January 14, 2008

Mr. Robert E. Brown
Senior Vice President, Regulatory Affairs
GE-Hitachi Nuclear Energy Americas, LLC
3901 Castle Hayne Road, MC A-45
Wilmington, NC 28401

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 124 RELATED TO ESBWR DESIGN CERTIFICATION APPLICATION

Dear Mr. Brown:

By letter dated August 24, 2005, GE-Hitachi Nuclear Energy Americas, LLC (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 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.

To support the review schedule, you are requested to provide the requested additional information within 45 days of the date of this letter.

If you have any questions or comments concerning this matter, you may contact me at 301-415-3025 or cpp@nrc.gov or you may contact Amy Cubbage at 301-415-2875 or aec@nrc.gov.

Sincerely,

/RA/

Chandu Patel, Senior 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

January 14, 2008

Mr. Robert E. Brown
Senior Vice President, Regulatory Affairs
GE-Hitachi Nuclear Energy Americas LLC
3901 Castle Hayne Road, MC A-45
Wilmington, NC 28401

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 124 RELATED TO ESBWR DESIGN CERTIFICATION APPLICATION

Dear Mr. Brown:

By letter dated August 24, 2005, GE-Hitachi Nuclear Energy Americas, LLC (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 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.

To support the review schedule, you are requested to provide the requested additional information within 45 days of the date of this letter.

If you have any questions or comments concerning this matter, you may contact me at 301-415-3025 or cpp@nrc.gov or you may contact Amy Cubbage at 301-415-2875 or aec@nrc.gov.

Sincerely,

Chandu Patel, Senior 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 w/encl: See next page

Distribution:

Public	RidsNroDeSeb2	DShum, NRO	JFair, NRR
NGE1 R/F	RidsNroDeEmb2	JCDehmel, NRO	RDavis, NRO
RidsNroDnrlNge1	CLi, NRO	CHinson, NRO	GThomas, NRO
RidsNroDnrlNge2	RidsNroDsraSbpb	RidsNroDcipChpb	RidsNroDsraSrsb
CPatel, NRO	YDiaz-Castillo, NRO	DJeng, NRO	DCurtis, NRO
RidsAcrsAcnwMailCenter	RidsNroDeCib2	MShams, NRO	RidsNroDeCib2
ACubbage, NRO	EForrest , NRO	TScarbrough, NRO	
RidsOgcMailCenter	RidsNroDsraSbcv	APal, NRO	
SChakrabarti, NRO	JHernandez, NRO	RMcNally, NRO	

ADAMS ACCESSION NO: ML080020219

OFFICE	PM:NRO:DNRL:NGE1	NGE1/BC
NAME	CPatel	MShuaibi
DATE	1/10/2008	1/14/2008

OFFICIAL RECORD COPY

Requests for Additional Information (RAIs)
ESBWR Design Control Document (DCD), Revision 4

RAI Number	Reviewer	Question Summary	Full Text
3.3-3 S01	Shams M	Discuss GEH's approach for ensuring that the Radwaste Building's failure under full tornado loadings is either precluded or would not impair safety-related functions for adjacent C-I and C-II SSCs.	In DCD Revision 3, Section 1.2.2.16.9, the applicant stated that the Radwaste Building is a non-seismic category structure and it is designed according to the safety classification defined in Regulatory Guide (RG) 1.143. Note 1 for Table 2.0-1 of the DCD indicates that the Radwaste Building is classified as Class RW IIa and is designed to the corresponding parameters in Table 2 of RG 1.143. This indicates that, for tornado hazard, the Radwaste Building is designed for three-fifths of the design basis tornado parameters used for seismic Category I structures. Given the exemption of the Radewaste Building from the location criteria and its reduced tornado design criteria, describe in details the approach and the technical bases for ensuring that the failure of the Radwaste Building under full tornado loadings either is precluded or will not adversely impact the safety-related functions of adjacent C-I and C-II SSCs.
3.5-19	Shams M	Confirm that the method described in the Bechtel Topical Report is used in the missile impact analysis or provide a full description of the actual method used	ESBWR DCD Revision 4, Section 3.5.3.2 states that the overall structural response due to missile impact is evaluated using an analysis procedure "similar" to that of Reference 3.5-7. Reference-3.5-7 is Bechtel Topical Report BC-TOP-9A, Revision 2, September 1974. However, in its response to NRC **RAI 3.8-64**, Supplement 2, dated June 26, 2007, GEH indicated that effects of impact loads generated by an automobile missile was estimated by the method described in Bechtel Topical Report BC-TOP-9A. The staff questioned the term "similar" and requests GEH to either confirm, in the DCD, that the method described in the Bechtel Topical Report is used in the missile impact analysis or to provide a full description of the actual method used.

Enclosure

RAI Number	Reviewer	Question Summary	Full Text
3.8-5 S03	Chakrabarti S	Provide confirmation that the regulatory positions in the current RG 1.136, Revision 3 are met by the 2004 Edition of the ASME Code.	In the response dated August 13, 2007, GEH stated that RG 1.136, Revision 3, which endorses the 2001 Edition of the ASME Code, Section III, Division 2, through the 2003 Addenda, did not exist six months prior to the ESBWR design certification application. Therefore, GEH stated that RG 1.136, Revision 2 (not Revision 3) is applicable to the ESBWR. In addition, GEH referred to the ASME Code Section III comparisons presented in the original and Supplement 1 responses to RAI 3.8-5 which included the differences between the 2004 Edition of the ASME Code, Section III and the 2001 Edition of the ASME Code, Section III through the 2003 Addenda. The staff reviewed the comparisons presented in the prior responses to RAI 3.8-5, which included the differences between the 2004 Edition of the ASME Code, Section III and the 2001 Edition of the ASME Code, Section III through the 2003 Edition. The staff agrees with GEH that the revisions identified in the 2004 Edition of the ASME Code, Section III, Division 2, Subsection CC for the concrete portions of the containment are acceptable. However, since GEH utilized the recent 2004 Edition of the ASME Code, Section III, Division 2, Subsection CC, based on a comparison to the Code through the 2003 Addenda, GEH needs to confirm that the regulatory positions in the current RG 1.136, Revision 3, which endorses the Code through the 2003 Addenda, are also met.
3.8-9 S 03	Chakrabarti S	Provide technical basis for combining multiple dynamic loads using the SRSS method.	In the response dated August 13, 2007, GEH stated that the ESBWR hydrodynamic load definitions and bases are described in the ESBWR containment loads report NEDE-33261P. These include the SRV loads, LOCA CO loads, and LOCA chugging loads. The ESBWR load definitions are developed based on the corresponding ABWR loads. The response explained, for each of these loads, how the specific defined load bounds all future occurrences of the load with a confidence level that is greater than 84% non-exceedance probability. The concern raised by the staff in the RAI was not in demonstrating a confidence level of 84% when defining each individual load, but rather the technical basis for combining multiple dynamic loads using the SRSS method. SRSS combination method is acceptable for combining the structural responses

RAI Number	Reviewer	Question Summary	Full Text
			from seismic plus LOCA; however, the basis of the criteria for combining other dynamic loads (e.g., SRV and individual LOCA loads (AP, PS, CO, CH, LCO, HVL, etc) is not evident. According to NUREG-0484, Revision 1, the use of SRSS (rather than the absolute sum method) for combining the other loads would require demonstrating that a non-exceedance probability (NEP) of 84% or higher is achieved for the combined response due to multiple dynamic loadings considering the time-phase relationship. Acceptable methods for achieving this goal are clearly described in the conclusion section of NUREG-0484, Revision 1. If GEH uses the SRSS method for combining the other dynamic loads, then the technical basis for using this method needs to be provided as discussed above.
3.8-110 Supplement 1	Chakrabarti S	Provide confirmation that the regulatory positions in RG 1.57, Revision 1 are met by the 2004 Edition of the ASME Code.	In the response dated June 29, 2007, GEH stated that the ESBWR design certification is based on RG 1.57, Revision 0, which is the version in effect six months prior to the design certification application. In addition, GEH referred to the ASME Code Section III comparisons presented in the response to RAI 3.8-5 which included the differences between the 2004 Edition of the ASME Code, Section III and the 2001 Edition of the ASME Code, Section III through the 2003 Addenda. RG 1.57, Revision 1 endorses the 2001 Edition of the ASME Code through the 2003 Addenda. The staff reviewed the comparisons presented in the original and the Supplement 1 responses to RAI 3.8-5, which included the differences between the 2004 Edition of the ASME Code, Section III and the 2001 Edition of the ASME Code, Section III through the 2003 edition. The staff agrees with GEH that the revisions identified in the 2004 Edition of the ASME Code, Section III, Subsection NE for the applicable steel portions of the containment are acceptable. However, since GEH utilized the recent 2004 Edition of the ASME Code, Section III, Division 1, Subsection NE, based on a comparison to the Code through the 2003 Addenda, GEH needs to confirm that the regulatory positions in the current RG 1.57, Revision 1, which endorses the Code through the 2003 Addenda, are also met.

RAI Number	Reviewer	Question Summary	Full Text
3.8-117	Chakrabarti S	Provide a comprehensive description of Passive Containment cooling System (PCCS) in view of the rules for Class MC containment vessels in ASME Code Section III.	DCD Revision 4, Section 3.8.2.1 has been revised to add the PCCS condensers as steel components of the concrete containment vessel. DCD Revision 4, Section 3.8.2.4.1.5 has also been added, to provide a description of the PCCS condensers. The fourth paragraph states "The PCCS condenser parts conform to the design requirements of Subarticles NE-3200 and NE-3300 of ASME Code, Section III, Subsection NE (Class MC). The PCCS condenser support is evaluated in accordance with the ASME Code, Section III, Subsection NF." In order to complete its review, the staff requests the applicant to address the following: a. ASME Code Section III, Subsection NE (Class MC), Subarticle NE-1120 states "Only containment vessels and their appurtenances shall be classified as Class MC. Piping, pumps, and valves which are part of the containment system (NE-1130) or which penetrate or are attached to the containment vessel shall be classified as Class 1 or 2 by the Design Specification and meet the requirements of the applicable Subsection." It appears to the staff that the PCCS condensers and the piping between the condensers and the drywell would be more appropriately classified as Class 1 or Class 2. These sections of the ASME Code (NB- 3200 and 3300 or NC-3200 and 3300) provide design and analysis procedures that the staff considers more applicable to piping and components. Explain the exact meaning of the statement "The PCCS condenser parts <u>conform to the design requirements</u> of Subarticles NE-3200 and NE-3300 of ASME Code, Section III, Subsection NE (Class MC)." Were the condensers and piping initially designed to NE, NB, or NC? If NB or NC, were any design modifications necessary to conform with NE? If NE, would any design modifications be necessary to conform with NB or NC? b. The PCCS condensers are designated as part of the containment pressure boundary. This appears to be a unique application of condensers. In order to develop reasonable assurance that the

RAI Number	Reviewer	Question Summary	Full Text
			containment has been adequately designed, the staff requests the applicant to provide a comprehensive description of the condenser and connecting piping. The description should include details and figures showing the individual parts of the condenser and how they are connected; dimensions; materials; the piping and pipe supports between the containment top slab and condenser; and the supporting elements from the condenser to the top slab and lateral supports to the pool walls. c. Since the PCCS condensers and piping are part of the containment pressure boundary, include in the DCD a description of the analysis and design evaluation (including results) comparable to the information provided for other steel components of containment. d. Provide a detailed description of how the preoperational pressure tests will be performed for the PCCS condenser and associated piping in accordance with the requirements of the applicable subsection of ASME Code Section III, including discussion of the provisions of the Code where it is not obvious the Code provisions can be met. As an example, how is examination for leakage accomplished after application of test pressure? e. Provide a detailed description of how the preservice and inservice inspection requirements of ASME Code Section XI, Subsection IWE, will be effectively implemented for the PCCS condensers and associated piping. The staff notes that the IWE requirements are applicable primarily to accessible shell type structures.
3.8-118	Chakrabarti S	Provide the technical basis for providing bolting and nut materials that are not recognized by ASME Section III, Division 1, Subsection NE.	In DCD Revision 4, Section 3.8.2.6, additional bolting materials have been inserted, for consistency with DCD Figures 3G.1-51 through 3G.1-53. The DCD 3.8 Revision 3 to Revision 4 Change List Summary, Item 46, indicates that SA-540 Gr. B24 Class 3 bolting material and SA-479 Type 304 nut material have been added. The staff notes that this bolt material is not recognized in the 2004 Edition of ASME Code, Section III, Division 1, Subsection NE, Table NE-2121(a)-2. Acceptable

RAI Number	Reviewer	Question Summary	Full Text
			nut materials are not listed in the table; however, NE-2128(a) specifies SA-194 or a nut material compatible with the bolt material. The staff requests the applicant to provide its technical basis for specifying a bolt material for the drywell head (Figure 3G.1-51), the equipment hatch (Figure 3G.1-52), and the wetwell hatch (Figure 3G.1-53), that is not listed in Table NE-2121(a)-2. Also, clarify the basis for specifying the nut material of SA-479 Type 304. The staff also notes that DCD Section 3.8.2.6 identifies that ASTM A325 or A490 may be used as an alternate material for nuts. Since this material designation is considered to be applicable to bolts, GEH is requested to clarify why this material was identified for nuts. In addition, since bolting material designations ASTM A325 and A490 are not recognized in the 2004 Edition of ASME Code, Section III, Division 1, Subsection NE, Table NE-2121(a)-2, explain why they are included in DCD Section 3.8.2.6.
3.8-119	Chakrabarti S	Provide descriptive information of the hydrodynamic loadings applied to the structural models in the DCD.	Appendix 3B of DCD Revision 4 has deleted significant portions of information for the containment hydrodynamic load definitions which were utilized in the structural evaluations for the containment and containment internal structures. In addition to deleting some important text information, all of the figures in the previous DCD Revision 3, Appendix 3B (Figures 3B-1 through 3B-11), have been removed. The current text in Appendix 3B now refers to Reference 3B-1, GEH Energy report "ESBWR Containment Load Definition," (NEDE-33261P and 33261) for the deleted information. The descriptive information of the hydrodynamic loadings applied to the structural models needs to be included in the DCD, just as seismic loading descriptions are included in the DCD. This description should include some pressure distribution diagrams on the containment and containment internal structures, representative pressure time histories, and sequencing of loading events comparable to the figures deleted from DCD Revision 3.
3.8-120	Chakrabarti S	Provide clarification for use of some terms, and	The staff notes that DCD Revision 4 Appendix 3G presents revisions in the various design load tables and stress result tables for all of the

RAI Number	Reviewer	Question Summary	Full Text
		identify the material grade for the various steel materials used. Explain the use of large plate thicknesses for ASTM A-709 HPS 70W and acceptability of welding this material to the containment liner.	structures. As a result, the staff requests that the following items be addressed: (a) DCD Tier 2, Chapter 3, Revision 3 to Revision 4 Change List (Appendices 3G - 3L) indicates that the numerous changes are due to "reanalysis incorporating updated design conditions" and "due to reanalysis reflecting the change of hydrodynamic load." Provide an explanation for the expressions: "updated design conditions" and the "change of hydrodynamic load." (b) The stress result tables compare the calculated stress results against allowable stresses. In order to do so, the specific material properties must have been already selected or assumed. However, in a number of cases presented in DCD Revision 4, the grade of the steel material is not identified. For example, Section 3.8.3 does not identify the grade for ASTM A-572, A-516, and A-668. The steel material grade needs to be specified because it defines the yield strength from which the allowable stresses are obtained. The staff requests that applicable sections of the DCD be revised to identify the material grade for the various steel materials used so that they will be consistent with the material properties assumed in the design. (c) DCD Section 3.8.3.6.3 indicates that the reactor shield wall may be constructed from steel material ASTM A-709 HPS 70W. DCD Section 3.8.3.1.3 indicates that the plate thickness varies along the elevation and is 6-5/16 in., 8-1/4 in., and 10-1/4 in. In addition, DCD Figure 3G.1-58 shows the variation in thickness of the steel material of the reactor shield wall. Since ASTM A-709 HPS 70W is not manufactured in thicknesses greater than 4 inches, explain whether one of the other material choices in the DCD will be used or how the analysis and design considers this limitation. The staff has also raised a concern under RAI 5.2-50 related to welding the A-709 material to the containment steel liner and the acceptability of a code case for this type of welding. GEH needs to resolve this issue as well.

RAI Number	Reviewer	Question Summary	Full Text
3.8-121	Chakrabarti S	Describe the approach, including technical basis, used for the design of the composite floor slabs.	DCD Revision 4, Sections 3.8.4.1.1 and 3.8.4.6.5 have been revised to describe the use of composite structures for most reactor building slabs. These composite structures are constructed from reinforcing bars, steel plates, steel beams, concrete, and studs. The strength of the slab is calculated using reinforced concrete design methodology except that the steel plate is treated as being equivalent to two orthogonal rebars with the same sectional area as the plate. The studs are designed to ANSI/AISC N690 and the stresses in the rebar, steel plates, and concrete meet the allowable stresses in ASME Code Section III, Division 2, Subsection CC. Since there is essentially no guidance on the design of such composite floor members in Subsection CC of the Code, describe the approach being used in greater detail. This should include the basis for treating the steel plates as two orthogonal rebars, since the steel plates are subjected to biaxial tension and the individual rebars are not. Explain how the forces acting in different directions are determined for designing the studs. How are the allowable stresses for the steel beams and steel plates determined since allowables for these steel members are not presented in Subsection CC of the Code? Explain whether temporary shoring is provided beneath the entire steel slab section until the concrete develops its full strength. If not, explain how the initial stresses during construction (based on only the steel section) are considered in the design for all other load combinations (where the full composite section properties are relied upon). Also, identify any test data and/or peer reviewed articles that support the design approach being used for the composite floor slab configurations presented in the DCD.
3.8-122	Chakrabarti S	Specify the concrete material strength for all Seismic Category I structures. Also, clarify that all of the information included in DCD Section 3.8.1.6.1 is also applicable to the other Seismic	DCD Section 3.8.4.6.1 Revision 4, which discusses the concrete material for other Seismic Category I structures, deleted the sentence “The specified compressive strength is 34.5 MPA (5000 psi).” As a result this section now reads “Concrete material is the same as described in DCD Subsection 3.8.1.6.1 with the following exception: Concrete is batched and placed according to ACI 349-01.” DCD Section 3.8.1.6.1 states that the specified compressive strength of concrete at 28 days, or earlier, is 5000 psi for the containment and 4000 psi for the foundation mat. Since this section does not specify the material strength for any other

RAI Number	Reviewer	Question Summary	Full Text
		Category I structures.	structures, the applicant is requested to specify in either DCD Section 3.8.1.6.1 or DCD Section 3.8.4.6.1, the concrete material strength for all Seismic Category I structures. Also the applicant is requested to clarify that all of the information included in DCD Section 3.8.1.6.1 is also applicable to the other Seismic Category I structures, with the exception previously noted that "concrete is batched and placed according to ACI 349-01." If not, provide the comparable information in DCD Section 3.8.4.6.1. In a related matter, the staff notes that DCD Section 3.8.5.6 states that the foundations of Seismic Category I structures are constructed of reinforced concrete using proven methods common to heavy industrial construction and references DCD Section 3.8.1.6 for further discussion. The staff notes that DCD Section 3.8.1.6 provides the materials and quality control requirements for the concrete containment. Therefore by reference to this section, the applicant appears to be committing to use the materials and quality control requirements specified for the concrete containment for the foundations of all Seismic Category I structures. The applicant is requested to confirm that this is the intent. If not, revise DCD Section 3.8.5.6 to include the applicable information.
3.8-123	Chakrabarti S	For the shear keys in the Fire Water Service Complex (FWSC), provide information related to the forces, stresses, and steel reinforcement details. Also, explain how the effect of the shear keys is included in the NASTRAN model and how the shear keys are designed.	DCD Section 3G.4.5.5 which discusses foundation stability for the FWSC states that shear keys under the basemat are used to resist sliding. These shear keys are shown in Figures 3G.4-1 and 11 and appear to be a critical element for assuring the stability of the FWSC against sliding. However, there is no information for these shear keys related to the forces and moments, concrete and rebar stresses, transverse shear forces, and steel reinforcement details. This information should be provided in the DCD in a manner similar to that provided for other critical sections. Also, explain in the DCD how the effect of the shear keys are included in the base details of the NASTRAN model and describe how the shear keys are designed based on the results of the NASTRAN analysis.
3.7-63	Jeng D	Clarify the elevation of	DCD Revision 4 Section 3A.4.1 states:

RAI Number	Reviewer	Question Summary	Full Text
		the input ground motion for the CB and provide the technical basis for using 1.35 times the RBFB/CB foundation input motion for the FWCS input motion	"....For the generic sites defined in Subsection 3A.3.1, the design response spectra are conservatively applied at the level of foundation in the free field. The input motion for North Anna ESP site is also defined at the foundation level. For the layered site cases, the input ground motion is defined as an outcrop motion at the RBFB foundation level for the RBFB and CB. The corresponding surface motion is generated for use as input to the SASSI2000 calculation for each site. For the FWSC, which is essentially a ground surface founded structure, the input ground motion is taken to be 1.35 times the RBFB/CB foundation input motion and is applied directly at the foundation level." The staff requires the following clarification and additional information related to the above statements: (a) Based on the first two sentences above, it appears to the staff that the ground motion for the CB was applied at two different elevations: at the CB foundation level for the generic sites defined in Subsection 3A.3.1, and at the RBFB foundation level for the layered site cases. Please confirm this, or clarify what was actually done. If this is the case, please describe what differences in CB response would be expected for the layered site cases if the input ground motion had been defined as an outcrop motion at the CB foundation level. (b) The third sentence above defines the input ground motion used for the FWSC SSI analyses as "1.35 times the RBFB/CB foundation input motion…applied directly at the foundation level." Please provide a detailed technical basis for the selection of the 1.35 factor, including pertinent quantitative information upon which this determination is based.

RAI Number	Reviewer	Question Summary	Full Text
3.7-64	Jeng D	Describe the CB design change and the CB re-analysis; explain significant differences between Revision 3 and Revision 4 results.	Item 18 in the "Tier 2, Appendix 3A, Revision 3 to Revision 4 Change List" identifies a revision to Table 3A.5-2, and states "Replaced soil spring and damping coefficients due to the CB design change (making entire CB Seismic Category I)." The staff compared the Revision 3 table to the Revision 4 table, and identified significant changes only for the X-X Rot and Y-Y Rot Damping coefficients. Item 38 in the "Tier 2 Appendix 3A Revision 3 to Revision 4 Change List" identifies a revision to Tables 3A 7-8 through 3A.7-14, and states "Replaced Eigenvalue analysis results to reflect the CB re-analysis (making entire CB Seismic Category I)." The staff compared the Revision 3 tables to the Revision 4 tables, and identified significant changes in the natural frequencies, both in magnitude and distribution. Please provide 1. a detailed description of the "CB design change"; 2. a detailed description of the "CB re-analysis"; 3. an explanation how the design change affects the X-X Rot and Y-Y Rot Damping coefficients; 4. an explanation why only these 2 parameters are affected; and 5. an explanation for the significant changes in the natural frequencies obtained in the CB re-analysis.
3.9- 178	Scarbrough T	Valve design-basis capability verification	Section 3.9.3.5, "Valve Operability Assurance," discusses operability assurance of active Code valves, including the actuator, and states that safety-related valves are qualified by testing and analysis. The American Society of Mechanical Engineers (ASME) has prepared ASME Standard QME-1-2007, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants," to incorporate lessons learned from nuclear power plant operation and research programs for the design and qualification of the capability of valves (including power-operated valves, check valves, and pressure relief valves) to perform their design-basis functions. The NRC staff is proposing a revision to RG 1.100 to address ASME QME-1-2007. GEH is requested to revise the DCD to incorporate lessons learned for the functional qualification of valves used in nuclear

RAI Number	Reviewer	Question Summary	Full Text
			power plants, such as through reference to ASME Standard QME-1-2007.
5.2-20 S03	Scarbrough T	Safety Relief Valves and Safety Valves operating experience	In response to RAI 5.2-20 S02 and RAI 5.2-22 S02 (MFN 06-178, Supplement 2, November 15, 2007), GEH states that the selection of a specific valve design for the safety relief valves (SRVs) and safety valves (SVs) considers relevant operating experience, including the documents referenced in the RAI. GEH is requested to revise the DCD to state that the operating experience will be considered in the design of SRVs and SVs including consideration of the referenced documents, such as Regulatory Issue Summary 00-012, "Resolution of Generic Safety Issue B-55, 'Improved Reliability of Target Rock Safety Relief Valves';" IE Circular 79-18, "Proper Installation of Target Rock Safety Relief Valves;" Bulletin 74-04, "Malfunction of Target Rock Safety Relief Valves;" and NUREG-0763, "Guidelines for Confirmatory In-Plant Tests of Safety Relief Valve Discharges for BWR Plants."
3.9-179	Scarbrough T	Accessibility for Inservice Testing	The NRC regulations in 10 CFR 50.55a(f) require that nuclear power plants be designed for access to enable the performance of inservice testing for assessing operational readiness as set forth in the applicable ASME Code. The NRC regulations in 10 CFR 50.55a(g) provide similar access requirements for inservice inspection of component supports. GEH is requested to specify that the design of the nuclear power plant structures, systems, and components will provide access for the performance of inservice testing and inservice inspection (ISI) of pumps, valves, and dynamic restraints within the IST and ISI programs.
3.9-180	Scarbrough T	MOV tests	Paragraph a, Active Motor Operated Valve Tests, under Item (1), Power Operated Valve Exercise Tests, in Subsection 3.9.6.1.5, "Specific Valve Test Requirements," states that inservice operability testing of active MOVs relies on nonintrusive diagnostic techniques to permit periodic assessment of the valve's ability to perform its safety-related function during design-basis conditions. GEH is requested to discuss its intent regarding reference to "nonintrusive diagnostic techniques" and the justification for the use of such techniques.
3.9-181	Scarbrough T	Reference to ASME Code Case OMN-1 on	Paragraph a) under Item (1) in Subsection 3.9.6.1.5 states that ASME Code Case OMN-1, Revision 1, will be used to develop test frequencies.

RAI Number	Reviewer	Question Summary	Full Text
		MOV testing	GEH is requested to revise the DCD to specify that the use of ASME Code Case OMN-1, Revision 1 will be subjected to relief request if necessary.
3.9-182	Scarbrough T	MOV risk ranking guidance	The bullet titled “Risk Ranking” in Paragraph a under Item (1) in Subsection 3.9.6.1.5 states that guidance for MOV risk ranking is outlined in the Joint Owners’ Group (JOG) MOV Periodic Verification Program Summary (MPR-2524-A). GEH is requested to revise the DCD to indicate that the NRC staff review of MPR-2524-A is described in a safety evaluation dated September 25, 2006.
3.9-183	Scarbrough T	Ambient temperature consideration in MOV functional margin	The second paragraph under the bullet titled “Functional Margin” in Paragraph a) under Item (1) in Subsection 3.9.6.1.5 does not indicate that ambient temperature effects need to be considered in determining the motor actuator capability. GEH is requested to include ambient temperature in the list of considerations for MOV capability when determining functional margin.
3.9- 184	Scarbrough T	Application of Generic Letter 96-05 and Joint Owners Group Program on MOV Periodic Verification	The third paragraph under the bullet titled “Functional Margin” in Paragraph a under Item (1) in Subsection 3.9.6.1.5 states that the MOV Program utilizes guidance from GL 96-05 and the JOG MOV Periodic Verification study, MPR 2524-A. GEH is requested to revise the DCD to state that, the IST and MOV programs will implement GL 96-05 and the JOG program as discussed in the NRC safety evaluation dated September 25, 2006.
3.9-185	Scarbrough T	MOV design-basis capability verification	The paragraph titled “Design Basis Verification Test” in Paragraph a under Item (1) in Subsection 3.9.6.1.5 states, prior to power operation, a design-basis verification test is performed upon each MOV to verify its capability to meet the safety-related design-basis requirements. The verification of design-basis capability needs to be accomplished for each safety-related MOV as part of the design and qualification process prior to installation of the MOV in the nuclear power plant. For example, ASME has prepared ASME Standard QME-1-2007, “Qualification of Active Mechanical Equipment Used in Nuclear Power Plants,” to incorporate lessons learned from nuclear power plant operation and research programs for the design and qualification of the capability of power-operated valves to perform their design-basis functions. The NRC staff is

RAI Number	Reviewer	Question Summary	Full Text
			proposing a revision to RG 1.100 to address ASME QME-1-2007. GEH is requested to revise the DCD to indicate the need to verify the design-basis capability of safety-related MOVs as part of the design and qualification process prior to installation (such as through application of ASME Standard QME-1-2007).
3.9-186	Scarbrough T	MOV design-basis capability testing	The paragraph titled “Design Basis Verification Test” in Paragraph a under Item (1) in Subsection 3.9.6.1.5 states that the MOV test is performed at conditions that are as close to design-basis conditions as practicable. GEH is requested to revise the DCD to indicate that where design conditions cannot be achieved the design-basis capability of the MOV will need to be justified by analytical means based on the functional qualification program and extrapolation of test data.
3.9- 187	Scarbrough T	Consideration of uncertainties in MOV functional margin and periodic test intervals	The paragraph titled “Active MOV Test Frequency Determination” in Paragraph a) under Item (1) in Subsection 3.9.6.1.5 states that the ability of a valve to meet its design-basis functional requirements (i.e., required capability) is verified during the design-basis verification test and that the preservice test measures the valve’s actual actuator output capability. This information is then used to determine a periodic test interval that is compared to the valve’s historical data to verify that any potential valve degradation would not reduce the functional margin to less than zero. GEH is requested to revise the DCD to indicate that uncertainties need to be included in the output and required capabilities when determining functional margin. GEH is also requested to address the determination of potential valve degradation when historical data for the specific valve would not be available at initial plant operation. For example, the JOG Program on MOV Periodic Verification includes provisions for consideration of potential degradation for various valve types.
3.9-188	Scarbrough T	Other power-operated valve (POV) testing	Paragraph b, Other Power-Operated Valve Operability Tests, under Item (1) in Subsection 3.9.6.1.5 states that Power-Operated Valves other than active MOVs are exercised quarterly in accordance with ASME OM ISTC. GEH is requested to revise the DCD to address the implementation of Regulatory Issue Summary 2000-003, “Resolution of Generic Safety Issue 158: Performance of Safety-Related Power-Operated Valves Under Design Basis Conditions.”

RAI Number	Reviewer	Question Summary	Full Text
3.9-189	Scarbrough T	Other POV design-basis capability verification	The paragraph titled “Design Basis Verification Test” in Paragraph b under Item (1) in Subsection 3.9.6.1.5 states, prior to power operation, a design-basis verification test is performed upon each Power-Operated Valve (POV) to verify its capability to meet the safety-related design-basis requirements. As discussed with regard to MOVs, the verification of design-basis capability needs to be accomplished for each safety-related POV as part of the design and qualification process prior to installation of the POV in the nuclear power plant. GEH is requested to revise the DCD to indicate the need to verify the design-basis capability of safety-related POVs as part of the design and qualification process prior to installation (such as through application of ASME Standard QME-1-2007).
3.9-190	Scarbrough T	POV design-basis capability test	The paragraph titled “Design Basis Verification Test” in Paragraph b under Item (1) in Subsection 3.9.6.1.5 states that the POV test is performed at conditions that are as close to design-basis conditions as practicable. GEH is requested to revise the DCD to indicate, where design conditions cannot be achieved, the design-basis capability of the POV will need to be justified by analytical means based on the functional qualification program and extrapolation of test data.
3.9-191	Scarbrough T	NRC RG 1.192 on ASME OM Code Cases	The second paragraph in Section 3.9.6.6, “10 CFR 50.55a Relief Requests and Code Cases,” refers to RG 1.147 with regard to NRC staff acceptance of ASME OM Code Case OMN-1. This reference should be to RG 1.192 for ASME OM Code Cases.
3.9-192	Scarbrough T	IST program 120-month interval	Section 3.9.6.7, “Inservice Testing Program Implementation,” states that the duration of each 120-month test interval may be modified by as much as one year as allowed by the Code. ISTA-3120, “Inservice Test Interval,” in the ASME OM Code-2004 states in paragraph (d) states that adjustments shall not cause successive intervals to be altered by more than one year from the original pattern of intervals. Therefore, if the COL Holder extends an IST Program interval by one year, then successive intervals cannot exceed 10 years unless the interval is decreased to allow the original pattern of intervals to be achieved. GEH is requested to revise the DCD to include the additional Code provision with respect to modifying the IST Program interval.
3.9-193	Scarbrough T	POV design-basis	The first paragraph in Section 3.9.6.8, “Non-Code Power Testing of Other

RAI Number	Reviewer	Question Summary	Full Text
		capability	Operated Valve Testing," states that active POVs are tested to verify that the valve opens and closes under static and design conditions. Where design conditions cannot be achieved, Section 3.9.6.8 states that testing is performed at the maximum achievable dynamic conditions. GEH is requested to revise the DCD to indicate, where design conditions cannot be achieved, the design-basis capability of the POV will need to be justified by analytical means based on the functional qualification program and extrapolation of test data.
3.9-194	Scarbrough T	POV test parameters	The first paragraph in Section 3.9.6.8 lists critical parameters to be measured during POV testing. If Section 3.9.6.8 only applies to POVs other than MOVs, GEH is requested to clarify the relationship between Section 3.9.6.8 and paragraph b under Item (1) in Subsection 3.9.6.1.5.
3.9-195	Scarbrough T	POV functional capability	The second paragraph in Section 3.9.6.8 states that operating loads including uncertainties are compared to the structural capabilities of the POV. GEH is requested to revise the DCD to include the consideration of uncertainties in the determination of structural as well as functional capabilities of the POV.
3.9-196	Scarbrough T	Inservice testing verification items	The third paragraph in Section 3.9.6.8 provides a list of items that are verified to demonstrate the acceptability of the functional performance of POVs during pre-operational testing. GEH is requested to revise the DCD to indicate that these items are also applicable in demonstrating the acceptability of functional performance of POVs during inservice testing.
3.9-197	Scarbrough T	ESBWR systems for shutting reactor and maintaining safe shutdown	In MFN 06-489 (Supplement 4) dated November 15, 2007, GEH states that Revision 4 of the DCD provides system descriptions that discuss whether specific systems are required to achieve and/or maintain safe shutdown. GEH also states that Section 7 of the DCD discusses safe shutdown systems from an I&C standpoint and that Table 9A.2-2 lists systems required to achieve safe shutdown in the event of a fire. Rather than the general reference to various portions of the DCD Revision 4 with different objectives, GEH is requested to provide a specific list of systems used for shutting down the reactor and maintaining the reactor in stable safe shutdown condition.
3.9-198	Scarbrough T	Operational Program COL information item	For operational programs implementation, GEH states that the COL applicant shall provide a milestone for full implementation of the

RAI Number	Reviewer	Question Summary	Full Text
			programs. It is not sufficient for the COL applicant to provide a single milestone schedule for operational programs without a full description of that program. The NRC staff must have sufficient information provided by the COL applicant to prepare a safety evaluation that reaches a reasonable assurance finding that the operational program will support the protection of the public health and safety when the nuclear power plant is operated. As indicated in Commission guidance in SECY-05-0197, the COL applicant should fully describe operational programs, such as the IST program (including pumps, valves, and snubbers), MOV program, and equipment qualification program. Section 13.4, "Operational Program Implementation," of the ESBWR DCD Tier 2 (Revision 4) states that the COL Applicant shall develop a description of the Operational Programs, and references SECY-05-0197 and Regulatory Guide 1.206. GEH should revise the following Subsections in the ESBWR DCD to state that the COL applicant will provide a full description of the program in addition to the implementation milestone consistent with the guidance provided in SECY 05-0197 and RG 1.206: - Subsection 3.9.9-3-A, In-service testing Program" - Subsection 3.9.9-4-A, A Snubber inspection and Test Program - Subsection 3.11-1-A, Environmental Qualification Document - Subsection 3.9.3.7.1, Piping Supports
3.11-4 S02	Scarbrough T Pal A	EQ Program COL Information Item on EQ Records	In Subsection 3.11-2-H, "Environmental Qualification Records," of the ESBWR DCD Tier 2 (Revision 4), GEH deleted the provision that the COL Holder shall record and maintain the results of the qualification tests in an auditable file based on including the record requirements in DCD Section 3.11.2.2. Please revise DCD Section 3.11.2.2 to clarify the record requirements for equipment qualification of mechanical equipment.
3.11-15	Scarbrough T	Safety-related mechanical equipment located in harsh environment	The second paragraph in Section 3.11.1, "Equipment Identification," states that a list of safety-related mechanical equipment that is located in a harsh environment is included in the EQD to be prepared as mentioned in Section 3.11.2.2. The sixth paragraph in Section 3.11.2.2, "Qualification Program, Methods and Documentation," states that the EQD is developed during program implementation. GEH is requested to

RAI Number	Reviewer	Question Summary	Full Text
			identify the safety-related mechanical equipment that will be located in a harsh environment or explain how and when this will be identified.
3.11-16	Scarbrough T	Qualification of safety-related mechanical equipment	The second paragraph in Section 3.11.2.2 states that safety-related mechanical equipment that is located in a harsh environment is qualified by analysis of materials data, which are generally based on test and operating experience. GEH is requested to address the applicability of ASME Standard QME-1-2007 for environmental qualification of mechanical equipment, which is undergoing review for acceptance by the NRC staff.
3.9-199	Scarbrough T	Designation of Tier 2* components	Consistent with design certification rules for new reactor designs currently specified in 10 CFR Part 52, GEH is requested to discuss its plans to designate “power-operated valves” as Tier 2* components based on past challenges in providing assurance of their design-basis capability as demonstrated by operating experience at nuclear power plants. These power-operated valves would include, for example, motor-operated, pneumatic-operated, hydraulic-operated, and solenoid-operated valves as applicable to the ESBWR.
3.11-17	Pal A	Confirm that Table 3.11-1 includes all three categories of 10 CFR 50.49(b)	Please confirm that Table 3.11-1 includes all three categories of 10 CFR 50.49(b). (Table 3.11-1 did not include safety-related 480 Vac Isolation Power Center equipment, 250 V safety-related DC system, safety-related UPS system, both safety-related and non-safety related electrical penetrations.)
3.11-18	Forrest E	Provide analysis to confirm room temperatures for normal and accident conditions.	Tables 3H-3, 3H-4, 3H-9, and 3H-10 for the reactor building and control building provide maximum room temperatures for normal and accident conditions used in the establishment of equipment qualification. Please provide an analysis that shows that these temperatures will not be exceeded. The analysis should consider all heat loads affecting the room such as equipment loads, HVAC operation if it is not isolated, heat loads from adjoining rooms, solar loads, personnel loads, lighting, and external environmental conditions for both winter and summer design conditions to the extent they impact room temperatures. If passive measures are used to remove heat loads, please clearly identify these passive measures, the conditions under which they operate, and any surveillance activities that would be required. This analysis should be referenced and summarized

RAI Number	Reviewer	Question Summary	Full Text
			in the DCD to support a finding of acceptability.
3.11-19	Pal A	Revise Section 3.11.2.2 to reference qualified life of 60 years.	Section 3.11.2.2, third paragraph states that "Qualified mechanical and electrical equipment has a design life of 60-years. The design life is verified using methods and procedures of qualification and documentation as stated in IEEE-323 and as addressed herein." The EQ program develops qualified life for mechanical and electrical equipment. Revise as follows: "The mechanical and electrical equipment has a qualified life of 60-years. The qualified life is verified using methods and procedures of qualification and documentation as stated in IEEE-323 and as addressed herein."
3.11-20	Pal A	Provide Radiation Environment Conditions Inside Reactor Building and Control Building during Accident Conditions	Tables 3H-6 and 3H-7 are revised to indicate Radiation Environment Conditions Inside Reactor Building (3H-6) and Control Building (3H-7) for Normal Operating Conditions. Please provide Radiation Environment Conditions Inside Reactor Building and Control Building during Accident Conditions.
3.11-21	Pal A	Modify Section 3.11 (first paragraph) to include safety-related digital instrumentation and control components	In RAI response 3.11-8, GEH stated that safety-related digital instrumentation and control components are included in the scope of EQ. Section 3.11 (first paragraph) should be modified to include safety-related digital instrumentation and control components.
3.11-22	Pal A	Include reference to RG 1.209 and 1.180	The RG1.209 and 1.180 should be included under 3.11 (4).
9.3-41	Shum D	Discuss potential effects of low quality air from the service air system on the instrument air system.	In DCD, Revision 4, GEH redesigns the instrument air system (IAS) and service air system (SAS) configurations. In DCD, Revision 3, each system had its own air compressors. SAS provided a backup air supply to the IAS via a cross-tie between the distribution headers of the two systems. The cross-tie at the IAS distribution header was located upstream of the air filter/dryer units. In DCD, Revision 4, IAS does not have its own air compressor, instead, the IAS makes use of the SAS compressors and receives compressed air from the SAS via a line branched off the SAS distribution header. Compressed air from the SAS passes through ISA air filtering and drying units, and air receivers before

RAI Number	Reviewer	Question Summary	Full Text
			being distributed to the instrument air piping system. A cross-tie between the distribution headers of the SAS and IAS is provided to bypass the IAS air filtering and drying units and the air receivers. However, GEH has not addressed the effects of the bypass of lower quality/contaminated SAS air on instrument and controls and pneumatic components. Provide detailed discussion to demonstrate how failures (resulting from the bypass of lower quality/contaminated SAS) of the instrument and controls and pneumatic components will be prevented.
9.1-46	Hernandez J	Provide information related to spent fuel pool water level	With regards to the spent fuel pool (SFP), provide the following information: (1) What is the depth of water above the top of active fuel in the pool if the pool is drained to the bottom of the transfer gates? (2) What is the volume of water in the SFP when the level is at the bottom of the gates? (3) What is the time to fuel uncovery if the pool contains the design-basis spent fuel heat load plus one full core offload, there is no forced cooling available, and the pool level is at the bottom of the transfer gates?
9.1-47	Hernandez J	Provide information related to FAPCS	With regards to the fuel and auxiliary pools cooling system (FAPCS), provide the following information: (1) What design features prevent drainage of water from the suppression pool or the GDCS pools into the Fuel Building, if these cooling paths are operating at the same time? (2) What is the maximum volume of water that can be drained from the suppression pool into the Fuel Building if the FAPCS flow paths are inadvertently crosstied? (3) What is the maximum volume of water that can be drained from the GDCS pools into the Fuel Building if the FAPCS flow paths are

RAI Number	Reviewer	Question Summary	Full Text
			inadvertently crosstied?
9.1-48	Hernandez J	Provide information related to IC/PCC pools	With regards to the isolation condenser and passive containment cooling (IC/PCC) pools cooling trains: (1) What is the initial IC/PCC pool temperature assumed in the ESBWR safety analyses? (2) Is the operation of FAPCS required to ensure this temperature is maintained during the most limiting plant operating modes and environmental conditions?
10.2-27	Hernandez J	Clarify seismic design of turbine stop valves.	DCD Tier 2, Section 10.2.1.1 Revision 3 states that the main steam stop valve and steam line from the stop valve to the turbine are analyzed to maintain structural integrity following a safe shutdown earthquake (SSE). This statement was deleted in Revision 4. However, this is inconsistent with footnote (9) in Table 3.2-1. Please, clarify the seismic design of the turbine stop valves.
10.4-16	Hernandez J	Clarify design provisions to avoid water hammer in the condensate and feedwater system.	DCD Tier 2, Section 10.4.7.3 Revision 4 states that the ESBWR design utilizes design features, such as keep-full system water lines, that minimize the occurrence of water hammer incidents. Describe how keep-full system water lines are used in the condensate and feedwater system, given that the system is normally operating.
9.2-19	Li C	Specify the minimum flow for the external makeup water beyond seven days.	In DCD Rev. 4, Section 9.2.5. with regards to external makeup water supply beyond 7 days following an accident, GE states that the makeup water source is not required to be safety-related, but must be from either diverse sources or a highly reliable source. Describe the minimum flow requirements of the makeup water supply beyond 7 days. Table 9.5-2 of DCD specified the minimum makeup flow for FPS to be 200 gpm at 72 hours, but not the minimum makeup flow requirement beyond 72 hours. Clarify whether the minimum makeup flow is 200 gpm or some other values.
9.2-20	Li C	Explain the inconsistency in Table 9.2-3.	Table 9.2-3 in the DCD, Tier 2 lists the Reactor Component Cooling Water System (RCCWS) heat loads during normal plant power operation and during various cooldown modes. During normal operation, the nominal Chilled Water System (CWS) heat load is 12.3 MW.

RAI Number	Reviewer	Question Summary	Full Text
			For the "Normal Cooldown" and "Cooldown with LOPP" modes, the nominal CWS heat load is assigned only to RCCWS Train A. The Train B summaries do not include any requirements to supply the CWS. This does not seem consistent. If Train B equipment (pumps, switchgear, I&C cabinets, etc.) is operating during these cooldown conditions, it seems that CWS Train B should also be operating to provide cooling for the respective equipment rooms. Why do the "Normal Cooldown" and "Cooldown with LOPP" summaries in DCD, Table 9.2-3 not list this CWS heat load for RCCWS Train B?
9.2-21	Li C	Discuss the compliance of GDC 4, 44, 45, and 46 for CWS	In Revision 4, DCD, Tier 2, it was determined that portions of the HVAC systems perform RTNSS function. The chilled water system provide cooling for the HVAC systems. The RTNSS function is an important safety function. Discuss the compliance of GDC 4, 44, 45, and 46 in Section 9.2.7.
9.2-22	Li C	Provide more information on the compliance of GDC and the system description	Some information for TCCWS were deleted in Revision 4 of DCD, Tier 2, Section 9.2.8 from previous revisions. • Add the compliance of GDC 2 back to Section 9.2.8, • Add the compliance of GDC 44, 45, and 46 back to Section 9.2.8, or explain why the above criteria are not applicable for the TCCWS. Specify the number of pumps and heat exchangers that are aligned for service during normal plant power operation.
3.7-16 S 03	Jeng D	Explain some of the results provided in response to Supplement 2 of RAI 3.7-16.	The staff reviewed the applicant's Supplement 2 response to RAI 3.7-16, and needs the following Supplemental information: (1) The staff requests the applicant to amend its Supplement 1 response, part (b), third paragraph, which begins "Adding frequencies....." The staff agrees with the applicant's conclusion that there is little impact on the response spectra; however, the applicant's explanation for the behavior of the transfer function at 7.8 Hz is considered to be conjecture and

RAI Number	Reviewer	Question Summary	Full Text
			cannot be confirmed. Please clarify or remove the statement. (2) The staff requests the applicant to clarify whether the results presented in Figure 3.7-16(21) for the CL-1 to CL-4 envelope (dotted curve) include a soil profile equivalent to the sketch shown to the right of the plot (NRC Problem 4). If it does, then explain why the solid curve is not enveloped by the dotted curve. (3) The staff requests the applicant to explain why the "DCD method" results in Figure 3.7-16(21), for NRC Problem 4, are apparently equivalent to the "DCD method" results in Figure 3.7-16(22), for NRC Problem 6. (4) The staff requests the applicant to confirm that the analysis model used to develop the "PROB-4" and "PROB-6" results presented in Figures 3.7-16(23) and 3.7-16(24) is the SASSI model, and also to revise these figures to clearly indicate the analysis model used. The stick model sketch and node numbers, shown on the left in the two figures, appear to be representative of the DAC-3N model, not the SASSI model. Please explain.
3.2-66	McNally R	In Rev. 4 of the DCD, the Turbine Building has been reclassified from Seismic Category II to Non-Seismic (NS) without adequate justification.	In Rev. 4 of the DCD Table 3.2-1 shows the Turbine Building seismic classification has been changed from Seismic Category II to NS (non-seismic) without adequate justification. The Turbine Building is adjacent to the Seismic Category I Control Building and Table 3.2-1 shows that the Turbine Building contains Seismic Category I components, including portions of the Reactor Protection System, and Seismic Category II main steam piping. In addition, RTNSS SSCs with importance to safety, such as the Turbine Building HVAC, are enclosed by the Turbine Building. Considering that a collapse or failure of the building structure could adversely affect these SSCs, this NS classification appears to be inconsistent with RG 1.29 Regulatory Position C.2. This position identifies those portions of SSCs of which continued function is not required but of which failure could reduce the functioning of any plant feature included in items 1.a through 1.q above to an unacceptable safety

RAI Number	Reviewer	Question Summary	Full Text
			level or could result in incapacitating injury to occupants of the control room should be designed and constructed so that the SSE would not cause such failure. Subsection 3.2.1 of the application does not include the basis for the change in seismic classification of the Turbine Building or the technical justification as to how the Turbine Building is designed and analyzed so that seismic interaction effects are precluded from adversely affecting Seismic Category I SSCs, the Seismic Category II main steam piping and RTNSS SSCs that are relied upon after an SSE. The applicant is requested to provide the following additional information: i) Consistent with the criteria in SRP 3.7.2 and DCD 3.7.2.8, explain how the seismic interaction effects of the Turbine Building, as a non-seismic structure, meets one of the three criteria and clarify how the disposition of each non-category I structure is formally documented and available for NRC review. The technical justification for applying the International Building Code (IBC) to the design of the Turbine Building and other measures to preclude adverse seismic interactions should also be addressed in the response and in the appropriate DCD section. The justification of the IBC code provisions should discuss in details GE's approach to addressing the incompatibility of IBC hazard level and performance level to the SSE and the functional performance level required of safety-related SSCs. ii) Explain how the Turbine Building will be seismically analyzed to support the analysis of Seismic Category I components, the Seismic Category II Main Steam Piping and RTNSS SSCs. iii) Identify the pertinent quality assurance requirements of Appendix B to 10 CFR Part 50, addressed in RG 1.29 Position C.4 that are applicable to the Turbine Building. iv) Clarify if this change in seismic classification represents an

RAI Number	Reviewer	Question Summary	Full Text
			exception to RG 1.29 and SRP 3.2.1, include a technical justification for this exception and update other affected sections of the DCD including Tables 1.9-3, 1.9-21a and 17.0-1.
3.12-3 S03	Fair J	GEH's use of SRSS of group responses in the application of Independent Support Motion (ISM) response spectrum analysis does not meet the current staff position.	GEH uses SRSS of group responses in its application of Independent Support Motion (ISM) response spectrum analysis. The staff position in NUREG-1061, Volume 4 specifies absolute sum. GEH provided the results of a study performed to justify its use of SRSS for group responses in its September 13, 2007, letter. The study compares the results from a sample of two piping runs analyzed using multi-support time history (a method acceptable to the staff) with the proposed GEH use of ISM with SRSS of group responses. The study indicated that multi-support time history responses exceeded the ISM responses at several locations in the feedwater system, the maximum being 8%. As a consequence, the staff recommends that GEH increase the piping stresses and loads by 10% when using the ISM SRSS method. Alternatively, GEH should follow the staff position in NUREG-1061, Volume 4.
3.12-15 S03	Fair J	The GEH criteria for overlapping analysis does not meet the current staff guidance	GEH provided a markup of DCD Section 3.7.3.17 in its September 13, 2007, letter. The DCD provides modeling assumptions for decoupling piping runs where there is no rigid anchor provided. DCD Section 3.7.3.17 (2) and (4) specify an overlap portion of piping that extends in at least two restraints in each direction. This criterion does not meet the staff guidance contained in NUREG/CR-1980. GEH should follow the staff guidance in NUREG/CR-1980.
5.2- 66	Thomas G	Verify the capacity of the SRV	It seems that the SRV capacities given in Table 5.2.2 and Table 6.3-1 are inconsistent, please verify the correct value.
5.2-67	Thomas G	Provide revised Figures 5.2-4a through 4f	Figures 5.2-4a through 4f were deleted in Rev.4 with a statement that "Obsolete Figure to be replaced later." Add the Figures. Confirm that credit is taken only for one SRV for the analysis results shown in the Figures.
5.2-68	Davis R	Modify the DCD to indicate that the CRD penetration and instrumentation nozzle	In ESBWR DCD, Revision 4, Subsection 5.2.4.2, the applicant has revised the DCD to indicate that CRD penetration and instrumentation nozzle welds are accessible to perform visual VT-1 and VT-3 examinations during system leakage and system hydrostatic

RAI Number	Reviewer	Question Summary	Full Text
		welds will be accessible to perform Code required VT-2 examinations during system leakage testing as required by ASME Code Section XI	examinations. Given that VT-2 examinations are required to be conducted on these welds during system leakage testing, the staff requests that the applicant modify the DCD to indicate that these welds will also be accessible to perform Code required VT-2 examinations during system leakage testing as required by ASME Code Section XI, IWB-2500-1.

DC GE - ESBWR Mailing List

cc:

Ms. Michele Boyd
Legislative Director
Energy Program
Public Citizens Critical Mass Energy
and Environmental Program
215 Pennsylvania Avenue, SE
Washington, DC 20003

W. Craig Conklin, Director
Chemical and Nuclear Preparedness &
Protection Division (CNPPD)
Office of Infrastructure Protection
Department of Homeland Security
Washington, DC 20528

Mr. Marvin Fertel
Senior Vice President
and Chief Nuclear Officer
Nuclear Energy Institute
1776 I Street, NW
Suite 400
Washington, DC 20006-3708

Mr. Ray Ganthner
AREVA, Framatome ANP, Inc.
3315 Old Forest Road
P.O. Box 10935
Lynchburg, VA 24506-0935

Vanessa E. Quinn, Acting Director
Technological Hazards Division
National Preparedness Directorate
Federal Emergency Management Agency
500 C Street, NW
Washington, DC 20472

Email

APH@NEI.org (Adrian Heymer)
awc@nei.org (Anne W. Cottingham)
bennettS2@bv.com (Steve A. Bennett)
bevans@enercon.com (Bob Evans)
bob.brown@ge.com (Robert E. Brown)
BrinkmCB@westinghouse.com (Charles Brinkman)
chris.maslak@ge.com (Chris Maslak)
CumminWE@Westinghouse.com (Edward W. Cummins)
cwaltman@roe.com (C. Waltman)
dan1.williamson@ge.com (Dan Williamson)
david.hinds@ge.com (David Hinds)
david.lewis@pillsburylaw.com (David Lewis)
David.piepmeyer@ge.com (David Piepmeyer)
dlochbaum@UCSUSA.org (David Lochbaum)
don.lewis@ge.com (Don Lewis)
erg-xl@cox.net (Eddie R. Grant)
frankq@hursttech.com (Frank Quinn)
Frostie.white@ge.com (Frostie White)
gcesare@enercon.com (Guy Cesare)
george.honma@ge.com (George Honma)
george.stramback@gene.ge.com (George Stramback)
george.wadkins@ge.com (George Wadkins)
GovePA@BV.com (Patrick Gove)
greshaja@westinghouse.com (James Gresham)
gzinke@entergy.com (George Alan Zinke)
hickste@earthlink.net (Thomas Hicks)
james.beard@gene.ge.com (James Beard)
jcurtiss@winston.com (Jim Curtiss)
jgutierrez@morganlewis.com (Jay M. Gutierrez)
jim.kinsey@ge.com (James Kinsey)
jim.riccio@wdc.greenpeace.org (James Riccio)
JJNesrsta@cpsenergy.com (James J. Nesrsta)
joel.Friday@ge.com (Joel Friday)
john.o'neil@pillsburylaw.com (John O'Neil)
john.sorensen@ge.com (John Sorensen)
Joseph.savage@ge.com (Joseph Savage)
Joseph_Hegner@dom.com (Joseph Hegner)
junichi_uchiyama@mnes-us.com (Junichi Uchiyama)
kathy.sedney@ge.com (Kathy Sedney)
kenneth.ainger@exeloncorp.com (Kenneth Ainger)
KSutton@morganlewis.com (Kathryn M. Sutton)
kurt.schaefer@ge.com (Kurt Schaefer)
kwaugh@impact-net.org (Kenneth O. Waugh)
lou.lanese@ge.com (Lou Lanese)
lynchs@gao.gov (Sarah Lynch - Meeting Notices Only)
MaddenG@BV.com (George Madden)
Margaret.Bennet@dom.com (Margaret Bennet)

maria.webb@pillsburylaw.com (Maria Webb)
mark.beaumont@wsms.com (Mark Beaumont)
Marvin.Smith@dom.com (Marvin L. Smith)
matias.travieso-diaz@pillsburylaw.com (Matias Travieso-Diaz)
media@nei.org (Scott Peterson)
mgiles@entergy.com (M. Giles)
mike_moran@fpl.com (Mike Moran)
mwetterhahn@winston.com (M. Wetterhahn)
nirsnet@nirs.org (Michael Mariotte)
PAC2@nrc.gov (Peter Cochran)
pareez.golub@ge.com (Pareez Golub)
Pat.Woodfin@ge.com (Pat Woodfin)
patriciaL.campbell@ge.com (Patricia L. Campbell)
paul.gaukler@pillsburylaw.com (Paul Gaukler)
Paul@beyondnuclear.org (Paul Gunter)
peter.jordan@ge.com (Peter Jordan)
phinnen@entergy.com (Paul Hinnenkamp)
pshastings@duke-energy.com (Peter Hastings)
RJB@NEI.org (Russell Bell)
RKTemple@cpsenergy.com (R.K. Temple)
roberta.swain@ge.com (Roberta Swain)
ronald.hagen@eia.doe.gov (Ronald Hagen)
sandra.sloan@areva.com (Sandra Sloan)
SauerB@BV.com (Robert C. Sauer)
sfrantz@morganlewis.com (Stephen P. Frantz)
sharon.lyons@ge.com
steven.hucik@ge.com (Steven Hucik)
steven.stark@ge.com (Steven Stark)
tom.miller@hq.doe.gov (Tom Miller)
trsmith@winston.com (Tyson Smith)
VictorB@bv.com (Bill Victor)
waraksre@westinghouse.com (Rosemarie E. Waraks)
wayne.marquino@ge.com (Wayne Marquino)
whorin@winston.com (W. Horin)