

November 24, 2009

Mr. Jerald G. Head  
Senior Vice President, Regulatory Affairs  
GE Hitachi Nuclear Energy  
3901 Castle Hayne Road MC A-50  
Wilmington, NC 28401

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 394 RELATED TO  
ESBWR DESIGN CERTIFICATION APPLICATION

Dear Mr. Head:

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 (RAI) is contained in the enclosure to this letter.

If you have any questions or comments concerning this matter, you may contact me at 301-415-3179 or [Ilka.Berrios@nrc.gov](mailto:Ilka.Berrios@nrc.gov) or you may contact Amy Cubbage at 301-415-2875 or [Amy.Cubbage@nrc.gov](mailto:Amy.Cubbage@nrc.gov).

Sincerely,

*/RA/*

Ilka Berrios, Project Manager  
ESBWR/ABWR Projects Branch 1  
Division of New Reactor Licensing  
Office of New Reactors

Docket No. 52-010

Enclosure:  
Request for Additional Information

cc: See next page

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Distribution: See next page

ADAMS ACCESSION NO. ML093170682

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| <b>DATE</b>   | 11/23/09 | 11/24/09 |

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SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 394 RELATED TO  
ESBWR DESIGN CERTIFICATION APPLICATION DATED NOVEMBER 24,  
2009

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**Requests for Additional Information (RAIs)  
ESBWR Design Control Document (DCD), Revision 6**

| RAI Number  | Reviewer               | Question Summary  | Full Text   |
|-------------|------------------------|---|---|
| RAI 12.2-28 | Cicotte G/<br>Hinson C | Describe what effect the Rev 6 change of only running 66% (vs 100%) of the condensate flow through a demin will have on component dose rates due to the increase in component source terms. | <p>Section 12.2 of the Tier 2 FSAR, "Plant Sources," states in part:</p> <p>"Airborne sources are calculated using the source terms given in Section 11.1. . . ."</p> <p>Table 11.1-3 was revised in Revision 6 of the Tier 2 FSAR to indicate that the ratio of condensate demineralizer flow to steam flow is 66.3%, versus the previous 100%. The staff was unable to determine the specific rationale for the change.</p> <p>The staff noted that this change appears to result in greater buildup of radionuclides in liquid inventory, instantaneous liquid effluent release rates, and other aspects of plant operation potentially affecting worker and public dose. However, there did not appear to be a corresponding analysis of the change in dose estimations, in particular regarding whether and to what extent the radionuclide concentrations as listed in Tables 11.1-4a through 11.1-7b would be affected by the change in the ratio of condensate demineralizer versus steam flow rate. The staff needs to evaluate the effect on release rates and dose.</p> <p>Please explain:</p> <ol style="list-style-type: none"> <li>1. The rationale that addresses the change in the ratio of condensate demineralizer flow to steam flow.</li> <li>2. The effects on liquid and gaseous concentrations in systems and effluents, including any changes in public and population dose, and dose to the maximally exposed individual.</li> <li>3. The interaction between the design basis and normal source term values in Section 11.1, and the doses listed in Section 12.2.</li> <li>4. The effect of the changes to system radionuclide inventory on sources of in-plant exposure as described in Section 12.2</li> </ol> |

| RAI Number | Reviewer | Question Summary | Full Text  |
|------------|----------|------------------|--|
|            |          |                  | <p>5. Any implications for radiation protection design considerations (section 12.1.2 of the Tier 2 FSAR). The changes made to Table 11.1-3 appear to have resulted in increases in most or all of component activities listed in Tables 12.2-6 through 12.2-14. For <u>each</u> of these radioactive components,</p> <ul style="list-style-type: none"> <li>a. Verify that you have performed a detailed analysis on the affected components to determine the effects of the increased component activity on the expected component dose rates.</li> <li>b. Describe what effect the increase in component activity has on the dose rate levels and radioactive zone designations in the vicinity of <u>each of these components</u> (provide verification for your response) and reference appropriate Section 12.3 plant layout figures where radiation zone increases have been made.</li> <li>c. Describe what effect the increase in component activity will have on the doses to personnel performing maintenance on these components (in particular, describe how the doses associated with liquid and solid waste handling operations (such as condensate demineralizer maintenance) will be affected).</li> <li>d. Describe what effect the potential increase in component doses will have on the total plant collective dose described in DCD Tables 12.4-1 through 12.4-7.</li> <li>e. In describing the basis of the dose assessment for the ESBWR design, Section 12.4 of the DCD states the dose rates listed in Tier 2 Tables 12.4-2 through 12.4-7 are based on a combination of ESBWR radiation zoning levels and “experiential” data based on previous and current BWR plant designs. RG 8.19, “Occupational Radiation Dose Assessment in Light Water Reactor Power Plants- Design Stage Man-Rem Estimates” states that “to the extent possible, estimates should include consideration of the design of the proposed plant, including radiation field intensities calculated on the basis of the</li> </ul> |

| RAI Number | Reviewer | Question Summary | Full Text   |
|------------|----------|------------------|---|
|            |          |                  | <p>plant-specific shielding design, taking into account the effect of any dose-reducing design changes.” Describe to what extent the estimated average dose rates listed in Tier 2 Tables 12.4-2 through 12.4-7 are based on the actual estimated ESBWR radiation zoning levels as depicted in Tier 2 Figures 12.3-1 through 12.3-22 and provide representative examples from Tables 12.4-2 through 12.4-7 where actual estimated ESBWR dose rates are used.</p> <p>In reviewing Tier 2 Section 12.4 of Revision 6 of the DCD, the staff noted that there are several references to the fact that 100% of the condensate water will be processed through the demineralizer instead of the 66.3% as listed in revised (Revision 6) Tier 2 Table 11.1-3.</p> <p>6. Modify the following sections of Tier 2 Section 12.4 to reflect the revised condensate cleanup percentage as reflected in Tier 2 Table 11.1-3:</p> <p>(Section 12.4.6, paragraph 4 of “Drywell” section) “In addition, deposited activity in the feedwater lines is expected to be lower than typical BWRs owing to an enhanced condensate system with full cleanup of all condensate water ...”</p> <p>(Section 12.4.6, paragraph 4 of “Turbine Building” section) “Low-pressure feedwater drains from the feedwater heaters are cascaded back to the condenser, thus, all corrosion products from these drains are filtered via condensate filter/demineralizers before returning to the RPV.”</p> |

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(Revised 10/01/2009)

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