October 1, 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. 260 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 301-415-8484 or Tom.Tai@nrc.gov or you may contact Amy Cubbage at 301-415-2875 or Amy.Cubbage@nrc.gov.

Sincerely,

/RA/

Tom M. Tai, Senior 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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Distribution: See next page

ADAMS ACCESSION NO. ML082700442

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SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 260 RELATED TO ESBWR DESIGN CERTIFICATION APPLICATION DATED OCTOBER 1, 2008

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

RAI Number	Reviewer	Question Summary	Full Text
6.4-21	Forrest. E	CRHA Passive Cooling Calculation Audit "092-134-F-M-05001", Issue 3	In the review of the Passive Cooling Analysis for the Control Room Habitability Analysis (CRHA), the staff developed the following questions and requires additional information to complete the review: 1. Temperature Limit for occupancy: Please provide the basis for a 15 degree F rise in temperature with respect to operator performance in considering GDC 19 requirements for control room habitability. Results indicate that CR temperatures will exceed 85 degrees F in less than 24 hours and remain above that for the remainder of the 72 hour period. Please address the impact of temperature and high humidity on operator performance and comfort during the 72 hour period. Was ASHRAE 55-1992 (referenced in NUREG 0700) considered or is there another industry standard that establishes acceptability of operators working in elevated temperature environments for the expected time period? 2. Post 72-hour Cooling: At several places in the calculation, normal HVAC cooling is assumed to be available at 72 hours. The chiller system that would provide cooling for the normal HVAC is not powered from RTNSS sources, and thus is not available. Please discuss the role of the RTNSS auxiliary CR cooling system added as part of DCD Revision 5 and its impact on this calculation. Does it have the capacity to pick up Non-safety related loads which are said to be restored to the normal operational values after 72 hours in section 4.1.3 of the calculation in which the heat load in the CR increases by a factor of 10? Does it also provide cooling to the safety related DCIS rooms after 72 hours as mentioned in Chapter 19 of DCD Rev 5 as DCIS Room coolers? 3. Lighting: The staff is concerned about the amount on lighting provided during the 0 to 72 hour post accident period. During the July 25 audit of the CRHA cooling calculation, GEH staff stated that the normal lighting load was 2000 watts and that the light intensity was between 75 and 100 lumens per square foot. The calculation assumes a lighting heat load of 200 watts. The staff is concerned that 200 watts would not provide

RAI Number	Reviewer	Question Summary	Full Text
			sufficient lighting for the activities (reading drawings, procedures, record keeping, and conducting discussions to evaluate the situation) that may be required in the 0-72 hour period. While it may be possible to reduce some of the lighting, the MCR must continue to meet the GDC 19 requirement of being a place from which actions can be taken to operate the nuclear reactor and maintain it in a safe condition under accident conditions. Please clarify the adequacy of lighting and the impact of additional heat loads if additional lighting is required. Please show how the increased heat loads impact the cooling load calculation results. 4. Control Room Occupancy: The calculation assumes 5 people are present in the MCR for sensible and latent heat loads (Table B4). The staff's evaluation to the EPRI URD (NUREG 1242) in Chapter 10 Section 4.2 "Operation Crew" addresses occupancy and includes an expanded plant staff presence consisting of an NRC observer, a Plant Management observer, and a communications facilitator. The GEH response to RAI 13.3-5 S02 states that in the event the TSC is not habitable, the TSC function would be transferred to the MCR. This could lead to the presence of two additional people. RAI 6.4-20 (Item B) also addresses the impact of TSC personnel migrating to the MCR. Please clarify the number of people that will be present in the MCR and address the impact of any additional heat loads. Please show how the increased heat loads, both sensible and latent, impact the cooling load calculation results. 5. Accident Scenario-Non Safety Heat loads: The calculation states that the non-safety heat loads stay active for the first two hours. These loads are identified in Table B3 as N-DCIS loads on elevation +4650, the floor above the CRHA. The inclusion of the heat load is conservative. The inclusion of any non-safety related cooling or operation of any non-safety function during this period that results in heat load reduction is generally not acceptable without specific review by the staff. Please clarify that no credit has been given for the operation of non-safety related cooling systems to mitigate non-safety heat loads in the calculation and that N-DCIS operation has not been credited for any action during the 0-72 hour period.

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			6. Thermal Properties of Concrete: Concrete characteristics were presented in Section 2.7 of the calculation as being conservative. The staff does not have Reference 5.7 available. Please provide a copy of this reference and state to what extent it can be considered and industry standard. The staff did review an American Concrete Institute Standard (ACI 122R-02). For 120 lb/ft^3 concrete, a thermal conductivity value of 5.51 $BTU \cdot in/h \cdot ft^{2} \cdot {}^{o}F$ and a heat capacity of 0.21 $BTU/lb \cdot {}^{o}F$ were obtained. The thermal conductivity used in the calculation (6.0 $BTU \cdot in/h \cdot ft^{2} \cdot {}^{o}F$) does not appear to be conservative with respect to the value determined by the staff. Thermal conductivity is very dependent on concrete density. To understand the degree of conservatism in the material properties, the staff needs to know the minimum concrete density of the poured concrete as specified in the construction specification and tested during the pour. The information is necessary to consider in evaluating the thermal properties. The staff also needs to know how the thermal properties were adjusted to account for structural steel and rebar. Please provide an ITAAC to show that the as built concrete thermal properties are conservative with respect to the values used in the analysis. 7. Room, Floor and Wall Dimensions: Please provide a copy of Reference 5-6 to facilitate the staff evaluating the room dimensions and concrete structure thicknesses. 8. Modeling Assumption: The staff is concerned that the CR node consists of a number of rooms, a false ceiling, and a false floor. Stratification is likely to occur with the higher temperature HVAC air entering the room at or above the false ceiling with minimal distribution. It is not clear that stratification would produce a favorable effect. Concrete walls and floor at lower levels would be less effective as heat transfer surfaces. Failure to consider temperature differences in the room is not conservative. There is no mechanical means to mix or distribute the air uniformly in this very large volume. Although the false floor and suspended ceiling have registers in them for recirculating air, they still are a resistance to heat transfer from the bulk room air to the ceiling or floor, especially since there is essentially no air circulation. Considering the closeness of the results (92.5 degree F calculated to a 93 degree F limit), it is necessary to demonstrate that these

RAI Number	Reviewer	Question Summary	Full Text
			modeling assumptions are conservative. Please provide additional information to provide assurance that non-conservative modeling assumptions are not the reason for the results being acceptable. 9. Computer Model: Please provide a clear path from the design/assumptions to the computer model such as a nodalization diagram. Please identify all modeling elements, indicating whether derived conservatively or best estimate. 10. Heat Sinks: Please discuss how passive heat structures are nodalized, especially concrete structures which require a finer mesh considering the thermal diffusion length. Please identify surface coatings on concrete and steel and show how the additional resistance of the coating is accounted for in the analysis. Please show how the air gap between steel-lined concrete structures is considered in the analysis.

cc:

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