August 3, 2009

Mr. Jerald G. Head
Senior Vice President, Regulatory Affairs
GE Hitachi Nuclear Energy
3901 Castle Hayne Road MC A-18
Wilmington, NC 28401

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 363 RELATED TO ESBWR DESIGN CERTIFICATION APPLICATION

Dear Mr. Head:

By letter dated August 24, 2005, GE Hitachi Nuclear Energy 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 301-415-3808 or zahira.cruz@nrc.gov, or you may contact Amy Cubbage at 301-415-2875 or amy.cubbage@nrc.gov.

Sincerely,

/RA/

Zahira Cruz Perez, 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. ML092120417 NRO-002

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DATE	08/03/09	08/03/09

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SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO.363 RELATED TO ESBWR DESIGN CERTIFICATION APPLICATION DATED AUGUST 3, 2009

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Requests for Additional Information (RAIs)
ESBWR Design Control Document (DCD), Revision 5

RAI Number	Reviewer	RAI Summary	RAI Text
RAI 3.8-94 S05	Chakrabarti S	Additional information on Energy Balance Method (EBM).	Item B in the RAI 3.8-94 S04 response provided only a one sentence description of the Energy Balance Method (EBM) and identified the source for this method which is a paper presented in the 6th SMiRT conference. A review of this paper has led to the need for GEH to address some items: 1. The formulation presented in the referenced paper is applicable to circular rigid foundations. Provide justification for use of these formulations for the rectangular foundations for ESBWR. Otherwise, if a new set of formulations were derived for the rectangular foundations at ESBWR, provide the basis for these new formulations. 2. In the referenced paper, the results using the EBM were compared with the more accurate nonlinear analysis method that considered uplift appropriately. For most of the responses, it appears that the EBM is unconservative. For example, in the case of the maximum basemat uplift ratio (alpha in percent), the range of underprediction was from 13 percent for the case of 1,000 fps soil shear wave velocity rising to 32 percent for the case of 6,000 fps soil shear wave velocity. Similarly, in the case of maximum basemat moment, the range of underprediction was from 7.5 percent for the case of 3,000 fps soil shear wave velocity rising to 30 percent in the case of 6,000 fps soil shear wave velocity. In view of this substantial underprediction of uplift and basemat moment, what is the basis for still using the EBM to obtain the soil bearing pressure calculation. The paper also discusses a Modified Energy Balance Method (MEB) which appears to be much more accurate when compared to the nonlinear analysis method. Explain why this method wasn't utilized. 3. Confirm that the "Contact Width - CW" used in the formulations for bending about the other (perpendicular) horizontal axis corresponds to the full width of the foundation. If this is the case, then explain why the full width is utilized. Has it been determined that no uplift is possible for rotation about the other horizontal axis or that the uplift about both axes do not occur at the same time? The staff notes that if there is uplift possible for rotation about the other

			horizontal axis, this might cause higher soil bearing pressures than those calculated in the RAI response. 4. It appears that the EBM approach calculates not only the uplift, but also a new basemat moment resulting from consideration of the uplift. Therefore, explain whether a new basemat moment was calculated using the EBM approach or the original moment was utilized for calculating the soil bearing pressure. As a sanity check, if a new moment was utilized, then provide the magnitude of the new calculated basemat moment and compare it against the original moment obtained from the envelop of all of the SASSI runs. Also, as a sanity check provide the magnitude of the maximum soil bearing pressure calculated from the envelop of all of the SASSI runs so that a comparison can be made with this new EBM approach. Lastly, provide the magnitude of the uplift calculated using the EBM so that a comparison can be made with the extent of implied uplift (i.e., tensile basemat/soil interface loads) shown in Figure 3.8-94(40) of the RAI response. The above requested information should be provided for all of the structures. The staff notes that based on Table 1 from the referenced paper, if the original moment was used rather than the new moment calculated using the EBM, the basemat moment appears to be conservative in all of the cases studied (when compared to the accurate nonlinear solution) while the new moment appears to underpredict the basemat moment as discussed in item 2 above. Therefore, depending on which moment was used for calculating the soil bearing pressure, one part of item 2 above could be resolved.

cc:

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