

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: ECONOMIC SIMPLIFIED BOILING WATER REACTOR (ESBWR) CHAPTER 14  
OPEN ITEMS

Dear Mr. Brown:

As you are aware, the U.S. Nuclear Regulatory Commission staff is preparing the safety evaluation report (SER) for the ESBWR design certification application submitted by GE Hitachi Nuclear Energy on August 24, 2005. The staff has identified 64 open items as of June 24, 2008 for SER Chapter 14, "Verification Programs," which are enclosed for your information. The staff is prepared to review your responses to the open items and have conference calls and meetings with your staff, as appropriate, to resolve these open items to support issuance of the SER.

Please provide a response date for any late or unscheduled open items discussed in the enclosure.

This open item letter is based on the staff's review of the ESBWR Design Control Document (DCD) Revision 4, Request for Additional Information (RAI) responses and other submittals received to-date. The staff will continue its review as additional RAI responses and other deliverables are submitted, including future DCD Revisions. The staff will inform cognizant GEH staff of any resulting changes to the status of Chapter 14. If you have any questions, please contact Amy Cabbage at (301) 415-2875 or [Amy.Cabbage@nrc.gov](mailto:Amy.Cabbage@nrc.gov) or Leslie Perkins at (301) 415-2375 or [Leslie.Perkins@nrc.gov](mailto:Leslie.Perkins@nrc.gov).

Sincerely,

**/RA/**

Jeffrey Cruz, Chief  
ESBWR/ABWR Projects Branch 1  
Division of New Reactor Licensing  
Office of New Reactors

Docket No. 52-010

Enclosure:  
As stated

cc: See next page

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Jeffrey Cruz, Chief  
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As stated

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NRO-002

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LETTER TO R. E. BROWN FROM J. CRUZ REGARDING ECONOMIC SIMPLIFIED BOILING  
WATER REACTOR (ESBWR) CHAPTER 14 OPEN ITEMS DATED JUNE 25, 2008:

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**GE Hitachi Nuclear Energy**  
**ESBWR Preliminary Open Items**  
**Chapter 14**  
**Verification Programs**

RAI 14.2-63 Supplement No. 2, May 22, 2008, ML081280554

In response to RAI 14.2-63, Supplement 1, GEH proposes to update ESBWR DCD Tier 2 Section 14.2.8.1.32 to include that the “test method used will form the basis for use during subsequent leakage rate tests conducted at the same frequency as the ILRT.”

In RAI 6.2-145, Supplement 2, the staff requested GEH to provide additional justification for this proposed change. Please make the responses to RAIs 14.2-63 and 6.2-145 consistent.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-43 Supplement No. 1, February 22, 2008, ML080510096

In the response to RAI 9.4-39 (MFN 07-592) item D, it is stated that the RTNSS function supported by the Control Room HVAC System (CRVS) is to provide post 72-hour cooling for DCIS and Control Room Habitability. The safety-related DCIS are located below the CRHA and are normally cooled by the control room general area ventilation system (CRGAVS). Although the CRGAVS is designated non-safety, it must operate post accident to provide cooling as a RTNSS system. ITAAC should be established to verify its capability. Please review your response to RAI 14.3-43 and make appropriate changes to include the CRGAVS in the ITAAC program.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-61 Supplement No. 2, May 15, 2008, ML081300488

In response to RAI 14.3-61 S01, GEH stated that the technical support center ventilation system (TSCVS) is not a safety related system and therefore no ITAAC is required. In its response to RAI 14.3-150, GEH indicated that it will be impossible to develop generic emergency planning ITAAC due to site-specific differences. SRP Section 14.3 in Table 14.3.10-1 Item 8.1.3 and RG 1.206, Appendix B, Page C.II.1-B-5 Item 8.1.3 both establish an acceptance criteria for an ITAAC for inspection of the TSC that requires comparable habitability with the control room. Comparable habitability with the control room is independent of site related differences.

To demonstrate the TSC's comparable habitability with the control room, the ITAAC must include specific design certification criteria, if applicable, or otherwise identify specific capabilities. This would confirm that the TSC ventilation system -- including HEPA and carbon filters, and radiation monitors -- are installed in accordance with the DCD, and that the functional requirements for flow rates, pressurization, and temperature control are satisfied.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-68, October 10, 2006, ML062790238

DCD Tier 1, Revision 1, Section 2.8 does not specify any ITAACs for the ESBWR fuel design. Further, DCD Tier 2, Revision 1, Chapter 14 does not specify any test programs directed at validating local core flow characteristics. The ESBWR reactor vessel design, with the absence of jet pumps (and significantly lower core mass flow rate), represents a departure from the current fleet of BWRs in the United States. The staff has concerns regarding the uncertainty in predicted local core flow characteristics due to (1) the absence of jet pumps, (2) the potentially higher sensitivity of local flow characteristics to local power conditions, (3) the ESBWR's 1132 fuel bundle core configuration, and (4) the lack of prototypical operational experience. An increase in the uncertainty to predict local flow characteristics would further challenge critical power ratio fuel design limits during normal operation and anticipated operational occurrences. Justify the lack of an ITAAC or test program to address this potentially larger uncertainty in predicted local core flow characteristics. Alternatively, develop an ITAAC or test program which either directly or indirectly confirms core flow characteristics in different regions of the core.

*Status: GEH responded on 4/18/2008, MFN 08-086, Supplement 37.  
GEH's response is under staff review.*

RAI 14.3-131 Supplement No. 2, April 8, 2006, ML080770452

In its letter of November 29, 2007, GEH provided revisions to DCD Chapter 14 to address Piping DAC in response to a discussion on the same topic from a meeting with the NRC on October 18, 2007. NRC staff met with GEH on February 14, 2008 to discuss the changes. During this meeting, staff explained three points that would be needed to address DAC in the DCD: 1) a description of the subject area for which DAC is being used and the approach to be taken to complete the design in Tier 2 of the DCD; 2) Design ITAAC; and 3) marking of the methodology to be used as Tier 2\* prior to certification. Considering the need for the aforementioned three points to address DAC and after reviewing the proposal provided in the response to RAI 14.3-131 S01, the NRC has the following supplemental questions:

1. In its letter of November 29, 2007, GEH responded to NRC RAI 14.3-131 S01 by stating that all ASME piping and components are designed, fabricated, installed and tested in accordance with the requirements in ASME Code, Section III. GEH also stated that DCD Tier 1, Section 3.1, Design Descriptions, will be clarified to address additional DAC scope as discussed with the NRC staff on October 18, 2007. In reviewing the content of the aforementioned Tier 1, Section 3.1, as attached to the above GEH letter, the staff did not find information on how components associated with piping will be considered when completing the work to close the piping DAC.
2. In its letter of November 29, 2007, GEH responded to NRC RAI 14.3-131 S01 by stating that a review of DCD (Revision 4) Tier 2, Section 3.9.2 and Section 3.9.3 indicates that the details for DAC closure as related to attached components are adequately addressed in these two sections. In reviewing DCD Tier 2, Section 3.9.2 and Section 3.9.3, however, the staff could not locate where such details for DAC closure are addressed. Further, similar details are not provided for the piping design and pipe break hazard analysis. GEH is requested to provide such information and to revise Tier 2 to address DAC closure.
3. In its letter dated November 29, 2007, GEH responded to NRC RAI 14.3-131 S01 pertaining to pipe break hazards analysis. GEH stated that ESBWR DCD Section 3.6.5

contains COL Information Item 3.6.5-1-A requiring the applicant to provide a pipe break evaluation report as discussed in Section 3.6.2.5. GEH also stated that the information required by the COL Information Item 3.6.5-1-A is met and satisfied by the closure of Tier 1, Table 3.1-1 ITAAC criteria and the COL Information Item 3.6.5-1-A is deleted. Subsequently, during the discussion with the NRC staff in a meeting on February 14, 2008, GEH indicated that the staff's concerns raised in RAI 14.3-212 concerning the deletion of COL Information Item 3.6.5-1-A by the closure of Tier 1, Table 3.1-1 ITAAC criteria is therefore, addressed. In its response to RAI 14.3-212 dated March 20, 2008, GEH modified ITAAC 3.1-1 Item 3 to apply to the "as-designed" rather than the "as-built" pipe analysis. The write-up refers to ITAAC 1 through 6, but only five ITAACs were included.

Based on its review of the information provided by the applicant, the staff determined that the ITAAC, as provided in the March 20, 2008, response should state "as-designed pipe break analysis results," as opposed to "pipe analysis." This change should also be made under Inspections, Tests, and Analysis to refer to the report call out in Section 3.6.2.5 of the DCD. Further, Item 6 should remain and be modified to address reconciliation with the report called out in Section 3.6.2.5.

Furthermore, the staff disagreed with the applicant's response to a related RAI 14.3-210. The staff maintains that either a description of the as-designed pipe break hazards analysis completion schedule or an action item to provide the schedule as part of the COL application is needed because of the proposed deletion of COL Information Item 3.6.5-1-A from ESBWR DCD. If the COL information item remains and since the delay is related to piping DAC, the applicant will either have to provide the requested information, in accordance with RG 1.206 Section C.III.5.1, or to provide the NRC with a schedule for completion of the detailed design and propose a method for final closure, in accordance with Section C.III.4.3. GEH is, therefore, requested to include information for both as-designed and as-built pipe break hazards analysis in ITAAC Table 3.1-I, and to provide a description pertaining to the closure schedule of the as-designed pipe break hazards analysis in DCD Tier 2 section and a similar description for the piping design given the deletion of the COL information item related to design reports and specifications.

4. In its letter dated November 29, 2007, GEH responded to NRC RAI 14.3-131 S01 by revising the ITAAC. In ITAACs 1 and 2 in Table 3.1-1, GEH modified the ITA and AC columns to include ASME Code Design Reports in lieu of the ASME Code Certified Stress Report. For clarification, in order to meet the Code requirements, the ITAACs should state that the ASME Code Design Reports are in accordance with the requirements of ASME Section III, Subarticle NCA-3550.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-174, December 20, 2007, ML073532238

Although DCD Tier 1, Revision 4, Table 3.4-1 is entitled "ITAAC for Ventilation and Airborne Monitoring and Shielding," the ITAAC for airborne radioactivity monitoring has been removed from Table 3.4-1. Provide ITAAC for the in-plant airborne radioactivity monitoring system that state that airborne radioactivity monitoring is provided for those normally occupied areas of the plant in which there exists a significant potential for airborne contamination. The airborne radioactivity monitoring system should have the capability of detecting the time integrated

concentrations of the most limiting internal dose particulate and iodine radionuclides in each area equivalent to the occupational concentration limits in 10 CFR 20, Appendix B for 10 hours. The airborne radioactivity monitoring system should also provide local audible alarms (visual alarms in high noise areas) with variable alarm set points, and readout/annunciation capability.

*Status: GEH responded on April 2, 2008, MFN 08-086, Supplement 21  
GEH's response is under staff review.*

RAI 14.3-175, December 20, 2007, ML073532238

In DCD Tier 1, Revision 4, Table 2.3.2-1 (ARM Locations) was modified to delete the elevation of each ARM and to no longer list the number of individual area radiation monitors (ARMs) located in each location (e.g., Revision 4 lists a single listing for the ARMs in the Instrument Rack Area in the Reactor Building while Revision 3 had eight separate listings (numbered 1-8) for ARMs in the Instrument Rack Area in the Reactor Building). This modification to the data in Table 2.3.2-1 makes this table inconsistent with the ITAAC for the Area Radiation Monitoring System shown in DCD Tier 1, Revision 4, Table 2.3.2-2, since the ITAAC is based on inspections, tests, and analysis being performed on each ARM channel and Table 2.3.2-1 in DCD Tier 1, Revision 4, no longer lists each individual ARM location (as was indicated in the Revision 3 version of Tier 1, Table 2.3.2-1). In order to make the ITAAC consistent with the table, modify Table 2.3.2-1 to provide a listing for each individual ARM.

*Status: GEH responded on 4/17/2008, MFN 07-086, Supplement 23.  
GEH's response is under staff review.*

RAI 14.3-182 Supplement No. 1, April 23, 2008, ML080930620

GEH Response to 14.3-182 sent in letter MFN 08-086, Supplement 18 dated March 17, 2008 requires more clarification.

Tier 1 Table 2.1.2-3, ITAAC for the Nuclear Boiler System, Item #24

Reference is made to type testing and the acceptance criteria of 1000 psig or greater. Please confirm that the DPV tested for SBWR prototype demonstrates that pressure is not a critical parameter in the opening capability of the valve. Please establish a specific pressure test value in the ITAAC Acceptance Criteria with a tolerance.

*Status: GEH has not yet committed to a response date*

RAI 14.3-196 Supplement No. 1, April 23, 2008, ML070930620

Item # 7 of the SLCS ITAAC Table 2.2.4-6, Revision 4 verifies the 86 GPM equivalency required by the ATWS Rule. Provide the summary of the calculations performed to verify the 86 GPM equivalency in DCD Tier 2.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-204 Supplement No. 1, May 6, 2008, ML0081150839

- (1) Relocate the Design Descriptions that were submitted in Tier 1 Sections 2.8.1 (Fuel Rods and Bundles) and 2.8.2 (Fuel Channel) in Revision 3 of the DCD to Tier 2, Appendix 4B under 4B.1 GENERAL CRITERIA in Revision 5 of DCD.
- (2) The design and construction of Fuel Assemblies and Control Rods should be verified by ITAAC, including the number of fuel bundles and control rods, equipment qualification of these components such as Seismic qualification and compliance with ASME code. In addition, ITAAC verification of the configuration of the fuel bundles and the control rods in the core should be provided
  - (a) Add Fuel Bundles, Control Rods and the Mechanical equipment associated with Fuel Bundle and Control Rods to Tier 1, Nuclear Boiler System Section 2.1.2, Table 2.1.2-1 and include Seismic qualification and ASME applicability.
  - (b) Add an ITAAC in Table 2.1.2-3 to verify the following:

The Fuel Rods, Bundles, Fuel Channels and Control Rods and associated mechanical equipment listed in Table 2.1.2-1 have been designed and constructed in accordance with the established design requirements (Design Commitment)

An Analysis/Inspection is performed of the reactor Core Design and construction (Inspections, Testing, and Analyses)

A report exists and concludes that The Fuel Rods, Bundles, Fuel Channels and Control rods listed in Table 2.1.2-3 have been designed and constructed in accordance with the established design requirements (Acceptance Criteria)

- (c) Add a core configuration diagram to Tier 1 showing the relative positions of the fuel bundles and control rods, and an ITAAC to verify internal component configuration necessary to ensure the core configuration will be installed as designed.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-206 Supplement No. 1, May 21, 2008, ML081410100

GEH's response to RAI 14.3-206 did not address the staff's question. DCD Tier 1, Section 3.8 includes (1) safety-related electrical equipment [10 CFR 50.49 (b)(1)], (2) safety-related mechanical equipment, and (3) safety-related digital I&C equipment. The scope of environmental qualification (EQ) includes 10 CFR 50.49 (b)(1), (b)(2), and (b)(3) equipment. SRP 14.3.6 discussed EQ of electrical equipment important to safety. SRP 14.3.6 states that applicants must ensure that safety-related, certain non-safety-related, and certain post-accident monitoring equipment can perform their functions in various anticipated environments. Revise DCD Tier 1, Section 3.8, Design Description and Table 3.8-1 to include 10 CFR 50.49(b)(2) and (b)(3) equipment or provide justification for not including them.

*Status: GEH has not yet committed to a response date.*

The following statement was provided in the GEH response to RAI 14 3-209 as a revision to Section 9.5.1.9:

“The manual firefighting capability is provided for those containment spaces containing mechanical or electrical equipment that use, contain or requires for maintenance, significant quantities of combustibles, when the containment is not otherwise inerted.”

This new statement of design criteria is not the same as the design criteria provided in other sections of the DCD and in another RAI response related to hose station coverage inside containment, including the following (underlining added for emphasis):

- Tier 2, Section 9.5.1.6, Revision 4, states “All rooms within the plant buildings are within the reach of at least one effective hose stream from a Class III hose station.”
- GEH response to RAI 9.5-21 states “Hose racks are located in each stairwell, with extra fire hose and fire extinguishers staged at hatch openings as required, to provide full coverage throughout the Drywell and Containment during outages.”
- Appendix 9A, Table 9A.5-1, Revision 4, indicates that for containment backup fire suppression “Hose racks and ABC fire extinguishers (via hatches at EL 6400, EL 13570 and EL17500) (extra fire hose and fire extinguishers staged at hatches as required)” are provided.

Other draft changes provided in the GEH response to RAI 14.3-209 are consistent with the DCD excerpts and RAI 9.5-21 response above, including (underlining added for emphasis):

- Tier 1 Section 2.16.3, Item (3), Draft Revision 5 states “The FPS provides for manual suppression capability to plant areas containing safety-related equipment.”
- Table 2.16.3-2, Item 3, Draft Revision 5, Inspections, Tests, and Analyses (ITAAC) for this item states that “Inspections of the as-built manual fire suppression system will be performed to verify that any location that contains or could present a hazard to safety-related equipment can be reached by at least one effective hose stream with a maximum of 30.5 meters (100 ft) of hose.”

The above descriptions and response to RAI 9.5-21 are consistent and in accordance with regulatory expectations, as well as the acceptance criteria for manual hose station protection provided in RG 1.189, Regulatory Position 3.4.1. They reflect a design criteria based on the location of safety related equipment.

On the other hand, the revised design criteria provided in draft Revision 5 of Section 9.5.1.9, as quoted above, is not in accordance with Regulatory Position 3.4.1. This new criteria is based on combustible loading, not on the location of safety related equipment.

1. Table 2.16.3-2, Item 3, Draft Revision 5, ITAAC and Acceptance Criteria: This ITAAC does not distinguish between areas inside containment and areas outside containment. GEH should verify that all areas of the containment and drywell can be reached by an effective hose stream using 100 ft of hose connected to a hose station outside containment. A

separate ITAAC should be provided for hose station coverage inside containment, if additional hose will be required.

2. During an NRC/GEH phone conference on April 4, 2008, GEH noted that they are crediting the standard 30 feet of hose stream when determining adequate coverage – which is acceptable to the NRC. This is consistent with the description in the Inspection, Tests, Analyses description for Item 3 of Table 2.16.3-2 in Tier 1. However, the description in the Acceptance Criteria column for this same item does not appear to credit the length of the hose stream – only the 100 ft hose length – for determining acceptable coverage. The Acceptance Criteria should be revised.

Section 9.5.1.9, Smoke Detection and Fire Alarm System, which was revised for draft Revision 5 of the DCD to respond to RAI 14.3-209, is not the appropriate location for a discussion of manual fire fighting capabilities. This issue should be addressed in Section 9.5.1.6, “Manual Suppression Means.”

*Status: GEH has not yet committed to a response date.*

RAI 14.3-210 Supplement No. 2, May 27, 2008, ML081440404

In response to RAI 14.3-210, GEH disagreed with the staff’s request to add a COL information item to the DCD. During a May 21, 2008 telecom between GEH and the staff, GEH’s response to RAI 14.3-210 was discussed. The staff reiterated that because DAC closure could be performed in several design phases, schedule information for closure is necessary for the staff to be able to appropriately schedule its activities related to DAC closure. This COL information item will ensure that every COL applicant referencing the ESBWR DCD provides the NRC with a schedule for DAC closure, even if the initial response to the COL information item is to make a commitment to provide such a schedule at a time when information is mature enough to be able to make reasonable schedule commitments. As such, the staff requests that GEH include a COL information item in the DCD for the COL applicants/holders to provide a schedule for DAC closure.

In addition, the staff and GEH discussed comments associated with an appendix to Tier 2, Section 14.3 included in the response to RAI 14.3-210. The staff requests GEH to incorporate those verbal comments.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-211, December 20, 2007, ML073532238

ITAAC Table 3.3-1 contains 11 items, one for each element of NUREG-0711 and the corresponding ESBWR element implementation plan. However, the Design Commitment column for each element refers to the overall MMIS and HFE Implementation Plan rather than the specific pertinent elements implementation plan. Please update the 11 Design Descriptions to refer to the applicable implementation plans.

*Status: GEH responded on May 15, 2008, MFN 08-086, Supplement 46.  
GEH’s response is under staff review.*

RAI 14.3-212, December 20, 2007, ML073532238

The COL Information Item 3.6.5 requires that the COL applicant provide details of pipe break analysis results and protection methods. In DCD Revision 4, Sections 3.6.2.5 and 3.6.5-1-A, the applicant revised the sections and simply moved the task to ITAAC 3.1-1 Item 3. That ITAAC item requires inspection of the as-built pipe break analysis. The intent of the COL Information Item was to make available the detailed design information prior to implementation/installation. The staff continues to believe that the design information should be made available prior to implementation/installation. RG 1.206, Section C.III.4.3, allows the applicant to propose an alternative to the COL Information Item. Since the ITAAC 3.1-1 Item 3 does not cover the level of detail described in RG 1.206 C.III.4.3, a different alternative is needed along with the described justification.

*Status: GEH responded on March 20, 2008, MFN 08-086, Supplement 7. GEH's response is under staff review. However, resolution of this RAI is dependent on the resolution of RAI 14.3-210. GEH has not yet committed to a response date for RAI 14.3-210.*

RAI 14.3-213 Supplement No. 1, April 23, 2008, ML080930620

In NRC RAI 14.3-213, the staff requested that GEH modify Table 2.1.2-3, "ITAAC For Nuclear Boiler System," in order to provide clarification. The staff also requested that the applicant review ITAAC for all Class 1, 2, and 3 systems and verify that they are consistent with the Nuclear Boiler System (NBS) ITAAC where applicable. GEH responded by letter dated February 15, 2008 (MFN 08-086 Supplement 3) and provided its proposed changes to ITAAC for Class 1, 2, and 3 systems. In reviewing the applicants proposed changes, the staff identified the following:

1. The ITAAC for the ASME Code Class 2 portion of the turbine main steam system (TMSS) is not consistent with the NBS ITAAC. The staff requests that the applicant provide ITAAC for the ASME Code Class 2 portion of TMSS as it relates to design, fabrication, examination and testing in accordance with the requirements of ASME Code. The staff would expect the ITAAC to look very similar to the NBS ITAAC.
2. Proposed Table 2.4.2-3, ITA 4.b1 states, "Inspections of certified documents for as-built piping will be inspected." The staff requests that GEH modify this ITA to state "Inspection of certified documents for as-built piping will be conducted" to be consistent with similar Tier 1 ITAs.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-216 Supplement No. 1, May 15, 2008, ML081300488

GEH has added ITAAC #10 in Table 2.16.2-6 in response to RAI 14.3-216, making a commitment to test the as-built EFUs efficiency by meeting RG 1.52 requirements for HEPA and carbon filters. In this regard, GEH also made a commitment to test each charcoal adsorber in accordance with RG 1.40. Please explain the relevance of RG 1.40 (Qualification Tests of Continuous-Duty Motors Installed inside the Containment of Water-Cooled Nuclear Power Plants) to the HEPA and carbon filters' in-place testing for the control room.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-217, Supplement No. 1, April 23, 2008, ML080930620

In the response to RAI 14.3-217, GEH stated that DCD Tier 2 Figures 6.4-1, 9.4-1, and DCD Tier 1 Figure 2.16.2-4 had been revised to illustrate the controlled air leakage path from the Control Room Habitability Area (CRHA) envelope. The controlled leakage is needed to maintain the required minimum positive pressure and the minimum fresh air flow rate in the CRHA. However, an arrow marked on the figures to denote the leakage location provides no information regarding its control design features for balancing the fresh air supply and discharge while maintaining pressure. Please describe your control leakage design features. Specifically, please provide details to assure that the flow from the EFU system will always be 424 CFM or greater, while maintaining a positive pressure in the CRHA greater than or equal to 1/8 inch w.g. Consider in your response the control of the air leakage path being based on (1) CRHA pressure and; (2) the loading of EFU filters or other flow resistances which could cause reduction in EFU fan flow rate. The essential control features should be based upon the EFU flow measurement and CRHA pressure. This information should be incorporated into the DCD.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-218, December 20, 2007, ML073532238

DCD Tier 1, Table 2.16.2-4, Item 4 identifies an ITAAC to ensure that the control room habitability area bulk air temperature will be maintained within the given habitable temperature range. However, the ITAAC addresses only the loss of cooling during the summer conditions, as it focuses on the maximum CRHA air temperature rise that would result from the loss of normal cooling. The ITAAC does not cover a loss of heating during cold weather.

DCD Tier 2, Table 9.4-1 does not report the maximum CRHA (station blackout) temperature drop below normal operating temperatures, during a winter situation. Please provide the CRHA temperature drop limit.

Please provide an ITAAC to cover the loss of normal heating during a winter DBA condition, and to ensure that the CRHA bulk air temperatures is acceptable.

*Status: GEH responded on May 29, 2008, MFN 08-397.  
GEH's response is under staff review*

RAI 14.3-219, Supplement No. 1, May 15, 2008, ML081300488

In the March 5, 2008, response to RAI 14.3-219, GEH added Part (b) to ITAAC #9 in Table 2.16.2-6, making a commitment to test and verify that the dedicated portable AC generator(s) are available on site, and are capable of providing post 72-hour power to the EFU fan system. GEH's response to RAI 9.4-31 (MFN 08-343, Dated April 11, 2008) showed that the post 72-hour backup power to each EFU fan system will be rather provided by two ancillary diesel generators. This design change has made ITAAC #9 about portable AC generator(s) irrelevant.

Update DCD Tier 1 to provide ITAAC to verify the on-site ancillary diesel generators' capabilities to provide post 72-hr power to the EFU fan system, as well as all other intended RTNSS loads.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-220, December 20, 2007, ML073532238

DCD Tier 1, Table 2.16.2-1 does not list safety-related dampers for supply inlet, exhaust outlet and smoke purge outlets of the Reactor Building Clean Area HVAC Subsystem (CLAVS). The description states that the CLAVS area is "non-radiologically controlled." The staff needs additional information on how the Reactor Building Contaminated Area HVAC Subsystem (CONAVS) volumes and Reactor Building Refueling and Pool Area HVAC Subsystem (REPAVS) volumes which are isolated by SR dampers are sealed from the CLAVS clean area volume during an accident when the negative pressure differentials between volumes are not maintained. Since there are no safety-related dampers to assure CLAVS isolation post accident, the CLAVS volume may be considered part of the external environment. As such, all releases to the CLAVS by way of the CONAVS or REPAVS volumes must be considered as exfiltration from the RB.

Has the volume used in the design basis analysis for the reactor building been reduced by the volume of the non-radiologically controlled CLAVS volume which is not isolated by safety-related dampers? If the CLAVS area is credited as a radiation control area, please revise the description and add the CLAVS dampers to the list of safety-related components in Tier 1, Table 2.16.2-1.

The CLAVS area is stated as being a non-radiological control area which may mean that no credit is given to these non-safety-related dampers and that the CLAVS area is effectively open to the environment. In the testing of RBVS isolation dampers per Table 2.16.2-2, Item 2, are the CLAVS exhaust and supply dampers which are not listed as safety related in Table 2.16.2-1 tested for isolation?

*Status: GEH responded on April 25, 2008, MFN 08-086, Supplement 38.  
GEH's response is under staff review*

RAI 14.3-221, December 20, 2007, ML073532238

Regarding the Design Description in Tier 1 Section 2.16.2.1, how does the Reactor Building HVAC System (RBVS) maintain isolation and control of releases post accident as in Item 2 (The RBVS isolation dampers automatically close upon receipt of a high radiation signal or loss of AC power) if it operates to provide post 72-hour cooling as in Item 7 (The RBVS provides post 72-hour cooling for DCIS, CRD and RWCU pump rooms...)?

What parts of the RBVS are operating and does it exhaust from the building?

Does it provide for either cooling or control of hydrogen in safety-related battery rooms?

In testing the RB for leak tightness as per Tier 1 Table 2.16.5-2, Item 4, does the test have to consider the RBVS running in the 72 hour post accident cooling mode? What portions of the RBVS system are classified as RTNSS? Is the CLAVS area of the RB considered as part of the RB for testing?

How is the RTNSS qualification demonstrated and verified? Can the releases be demonstrated to be less than the 50 percent mass per day leakage rate assumed in the design basis analysis?

What cooling systems (chilled water, component cooling water, etc.) are required to support the RBVS cooling functions? What source of power is supplied to these systems?

Are the supporting cooling systems classified as RTNSS?

Has the 72-hour post accident RBVS operation requirements been evaluated for winter and summer design temperature conditions?.

*Status: GEH responded on April 25, 2008, MFN 08-086, Supplement 38.  
GEH's response is under staff review*

RAI 14.3-225, December 20, 2007, ML073532238

In DCD Tier 1, Table 2.16.2-4, Item 4a, the confirmation of temperature rise is for a 72-hour duration. Please identify the systems that are required to assure that temperature rise does not exceed 15 degrees after 72. Please establish an ITAAC to verify this capability.

*Status: GEH responded on March 31, 2008, MFN 08-086, Supplement 20.  
GEH's response is under staff review.*

RAI 14.3-229 Supplement No. 1, May 22, 2008, ML081280554

In response to RAI 14.3-229, GEH proposes to update ESBWR DCD Tier 1 Table 2.15.1-2 to include that the acceptance criteria for drywell to wetwell bypass leakage tests as that "[r]eport(s) document that the results of the drywell to wetwell bypass leakage is less than or equal to 50 percent of the assumed value in the containment capability design basis containment response analysis."

In RAI 6.2-145, Supplement 2, the staff requested GEH to provide additional justification for this proposed change. Please make the responses to RAIs 14.3-229 and 6.2-145 consistent.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-242 Supplement No. 1, May 6, 2008, ML081150839

Conformance to IEEE Std. 603-1991, which the definition of the term "division" is a normative part of, is required by 10 CFR 50.55a(h). As a result of RAI 7.1-46, MFN 06-482, dated December 31, 2006, the applicant committed to revising this definition to meet that of the requirements and to be incorporated in Revision 3 of the DCD. This change was completed.

The usage of the term "division" as defined by IEEE Std. 603-1991 is required by 10 CFR 50 and as referenced by 10 CFR 52. This term is to be used not just for future designs, as the response suggests, but the completed designs and operating reactors as well. The completed design must establish and always have the capability to maintain the three types of independence noted.

In Revision 4 of the DCD, GEH changed the definition. As RAI 14.3-242 states, the applicants definition of the term "division" is a deviation from IEEE Std. 603-1991 and, therefore 10 CFR 50.55a(h) and would require an exemption. The applicant should refer to 10 CFR 50.12, "Specific Exceptions" which discusses the necessary application, conditions and circumstances

necessary for the Commission to grant an exemption from the requirements if the applicants intend to propose a change to the definition of "division."

*Status: GEH has not yet committed to a response date.*

RAI 14.3-246 Supplement No. 1, April 11, 2008, ML081010599

Item 8a, under the design description of Section 2.1.2 Nuclear Boiler System, states "Control Room Alarms," displays, and/or controls provided for the NBS System are defined in Table 2.1.2-2." the following issues still exist with regards to Table 2.1.2-2:

- 1) The table does not identify the existence of alarms or controls.
- 2) The table does not identify what functions or equipment is in the control room.
- 3) The table lists pressure and level transmitters which should be shown on Figure 2.1.2-2.
- 4) The table has a column heading of "active function". The text does not define what that means, or specifically how that relates to the transmitters listed.
- 5) The table lists the attributes of "Safety Related Electrical Equipment" and "Seismic Category I" for the pressure and level transmitters but does not list them as being qualified for harsh environments. Will these be located in a harsh environment?

*Status: GEH has not yet committed to a response date.*

RAI 14.3-250 Supplement No. 1, May 15, 2008, ML081300488

In RAI 14.3-250 the staff requested that GEH display controls on DCD Tier 1 Figure 2.2.2-1, Control Rod Drive System.

In response GEH stated that "Tier 1 functional arrangement information can be provided in tabular or graphical form. The form selected is based on the nature of the information. When instruments are shown on the figure, the placement on the figure implies spatial or relational aspects of the configuration (e.g. the instrument is mounted on the accumulator, or the instrument is mounted on the pipe upstream of the check valve) that may not be required. In this case, the tabular form is appropriate because the location of the controls is not critical to the performance of the system during accident and transient conditions."

The staff disagrees with the response provided. For the minimal identification of instruments, the staff refers to NUREG-0800, Section 14.3, Appendix C, "Detailed Review Guidance", Section 1.B "Figures," states "As a minimum, the instruments (pressure, temperature, etc.) required to perform Generic Technical Guidelines (e.g., ERGs, EPGs)(as described in the DCD, Tier 2, Chapter 18) should be shown on the figures, or described in the DD."

In addition DCD, Tier 1, Section 1.1.2.4 "Interpretation of Figures" states "Unless specified explicitly, these figures are not indicative of the scale, location, dimensions, shape, or spatial relationships of as-built structures, systems, or components. In particular, the as-built attributes of structures, systems, and components may vary from the attributes depicted on these figures, provided that those safety functions discussed in the Design Description pertaining to the figure are not adversely affected."

Therefore, the staff requests the applicant to confirm that these instruments, described above, are shown in the figures or described in the DD.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-251 Supplement No. 1, April 23, 2008, ML080930620

In the original RAI, the staff requested information from Table 2.2.3-3, "FWCS Controls", which lists the various control modes for the feedwater control system (FWCS); manual, automatic (single and three element) etc., should be used in Table 2.2.3-1, "Feedwater Control Modes." Currently, the only information in the "Feedwater Control Modes" table is "FWCS is a triple-redundant, fault tolerant digital controller (FTDC)." This table's content, description, or both, should be revised to provide a consistent design commitment.

The design commitment, which is a functional arrangement, must be clear, concise and recognizable information that will be provided in the inspection and test report(s) document(s) presented for review. Per RG 1.206, a functional arrangement is defined as (for a system) "the physical arrangement of systems and components to provide the service for which the system is intended and that is described in the ITAAC design description and as shown in the figures." Figure 2.2.3-1 provides a simple diagram for the FCS logic but is not referenced by the functional arrangement nor the design commitment. The acceptance criteria can also be derived from further Tier 2 material. From the FWCS Tier 2 description in Section 7.7.3.2.1 of the DCD, it does not stipulate what attribute is "triple redundant" but it does state "including power supplies and input/output signals." Tier 2 goes on to state the FTDC "consists of three parallel processing channels, each containing hardware and software for execution of the control algorithm." Therefore, the staff is also requesting if the intent is to maintain the existing topic in the functional arrangement then it should stipulate the attributes which are to be triple redundant, in terms of components, features or functions, with Figure 2.2.3-1 revised and referenced, accordingly.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-252, December 20, 2007, ML073532238

If the redundant nature of the FWCS is being taken credit for in any analysis, then an adequate description of the type of redundancy (parts of, such as processor only, or complete three channel design etc.) and a specific ITAAC should be created to confirm with loss of one, and two, channels FWCS output is maintained.

*Status: GEH responded on May 9, 2008, MFN 08-086, Supplement 43.  
GEH's response is under staff review*

RAI 14.3-253 Supplement No. 1, May 6, 2008, ML081150839

A. The DCD does not sufficiently explain the necessity for recharging the manually operated nitrogen and sodium pentaborate solution supply systems. If recharging of the accumulator pressure is required in order for the accumulator to perform its safety function, then adequate time to recharge, or delay until that function can be utilized, is a functional requirement that is part of the design basis. Per IEEE Std. 603-1991, the design basis shall include, per Criterion 4.5.1, "The points in time and the plant conditions during which manual

control is allowed." Therefore, if recharging of the accumulator is required to perform its safety function, then this design attribute should be included in Tier 1.

- B. The level, or concentration, of boron is critical to shutdown of the reactor. If the boron concentration to be achieved, identified in the ITAAC referenced, can be done without measurement then how that level of concentration is assured should be identified in Tier 1. If measurement or monitoring is necessary, it should be identified in Section 2.2 as it was in Revision 3. This is also part of the Safety System Designation, Criterion 4, design basis of IEEE Std. 603-1991.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-257 Supplement No. 1, May 6, 2008, ML081150839

Per SECY-92-053, "Use of DAC during 10 CFR Part 52 Design Certification Reviews", DAC should be "clear" and then "objectively" verifiable. The description of Design Commitment 2, which currently references Table 2.2.6-2, merely identifying "controls" should be further defined beginning with the descriptions in the RAI response. Perhaps "fixed or dedicated controls in the RSS" would better describe the intent of design commitment (DC) 2 and reference to Figure 2.2.6-1, which was removed from the DCD in Revision 4. Figures should be included in Tier 1 Design Descriptions per NUREG-0800, Section 14.3. The applicant can propose a new description of DC 2 in the supplemental response upon a more thorough review of the design.

With regards to Table 2.2.6-2, the RAI response states "defines the minimum level of diversity to be provided in the hardware design of each RSS to ensure compliance with GDC 19." This statement, or the information, is not in Tier 1 or Tier 2, and should be added. Tier 2 merely states that the RSS conforms with GDC 19 but does not attempt to specifically show how that is implemented. Also, the applicant is requested to explain what is meant by "minimum level of diversity" with regards to GDC 19. This "Control Room" requirement does not require diversity for equipment inside or outside the control room.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-259 Supplement No. 1, April 23, 2008, ML080930620

In response to RAI 14.3-259, GEH stated that the basic configuration drawing (Figure 2.2.7-1) for RPS in ESBWR DCD Revision 3 contained details that were not appropriate for the ESBWR Tier 1 document. The staff does not understand what is meant by "not appropriate for ESBWR Tier 1 document." NUREG-0800, Section 14.3, states "Figures should be provided for most systems, with the amount of information depicted based on the safety significance of the SSCs. Where figures are not required, generally for simple non-safety significant systems, the narrative should be sufficient to describe the system. The figures are intended to depict the functional arrangement of the significant SSCs of the standard design." The RPS is not a simple non-safety significant system. Additionally, the narrative, in this case from Tables 2.2.7-1, 2.2.7-2 and 2.2.7-3, does not depict the information that was provided in Figure 2.2.7-1.

The RPS design will be completed during the DAC process. SECY-92-053, "Use of DAC During 10 CFR Part 52 Design Certification Reviews," states "The DAC, and any related interface requirements, need to be sufficient for the staff to conclude that any additional design detail developed after the design certification, which satisfies those criteria, would not alter the staff's safety conclusion." SECY-92-053 goes on to state, "The second part of the review (of

DAC/ITAAC) will address the implementation of digital control systems to meet the functional system requirements. This will rely upon a formal process with phased ITAAC for design development.” The applicant is requested to identify what information is “not appropriate” from Figure 2.2.7-1 and identify the life cycle activity and the output documents during the DAC process that will provide this information. This information can be extracted from the current description of the ESBWR Lifecycle Process presented by the SMP and SQAP.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-260, December 20, 2007, ML073532238

Without an adequate description to make a reasonable regulatory determination of “triple redundant”, the interfacing systems, power or gateways, Figure 2.2.9-1, Simplified Block Diagram, which was in Revision 3, should be reinserted. Also, to what credit is the “triple redundancy’ used for? Simply stating it has no regulatory significance. If there is any credit taken then the test to specifically confirm with loss of one, and two, channels SB&PC output is maintained. (As was done in Revision 3).

*Status: GEH responded on May 9, 2008, MFN 08-086, Supplement 43.  
GEH’s response is under staff review.*

RAI 14.3-261, December 20, 2007, ML073532238

The following functions were removed from Revision 4 of the functional description in Revision 3. These along with the interface diagram needs to be added to make a safety evaluation.

- 1) Processing of manual demands for nuclear system isolation
- 2) The logic functions of ECCS, CRHS, LDIS and the ICS.

*Status: GEH responded on April 16, 2008, MFN 08-086, Supplement 30.  
GEH’s response is under staff review*

RAI 14.3-262, December 20, 2007, ML073532238

Clarify the following functional requirements in Section 2.2.14 including the bracketed information at the end.

- (6) The containment isolation components that correspond to the isolation functions defined in Table 2.2.14-2 are addressed in Subsection 2.15.1. [TCF510]
- (7) Confirmatory analyses to support and validate the DPS design scope. [SMK511]
- (8) Failure Modes and Effects Analysis (FMEA) per NUREG/CR-6303 of safety-related protection system platforms (RPS and SSLC/ESF) completed to validate the DPS diverse protection function. [SMK512]

*Status: GEH responded on March 18, 2008, MFN 08-086, Supplement 13.  
GEH’s response is under staff review. However, resolution of this RAI is dependent on the resolution of RAI 14.3-263. GEH responded to RAI 14.3-263 on April 2, 2008,*

*MFN 08-086, Supplement 21. GEH's response is under staff review*

RAI 14.3-263, December 20, 2007, ML073532238

Figure 2.2.14-1, DICS Diagram is not in the DCD as referenced

*Status: GEH responded on April 2, 2008, MFN 08-086, Supplement 21.  
GEH's response is under staff review*

RAI 14.3-265, December 20, 2007, ML073532238

The applicant has presented an Applicability Matrix showing only certain sections of IEEE-603 (the particular version not stated) applicable to certain systems. However, if the intent is to the substantiate conformance to IEEE-603, all sections of this standard must be addressed and the table completed. It should be identified why certain sections do not require ITAAC, and how compliance is substantiated or links could be provided to existing non system based ITAAC. As an example, this could be ITAAC for IEEE Sections 5.4 Equipment Qualification or Section 5.3 Quality.

*Status: GEH responded on May 9, 2008, MFN 08-086, Supplement 43.  
GEH's response is under staff review*

RAI 14.3-271, December 20, 2007, ML073532238

Update ITAAC Columns 2 and 3 - Tier 1 Table 3.3-1 Column 2 (Inspections, Tests, Analyses) and Column 3 (Acceptance Criteria) should be revised for each Design Commitment to ensure that they accurately reflect the methodology described in the final versions of the implementation plans following revisions to address the staff's RAIs identified in Chapter 18 of the SER.

In addition, please review all of the items in the acceptance criteria column to ensure that the text is complete. For example Table 3.3-1 Item 1, the Acceptance criteria states:

Summary reports document that:

- a. The OER team members and backgrounds.
- b. The scope of the OER.
- c. The sources of the operating experience reviewed and documented results.
- d. The Process for issue analysis, tracking and review."

This is not complete and does not provide an acceptable acceptance criterion.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-284, December 20, 2008, ML073532238

Section 2.1.2, Nuclear Boiler System, Design Description (10): For clarity, the staff requests the applicant to reword to say "Each pneumatically operated valve..." rather than "The ...valve(s)..."

Clarify whether all valves fail at once if there are multiple valves?

*Status: GEH responded on April 11, 2008, MFN 08-086, Supplement 27. GEH's response is under staff review. However, resolution of this RAI is dependent on the resolution of RAI 14.3-305, Supplement No. 1. GEH has not yet committed to a response date for RAI 14.3-305, Supplement No. 1.*

RAI 14.3-301 Supplement No. 1, May 21, 2008, ML081410100

In response to RAI 14.3-301, GEH acknowledged that the intent of the acceptance criteria for “physical separation” of redundant divisions is to ensure that compliance with single failure criterion. However, in attempting to clarify the acceptance criteria phrase “physical separation between trains by structural and/or fire barriers”, GEH proposed replacing the “physical separation” ITAAC for five systems (Nuclear Boiler System, Standby Liquid Control System, Isolation Condenser System, Gravity-Driven Cooling System, and Passive Containment Cooling System) with one “physical separation” ITAAC in Tier 1, Section 3.1, Design of Piping Systems and Components.

The staff does not agree with this approach. The staff understands the scope of Tier 1, Section 3.0, Non-System Based Material, to be self-explanatory and the five ITAAC being replaced are clearly system-based. The staff understands the “physical separation” ITAAC included in Tier 1, Section 3.1, to be associated only with those piping systems which have not yet been designed as part of the ESBWR design certification application and will be designed in the future in accordance with the design process established in Section 3.1. Finally, the staff finds that by grouping the five systems discussed above into one “physical separation” ITAAC will be extremely problematic with respect to ITAAC closeout and verification activities.

The staff requests that the applicant clarify the acceptance criteria phrase “physical separation between trains by structural and/or fire barriers” and in a simple manner that is straight forward in addressing compliance with the single failure criterion while at the same time avoids complicating the closeout and verification activities for the ITAAC.

*Status: GEH has not yet committed to a response date.*

RAI 14.3 - 304 Supplement No. 1, May 9, 2008, ML081260456

In letter MFN 08-086, Supplement 15, GEH provided their response to RAI 14.3-304 regarding testing of repositionable valves as specified in ITAAC #9 in Tier 1, Table 2.1.2-3 of the ESBWR DCD. In its response, GEH indicated that the valve testing could only be performed under preoperational conditions and that this is in accordance with NRC guidance in SRP 14.3.3.

The staff does not agree with GEH's proposed resolution to RAI 14.3-304. In its review of the response, the staff was still in disagreement with GEH in that testing at preoperational conditions alone could not be relied upon to demonstrate valve function at design conditions. The staff reiterates that without analyses to extrapolate the test results at pre-operational conditions to design conditions the valve function at design conditions cannot be adequately verified. In addition, the staff confirms that the guidance in SRP 14.3.3 for MOVs and other valves discusses in-situ testing of valves at pre-operational conditions. However, the guidance goes on to state that “Tier 2 information should be provided that defines that these tests will be conducted under maximum achievable pre-operational conditions and describes the analyses that will be performed to show how test results demonstrate the valves will function under design basis conditions.”

During a public meeting with GEH on April 22, 2008, the GEH response to RAI 14.3-304 was discussed further. Potential clarifications regarding the purpose of the test specified in ITAAC #9 were discussed. These discussions focused on the proper functioning of valves (e.g., solenoid valves) and closure signals that are necessary to support the design function of the repositionable valves. In addition, the adequate verification of the design function of the repositionable valves was discussed as being addressed by other ITAAC. In light of these meeting discussions, the staff requests that GEH provide additional clarification on the purpose of ITAAC #9 and revise it, as appropriate.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-305 Supplement No. 1, May 9, 2008, ML081260456

In letter MFN 08-086, Supplement 27, GEH provided their response to RAI 14.3-305 regarding testing of pneumatically operated valves as required by ITAAC #10 in Tier 1, Table 2.1.2-3 of the ESBWR DCD. In its response, GEH indicated that the testing necessary to adequately demonstrate valve function is adequately covered by ITAAC #15 and #16 for the MSIVs and by ITAAC #26 for the Safety Relief Valves (SRVs) and, as a result, ITAAC #10 would be deleted.

The staff does not agree with GEH's proposed resolution to RAI 14.3-305. In its review of the response, the staff found that it was not readily apparent that the requirements of ITAAC #15 and #16 for MSIVs and ITAAC #26 for SRVs adequately demonstrate the valve functions that were intended to be verified by ITAAC #10. The staff requests that GEH provide additional clarification and an appropriate basis that demonstrates that the requirements of ITAAC #15 and #16 for MSIVs and ITAAC #26 for SRVs adequately demonstrate the valve functions to be verified by ITAAC #10.

This RAI supplement also applies to the GEH response to RAI 14.3-284.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-345, December 20, 2007, ML073532238

For ITAAC Table 2.1.2-3 Item 6a, there is a reference to Table 2.1.2-2. However, the divisions that are the subject of ITAAC verification are not clearly identified in Table 2.1.2-2 (i.e., there is no clear correlation between Table 2.1.2-1 and the ITAAC in Section 2.13). The staff requests that the applicant provide a clear identification of the divisions in Table 2.1.2-2 to facilitate completion of the ITAAC per Section 2.13.

Also, there are no clear criteria provided for physical separation as discussed in Item 6b. and likewise, no such criteria provided in the Section 2.2.15 ITAAC to which this is referred. The staff requests the applicant to provide suitable justification for this approach or provide the necessary criteria.

*Status: GEH responded on May 9, 2008, MFN 08-086, Supplement 43.  
GEH's response is under staff review*

RAI 14.3-348, December 20, 2007, ML073532238

For ITAAC Table 2.2.1-6 Item 3, the ITA and AC are not consistent with the DC regarding interfacing systems. The staff requests that the applicant modify the ITA and AC to include a

verification of the associated interfacing systems specified in Table 2.2.1-3. In addition, the AC should include verification that the list of systems identified as interfaces in Table 2.2.1-3 is a complete list. The applicant should confirm that there are other ITAAC to verify the functional performance of the associated interfacing systems.

*Status: GEH responded on May 2, 2008, MFN 08-086, Supplement 40.  
GEH's response is under staff review*

RAI 14.3-351, December 20, 2007, ML073532238

For ITAAC Table 2.2.4-6 Item 12, the staff requests that applicant clarify the DC which states "components will retain their pressure boundary *at under* internal pressures that will be experienced during service." In addition, the staff requests that the applicant clarify an apparent inconsistency for hydrostatic testing of components and piping (i.e., component hydro is specified in the DC as internal pressures experienced during service whereas piping hydro is specified in the DC as design pressure).

*Status: GEH responded on April 25, 2008, MFN 08-086, Supplement 39.  
GEH's response is under staff review*

RAI 14.3-352 Supplement No. 1, April 8, 2008, ML080770452

The RAI observed that ITAAC Table 2.2.4-6, "ITAAC for the Standby Liquid Control System," Item 14 states that some of the equipment listed in Table 2.2.4-4 must retain its functional capability. The Design Commitment (DC) reads as follows: "Each of the components identified in Table 2.2.4-4 for which functional capability is required is designed to withstand combined normal and seismic design basis loads without a loss of its functional capability." The DC for ITAAC 2.2.4-6, Item 14 is written such that that an indication of which specific equipment items must remain functional is expected in the equipment table, Table 2.2.4-4. However, no indication is provided. The RAI requested revision to the equipment table to provide clarity on which items must remain functional and under which conditions.

In its response GEH modified the equipment table, Table 2.2.4-4 by adding a column labeled "FUNCTIONAL CAPABILITY REQUIRED." The data provided in the column is a statement of "ACTIVE" or "PASSIVE" which corresponds to the type of equipment listed. Specifically, those components listed which have had "ACTIVE" added would be expected to have moving parts. Those which have the "PASSIVE" label applied do not appear to have moving parts.

This information on the type of function each component utilizes may be useful. It does not, however, provide all the information requested in the RAI. The inspector will need to know which equipment in the system must remain functional, that is able to perform its intended safety function after enduring loading: "Normal", "Seismic" or the combination of both. So that they can review the report and verify that it indicates all of the correct and necessary equipment has been examined and will retain its function. Other equipment may only need to retain its structural integrity to perform its function. The staff requests the applicant to clarify the meaning of "active" and "passive" with respect to functionality in terms of operability and structural integrity. If all of the equipment listed in Table 2.2.4-4 must retain its function after the loading, that the DC should be revised to clearly indicate such.

*Status: GEH responded on May 13, 2008, MFN 08-086, Supplement 50.  
GEH's response is under staff review*

RAI 14.3-353, December 20, 2007, ML073532238

For ITAAC Table 2.4.1-3 Item 5b, the staff requests that the applicant clarify which lines in Table 2.4.1-3 are required to retain their functional capability and under what circumstances (i.e., is it only the Seismic Category I equipment).

*Status: GEH responded on May 13, 2008, MFN 08-086, Supplement 50.  
GEH's response is under staff review*

RAI 14.3-354, December 20, 2007, ML073532238

For ITAAC Table 2.4.2-3 Item 5b, the staff requests that the applicant clarify which lines in Table 2.4.1-3 are required to retain their functional capability and under what circumstances (i.e., is it only the Seismic Category I equipment).

*Status: GEH responded on May 13, 2008, MFN 08-086, Supplement 50.  
GEH's response is under staff review*

RAI 14.3-357, Decemer 20, 2007, ML073532238

For ITAAC Table 2.5.5-1, Item 2, the staff requests that the applicant modify the ITA to clearly state that "inspections and analyses...will be performed."

*Status: GEH responded on February 6, 2008, MFN 08-086.  
GEH's response is under staff review. However, resolution of this RAI is dependent on the resolution of RAI 14.3-359 Supplement No. 1. GEH has not yet committed to a response date for RAI 14.3-359 Supplement No. 1.*

RAI 14.3-359 Supplement No. 1, April 11, 2008, ML081010599

Staff requested that GEH include a design commitment for the seismic qualification as none was present in Revision 4 of the DCD. Additionally, GEH was requested to modify the ITA to clearly state that "inspections and analyses ...will be performed."

In their response GEH agreed to include a DC for the item, additionally they committed to modify the design descriptions in Section 2.5.5 of Tier 1 material to match. However, GEH did not comment on modifying the corresponding descriptions in Tier 2 material.

It is requested that GEH review the supporting Tier 2 material to ensure complete agreement of the seismic qualification of the equipment.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-366, December 20, 2007, ML073532238

GEH has not addressed the staff's concern regarding scenario reuse. Further, Section 4.4.9.1, of NEDO-33226, Revision 1, discusses the presentation of scenarios to crews, but does not address how scenarios will be assigned to crews or scenario sequencing. Please provide a high-level discussion of scenario sequencing and address the staff's concern about scenario reuse.

*Status: GEH responded on March 28, 2008, MFN 08-086, Supplement 19. GEH's response is under staff review. However, resolution of this RAI is dependent on the resolution of RAI 14.3-131 Supplement No.2. GEH has not yet committed to a response date for RAI 14.3-131 Supplement No. 2.*

RAI 14.3-367 Supplement No. 1, May 15, 2008, ML081300488

The staff requested clarification of “a hydrostatic or pressure test” phrase used in the ITA.

However, in response GEH used the term ‘pressure test’ instead of the more acceptable term ‘hydrostatic test’ which is the preferred test of the ASME code. GEH should modify the ITA and AC to use the term ‘hydrostatic test’.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-368 Supplement No. 1, May 15, 2008, ML081300488

The staff stated that for ITAAC in Table 2.6.2-2, Items 5i) and 5ii), there is inconsistency between DC, ITA, and AC in that the DC refers to “equipment and piping” and the ITA and AC refer only to “equipment.” The staff requested that the applicant revise the ITA and AC to be consistent with the DC. In addition, the ITA refers to “type tests and/or analyses”, the staff requested that the applicant modify to "type tests and analyses". GEH in their response addressed the staff's original concerns; however, the staff requests that GEH modify this ITAAC as follows:

GEH should revise Item 5 a.ii) in Table 2.6.2-2 to be more in line with the change for RAI 387 for Item 3 a) in Table 2.16.2-2.

GEH should revise Item 5a.iii) in Table 2.6.2-2 to be more in line with the change for RAI 387 for Item 3.b) in Table 2.16.2-2.

For the above changes for RAI 368, GEH should either use the term ‘equipment’ or the term ‘equipment and valves’ when referring to the items in Table 2.6.2-1. The DC, the ITA for items 5a.ii) and 5.a.iii), and the AC for all three items all refer to the term ‘equipment’, but the ITA for Item 5a.i) uses the term ‘equipment and valves’.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-369 Supplement No. 1, May 15, 2008, ML081300488

The staff stated that for ITAAC Table 2.6.2-2, Item 7 a), the ITA specifies the performance of a test for the flow path, however, the AC implies that capacity is confirmed. The staff requested that the applicant modify the ITA to include a confirmation of capacity and revise the AC to include the flow rate criteria for acceptance. GEH in their response just added the words “the flow rate capacity is greater or equal to 541.5 m<sup>3</sup>/hr” in the AC. GEH should modify the ITA to confirm the flow path and capacity, and then modify the AC accordingly but still include the flow rate.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-371 Supplement No. 1, May 6, 2008, ML081150839

It is assumed that GEH intends to deal only with the piping in this ITA therefore - GEH's proposed revisions are not quite acceptable as written. The way the ITA has been revised it may be interpreted to mean they intend to use the B31.3 testing procedure for all the API and BPVC code units as well as the piping. If the ITA and AC were revised as shown below, they would be acceptable.

**ITA** "A hydrostatic test in accordance with ASME/ANSI B31.3 will be conducted on the LWMS piping systems, except (1) at atmospheric tanks where no isolation valves exist, (2) when such testing would damage equipment, and (3) when such testing could seriously interfere with other systems or components required to be hydrostatically tested by the API or ASME codes and standards per Regulatory Guide 1.143, Revision 2."

**AC** "The reports document that the results of the hydrostatic test of the LWMS piping systems in accordance with ASME/ANSI B31.3 conform with the requirements in the ASME Code per Regulatory Guide 1.143, Revision 2 indicate no unacceptable pressure boundary leakage."

*Status: GEH has not yet committed to a response date.*

RAI 14.3-373, December 20, 2007, ML073532238

For ITAAC Table 2.12.1-1 Item 1, refers to Subsection 2.15-1 for verification of the safety-related containment penetrations and isolation valves, however, no mention is made of these MWS components in Subsection 2.15.1. The staff requests that the applicant provides a list of the MWS penetrations and isolation valves for verification in Subsection 2.15.1 or provide a suitable justification for not including such a list.

*Status: GEH responded on April 2, 2008, MFN 08-086, Supplement 26.  
GEH's response is under staff review*

RAI 14.3-374, December 20, 2007, ML073532238

For ITAAC Table 2.12.7-1 Item 3, the staff requests that the applicant provide a suitable DC that is consistent with the ITA and AC.

*Status: GEH responded on April 2, 2008, MFN 08-086, Supplement 26.  
GEH's response is under staff review*

RAI 14.3-377, December 20, 2007, ML073532238

For ITAAC Table 2.15.1-2 Item 2, the DC, ITA, and AC appear to be inconsistent. The DC refers to design and construction in accordance with the ASME Code while the ITA and AC only verify that the as-built complies with the ASME Code requirements. The staff requests that the applicant modify the ITA and AC to also include the appropriate documentation to verify that the design complies with the ASME Code.

*Status: GEH responded on February 15, 2008, MFN 08-086, Supplement 3.  
GEH's response is under staff review. However, resolution of this RAI is dependent on the resolution of RAI 14.3-131 Supplement No.2. GEH has not yet committed to a response date for RAI 14.3-131 Supplement No. 2.*

RAI 14.3-379, December 20, 2007, ML073532238

For ITAAC Table 2.15.1-2 Item 6a, there is no clear correlation between the safety-related components and their power division in either Section 2.13 or in Table 2.15-1. The staff requests that the applicant provide this correlation.

*Status: GEH responded on May 16, 2008, MFN 08-086, Supplement 52.  
GEH's response is under staff review.*

RAI 14.3-380 Supplement No. 1, April 8, 2008, ML080770452

The RAI requested revision of the ITAAC Table 2.15.1-2 "ITAAC For The Containment System," Item 9. Specifically, the RAI requested that the Design Commitment (DC) be revised to indicate what the design is committed to comply with, a citation of the code section. Additionally, the staff requested that the Acceptance Criteria (AC) be revised to give the specific design pressure required to demonstrate compliance.

In the response GEH has removed the design pressure from the DC, but not added a design code commitment. The revision states merely that the system "... retains its integrity when subject to design pressure." Additionally the AC is revised to say, "Test report documents that a pressure at or above 310 kpa gauge (45 psig) does not affect containment integrity." Per DCD Paragraph 2.15(8) that is the design pressure. While this does observe the request of adding the specific design pressure to the AC, it is such that it could be misinterpreted as the test pressure. If that were to happen, the test pressure would be in conflict with the ITA requirements as stated because ASME Section III, Division 2 Article CC- 110 states the test pressure shall be 1.15 times the design pressure.

The DC is not clearly stated, when combined with the revised AC, there is not a clearly acceptable point to demonstrate compliance and allow closure of this ITAAC. GEH is requested to revise the ITAAC to clearly state the DC and the AC.

*Status: GEH responded on May 15, 2008, MFN 08-086, Supplement 51.  
GEH's response is under staff review.*

RAI 14.3-384, December 20, 2007, ML073532238

For ITAAC Table 2.15.4-2 Item 5b, the staff requests that the applicant clarify or indicate which lines in Table 2.15-4-1 are required for functional capability and to provide a definition for what is meant by functional capability and under which conditions.

*Status: GEH responded on May 13, 2008, MFN 08-086, Supplement 50.  
GEH's response is under staff review.*

RAI 14.3-392, May 15, 2008, ML081300488

The ESBWR DCD Tier 1, Revision 4, Table 3.6-1 ("ITAAC For Design Reliability Assurance Program"), Item 1, Acceptance Criteria states:

"Reports and/or specifications exist that contain the list of risk-significant SSCs and conclude that the reliability of each as-built risk-significant SSC is consistent with the reliability assumed in the ESBWR Design PRA."

This acceptance criteria would be applicable to those risk-significant SSCs that are included in the ESBWR PRA. However, this acceptance criteria would not be applicable to those risk-significant SSCs not included in the ESBWR PRA but determined to be risk-significant through other methods (e.g., deterministic, expert panel). As noted in other approved design certifications (e.g., AP1000) the example provided below should be a more appropriate acceptance criteria:

"Reports and/or specifications exist that contain the list of risk-significant SSCs and conclude that the estimated reliability of each as-built risk-significant SSC is consistent with the assumed reliability (e.g., the reliability assumed in the ESBWR PRA) and that industry experience including operations, maintenance, and monitoring activities were assessed in estimating the reliability of these SSCs."

The staff requests that GEH revise the ITAAC D-RAP acceptance criteria in Table 3.6-1, Item 1 to be applicable to all risk-significant SSCs in RAP.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-393, May 15, 2008, ML081300488

ESBWR DCD Subsection 9.5.1.3, "Facility Features for Fire Protection", states: "Exposed structural steel protecting safety-related areas is fireproofed with material with a fire rating of up to 3 hours as determined from the FHA." Tier 1 of the DCD includes ITAAC for the 3-hour fire barriers that separate redundant trains, including walls, floors and ceilings. For interior structural members in areas important to safety that must also survive a fire, an ITAAC should be added to verify that the structural members have been protected in accordance with an approved protection system with the appropriate fire resistance rating.

*Status: GEH has not yet committed to a response date.*

RAI 14.3-394, May 21, 2008, ML081410100

Section 4, "Interface Material" of DCD, Tier 1, Revision 4 of ESBWR design states that an applicant for a combined license (COL) that references the ESBWR certified design must provide design feature or characteristics that comply with the interface requirements for the plant design and inspections, tests, analyses, and acceptance criteria (ITAAC) for the site specific portion of the facility design, in accordance with 10 CFR 52.79(c). However, no interface requirements were identified for the offsite power system in the certified design. RG 1.206, CIII.7.2, Site-Specific ITAAC, recommends that applicants should develop ITAAC for the site-specific systems that are designed to meet the significant interface requirements of the standard certified design, that is, the site-specific systems that are needed for operation of the plant (e.g., offsite power).

As indicated in Section 8.1.5.2.4 of DCD, the ESBWR standard design complies with the requirements of GDC 17 with respect to two independent and separate offsite power sources. Therefore, an ITAAC is needed so that the NRC staff can verify that the required circuits from

the transmission network satisfy the requirements of GDC 17 with regards to its capacity and capability regardless of its low risk significance in ESBWR design.

Revise Section 4 of DCD, Tier 1 to include interface requirements for the offsite power system. It is expected that site-specific ITAAC for offsite power will be provided by the COL applicants to satisfy the interface requirements.

*Status: GEH has not yet committed to a response date.*

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(Revised 06/10/2008)

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