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MFN 07-072 Supplement 2

Docket No. 52-010

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U.S. Nuclear Regulatory Commission  
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Subject: **Response to Portion of NRC Request for Additional Information  
Letter No. 83 – Safety Analysis – RAI Number 20.0-4 S02**

Enclosure 1 contains GEH's response to the subject NRC RAIs transmitted via the Reference 1 letter. Enclosure 2 contains markups of the affected ESBWR Tier 2 DCD pages.

If you have any questions or require additional information regarding the information provided here, please contact me.

Sincerely,

*Bathy Sedney for*

James C. Kinsey  
Project Manager, ESBWR Licensing

*DOB*  
*NRD*

Reference:

1. MFN 06-516, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 83 Related to the ESBWR Design Certification Application*, December 7, 2006

Enclosures:

1. MFN 07-072 Supplement 2 – Response to Portion of NRC Request for Additional Information Letter No. 83 – Related to ESBWR Design Certification Application – Generic Issues – RAI Number 20.0-4 S02
2. MFN 07-072 Supplement 2 – Response to Portion of NRC Request for Additional Information Letter No. 83 – Related to ESBWR Design Certification Application – Generic Issues – RAI Number 20.0-4 S02 – DCD Markup Pages

cc: AE Cubbage USNRC (with enclosures)  
DH Hinds GE/ Wilmington (with enclosures)  
BE Brown GE/ Wilmington (with enclosures)  
eDRF 0071-5693

**Enclosure 1**

**MFN 07-072 Supplement 2**

**Response to Portion of NRC Request for**

**Additional Information Letter No. 83**

**Related to ESBWR Design Certification Application**

**Generic Issues**

**RAI Number 20.0-4 S02**

**For historical purposes, the original text of RAIs 20.0-4 and 20.0-4 S01 and the GE response is included. The original attachments and DCD mark-ups are not included to prevent confusion.**

**NRC RAI 20.0-4**

*Provide a consolidated response to New Generic Issue 156.6.1, "Pipe Break Effects on Systems and Components." DCD, Tier 2, Revision 1, Table 1.11-1 only states that this issue is address in Sections 3.5, 3.6, 3.8, and 3.9.*

**GE Response**

GE agrees. The Technical Resolution column for Issue 156.6.1 has been revised to read as follows:

(4) The ESBWR design considers the potential effects of pipe breaks on systems and components. See Sections 3.5, 3.6, 3.8, and 3.9 for details. Section 3.5 addresses the protection of ESBWR components against the effects of missiles. Section 3.6 addresses the protection of ESBWR components against dynamic effects such as pipe whip and jet impingement that is associated with postulated piping ruptures. Section 3.8 addresses the seismic design requirements for structures that contain safety-related components. Section 3.9 addresses the analysis methods used to evaluate Seismic Category I components and supports.

**DCD Impact**

DCD Tier 2, Section 1.11, Revision 3 has been updated for Issue 156.6.1.

**NRC RAI 20.0-4 S01**

*In response to RAI 20.0-4, MFN 07-072, New Generic Issue 156.6.1, "Pipe Break Effects on Systems and Components," GE wrote, see Sections 3.5, 3.6, 3.8, and 3.9 for details.*

*Please provide a description of how the generic issue is addressed with pointers to the lowest specific subsection in the DCD. GE should be clear on which specific aspect of the generic issue is discussed in each referenced DCD subsection..*

**GE Response**

The discussion of New Generic Issue 156.6.1 in Table 1.11-1 will be expanded as requested to describe how the issue is addressed and to provide more specific references to DCD subsections that contain additional details.

**DCD Impact**

The DCD markup for this response is provided in MFN 07-072, Supplement 1.

**NRC RAI 20.0-4 S02**

*Staff has reviewed GE response to Supplement 1 of RAI 20.0-4, concerning New Generic Issue 156.6.1, and has the following additional requests:*

*A. As discussed during the June 13, 2007, conference call, the staff conveyed to GE that missile protection included in DCD, Section 3.5, is not within the scope of New Generic Issue 156.6.1 and therefore, reference to the DCD 3.5 subsections should be deleted from Table 1.11-1.*

*B. As discussed during the June 13, 2007, conference call, the staff conveyed to GE that Table 1.11-1 should include a pointer/discussion of DCD, Section 3.6.1, as it relates to New Generic Issue 156.6.1.*

*C. The revised Table 1.11-1 refers to DCD, Table 3.9-2, for load combination and acceptance criteria for safety-related, ASME Code Class 1, 2, and 3 components, component supports, and Class CS Structures. As discussed during the June 13, 2007, conference call, please clarify which load combination requirement included in DCD, Table 3.9-2 addresses the load combination requirements for design basis pipe breaks related loads as defined and described in Standard Review Plan, Section 3.9.3, Revision 2, March 2007, Tables I and II.*

*D. Section 3.8 addresses the design requirements for seismic category I structures that contain safety-related components. The proposed revision in GE's response, pertaining to Section 3.8 should be modified, as above, to emphasize that Section 3.8 addresses all design requirements, not only seismic design requirements. Staff notes that there are several unresolved Section 3.6 RAIs (3.6-4, 3.6-6, 3.6-7(b), 3.6-7(c), 3.6-7(e), 3.6-8, and 3.6-11 through 3.6-19) that are related to jet forces modeling/evaluation that also apply to New Generic Issue 156.6.1. Therefore, the staff can not conclude that the pipe break effects (including the jet impingement effects) on systems and components are adequately addressed in DCD Section 3.6 until those RAIs are satisfactorily resolved.*

**GE Response**

Item A – GE agrees. References to DCD Section 3.5 and its subsections will be deleted from the discussion of New Generic Issue 156.6.1 in DCD Tier 2 Table 1.11-1.

Item B – GE agrees. References to DCD Subsection 3.6.1 will be added to the discussion of New Generic Issue 156.6.1 in DCD Tier 2 Table 1.11-1.

Item C – The loads as defined and described in SRP 3.9.3, Revision 2, March 2007, Tables I and II, are addressed in DCD Table 3.9-2 as shown in the following table:

	<b>SRP 3.9.3, Rev 2, March 2007, Plant Event</b>	<b>Corresponding DCD Table 3.9-2 Item(s)</b>	<b>Comment</b>
1	Normal Operation (NO)	1	
2	Plant/System Operating Transients (SOT) + OBE	2a + 2b 3	NO + SSE is analyzed instead of combining an SOT + OBE.  See DCD Section 3.7 for further discussion of OBE.
3	Design Basis Pipe Break (DBPB)	5	DBPB corresponds to SBL with Service Level C criteria in DCD Table 3.9-2
4	Main Steam/Feedwater Pipe Break (MS/FWPB)	Bounded by 6	MS/FWPB corresponds to IBL in DCD Table 3.9-2
5	DBPB or MS/FWPB + SSE	6	
6	LOCA	Bounded by 7	
7	LOCA + SSE	7	

Item D – GE agrees. The discussion of Section 3.8 for New Generic Issue 156.6.1 in DCD Tier 2 Table 1.11-1 will be revised to indicate this section addresses all design requirements instead of only addressing seismic design requirements.

#### **DCD Impact**

DCD Tier 2, Table 1.11-1 will be revised as noted in the attached markup for New Generic Issue 156.6.1.

**Enclosure 2**

**MFN 07-072 Supplement 2**

**Response to Portion of NRC Request for**

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**Related to ESBWR Design Certification Application**

**Generic Issues**

**RAI Number 20.0-4 S02**

**DCD Markup Pages**



Table 1.11-1 (continued)

Action Plan Item/Issue Number	Description	Associated Tier 2 Location(s) and/or Technical Resolution
Issue 156.4.2	Testing of the RPS and ESFS.	(4, 6) Covered by ASME Code requirements in accordance with 10 CFR 50.55(a) and the resolution of Issue 120.
Issue 156.6.1	Pipe Break Effects on Systems and Components.	(4) The ESBWR design considers the potential effects of pipe breaks on systems and components. Section 3.6, "Protection Against Dynamic Effects Associated with the Postulated Rupture of Piping," addresses the protection of ESBWR components against dynamic effects such as pipe whip and jet impingement that are associated with postulated piping ruptures. An analysis of pipe break events is performed to identify those safety-related systems, components, and equipment that are required to perform protective actions to mitigate the consequences of the pipe break event within acceptable limits. By means of design features such as separation, barriers, and pipe whip restraints, adequate protection is provided against the effects of pipe break events for safety-related items to an extent that their ability to shut down the plant safely or mitigate the consequences of the postulated pipe failure would not be impaired. Subsection 3.6.1.1 describes the criteria, assumptions, objectives and approach for establishing protection requirements for safety-related equipment. Subsection 3.6.1.3 describes the design evaluation process and the types of protection measures that are considered. Subsection 3.6.2.1 and its subsections establish the criteria for the location and configuration of postulated breaks and cracks. Subsection 3.6.2.2 describes the analytical methods used to define blowdown forcing functions and to perform the pipe-whip dynamic response analyses. Subsection 3.6.2.3.1 discusses the methods and criteria used to evaluate the jet effects resulting from the postulated breaks of high-energy piping on safety-related SSCs. Subsection 3.6.2.3.2 provides the criteria and methods used to evaluate the effects of pipe displacements on safety-related SSCs following a postulated pipe rupture.

Table 1.11-1 (continued)

Action Plan Item/Issue Number	Description	Associated Tier 2 Location(s) and/or Technical Resolution
		<p>Section 3.8, "Seismic Category I Structures," addresses all design requirements for structures that contain safety-related components. These structures are designed to withstand the loads resulting from the dynamic effects of pipe breaks. Subsection 3.8.1.3.5 defines the specific abnormal design loads resulting from pipe breaks that are considered in the design of the containment and its internal structures. Design loads affecting the Reactor Building structure as a result of pipe breaks are summarized in Subsection 3.8.4.3.1.</p> <p>Section 3.9, "Mechanical Systems and Components," addresses the analysis methods used to evaluate Seismic Category I components and supports. Subsection 3.9.1.4 refers to Tables 3.9-1 and 3.9-2 for definitions of the requirements for the assumed number of cycles associated with each design basis event and load combination requirements, respectively.</p>
Issue 157	Containment Performance.	(4) Resolution is specific to the type of containment design. Supplement 3 of Generic Letter 88-20 requested individual licensees of Mark II and Mark III containments to consider insights and improvements identified in the Containment Improvement Program, but did not identify any generic improvements. The ESBWR containment design, as described in Section 6.2, differs from those considered as part of this issue.
Issue 158	Performance of Safety-Related Power-Operated Valves under Design Basis Conditions.	(4)
Issue 159	Qualification of Safety-Related Pumps While Running on Minimum Flow.	(3)