July 5, 2007

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

SUBJECT: ECONOMIC SIMPLIFIED BOILING WATER REACTOR (ESBWR) CHAPTER 2 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 Economic Simplified Boiling Water Reactor (ESBWR) design certification application submitted by GE-Hitachi Nuclear Energy Americas LLC (GHNEA) on August 24, 2005. The staff has identified six open items for SER Chapter 2, "Site Characteristics," 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 the 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 3, 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 GHNEA staff of any resulting changes to the status of Chapter 2. If you have any questions, please contact Amy Cubbage at (301) 415-2875 or aec@nrc.gov or Andrea Johnson at (301) 415-2890 or axj2@nrc.gov.

Sincerely,

/RA/

Mohammed A. Shuaibi, Chief
ESBWR/ABWR Projects Branch 1
Division of New Reactor Licensing
Office of New Reactors

Docket No. 052-010

Enclosure:
As stated

cc: See next page

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ADAMS ACCESSION NO. ML071780382-Package

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GE-Hitachi Nuclear Energy Americas LLC (GHNEA) ESBWR
Preliminary Open Items
Chapter 2
Site Characteristics

Supplemental RAI for RAI's 2.4.1-2, 2.4-26 thru 2.4-30, 15.3-4 and 15.3-5, 5/21/07, ML071410293

In DCD Tier 2 Rev. 3, Chapter 2, the applicant states that SRP Section 2.4.13 does not apply to an ESBWR due to its mitigation capabilities. This is not in conformance with staff guidance in the SRP Section 11.2 and BTP 11-6. The applicant needs to add a COL action item for evaluating the effects of an accidental release of radioactive liquid waste on surface and ground water, as is necessary to address SRP Section 2.4.13 for a future site suitability assessment. In addition, the applicant needs to provide in the DCD the source term from the single tank (per assumptions BTP 11-6, March 2007*) that would be used by the COL applicant for a future site evaluation to address SRP 2.4.13. This is the postulated inventory to be used for site safety assessments.

The applicant needs to revise DCD Section 15.3.16 in response to RAIs 15.3-4 and 15.3-5 to clarify that sealing of concrete walls cannot be relied upon to contain the release of all of the liquid radwaste in the compartment, since the SRP Section 11.2 and BTP 11-6 preclude this. According to BTP 11-6, the applicant needs to provide additional details on "special design features" to support their statement and update the radiological assessment accordingly. These are features beyond those discussed in RG 1.143. As is stated in DCD Rev. 3, Section 15.3.16, the approach relies on the use of "a sealant" or "sealed concrete walls" as the mitigating feature of the design. However, BTP-11-6 states that "credit for liquid retention by unlined building foundations will not be given regardless of the building seismic category because of the potential for cracks. Credit is not allowed for retention by coatings or leakage barriers outside the building foundation."

Accordingly, the applicant is requested to update the basis and assumptions used in the analysis presented in DCD Tier 2, Rev. 3, Section 15.3.16 to be consistent with the SRP guidance in BTP 11-6; and discuss why the release of the postulated inventory of radioactive materials to surface or ground water is not limiting in the analysis as compared to the current case where the volatile airborne fraction of radioactivity (as radioiodines) is assumed to be released in the environment; and update the text and tables in DCD Rev. 3, Sections 15.3.16 and 2.4.13, and Table 2.0-2 of DCD Rev. 3, Section 2.0.

*BTP 11-6 is now part of updated SRP Section 11.2 (March 2007), which was previously located in SRP Section 15.7.3.

Status: GHNEA has not committed to a response date.

RAI's 2.4-14 & 2.4-15, 5/24/07, ML071790357

NRC requests an update of DCD Tier 1 and a reference added in DCD Tier 2 Chapter 2 to a discussion of tanks supporting the long-term decay heat removal function to include consideration of 'Degree Days Below Freezing' in the freezing protection discussion. NRC also

requests a COL item added to the DCD to assure that freeze protection, or a satisfactory rationale for not providing it, has been provided.

Status: GHNEA has committed to a response date of 10/05/2007.

RAI 2.3-8 Supplemental, 5/30/07, ML071580020

DCD Tier 2 Tables 15.4-14 and 15-4.21 indicate that a x/Q value of 1.00×10^{-3} s/m^3 is used to calculate doses at the EAB for the feedwater line break and the RWCU/SDC line break accidents, respectively. Please explain why the EAB x/Q value used in these radiological consequence analyses differs from the EAB x/Q value of 2.00×10^{-3} s/m^3 listed as a standard plant site design parameter in DCD Tier 1 Table 5.1-1 and Tier 2 Table 2.0-1. The use of a lower EAB x/Q value in these DCD radiological consequence analyses results in lower calculated doses for the EAB.

Status: GHNEA has not committed to a response date.

RAI 2.3-9 Supplemental, 5/30/07, ML071580020

a. One of the release pathways discussed in the response to RAI 2.3-9 dated November 13, 2006, is the main plant stack, which is not part of the ESBWR standard plant design. Because the main plant stack is not part of the ESBWR standard plant design, the DCD should explicitly state that the COL applicant should confirm at the COL stage that the main plant stack EAB and LPZ x/Q site characteristic values are less than or equal to the ESBWR EAB and LPZ x/Q standard plant site design parameters.

b. The response to RAI 2.3-9 dated November 13, 2006, discusses potential release pathways to the environment (e.g., reactor building leakage; reactor building roof; turbine building condenser; turbine building leakage; fuel building cask door; radwaste building) and control room receptors (e.g., control room air intake; CB inleakage locations) for various infrequent events and accidents.

   (i) Please provide one scaled general arrangement drawing showing all potential release pathways and receptors. Plant north should be indicated on this drawing.

   (ii) Please provide bounding control room x/Q values for all source/receptor combinations as standard plant site design parameters in DCD Tier 1 Table 5.1-1 and Tier 2 Table 2.0-1.

c. The response to RAI 2.3-9 dated November 13, 2006, provides a table of source/receptor inputs to the ARCON96 computer code for each source/receptor combination.

   (i) For each source/receptor combination, please add to the table of ARCON96 source/receptor inputs the building vertical cross-sectional area perpendicular to the wind for the buildings that have the largest impact on building wakes as discussed in the fifth item listed in Table A-2 of Regulatory Guide 1.194. This building area is used by ARCON96 to account for enhanced dispersion in the wake of buildings and may be different from the building area used to establish the initial diffusion coefficients for a diffuse area source.

(ii) For each source/receptor combination, please add the direction from the receptor to the source in degrees from plant north to the table of ARCON96 source/receptor inputs.

(iii) Please confirm that the "calculated distance to receptor" parameter identified in the table of ARCON96 source/receptor inputs is the horizontal distance to the release point.

(iv) Please add the table of ARCON96 source/receptor inputs to the DCD for use by future COL applicants. A non-proprietary version of this table should be included in the DCD.

d. Several accidents are assumed to have release pathways to the environment through a diffuse area source (e.g., the FHA, LOCA containment leakage, and instrument line break are assumed to be diffuse source releases from the reactor building; the LOCA MSIV leakage, MSLB, and instrument line break are assumed to be diffuse source releases from the turbine building). Regulatory Position 3.2.4.1 of Regulatory Guide 1.194 states that diffuse source modeling should be used only for those situations in which the activity being released is homogeneously distributed throughout the building and when the assume release rate from the building surface would be reasonably constant over the surface of the building.

(i) Regulatory Position 3.2.4.5 of Regulatory Guide 1.194 states that the height and width of the diffuse area source (e.g., the building surface) should be the maximum vertical and horizontal dimensions of the above-grade building cross-sectional area perpendicular to the line of sight from the building center to the control room intake. These dimensions should projected onto a vertical plane perpendicular to the line of sight and located at the closest point on the building surface to the receptor. Please confirm that this is the approach used to calculate the diffuse area sources for the reactor building and turbine building leakage pathways. [[ ]]

(ii) Since leakage is more likely to occur at a penetration, consideration should be given to the potential impact of building penetrations exposed to the environment. If the penetration release would be more limiting, the diffuse area source model should not be used. In particular, one of the assumed release pathways for the LOCA inside containment radiological analysis is MSIV leakage to the turbine building condenser. DCD Tier 2 Chapter 15.4.4.5.2.4 states that the two major points of release from the turbine building are expected to be (1) the truck doors at the far end of the turbine building and (2) the turbine building vent panels located midway on the turbine building on the side away from the reactor building. In contrast, the response to RAI 2.3-9 states that one of the release scenarios evaluated for MSIV leakage to the turbine building condenser is a diffuse release over the entire area of the turbine building. Please resolve this apparent conflict in the assumed MSIV leakage pathways to the environment by identifying all potential release pathways from the turbine building for all those accidents that have airborne releases in the turbine building and provide the appropriate ARCON96 source/receptor inputs.

(iii) The response to RAI 2.3-9 dated November 13, 2006, states that one potential release location for the FHA is the reactor building which was assumed to be a diffuse source. ESBWR Technical Specification 3.6.3.1 does not require the reactor building to be operable during Mode 6 (refueling). Please confirm that there are no other potential release pathways from the reactor building during refueling (e.g., an open equipment

hatch or personnel air lock) which could result in control room x/Q values that are higher than assuming a diffuse source release from the reactor building. If such release pathways are possible, provide the appropriate ARCON96 source/receptor inputs.

(iv) Revision 3 to DCD Tier 2 Figure 1.2-10 shows blowout panels located on the upper levels of the north and south walls of the reactor building. Please confirm that there are no high-energy accident releases within the reactor building that could potentially pressurize the reactor building and blow out these panels. If such release pathways are possible, provide the appropriate ARCON96 source/receptor inputs.

e. Airborne radiological releases from a number of the infrequent events (e.g., 1000 failed fuel rods, liquid containing tank failure) and accidents (e.g., FHA, instrument line break, MSLB) are assumed to occur in buildings (e.g., reactor building, turbine building, fuel building, radwaste building) whose exhaust may be discharged to the main plant stack. Please identify these infrequent event and accident scenarios and state in the DCD that the COL applicant should calculate and compare the main plant stack control room x/Q values to the control room x/Q values for all the other possible release pathways to ensure the bounding control room x/Q values are identified.

f. The response to RAI 2.3-9 dated November 13, 2006, states that the instrument line break release location is assumed to be the turbine building whereas DCD Tier 2 Chapter 15.4.8.5.1 and Table 15.4-7 state that the release location for the instrument line break is assumed to be via the reactor building. Please clarify this apparent discrepancy.

g. [[ ]]

h. One of the three potential unfiltered inleakage locations identified in the response to RAI 2.3-9 dated November 13, 2006, is the closest point from the turbine building and condenser to the control building (e.g., point "B" or the northwest corner of the control building). Please explain why this receptor location was not used to define the source/receptor configuration information presented in Table 1 to the response to RAI 2.3-9 for the turbine building condenser and turbine building leakage release pathways.

i. DCD Tier 2 Chapter 6.4.4 states that the initiation of the emergency mode of operation of the control room habitability area HVAC subsystem consists of (1) isolating the normal outside air intake and restroom exhaust and (2) starting one of the two emergency filter units which delivers filtered air from one of the two unique safety-related outside air intake locations. Please describe the relative location of these three outside air intakes (i.e., the normal mode air intake and the two emergency mode air intakes) to determine if they should be modeled as one or more separate receptors. Also discuss whether the isolated normal

outside air intake and restroom exhaust can be potential inleakage locations during the emergency mode of operation.

Status: GHNEA has not committed to a response date.

RAI 2.3-2 Supplemental, 5/30/07, ML071580020

The revised DCD Tier 2 Table 2.0-1 contained in Enclosure 1 to the GE Energy letter MFN 06-206, S01, dated May 8, 2007, lists the extreme wind site design parameter for seismic category I and II structures as a 100-year 3-sec gust wind speed of 150 mph. The same table lists the extreme wind site design parameter for non-seismic standard plant structures as a fastest-mile-wind wind speed of 110 mph. Regarding the non-seismic standard plant structure extreme wind site parameter, please consider (1) expressing this site parameter in the same 3-sec gust wind speed units used to present the seismic category I and II structure extreme wind site parameter and (2) selecting a 50-year wind speed value that is consistent with the 100-year wind speed value chosen for the seismic category I and II structures (e.g., 140 mph).

Status: GHNEA has not committed to a response date.

RAI 2.3-10 Supplemental, 4/2/07, ML070930066

Section 12.2.2.1 of DCD Revision 3 states that the Tier 1 and Tier 2 annual average (long term) atmospheric dispersion (x/Q) site design parameter value of 2.0×10^{-6} s/m^3 was derived executing the NRC computer code XOQDOQ for 27 US sites and one fictitious site. Similarly, Section 12.2.2.1 of DCD Revision 3 states that the Tier 1 and Tier 2 annual average atmospheric deposition (D/Q) site design parameter value of 4.0×10^{-9} m^2 was taken from a table of annual average meteorological coefficients prepared by the GE REFAE computer code. The annual average x/Q and D/Q site characteristics for the first three docketed early site permits (e.g., North Anna, Clinton, and Grand Gulf) are all larger (e.g., more conservative) than the ESBWR DCD annual average x/Q and D/Q site design parameters.
Consequently, please provide the following:

(a) Describe the input assumptions used in executing the XOQDOQ computer code to derive the ESBWR DCD long term x/Q site design parameter value of 2.0×10^{-6} s/m^3.

(b) Provide the technical bases for the GE REFAE computer code and the input assumptions used in executing the GE REFAE computer code to derive the ESBWR DCD long term D/Q site design parameter value of 4.0×10^{-9} m^{-2}.

Status: GHNEA has committed to respond by 7/6/07.

cc:

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