September 19, 2006

Mr. David H. Hinds, Manager, ESBWR
General Electric Company
P.O. Box 780, M/C L60
Wilmington, NC 28402-0780

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 61 RELATED TO ESBWR DESIGN CERTIFICATION APPLICATION

Dear Mr. Hinds:

By letter dated August 24, 2005, General Electric Company (GE) 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 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. This RAI concerns seismic, structural, and piping analyses as described in Chapter 3, Revision 1, of the ESBWR design control document. A draft of question 3.7-59 was sent to you via electronic mail on August 16, 2006, and was discussed with your staff during a telecon on September 5, 2006. A draft of questions 3.8-107 and 3.12-38 was sent to you via electronic mail on August 14, 2006; your staff did not request a telecon to discuss these questions. You agreed to respond to questions 3.7-59 and 3.8-107 on October 31, 2006, and to question 3.12-38 on October 6, 2006.

If you have any questions or comments concerning this matter, you may contact me at (301) 415-2863 or lwr@nrc.gov or you may contact Amy Cubbage at (301) 415-2875 or aec@nrc.gov.

Sincerely,

/RA/

Lawrence Rossbach, Project Manager
ESBWR/ABWR Projects Branch
Division of New Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 52-010

Enclosure: As stated

cc: See next page

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ACCESSION NO. ML062610002

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NAME	LRossbach	JColaccino
DATE	09/18/2006	09/19/2006

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Distribution for DCD RAI Letter No. 61 dated September 19, 2006

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Requests for Additional Information (RAIs)
ESBWR Design Control Document (DCD), Revision 1, Chapter 3

RAI Number	Reviewer	Question Summary	Full Text
3.7-59	Cheng T	Compare static and dynamic responses of the seismic stick models versus the static NASTRAN finite element model	Based on information obtained by the staff during the review and audit of ESBWR DCD Sections 3.7 and 3.8 in June and July 2006, the staff determined that General Electric (GE) developed the seismic stick models for the reactor building (RB)/fuel building (FB) and control building (CB) and the static NASTRAN finite element models for the RB/FB and CB directly from design information, without conducting any comparison/correlation of the static and dynamic responses of these models. The staff has concluded that comparison/correlation is required before the staff can complete its assessment of the adequacy of the stick models and the static NASTRAN finite element models. Consequently, the staff requests the applicant to provide the following additional information: (A) Comparison/correlation between the seismic stick models and the static NASTRAN models for both the RB/FB and the CB, based on static analysis - (i) Total reaction force/moment at the base (assume fixed base) due to a 1g static load applied separately in each horizontal direction and in the vertical direction. (ii) Deflection at the top of model in each direction. (iii) Total mass. (iv) Calculation of first mode frequency in each direction. The static analysis comparisons should be done for the complete model, and, if feasible, for each individual stick of the seismic model. Deflections at the top of the NASTRAN model should be representative values, based on engineering judgment. (B) Comparison/correlation between the seismic stick models and the static NASTRAN models for both the RB/FB and the CB, based on dynamic analysis -

			(i) Free vibration analyses (frequencies and mode shapes) for fixed base. (ii) Seismic time history analyses or response spectrum analyses for fixed base. The free vibration analysis (frequencies and mode shapes) results should demonstrate that the stick models reasonably include all significant frequencies and mode shapes that would affect the response to the design basis safe shutdown earthquake (SSE). The time history analysis or response spectrum analysis results should confirm the adequacy of the method currently employed by GE to apply the seismic loads to the static NASTRAN models. The time history analysis or response spectrum analysis results should demonstrate that any differences arising from the comparisons based on static analysis and free vibration analysis have minimal effect on the response to the design basis SSE. (C) An explanation for all significant discrepancies, and the technical basis for concluding that the discrepancies are acceptable.
3.8-107	Ashar H Bagchi G	Provide additional information regarding the input data and processing of the SSDP post-processor software.	General Electric, through its contractor, Shimizu Corporation of Japan, carried out elastic analyses of the complete nuclear island structure, including the reinforced concrete containment vessel (RCCV) for separate load conditions using a static NASTRAN finite element model. The seismic loads were imposed as inertia loads corresponding to the element mass and seismically induced acceleration values (obtained from a separate seismic analysis) applicable to the location of the element. Internal element loads for all the finite elements in the complete structure for a specific applied load are stored in a computer file. For each applied load, a specific file is produced. These computer files are used as input files along with the rules for combining the individual load files to a post-processor software called SSDP. SSDP assumes that linear superposition applies between different load combinations. Also provided as input information to the SSDP are the top, bottom and shear reinforcement areas associated with each finite element. It is not clear how the

			tangential shear reinforcements are treated in the SSDP package. In the post processing phase, SSDP checks demand against available reinforcement areas. During the staff audit of ESBWR DCD Section 3.8 in July 2006, the staff wanted to have a clear sense of the governing loads (moments, forces, shear etc.) at the critical sections. Staff asked for and reviewed the SSDP validation package, but found that the validation package did not contain several items of interest to the staff. Staff requests that the following information be provided: a) How does SSDP flag instances where reinforcement provided is less than the demand? b) How does SSDP identify governing load combinations and the corresponding loads on a given finite element? c) How does SSDP apply the reinforced concrete codes used in the United States, such as ACI 349, ASME Section III, Div 2, and how are the code editions that are accepted by the NRC incorporated in the SSDP to keep it current? d) How is the reinforcement pattern (radial and circumferential or rectangular grid) interpreted in the SSDP? e) How does the SSDP identify critical sections of a structure? f) In the reinforced concrete containment structure, how does SSDP evaluate the tangential shear stress to demonstrate compliance with the ASME Code?
3.12-38	Fair J	Audit Question 2: include SRV and LOCA loads on submerged components	Include the direct loading of safety relief valve (SRV) discharge and loss-of-coolant accidents (LOCA) on submerged components in the suppression pool. Include these loads in the DCD tables and the main steam (MS)/SRV analysis.

cc:

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