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MFN 06-308
Supplement 8

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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. 51 Related to ESBWR Design Certification Application – System Classifications – RAI Number 3.2-3 S02**

Enclosure 1 contains GE's response to the subject NRC Supplemental RAI transmitted via Reference 9.

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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NRO

References:

1. MFN 06-308, Letter from David Hinds to U.S. Nuclear Regulatory Commission, *Response to NRC Request for Additional Information Letter No. 51 Related to ESBWR Design Certification Application – Classification of Structures, Systems and Components – RAI Numbers 3.2-1 through 3.2-62,* September 8, 2006
2. MFN 06-308, Supplement 1, Letter from James C. Kinsey to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 51 Related to ESBWR Design Certification Application – Classification of Structures, Systems and Components – RAI Number 3.2-19 S01,* March 22, 2007
3. MFN 06-308, Supplement 2, Letter from James C. Kinsey to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 51 Related to ESBWR Design Certification Application – RWCU System – RAI Number 3.2-34 S01,* March 26, 2007
4. MFN 06-308, Supplement 3, Letter from James C. Kinsey to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 51 Related to ESBWR Design Certification Application – Classification of Structures, Systems and Components – RAI Numbers 3.2-3 S01 and 3.2-7 S01,* March 26, 2007
5. MFN 06-308, Supplement 4, Letter from James C. Kinsey to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 51 Related to ESBWR Design Certification Application – Turbine Main Steam System – RAI Number 3.2-1 S01,* March 30, 2007
6. MFN 06-308, Supplement 5, Letter from James C. Kinsey to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 51 Related to ESBWR Design Certification Application – Hydraulic Control Unit/Main Steam Piping – RAI Numbers 3.2-16 S01 and 3.2-21 S01,* April 18, 2007
7. MFN 06-308, Supplement 6, Letter from James C. Kinsey to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 51 Related to ESBWR Design Certification Application – Hydraulic Control Unit/Main Steam Piping – RAI Numbers 3.2-16 S01 and 3.2-21 S01,* May 2, 2007
8. MFN 06-308, Supplement 7, Letter from James C. Kinsey to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 51 Related to ESBWR Design Certification Application – System Classification – RAI Numbers 3.2-48 S02,* May 22, 2007
9. Email, Chandu Patel to John Leatherman, *Supplemental requests for information for ESBWR Chapter 3*, May 24, 2007.

Enclosure:

1. MFN 06-308, Supplement 8 – Response to Portion of NRC Request for Additional Information Letter No. 51 Related to ESBWR Design Certification Application – System Classifications – RAI Number 3.2-3 S02

cc:

AE Cubbage	USNRC (with enclosures)
GB Stramback	GE/San Jose (with enclosures)
BE Brown	GE/ Wilmington (with enclosures)
eDRF	00069-6622R1

Enclosure 1

MFN 06-308 Supplement 8

Response to NRC Request for Additional Information

Related to ESBWR Design Certification Application

Classification of Structures, Systems and Components

RAI Number 3.2-3 S02

Original Responses to RAI 3.2-3 and 3.2-3 S01 that were previously submitted under MFN 06-308 and MFN 06-308 Supplement 3 are included to provide historical continuity during review.

Original Response from MFN 06-308

NRC RAI 3.2-3

Revise Section 3.2.2.2 Quality Group B discussion

This section provides no discussion of significant safety systems described in RG 1.26 and Standard Review Plan (SRP) 3.2.2 for Quality Group B systems, such as those which provide reactor shutdown, emergency core cooling, post-accident containment heat removal, postaccident fission product removal, or decay heat removal. Please revise the Section 3.2.2.2 discussion to add these important system functions to the Quality Group B description.

GE Response

After reviewing all the RAIs on Section 3.2, GE decided to update Table 3.2-1 in its entirety to replace Safety Designation with Safety Class. This was done because it was not possible to determine from the table the proper Safety Class for components that were assigned a Safety Designation of Q and a Quality Group of "—". This situation arises for non-pressure-retaining components that in GE's viewpoint are not addressed in RG 1.26. Safety class for these types of components was defined in the revised table on the same basis that was applied for the ABWR design certification.

The requested discussion has been added to a new Subsection 3.2.3.2, which discusses the types of functions and systems that are considered to be in Safety Class 2. GE considers Safety Class 2 to be essentially equivalent to Quality Group B for pressure-retaining portions of systems and their supports.

Systems and functions that primarily fall into Safety Class 2 (and Quality Group B) for ESBWR include the Control Rod Drive system, containment isolation functions in various systems, the Gravity-Driven Cooling System (GDCS), the Isolation Condenser System (ICS) and the Passive Containment Cooling System (PCCS).

DCD Impact

Markups of the DCD were provided in MFN 06-308.

Response to Supplement 1 from MFN 06-308 Supplement 3

NRC RAI 3.2-3 S01

Email from Jim Gaslevic on 11/20/06

Item 3.2-3 a.

In the response to RAI 3.2-3, certain systems that perform a safety function identified in RG 1.26 as Quality group B were reclassified from Quality Group C to Quality Group B. For example, the GDCS was previously classified as Quality Group C and after further review is now classified as Quality Group B. However, Section 3.2.2.2 was not revised to include quality classification criteria for systems that provide an Emergency Core Cooling function such as the GDCS. The applicant is requested to submit a revision to Section 3.2.2.2 and Section 3.2.2.3 that includes the classification criteria for systems that perform an emergency core cooling function and other applicable safety functions to be consistent with revised Table 3.2-1 and RG 1.26.

Item 3.2-3 b.

In the response to RAI 3.2-3, safety classifications based on ANS 58.14 were identified and included in Table 3.2-1. DCD Section 3.2.3.1 defines Safety Class 1 as applicable to components of the reactor coolant pressure boundary (as defined in 10 CFR 50.2) and their supports whose failure could cause a loss of reactor coolant at a rate in excess of the normal makup system. GE is requested to clarify the maximum size of the piping connected to the RCPB that is excluded from Safety Class 1 on the basis of reactor coolant makup capability. Also, ANS 58.14 is currently withdrawn and has not been endorsed by the NRC. Until this standard is updated and submitted for endorsement, this remains an open item and safety class is subject to further review during the COL application.

GE Response

Item 3.2-3a

GE agrees with this request and has modified DCD Tier 2 Sections 3.2.2.2 and 3.2.2.3 in Revision 3 based on Regulatory Guide 1.26 to provide a more complete discussion of the criteria used to assign components to Quality Groups B and C.

Item 3.2-3b

The maximum diameter of piping connected to the RCPB that is excluded from Safety Class 1 on the basis of reactor coolant makeup capability is 25-mm (1-inch) piping. This is already stated in DCD Tier 2 Subsection 3.2.3.2 as Item (5) of the second list in the subsection.

This is the same value that was applied for the ABWR design and is somewhat conservative for application to ESBWR. For ABWR, a reactor coolant makeup capability of 182 m^3/hr (800 gpm) provided by the Reactor Core Isolation Cooling (RCIC) System was considered to establish this value. For ESBWR, a reactor coolant makeup capability of no less than 3920 liters/minute (1036 gpm) is provided by the high pressure makeup flow of the Control Rod Drive System (see DCD Tier 2 Table 4.6-1). Thus, the ABWR value for the maximum diameter of piping connected to the RCPB that is excluded from Safety Class 1 is conservatively applicable to ESBWR because ESBWR has a higher reactor coolant makeup capability than ABWR.

GE is aware of the withdrawn status of ANS 58.14 and that it is not officially endorsed by the NRC. However, DCD Tier 2 Subsection 3.2.3 describes the basis used by GE to assign a safety class to ESBWR structures, systems and components (SSCs). While the description of safety classes in DCD Tier 2 Subsection 3.2.3 is based on ANS 58.14 (and its predecessor standard, ANS 52.1), the NRC can review this DCD section independently of the supporting ANS standards as a basis for assigning a safety class to ESBWR SSCs. This should allow any open items that might be identified with respect to safety class to be resolved during design certification.

DCD Impact

DCD Tier 2, Subsections 3.2.2.2 and 3.2.2.3 have been modified in Revision 3 to address Item 3.2-3a.

Item 3.2-3b has no DCD impact.

NRC RAI 3.2-3 S02

Email from Chandu Patel, Supplemental requests for information for ESBWR Chapter 3, 05/24/07

Regarding 3.2-3b, the response acknowledges that GE is aware of the withdrawn status of ANS 58.14 and that the NRC has not endorsed this standard. Until this standard is revised and submitted for NRC endorsement, the application of this document to ESBWR can not be endorsed by the NRC. This remains an open item that may be resolved by a licensing commitment to submit the ANS accepted standard for NRC endorsement.

GE Response

GE will remove the references to the American Nuclear Society Standard, ANS 58.14-1993, "Safety and Pressure Integrity Classification Criteria for Light Water Reactors" from DCD Tier 2 Section 3.2. This is being done due to the NRC's concerns regarding the fact that this standard has been withdrawn and because the NRC has not endorsed it in any regulatory guidance issued at the time of docketing the ESBWR design certification application. Therefore, the NRC should no longer consider this an "open item" and GE will not commit to submit ANS 58.14 for NRC endorsement. GE requests that this portion of RAI 3.2-3 be considered closed. The basis for this response is provided below.

Basis for Response

As GE has explained in Section 3.2 of the ESBWR Design Control Document, the NRC regulatory requirements define the structures, systems, and components that must be safety-related in 10 CFR 50.2, as follows:

> *Safety-related structures*, systems and components means those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:
>
> (1) The integrity of the reactor coolant pressure boundary
>
> (2) The capability to shut down the reactor and maintain it in a safe shutdown condition; or
>
> (3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to the applicable guideline exposures set forth in § 50.34(a)(1) or § 100.11 of this chapter, as applicable.

It is this definition and NRC regulatory requirements that set forth the regulatory framework for assigning a safety and quality classification to structures, systems, and components that must be met. NRC regulatory guidance is provided in certain regulatory guides, which are referenced in Section 3.2 (also see NRC RG 1.206, for preliminary use, Section C.I.3.2.2, which provides similar information and which is excerpted in the attachment to this response). GE used these regulatory guides to further develop its approach for classifying structures, systems, and components as delineated in Section 3.2 and requests that the NRC review Section 3.2 in accordance with those regulatory guides and the Standard Review Plan applicable to the ESBWR design certification application. The Design Control Document need not reference, and GE's classification scheme is not dependent upon, ANS 58.14. Therefore, ANS 58.14 will no longer be referenced in Section 3.2 of the Design Control Document.

With regard to NRC's RAI 3.2-3 S02, it is neither necessary nor appropriate for GE to make a commitment to request NRC endorsement of an industry standard in the ESBWR review proceeding. First, GE has no control over the ANS standards committee responsible for revising this or any other standard. Second, ANS may not revise ANS 58.14 for quite some time, potentially well after the NRC has completed its review of the ESBWR design certification application and perhaps even after the first Combined License applications referencing the ESBWR design have been reviewed and approved. Indeed, ANS 58.14 may never be revised beyond the 1993 version. Third, NRC requirements and guidance in effect at the time of docketing the ESBWR design certification application form the basis for NRC's review of the application. Finally, as related to ANS 58.14-1993, the standard is clearly recognized and endorsed for specific use in NRC guidance (albeit still preliminary guidance) for developing new reactor licensing applications, such as a design certification application or a combined license application.

Specifically, Section C.I.6.3.2.3 of DG-1145 and RG 1.206 (Issued for Preliminary Use) endorses the use of ANS 58.14-1993 for classification of ECCS components. Specifically, RG 1.206 (for preliminary use), Section C.I.6.3.2.3, "Applicable Codes and Classifications," states:

> "Identify the applicable industry codes and classifications for the design of the system. An acceptable method to implement safety and pressure integrity classification of ECCS components is to use American National Standards Institute/American Nuclear Society (ANSI/ANS) 58.14-1993 (or later version)."

Although DG-1145 and RG 1.206 had not been issued when the ESBWR design certification application was docketed, the guidance provides useful insights in the review of the application. GE also notes, with regard to the "withdrawn" status of ANS 58.14 (1993), Reference 1 (see below) is a letter from ANS to the NRC Rules and Directives Branch, which commented on DG-1145. ANS makes the following statement in the table attached to its letter:

> "General comment for ANS-22: Direct reference to ANS standard is appropriate for any of the standards. This is especially true for ANS 58.14."

ANS also states in its comment letter regarding "withdrawn" standards in general:

> "It should be noted that standards require constant maintenance in a cycle of reaffirmation and revision. When standards are withdrawn, it is not necessarily for reason of technical or other deficiency. It is often because the incentive to expend

volunteer resources for revision could be limited particularly if the needs of design and operation requirements have already been fulfilled."

These statements make it clear that ANS still supports ANS 58.14-1993 as an acceptable standard to use for defining safety class even though it was officially withdrawn in 2003.

Based on the above discussion, GE still considers ANS 58.14-1993 to be an appropriate and acceptable standard to use for determining the safety class of structures, systems and components, and will use it as guidance to inform decisions on classifying equipment in accordance with NRC regulatory requirements, which govern NRC's review of the ESBWR design certification. However, GE will remove the references to ANS 58-14-1993 from Section 3.2 of the Design Control Document.

DCD Impact

References to ANS 58.14-1993 will be removed from Section 3.2 of the DCD as shown in the attached markup. However, in the event that it appears to be appropriate to refer to ANS 58.14-1993, it is GE's intent that it be only in reference to its use for providing useful insights in meeting NRC regulatory requirements that form the basis for the NRC's review of the ESBWR design certification application.

Reference

1. Letter, American Nuclear Society to Rules and Directives Branch, Office of Administration, US Nuclear Regulatory Commission, *American Nuclear Society (ANS) Standards Committee Comments and Input to DG-1145, "Combined License Applications for Nuclear Power Plants (LWR Edition)*," October 20, 2006.

Attachment

Excerpt from RG 1.206 (for preliminary use), Section C.I.3.2.2.

Attachment to GE's Response to NRC RAI 3.2-3 S02

Note that this is included for information only. This NRC regulatory guidance provides only useful insights to inform the review of the ESBWR design certification application, which was docketed prior to the issuance of such guidance, and does not form the basis for NRC decisions on the ESBWR design certification application. Reference 10 CFR 50.34(h) and 10 CFR Part 52 (2005).

Excerpt from NRC RG 1.206 (Issued for Preliminary Use):

C.I.3.2.2 System Quality Group Classification

The applicant should identify those fluid systems or portions thereof that are important to safety, as well as the applicable industry codes and standards for each pressure-retaining component. Section 50.55a, "Codes and Standards," of 10 CFR Part 50 specifies quality requirements for the RCPB, and Regulatory Guide 1.26 describes a quality group classification system and relates it to industry codes for water- and steam-containing fluid systems. Regulatory Guide 1.143 provides recommendations regarding system quality group classification and/or standards for radioactive waste management systems, and Regulatory Guide 1.151 provides this same information for instrument sensing lines. The applicant should indicate the extent to which it has followed the recommendations of Regulatory Guide 1.26, Regulatory Guide 1.143, and Regulatory Guide 1.151. The applicant should identify any differences between the recommendations and its application and justify each proposed quality group classification in terms of the reliance placed on those systems that perform any of the following functions:

(1) prevent or mitigate the consequences of accidents and malfunctions originating within the RCPB
(2) permit reactor shutdown and maintenance in the safe shutdown condition
(3) contain radioactive material

For such systems, the applicant should specify the proposed design features and measures that it would apply to attain a quality level equivalent to the level of the Regulatory Guide 1.26, Regulatory Guide 1.143 and Regulatory Guide 1.151 classifications (as applicable), including the quality assurance programs that would be implemented. The applicant should discuss the group classification boundaries of each safety-related system. The classifications should be marked/noted on drawings at valves or other appropriate locations in each fluid system where the respective classification changes in terms of the NRC group classification letters (for example, from A to B, B to C, C to D, as well as other combinations) or, alternatively, in terms of corresponding classification notations that can be referenced with those classification groups in Regulatory Guide 1.26, Regulatory Guide 1.143, and Regulatory Guide 1.151 as applicable.

acceptable for determination of seismic loads on NS structures and equipment including those designated as Regulatory Treatment of Non-Safety Systems (RTNSS). Refer to Appendix 19A, Table 19A-1 for a list of RTNSS SSCs.

3.2.2 System Quality Group Classification

The ESBWR meets the acceptance criteria of SRP 3.2.2 (Reference 3.2-3). NRC Regulatory Guide 1.26 (Reference 3.2-4) describes a quality group classification method for fluid systems and relates it to industry codes. Items are classified by Quality Group A, B, C or D, as indicated in Table 3.2-3. Table 3.2-3 tabulates the design and fabrication requirements for each quality group, as defined in Regulatory Guide 1.26.

Table 3.2-1 shows the quality group classifications for ESBWR components. Although not within the scope of the regulatory guide, the containment boundaries that are within the scope of ASME Code, Section III, are assigned quality group classifications in accordance with Table 3.2-2.

Due to the use of many passive safety-related systems in ESBWR, the definitions of the Quality Groups provided in Regulatory Guide 1.26 can be somewhat misleading when trying to apply them directly to the ESBWR design. The following definitions in this section are consistent with the definitions in Regulatory Guide 1.26 but have been modified to more accurately describe their application to the ESBWR design.

3.2.2.1 Quality Group A

Quality Group A (QGA) applies to pressure-retaining portions and supports of mechanical items that form part of the RCPB and whose failure could cause a loss of reactor coolant in excess of the reactor coolant normal makeup capability. These items are designed to meet the ASME Boiler and Pressure Vessel Code, Section III. Remaining portions of the RCPB are classified in accordance with Subsection 3.2.2.2.

3.2.2.2 Quality Group B

Quality Group B (QGB) applies to pressure-retaining portions and supports of containment and other mechanical items, requirements for which are within the scope of ASME Boiler and Pressure Vessel Code, Section III. These items are not assigned to QGA and are relied upon to accomplish one or more of the following safety-related functions:

- Maintain pressure integrity of RCPB items that are not QGA.
- During or following design basis accidents whose consequences could result in potential offsite exposures comparable to the guidelines of 10 CFR 50.34(a)(1). These items include those that:
  - Maintain pressure integrity of the containment, containment isolation, or extension of containment.
  - Maintain pressure integrity of items that are (1) exterior to the containment; (2) communicate with the RCPB or containment interior; and (3) are not isolated normally, cannot be automatically isolated, or are not isolated following design basis accident or anticipated operation occurrence (transient).

for their safety functions and that (1) do not operate during any mode of normal reactor operation and (2) cannot be adequately tested should be classified as Quality Group B.

b. Cooling water and seal water systems or portions of these systems important to safety that are designed for functioning on components and systems important to safety, such as reactor coolant pumps, diesels, and control room.

c. Systems or portions of systems that are connected to the reactor coolant pressure boundary and are capable of being isolated from that boundary during all modes of normal reactor operation by two valves, each of which is either normally closed or capable of automatic closure.

d. Systems, other than radioactive waste management systems, not covered by items a. through c. above that contain or may contain radioactive material and whose postulated failure would result in conservatively calculated potential offsite doses (using methodology as recommended by Regulatory Guide 1.3) that exceed 0.5 rem to the whole body or its equivalent to any part of the body. For those systems located in Seismic Category I structures, only single component failures need be assumed.

Quality Group C may also be assigned to Nonsafety-Related equipment in some instances.

3.2.2.4 Quality Group D

Quality Group D (QGD) applies to pressure-retaining portions and supports of items that are not assigned to QGA or QGB, or QGC but (1) are within the scope of the codes and standards defined on Table 3.2-3, and (2) are subject to one or more significant licensing requirements or commitments. These items include those that:

- Process, extract, encase, or store radioactive waste.
- Monitor radioactive effluents to ensure that release rates or total releases are within limits established for normal operation and design basis transients.
- Resist failure that could prevent any QGA, QGB or QGC items from performing a safety-related function
- Protect items necessary to attain or maintain safe shutdown following fire.

3.2.3 Safety Classification

Safety-related structures, systems, and components of the ESBWR Standard Plant are classified for design requirements as Safety Class 1, Safety Class 2, or Safety Class 3 in accordance with their safety importance. These safety classifications are identified on Table 3.2-1 for principal structures, systems, and components. Components within a system are assigned different safety classes depending upon their differing safety importance; a system may thus have components in more than one safety class. Safety classification for supports within the scope of ASME Code Section III depends upon that of the supported component.

This section provides definitions of the safety classes and gives examples of their broad application. Because of specific design considerations, these general definitions are subject to interpretation and exceptions. Table 3.2-1 identifies component classifications on a component-by-component basis for primary components.

3.2-4 USNRC, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," Regulatory Guide 1.26.

3.2-5 (Deleted)

3.2-6 International Building Code – 2003 by International Code Council, Inc. (300-214-4321).

3.2-7 NRC Regulatory Guide 1.3, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Boiling Water Reactors."

3.2-8 NRC Regulatory Guide 1.97, "Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants."