GE Energy

James C. Kinsey
Project Manager, ESBWR Licensing

PO Box 780 M/C J-70
Wilmington, NC 28402-0780
USA

T 910 675 5057
F 910 362 5057
jim.kinsey@ge.com

MFN 07-072 Supplement 1

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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 83 – Safety Analysis – RAI Numbers 20.0-2 S01 and 20.0-4 S01**

Enclosure 1 contains GE'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,

Kathy Sedney for

James C. Kinsey
Project Manager, ESBWR Licensing

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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 1– Response to Portion of NRC Request for Additional Information Letter No. 83 – Related to ESBWR Design Certification Application – Generic Issues – RAI Numbers 20.0-2 S01 and 20.0-4 S01
2. MFN 07-072 Supplement 1– Response to Portion of NRC Request for Additional Information Letter No. 83 – Related to ESBWR Design Certification Application – Generic Issues – RAI Numbers 20.0-2 S01 and 20.0-4 S0 – DCD Markup Pages

cc:	AE Cubbage	USNRC (with enclosures)
	GB Stramback	GE/San Jose (with enclosures)
	BE Brown	GE/ Wilmington (with enclosures)
	eDRF	0067-4203 and 0067-4206

Enclosure 1

MFN 07-072, Supplement 1

Response to NRC Request for

Additional Information Letter No. 83

Related to ESBWR Design Certification Application

Generic Issues

RAI Numbers 20.0-2 S01 and 20.0-4 S01

For historical purposes, the original text of RAIs 20.0-2 and 20.0-4 and the GE response is included. The original attachments and DCD mark-ups are not included to prevent confusion.

NRC RAI 20.0-2

DCD, Tier 2, Revision 1, Table 1C-1 states that GL 92-008 is not applicable because the ESBWR provides strict physical separation between the redundant safety-related divisions without the need for Thermo-Lag 330. This suggests that the ESBWR design, including plant specific electrical designs, does not require any local raceway fire barriers to ensure post-fire safe shutdown. Please confirm.

GE Response

GE confirms that this statement is correct. The ESBWR design meets Reg. Guide 1.75 requirements for separation criteria. Therefore, the ESBWR design does not require the use of Thermo-lag or any fire-retardant wraps.

Affected Documents

DCD Tier 2, Appendix 1C, Table 1C-1, has been updated to refer to RG 1.75 in the entry for GL 92-08.

NRC RAI 20.0-2 S01

NRC Response to GE Response to RAI 20.0-2

Reference GE Letter MFN 07-072, Dated March 19, 2007

The GE response to RAI 20.0-2 states that the ESBWR design does not require the use of Thermo-lag or any fire-retardant wraps because the ESBWR design meets Reg. Guide 1.75 requirements for separation criteria. Regulatory Guide 1.75, Criteria for Independence of Electrical Safety Systems, provides guidance for the electrical separation of safety-related circuits and references IEEE Standard 384-1992 Standard Criteria for Independence of Class 1E Equipment and Circuits, as providing specific details for that separation. However, neither RG 1.75 nor IEEE 384 are the appropriate guidance documents for fire-related separation of post-fire safe-shutdown electrical circuits. For example, the summary of IEEE 384-1992 includes the following statement: Section 8 of IEEE Std 384-1981 was previously included to provide interim criteria for implementation of independence requirements for safe shutdown systems required for exposure to fires. 10 CFR 50, Appendix R, has since been issued to provide the requirements for safe shutdown; consequently, Section 8 has been eliminated from the present issue of this standard. The requirements for separation of redundant trains for post-fire safe shutdown provided by Appendix R are included as guidance in RG 1.189. GE's response to this RAI should address their compliance with this guidance.

Thermo-Lag 330 and other fire-retardant wraps have been used in existing plants where redundant trains are in the same fire area. While the ESBWR generally provides 3-hour passive fire barriers between redundant post-fire safe-shutdown divisions (i.e., each division is located in a separate fire area), DCD, Appendix 9A identifies and evaluates areas of the ESBWR where

this level of separation is not feasible. These evaluations do not mention the use of fire-retardant wraps. GE should confirm that the ESBWR will not need to credit this type of fire barrier in these areas where 3-hour fire barriers cannot be provided to ensure post-fire safe shutdown.

DCD, Tier 2, Rev. 3, Section 9.5.1.3, states, The intent is to avoid the use of electrical raceway fire barrier systems (ERFBS) for ESBWR, relying instead on divisional separation by fire area and structural fire barriers. This statement is consistent with guidance provided by RG 1.189, Revision 1 (to be issued in April 2007). However, the statement leaves open the possibility of adding an ERFBS in the future or for COL applicants to rely on this type of protection and the statement is, therefore, not consistent with GE's response to this RAI (intent is to avoid is not the same as design does not require the use of).

GE Response

The previous RAI response should not have stated that "the ESBWR design does not require the use of Thermo-lag or any fire-retardant wraps because the ESBWR design meets Regulatory. Guide 1.75 requirements for separation criteria."

As indicated in the RAI supplement, the more stringent guidance in Regulatory Guide 1.189 applies to electrical cabling required to support systems needed for post-fire safe shutdown. Regulatory Guide 1.75 applies to electrical separation requirements for all other redundant safety-related equipment and associated electrical cables.

As stated in DCD, Tier 2, Revision 3, Subsection 9.5.1.3, "The intent is to avoid the use of electrical raceway fire barrier systems (ERFBS) for ESBWR." However, if the use of an ERFBS is required, the guidance in Regulatory Guide 1.189 will be followed.

Affected Documents

DCD Tier 2, Appendix 1C, Table 1C in the entry for GL 92-08 will be updated as shown in the attached markup.

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.

Affected Documents

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.

Affected Documents

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

Enclosure 2

MFN 07-072, Supplement 1

Response to NRC Request for

Additional Information Letter No. 83

Related to ESBWR Design Certification Application

Generic Issues

RAI Numbers 20.0-2 S01 and 20.0-4 S01

DCD Markup Pages

Table 1C-1

Operating Experience Review Results Summary – Generic Letters

No.	Issue Date	Title	Evaluation Result or Topic's Tier 2 Location(s)
92-08	12/17/92	Thermo-Lag 330-1 Fire Barriers	Not Applicable. Is a procurement communication. This GL only applies to Thermo-Lag 330-1 fire barrier systems. The design intent for ESBWR is to provide strict physical separation between the redundant safety-related divisions. If it is determined that a fire-wrapping material is required in some locations, an alternative material qualified per the guidance of RG 1.189 will be used. Subsection 9.5.1
93-05	9/27/93	Line-Item Technical Specifications Improvements to Reduce Surveillance Requirements for Testing During Power Operation	Not Applicable. Is an administrative communication. Lessons from the Tech Spec Improvement programs have been factored into the proposed ESBWR Tech Specs. Chapter 16.
93-06	10/25/93	Research Results on Generic Safety Issue 106, "Piping and the Use of Highly Combustible Gases in Vital Areas"	The ESBWR only uses highly combustible gases in any safety-related area for reference gas in the H_2/O_2 monitors. This calibration gas is only used periodically and normally valved out of service. The H_2 bottles are located in a nonsafety-related structure. The lines to the H_2 monitors are very small and would limit the flow in the event of a break. Subsection 9.5.1 and Section 1.11 (Issue 106)
93-08	12/29/93	Relocation of Technical Specification Tables Of Instrument Response Time Limits	Not Applicable. Is an administrative communication.
94-01	5/31/94	Removal of Accelerated Testing and Special Reporting Requirements for Emergency Diesel Generators	Not Applicable. Is a maintenance communication. The ESBWR does not have safety-related emergency diesel generators. There are no surveillance requirements for the nonsafety-related diesel generators.
94-02	7/11/94	Long-Term Solutions and Upgrade of Interim Operating Recommendations for Thermal-Hydraulic Instabilities in BWRs	The ESBWR addresses the concerns of Thermal-Hydraulic Instability. Section 4.4 and Appendix 4D

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 3.5, "Missile Protection," addresses the protection of ESBWR components against the effects of missiles. ESBWR components and equipment are designed to have a low potential for generation of missiles. Seismic Category I ESBWR structures are analyzed and designed to be protected against a wide spectrum of missiles. Subsection 3.5.1 describes the process used to identify potential missiles and how components and equipment are designed to have a low potential for generation of missiles. Subsections 3.5.1.1 and 3.5.1.2 examine the potential for internally generated missiles outside and inside containment, respectively, due to rotating equipment (Subsections 3.5.1.1.1 and 3.5.1.2.1) and pressurized components (Subsections 3.5.1.1.2 and 3.5.1.2.2). Subsections 3.5.1.1.3 and 3.5.1.2.3 discuss where credit is taken in the design for missile-consequence mitigation by structural walls and slabs. Subsection 3.5.2 discusses the equipment requiring protection against missiles by reference to all safety-related SSCs in Table 3.2-1. Subsection 3.5.3 describes the procedures by which structures and barriers are designed to resist potential missiles identified in Subsection 3.5.1. 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

Table 1.11-1 (continued)

Action Plan Item/Issue Number	Description	Associated Tier 2 Location(s) and/or Technical Resolution
		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 3.6.2.1 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. Section 3.8, "Seismic Category I Structures," addresses the seismic 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. 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.
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