." Please clarify whether GEH's style guide will simply repeat the guidance in NUREG-0700 or if GEH will provide ESBWR specific guidance on how the guidance is applied to the design. In addition, GEH's response did not "clarify the relationship between the HSI guidelines in the NEDO and those to be included in the style guide." Please provide the clarification as requested.
18.11-21 Supplement 2 (MFN 08-281, March 26, 2008)	Bongarra J	Participants and Validation Test	GEH's response to RAI 18.11-21, Supplement 1, addressed several aspects of human variability in validation testing of an integrated system. The only remaining question is the number of crews GEH plans to use for integrated system validation. Please indicate how many crews will participate in the testing.

RAI Number	Reviewer	Question Summary	Full Text
18.11-25 Supplement 2 (MFN 08-088, March 8, 2008)	Bongarra J	Clarify display aspects of automation	GEH's response to RAI 18.11-25, Supplement 1, addressed the aspect of the question associated with procedures. The staff needs additional clarification with regard to performance measures for displays. A list of measures is provided such as: enhanced ease of operating procedures use, reduced time demands, and increased accuracy, and reduced cognitive demands. Many of the measures are stated in relativistic terms, such as reduced time demands. For these measures, the question arises "compared with what?" That is, for example, reduced time demands compared with what? Performance measures stated in relative terms are generally used when the performance of a system is being compared with another system. For example, one might look to see if the new HSI design reduces time demands compared with an old HSI design. However, the overall GEH validation methodology is not one based on comparisons. Please clarify how these measures will be quantified.
18.11-32 Supplement 2 (MFN 08-281, March 26, 2008)	Bongarra J	Human Engineering Discrepancies (HED) resolution methodology	GEH's response RAI 18.11-32, Supplement 1, proposed an extensive revision to Section 4.6 of NEDO-33276 and Figure 4 that graphically depicts the risk significance methodology. Regarding RAI subpart A, GEH's revision to Section 4.6 and Figure 4 does not address discrepancy justification. Regarding RAI subpart B, GEH's revision to Section 4.6 and Figure 4 does not clarify the staff's concern about evaluating departures from HFE guidance. Regarding RAI subpart C, GEH has deleted specific solutions from the process and Figure 4. Revised Sections 4.6.1 and 4.6.2 provide a more general process for addressing HEDs and finding an engineering solution that is acceptable. The revised methodology requires additional clarification. Each of the decision blocks is not clearly described in the text, for example:

RAI Number	Reviewer	Question Summary	Full Text
			• Figure 4 begins with a decision block for "HED Valid?" What is the analyst evaluating at this point and how is the decision made. The write-up of the methodology in Section 4.6 begins with the second decision block "HFEITS Pri 1 or 2?" Thus no guidance is provided to the analyst. • Regarding the second decision block "HFEITS Pri 1 or 2?," how does the analyst make the decision whether the HED is Category 1 or 2? It appears the risk significance methodology results in a sorting of HEDs into four risk significance categories (see the bottom of Figure 4). If so, why is there a sorting at the top of the methodology? • Decision block 3 is "HED addressed in PRA R-I list or DB events?" How is this assessment made by the analyst? • How are more general HEDs evaluated? For example, departures from HFE guidance may result in a design deficiency that impacts multiple human actions. Some of these actions may be risk important, while others may not. Please provide additional clarifications to address the areas discussed above.
18.12-4 Supplement 3 (MFN 07-499, October 1, 2007; MFN 08-088, March 8, 2008)	Bongarra J	Clarify responsibility for design implementation	GEH provided a response to RAI 18.12-4 S01 in MFN 07-499 and an updated response (18.12-4 S02) in MFN 08-088. The GEH response in MFN 07-499 is acceptable to the staff and included a hand markup of NEDO-33278. However, GEH provided a slightly different response in MFN 08-088 and included a redline-strikeout version of the changes to NEDO-33278 which needs clarification. In MFN 07-499, GEH deleted NEDO-33278, Section 1.1, "Purpose," item 4, "Transfer design implementation responsibility to the COLOG [combined operating license owner's group]." Such a deletion is appropriate since GEH clarified in the RAI response that design implementation is the responsibility of the COL applicant, not the COLOG. However, the updated response in

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			MFN 08-088 retains item 4. This is inconsistent with the RAI response and other changes made to NEDO-33278 in MFN 08-088. Please clarify the role of the COL applicant and the COL owner's group.

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