

**Enclosure 2 Contains Sensitive Proprietary Information**

March 31, 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. 304 RELATED TO  
DESIGN CONTROL DOCUMENT (DCD) REVISION 5

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.

Pursuant to 10 CFR 2.390, we have determined that the enclosed RAIs contain proprietary information. We have prepared a non-proprietary version of the RAIs (Enclosure 1) that does not contain proprietary information. The proprietary information is indicated in brackets and underlined in Enclosure 2. We will delay placing this document in the public document room for a period of ten (10) working days from the date of this letter to provide you with the opportunity to comment on the proprietary aspects only. If you believe that any additional information in the enclosure is proprietary, please identify such information line by line and define the basis pursuant to the criteria of 10 CFR 2.390 before the public release date.

**Enclosure 2 Contains Sensitive Proprietary Information**

J. Head

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If you have any questions or comments concerning this matter, you may contact me at 301-415-6256 or [Dennis.Galvin@nrc.gov](mailto:Dennis.Galvin@nrc.gov) or you may contact Amy Cabbage at 301-415-2875 or [Amy.Cabbage@nrc.gov](mailto:Amy.Cabbage@nrc.gov).

Sincerely,

*/RA/*

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

Docket No. 52-010

Enclosure:

1. Request for Additional Information (Non-Proprietary)
2. Request for Additional Information (Proprietary)

cc: See next page (w/o enclosure 2)

J. Head

- 2 -

If you have any questions or comments concerning this matter, you may contact me at 301-415-6256 or [Dennis.Galvin@nrc.gov](mailto:Dennis.Galvin@nrc.gov) or you may contact Amy Cubbage at 301-415-2875 or [Amy.Cubbage@nrc.gov](mailto:Amy.Cubbage@nrc.gov).

Sincerely,

*/RA/*

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

Docket No. 52-010

Enclosure: 1. Request for Additional Information (Non-Proprietary)  
2. Request for Additional Information (Proprietary)

cc: See next page (w/o enclosure 2)

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NRO-010

<b>OFFICE</b>	PM:NGE1	LPM:NGE1
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<b>DATE</b>	03/30/09	03/31/09

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**Requests for Additional Information (RAIs):  
ESBWR Design Control Document (DCD) Revision 5 and NEDE-33374P, Revision 1**

RAI Number	Reviewer	Question Summary	Full Text
9.1-77 S01 (MFN 08-912, November 24, 2008)	Gilmer J	Provide fuel assembly and storage rack dimensions and tolerances. Also provide a complete description and justification of the method used to establish the criticality safety for the spent fuel storage racks.	<p>The requested references were provided for review during an audit at the GEH offices in Washington, D.C. on February 11 and 12, 2009. Supplementary information was also provided in the form of a presentation on the method that has historically been used by GEH to perform fuel storage rack analyses.</p> <p>From review of the requested references, review of additional reference material provided during the meeting, consideration of information provided in the methodology presentation, and from information gained through discussions with GEH staff, it has been determined that the information provided is not sufficient to complete the review.</p> <p>During the meeting GEH staff agreed to provide additional information related to:</p> <ul style="list-style-type: none"> <li>• Fuel assembly dimensions and tolerances.</li> <li>• Fuel storage rack dimensions and tolerances.</li> </ul> <p>To support completion of the review, provide the following:</p> <p>(1) The fuel assembly and fuel storage rack dimensions and tolerances, and</p> <p>(2) A complete description and justification of the method used to establish the criticality safety for the spent fuel storage racks.</p> <p>[[</p>

RAI Number	Reviewer	Question Summary	Full Text
			]]
9.1-78 S01 (MFN 08-912, November 24, 2008)	Gilmer J	Address the inconsistencies between the DCD and the topical report analyses. Include evaluation of all normal and credible abnormal conditions.	<p>The response in MFN 08-912 is not sufficient.</p> <p>The second paragraph of the response indicates that the [[</p> <p style="text-align: right;">]] Please address this inconsistency.</p> <ol style="list-style-type: none"> <li>1. The analysis must address the full scope of normal and credible abnormal conditions. Determination of normal and credible abnormal conditions should be specific to the ESBWR plant layout, fuel storage rack designs, and operations and activities that will occur in and around the fuel storage racks in the reactor building and in the fuel storage building. <ol style="list-style-type: none"> <li>a. The analysis should clearly state the range of fuel design parameters considered covered by the analysis. Describe the ranges of: <ol style="list-style-type: none"> <li>i. The number of gadolinium rods</li> <li>ii. The gadolinium content in the rods</li> <li>iii. The <sup>235</sup>U enrichment</li> <li>iv. The number and type of axial zones</li> <li>v. The range in the number of part-length rods</li> </ol> </li> </ol> </li> </ol>

RAI Number	Reviewer	Question Summary	Full Text
			<p>vi. The range in the lengths of the axial zones</p> <p>vii. The maximum burnup considered for the in-core cold <math>K_{inf}</math> peak</p> <p>On item vii, from well documented experience with evaluation of PWR burnup credit it is clear that at some point axial burnup distribution effects become important and must be evaluated. [[</p> <p style="text-align: right;">]]</p> <p>b. The new fuel storage rack analysis should include sensitivity studies to identify which fresh fuel assembly design variation yields the highest fuel storage rack <math>k_{eff}</math> value. For example, including some strategically placed part-length rods may result in a higher rack <math>k_{eff}</math> value. The report should include a sample input file from the fresh fuel rack analysis. Analyze or justify not analyzing a range of fuel bundle design variations in the fresh fuel rack analysis.</p> <p>c. [[</p> <p style="text-align: right;">]] Analyze or justify not analyzing abnormal conditions related to fuel assemblies being inadvertently released from the fresh fuel storage racks.</p> <p>d. [[</p> <p style="text-align: right;">]]</p>

RAI Number	Reviewer	Question Summary	Full Text
			<p>e. [[</p> <p style="text-align: right;">]] Analyze</p> <p>or justify not analyzing a more complete set of fuel bundle locations for both normal and abnormal conditions.</p> <p>f. [[</p> <p style="text-align: center;">]]</p> <p>g. [[</p> <p style="text-align: right;">]]</p> <p>h. [[</p> <p style="text-align: center;">]]</p> <p>If this is not the case, evaluate or justify not evaluating an abnormal condition associated with incorrectly storing fuel intended for one rack in the other rack. Limits and credited controls should be clearly identified.</p> <p>i. [[</p>

RAI Number	Reviewer	Question Summary	Full Text
			<p style="text-align: right;">]]</p> <p>j. [[  seismically induced displacements were modeled. ]]</p> <p>k. In Section 3.3, it is stated that [[    ]]</p> <p>l. Fuel in the fresh and spent fuel storage racks were analyzed both with and without the fuel channel. [[    ]]</p> <p>m. [[</p>



RAI Number	Reviewer	Question Summary	Full Text
			<p>n. [[ ]]</p> <p>Were other configurations evaluated? If so, describe these configurations and provide the resulting <math>k_{eff}</math> values. If not, justify not analyzing other configurations.</p> <p>o. [[ ]]</p> <p>]]</p> <p>Either analyze or justify not analyzing an abnormal condition for [[ ]]</p> <p>]] If such an error is considered incredible, justify this assertion.</p> <p>p. [[ ]]</p> <p>]]</p> <p>q. [[ ]]</p>

RAI Number	Reviewer	Question Summary	Full Text
			<p>r. [[ ]]</p> <p>s. [[ ]]</p> <p>t. [[ ]]</p> <p>]]</p>
9.1-79 S01 (MFN 08-912, November 24, 2008)	Gilmer J	Include a statement in the DCD that the criticality safety of fuel handling must be addressed by the COL applicant.	The response in MFN 08-912 indicates that the scope of NEDC-33374P will be restricted to the criticality safety of the ESBWR fuel racks. This response is acceptable. However, revise the DCD to reflect that the criticality safety of fuel handling must be addressed by the COL applicant.

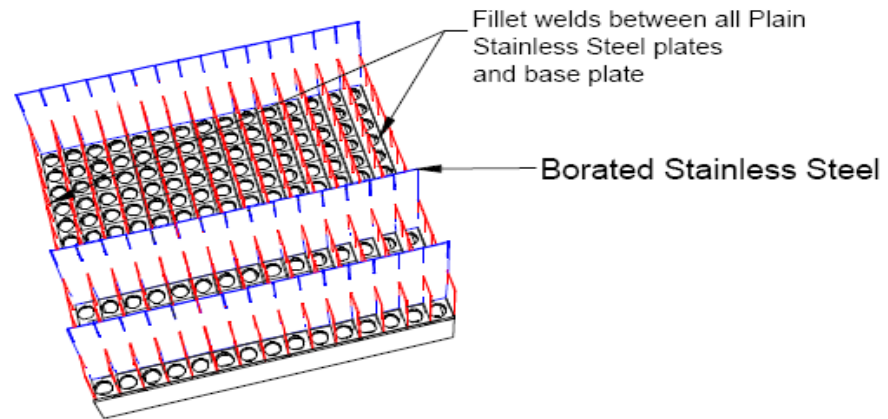
9.1-80 S01 (MFN 08-912, November 24, 2008)	Gilmer J	Provide additional justification for all assumptions and simplifications in the analysis.	The revised Section 3.0 represents a significant improvement over the original content of NEDC-33374P. However, all assumptions, approximations and simplifications should be identified and justified. [[
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Figure 4. Welds of the first level plain stainless steel to base plate



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9.1-81 S01 (MFN 08-912, November 24, 2008)	Gilmer J	Provide the model geometry, material, and tolerance data.	<p>The revised Section 4.0 represents a significant improvement over the original content of NEDC-33374P. However, some additional important information is needed to complete the review. Consequently the response is not sufficient.</p> <p>The required information includes:</p> <ul style="list-style-type: none"> <li>• fuel description information. Dimensions, materials, and tolerances.</li> <li>• fuel depletion information. Geometry and depletion environment.</li> <li>• storage rack materials and dimensions and design/manufacturing tolerances. This information is needed for fresh and spent fuel racks in the buffer pool and for the spent fuel racks in the spent fuel pool.</li> <li>• storage rack installation dimensions (spacing between rack modules and between rack modules and nearby structures, and layout of rack locations within the spent fuel pool) and tolerances. This information is needed for fresh and spent fuel racks in the buffer pool and for the spent fuel racks in the spent fuel pool.</li> </ul> <p>[[</p>







<p>9.1-89 S01 (MFN 08-912, November 24, 2008)</p>	<p>Gilmer J</p>	<p>Provide additional information so that the computed terms in the K(95/95) equation, related to verification of the computational method, can be verified.</p>	<p>The RAI response is not adequate.</p> <p>The intent of the RAI was to obtain sufficient information so that the NRC could determine:</p> <ul style="list-style-type: none"> <li>• that the uncertainty in the bias of the computational method is properly derived, and</li> <li>• that appropriate values (95% confidence) were used for the application-specific <math>\Delta K_u</math> values.</li> </ul> <p>Neither the response nor NEDC-33374P, Rev. 1, identifies what critical experiments were utilized or the results for computations of those experiments. [[</p>
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			<p>These technical uncertainties should be addressed. <span style="float: right;">]]</span></p> <p>Reference 6 was reviewed during an audit between GEH staff and NRC staff on February 11 and 12, 2009. Due to time constraints, it was not possible to check the details of the calculation of bias and bias uncertainty during the meeting. Based on this review, the following validation-related issues need to be addressed by the applicant:</p>
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<p>9.1-90 S01 (MFN 08-912, November 24, 2008)</p>	<p>Gilmer J</p>	<p>Provide the process and criteria used to select the critical experiments and a specific list of critical experiments which were used for the bias determination. Provide the critical experiment modeling results.</p>	<p>The RAI response is not adequate.</p> <p>The intent of the RAI was to obtain sufficient information so that the NRC could determine:</p> <ul style="list-style-type: none"> <li>• adequacy of the selected benchmark experiments, and</li> <li>• correctness of the statistical evaluation of computed results.</li> </ul> <p>[[</p> <p style="text-align: center;">]] (see NUREG/CR-6979).</p> <p>Provide the process and criteria used to select the critical experiments and a specific list of critical experiments which were used for the bias determination. Provide the critical experiment modeling results.</p> <p>Reference 6 was reviewed during an audit between GEH staff and NRC staff on February 11 and 12, 2009. Due to time constraints, it was not possible to check the details of the calculation of bias and bias uncertainty during the meeting. Based on this review, the following validation-related issues need to be addressed by the applicant:</p> <p>[[</p>
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9.1-95 S01 (MFN 08-912, November 24, 2008)	Gilmer J	Provide technical justification that the most limiting (most reactive) spacing of the 15x12 racks was evaluated. Also, provide technical justification that the location evaluated by NEDC-33374P, Rev. 1, for the dropped fuel bundle is of equal or greater reactivity than locations near corners of adjacent 15x12 racks.	The response and included sketch provided in MFN 08-912 do satisfy the RAI, but result in two additional needed clarifications regarding content of NEDC-33374P, Rev. 1. [[

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(Revised 03/25/2009)

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