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Subject: **Response to Portion of NRC Request for Additional Information Letter Numbers 98 and 100 Related to ESBWR Design Certification Application – Design of Structures, Components, Equipment and Systems – RAI Numbers 3.8-111, 3.8-112 and 3.8-114**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) sent by NRC letters dated May 29, 2007 and May 30, 2007, respectively. GEH response to RAI Numbers 3.8-111, 3.8-112 and 3.8-114 is addressed in Enclosure 1.

If you have any questions or require additional information, please contact me.

Sincerely,

Kathy Sedney for

James C. Kinsey
Vice President, ESBWR Licensing

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NRO

Reference:

1. MFN 07-317, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, General Manager, Regulatory Affairs, General Electric Company, *Request For Additional Information Letter No. 98 Related To ESBWR Design Certification Application*, dated May 29, 2007

2. MFN 07-327, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, General Manager, Regulatory Affairs, General Electric Company, *Request For Additional Information Letter No. 100 Related To ESBWR Design Certification Application*, dated May 30, 2007

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter Numbers 98 and 100 Related to ESBWR Design Certification Application – Design of Structures, Components, Equipment and Systems – RAI Numbers 3.8-111, 3.8-112 and 3.8-114

cc:	AE Cubbage	USNRC (with enclosure)
	GB Stramback	GEH/San Jose (with enclosure)
	RE Brown	GEH/Wilmington (with enclosure)
	eDRF	0000-0075-1740

Enclosure 1

MFN 07-606

Response to Portion of NRC Request for Additional

Information Letter Numbers 98 and 100

Related to ESBWR Design Certification Application

Design of Structures, Components, Equipment and Systems

RAI Numbers 3.8-111, 3.8-112 & 3.8-114

NRC RAI 3.8-111

The staff noted during its review of DCD Figures 3G.1-48 and 3G.1-49 that some liner plate thicknesses and the size of the stiffeners have been reduced between DCD Rev. 2 and DCD Rev.3. The applicant referenced RAI 3.8-24 as the basis for the change in the Rev. 3 Change Summary Table. The staff cannot identify any connection between RAI 3.8-24 and the design changes, other than a statement in the applicant's response to RAI 3.8-24 that these figures were revised. The staff requests the applicant to explain why these design changes were made and to provide the technical basis for the structural adequacy of these changes.

GEH Response

The changes to the wetwell floor slab liner plate (thickness reduced from 16 mm to 6.4 mm and anchor span reduced from 508 mm to 270 mm) were made in order to keep anchor displacements within the Code limits. To simplify fabrication and construction, the 16 mm plates at the wetwell wall liner bottom portion and the pedestal liner bottom portion were also changed to 6.4 mm thick. Strains in the thinner liner remain below the Code limits. The size of stiffeners (liner anchors) was changed from WT 6x8 to WT 4x7.5 for consistency with the design evaluation using load-displacement data for WT 4x7.5 and the resulting anchor loads are within the Code allowables. The use of WT 4x7.5 anchor also provides more space for placement of reinforcement.

DCD Impact

No DCD change is required in response to this RAI.

NRC RAI 3.8-112

DCD Tier 2, Rev 3, included changes to the design of the Control Building, and identified that the entire building is now a Seismic Category I structure. Please confirm that the design/analysis of the entire Control Building has been completed in accordance with Seismic Category I design criteria. If this is not the case, when will it be completed and by whom? Also, the information in Section 3G.2 of DCD Tier 2, Rev 3, needs to be updated to completely reflect the change in design. For example, Figure 3G.2-11 still indicates that the building above grade is Seismic Category II. Also, all the tables in Section 3G.2 need to be updated to report the applicable information for the walls in the Control Building above EL 4650 and the floor slabs at EL 9060 and EL 13500.

GEH Response

The design/analysis of the entire Control Building has been updated in accordance with Seismic Category I design criteria. The information requested has been included in DCD Tier 2, Revision 4.

DCD Impact

DCD Tier 2, Revision 4 has been submitted to the NRC.

NRC RAI 3.8-114

There were several open issues identified when the results from the confirmatory analysis using ANSYS model performed by the staff were compared with the NASTRAN model used by GE. The staff discussed these issues with GE during an audit in December 2006. The subjects covered included (1) comparison of results; (2) modeling differences; and (3) future actions to resolve differences in results. Twelve (12) post-audit action items were identified at the audit and are included in the staff's audit report (ML070430420).

GE submitted its response to the post-audit action items via MFN 06-262, Supplement 4 dated April 2, 2007, specifically in Appendix C, SER-ESB-038, Rev. 5. GE also submitted NASTRAN computer results.

The staff has two questions regarding this submittal:

A. *For Item No. 4 of the audit report, in SER-ESB-038, Rev. 5, GE provided the requested data. The Staff compared N, Qx, Qy, Mx, and Mz. Since ANSYS macros to calculate Qz and Nz have not yet been programmed by the staff, additional work is required by the staff to complete the macros and compare these quantities.*

   During its comparison, the staff noted an incompatible result in the NASTRAN analysis results, at the intersection of sections BB and CC in the basemat. For load case EW EQ, the NASTRAN results in Figure 5-237 show the in-plane moment Mx (My, in NASTRAN terminology) in CC at this intersection is 6.2 MN-m/m; the out-of-plane moment Mz (My, in NASTRAN terminology) in BB at the same location is 13 MN-m/m from Figure 5-219. The ANSYS results show these two quantities to be the same. The staff also noted that the NASTRAN magnitude of Mx (My, in NASTRAN terminology) in section CC is not conservative compared to the ANSYS result. Therefore, the staff requests GE to review the NASTRAN results at this location and possibly other locations, and explain this apparent incompatibility.

B. *For item No. 10 of the audit report, the axial force, in-plane and out-of-plane moments in the basemat sections predicted by NASTRAN are generally 30 percent to 100 percent higher than the ANSYS results. The main difference between the models is the attachment location for the soil springs. The staff requests GE to re-visit its prior study that concluded the spring attachment location had minimal effect on the results. If confirmed, then GE should try to identify other potential sources for the significant differences in results.*

GEH Response

A. Figures 5-219 and 5-237 provide element forces at the center of the elements on sections BB and CC shown in Figure 5-4. In Figure 5-219, the element at the intersection of sections BB and CC is located just to the left (west) of 0.0 m in the Y-coordinate. The bending moment M_y (NASTRAN) of this element is 6.82 MNm/m, and it agrees with the peak bending moment M_y (NASTRAN) occurring at the interaction of sections BB and CC in Figure 5-237.

   The differences in M_x (ANSYS)/M_y (NASTRAN) in section CC for the load case EW EQ are due to the differences in the locations of the CC section between NASTRAN and ANSYS. In NASTRAN, section CC is through the center of the elements to the west of column line RD as shown in Figure 5-4 for forces and moments. If the location of CC section in ANSYS is matched to the location in NASTRAN, the NASTRAN result is larger than ANSYS result; in the BB section, M_x of NASTRAN result is larger than M_x of ANSYS results at the intersection with CC section.

B. GEH has confirmed that analysis results are not sensitive to the attachment locations for the soil springs. Therefore, GEH tried to find other potential sources for the differences in the results as discussed below:

   On section AA of the basemat, NASTRAN results are higher than ANSYS results at the portion of the RPV Pedestal bottom. Vertical loads at the top of the Pedestal are applied as concentrated loads at the element nodes in NASTRAN. On the other hand, in the ANSYS model vertical loads are distributed over the wall thickness. Because of this difference in loading application, NASTRAN out-of-plane moments of the basemat are higher than ANSYS results, similarly the in-plane moments.

   On section BB, out-of-plane moments of NASTRAN in the area of the spent fuel pool and the east area of the FB are higher than ANSYS because the clear spans of the basemat in the NASTRAN model, which are defined as the centerline distance between walls, are longer than ANSYS.

   Application of concentrated loads and longer clear spans are also the sources for higher NASTRAN results at Section CC of the basemat.

DCD Impact

No DCD change is required in response to this RAI.