

June 25, 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. 214 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 is contained in the enclosure to this letter.

In RAI Letter No. 186 dated April 23, 2008, the staff issued a supplemental RAI 19.1-169 S01 for the ESBWR design certification application. Staff has requested that an update be made to this RAI (see bold and bracketed item in Enclosure).

Please correct your records accordingly.

If you have any questions or comments concerning this matter, you may contact me at 301-415-5787 or [Rocky.Foster@nrc.gov](mailto:Rocky.Foster@nrc.gov) or you may contact Amy Cabbage at (301) 415-2875 or [Amy.Cabbage@nrc.gov](mailto:Amy.Cabbage@nrc.gov).

Sincerely,

**/RA/**

Rocky D. Foster, Project Manager  
ESBWR/ABWR Projects Branch 2  
Division of New Reactor Licensing  
Office of New Reactors

Docket No. 52-010

Enclosure:  
Request for Additional Information

cc w/encl: See next page

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Dear Mr. Brown:

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The NRC staff has identified that additional information is needed to continue portions of the review. The staff's request for additional information is contained in the enclosure to this letter.

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Sincerely,  
**/RA/**  
Rocky D. Foster, Project Manager  
ESBWR/ABWR Projects Branch 2  
Division of New Reactor Licensing  
Office of New Reactors

Docket No. 52-010

Enclosure:  
Request for Additional Information  
cc w/encl: See next page

**ADAMS ACCESSION NO.:** ML081620540

NRO-002

<b>OFFICE</b>	PM:NRO:DNRLNGE2	LA:NRO/DNRL:NGE1	BC:DSRA/SPLB	PM:NRO:DNRL: NGE1
<b>NAME</b>	RFoster	SGreen	HHamzehee	ACubbage
<b>DATE</b>	06/10/2008	06/10/2008	06/13/2008	06/25/2008

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SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 214 RELATED TO  
ESBWR DESIGN CERTIFICATION APPLICATION DATED JUNE 25, 2008

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

<b>RAI Number</b>	<b>Reviewer</b>	<b>Question Summary</b>	<b>Full Text</b>
19.1.0-4 S02	Pohida M	Clarify Definitions of Disposition of Risk Assumptions listed in Column Two of DCD, Tier 2, Table 19.2-3	<p>The staff has reviewed GEH's response to RAI 19.1.0-4 S01. The staff has accepted the response to 19.1.0-4 S01 Part A (Assumption 2), Part B, Part C, Part D, and Part E (Assumption 1).</p> <p>Regarding GEH's response to 19.1.0-4 Part A (Assumption 1), the staff noted that this response is inconsistent with GEH's response to RAI 19.1.123 S02 which states, "Availability Controls Surveillance Requirements (ACSRs) 3.6.2.2 and 3.6.2.3 augment ACSR 3.6.2.1, which requires verification every 12 hours that the lower drywell hatch administrative closure plan be in place. The administrative closure plan (as outlined in the ACLCO Bases) provides for "administrative controls [that] assure trained personnel will be continuously located in the area of the doors and appropriate administrative controls are in place to communicate awareness of potential breaches and effect decisions to secure the hatches." This administrative control, verified to be in place every 12 hours, satisfies the intent of the NUMARC 91-06 guideline that states, "a procedure should be established to assure that closure can be accomplished in a time commensurate with plant conditions"; and recognizes that conditions change during the outage." As stated in RAI response 19.1.4-S01, GEH is requested to document as a key risk insight in DCD Table 19.2-3 that outage personnel will be continuously located in the area of the drywell hatch doors, or justify why this is not necessary.</p> <p>Regarding GEH's response to 19.1.0-4 Part E Assumptions 2, 3, and 4, the staff is requesting GEH to document as a key risk insight the sizes of piping penetrations in the vessel bottom head upstream of the isolation valves and associated position or alarm indication in the control room, or GEH is requested to model operator induced leaks using operating data in the Shutdown PRA.</p> <p>Regarding GEH's response to 19.1.0-4 Part F, the staff is requesting GEH to document as a key risk insight that drywell/containment fires that could result in loss of the reactor water cleanup (RWCU) and shutdown cooling (SDC) and the RWCU inboard containment isolation valves were screened based on spatial</p>

RAI Number	Reviewer	Question Summary	Full Text
			separation of the RWCU, or GEH is requested to assess and quantify drywell/containment fires that could result in loss of the RWCU/SDC and the RWCU inboard containment isolation valves in the ESBWR fire PRA.
19.1-13 S02	Fuller E	Update the response to NRC RAI 19.1-13 to include Level 3 results.	Please provide Level 3 PRA results for external events and shutdown events, extending the Level 2 results reported in your response to RAI 19.1-13 Supplement 01. Similar to what is reported in Section 10.2.4 of the PRA, please also compare these results to the safety goals.
19.1-144 S02	Pohida M	Shutdown IC Operation	<p>The staff reviewed GEH's response to RAI 19.1-144 S01. The NRC staff is concerned about the impact of non-condensable gases given Isolation Condenser system (ICS) operation from a cold shutdown condition. The NRC staff also requested a calculation to demonstrate that short term and long term core cooling can be provided by ICS operation following an extended loss of the RWCU/SDC function from a cold shutdown condition. Successful, automatic, IC operation significantly reduces the risk of loss of RWCU/SDC events during Mode 5 (from internal events and external events).</p> <p>GEH responded that loss of RWCU/SDC during shutdown would cause reactor pressure vessel (RPV) pressure and temperature to both increase to near or above Mode 1 conditions. GEH responded that if non-condensable gases accumulate in the IC such that the heat transfer drops below the decay heat of the reactor, the reactor pressure would increase to the setpoint for opening of the ICS vent line. The ICS venting process is the same irrespective of the initial condition operating mode. GEH replied that no specific calculations have been performed for the ICS system with an initial condition of the reactor in Mode 5 since it is bounded by operation from Mode 1 conditions.</p> <p>The staff does not agree that Mode 1 conditions for successful IC operation bound Mode 5 conditions. The staff requests the following information.</p> <p>A. As preparations take place for reactor vessel head removal in Mode 5, the vessel head space will be filled with air. The staff is requesting GEH to document the set point for the automatic opening of the vent valves in the</p>

RAI Number	Reviewer	Question Summary	Full Text
			<p>DCD and in Chapter 16 of the TS for IC operability, or GEH should add the operator action to vent the IC in the PRA.</p> <p>B. The staff understands that vessel level will be raised above the level eight (8) setpoint as preparations take place for reactor vessel head removal in Mode 5. The staff is concerned that the IC stub tube could become filled with water which would affect the ability of the IC to function. If GEH intends for the IC to initiate cooling with water in the IC stub tube, please demonstrate the ICS capability to remove decay heat at the highest maximum vessel level before de-tensioning of the reactor vessel head studs is initiated.</p> <p>C. The staff is requesting GEH to document in the DCD the maximum initial vessel levels for IC operability and successful IC operation.</p> <p>D. If there are RCS configurations in Mode 5 operation that will not support IC operability, then the staff is requesting GEH to remove credit of the ICS from the baseline PRA and the RTNSS evaluation for PRA plant operational states, Mode 5 and Mode 5-open.</p>
<p>19.1-169 S01 Revised (Note: This RAI supercedes RAI 19.1-169 S01 issued in RAI Letter 186)</p>	<p>Kelly G</p>	<p>Engineering basis for estimated probability of failure of a Seismic Category I structure when subjected to a Category 4 or 5 hurricane.</p>	<p>GEH's response to RAI 19.1-169 indicated that the buildings were built to withstand seismic criteria and are assumed to be able to withstand high winds. It did not provide a technical basis for why hurricanes or tornados cannot at any probability damage seismic Category I or II structures. Their argument is a deterministic, not a probabilistic one.</p> <p>Explain the basis for assuming in the high winds risk assessment that no hurricane or tornado will significantly damage any ESBWR seismic Category 1 or Category 2 structure.</p> <p><b>[In addition, please provide the engineering basis for the estimated probability of failure of a Seismic Category I structure when subjected to a Category 4 or 5 hurricane.</b></p>

RAI Number	Reviewer	Question Summary	Full Text
			<p>In general, please justify why the conditional probability of a Seismic Category I structure suffering significant damage from a Category 4 or 5 hurricane (considering that Category 5 winds may exceed those assumed in the ESBWR FSAR) is smaller than <math>10^{-7}</math>.</p> <p><b>One acceptable approach is to compare the design loads generated by a hurricane load combination to the actual controlling design or failure loads of the structure. Based on the controlling design load or the actual estimated failure load of the structure, estimate an equivalent failure hurricane wind speed and its associated annual exceedance probability. Calculate the structural failure probability associated with the equivalent failure hurricane wind. Discuss the calculations and major assumptions made.]</b></p>
19.1-174	Pohida M	Missing Shutdown Fire Risk Insights from DCD, Tier 2, Table 19.2-3	<p>Please include the following key risk assumptions, or explain why they are missing from the DCD, Tier 2, Revision 5, Table 19.2-3, "Risk Insights and Assumptions".</p> <ol style="list-style-type: none"> <li>a. Consistent with Regulatory Treatment of Nonsafety Systems (RTNSS) requirements, RCCW and PSW cables are to be separate and protected in fire area F4100, turbine building general area.</li> <li>b. Consistent with RTNSS requirements, PSW cables are to be separate and protected in fire area F3700, service water building.</li> </ol>
22.5-25	Shams M	Clarify the seismic design criteria of RTNSS Criterion C SSCs (DCD Section 19A.8.3)	<p>With regard to the seismic design criteria for RTNSS Criterion C SSCs discussed in DCD, Tier 2, Revision 5, Section 19A.8.3, the staff requests the following information:</p> <ol style="list-style-type: none"> <li>1. Provide a comparison to support GEH's assertion that non-seismic structures that are designed to the IBC-2003 will maintain a structural integrity with a margin of safety that is equivalent to a Seismic Category I structure under safe-shutdown earthquake (SSE). In this comparison, address all aspects of the two design and analysis methodologies including the design load combinations, the response modification factors (or energy absorption factors), member capacity reduction factors, construction detailing, the treatment of vertical seismic loads, and the treatment of</li> </ol>

RAI Number	Reviewer	Question Summary	Full Text
			<p>concurrent orthogonal seismic components. Otherwise remove this sentence from the DCD.</p> <p>2. Justify that qualifying RTNSS Criterion C equipment by using IEEE-344 to only demonstrate structural integrity will be sufficient to ensure the equipment functionality post an SSE event. Otherwise, if the functionality of these systems are not required post an SSE seismic event, provide a statement in the DCD to clarify that assertion.</p>



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(Revised 06/10/2008)

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