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MFN 08-830

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Subject: **Response to Portion of NRC Request for Additional Information Letter Nos. 176, and 160 - Related to ESBWR Design Certification Application – Design of Structures, Components, Equipment, and Systems - RAI Numbers 3.11-20 S01 and 3.11-25**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to a portion of the U.S. Nuclear Regulatory Commission Request for Additional Information (RAI) sent by NRC Letters 176 and 160 (References 1 and 2). The GEH response to RAI Numbers 3.11-20 S01 and 3.11-25 are addressed in Enclosure 1.

The original RAI 3.11-20 was received from the NRC on January 14, 2008 (Reference 3), and the GEH response was transmitted to the NRC on March 27, 2008 (Reference 4).

If you have any questions about the information provided here, please contact me.

Sincerely,

Richard E. Kingston

Richard E. Kingston
Vice President, ESBWR Licensing

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NRO

References:

1. MFN 08-375, *Letter from the U.S. Nuclear Regulatory Commission to Robert E. Brown, Request for Additional Information Letter No. 176, Related To ESBWR Design Certification Application*, dated April 10, 2008 (RAI 3.11-20 S01)
2. MFN 08-221, *Letter from the U.S. Nuclear Regulatory Commission to Robert E. Brown, Request for Additional Information Letter No. 160, Related To ESBWR Design Certification Application*, dated March 6, 2008 (RAI 3.11-25)
3. MFN 08-029, *Letter from the U.S. Nuclear Regulatory Commission to Robert E. Brown, Request for Additional Information Letter No. 124, Related To ESBWR Design Certification Application*, dated January 14, 2008
4. MFN 08-296, *Response to Portion of NRC Request for Additional Information Letter No. 124 Related to ESBWR Design Certification Application - Design of Structures, Components, Equipment, and Systems - RAI Number 3.11-20* dated March 27, 2008

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter Nos. 176 and 160, Related to ESBWR Design Certification Application – Design of Structures, Components, Equipment, and Systems - RAI Numbers 3.11-20 S01 and 3.11-25

cc:

AE Cubbage	USNRC (with enclosure)
RE Brown	GEH/Wilmington (with enclosure)
DH Hinds	GEH/Wilmington (with enclosure)
eDRF	0000-0092-6577

Enclosure 1

MFN 08-830

Response to Portion of NRC Request for

Additional Information Letter Nos. 176 and 160

Related to ESBWR Design Certification Application

Design of Structures, Components, Equipment, and Systems

RAI Numbers 3.11-20 S01 and 3.11-25

For historical purposes, the original text of RAI 3.11-20 and the GE response is included. This response does not include any attachments or DCD mark-ups.

NRC RAI 3.11-20

NRC Summary:

Provide Radiation Environment Conditions Inside Reactor Building and Control Building during Accident Conditions

NRC Full Text:

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.

GEH Response

DCD Rev 3 Tables 3H-6 and 3H-7 had their titles revised as part of an effort to make the text in all the table titles in appendix 3H consistent for inclusion in DCD Rev 4. When the revisions were made to DCD Rev 3, the title for Tables 3H-6 and 3H-7 were mislabeled. The title should reflect that these tables present the limit for radiation environment conditions as was stated in DCD Rev 3. Radiation conditions for normal operation and accident conditions can be found in DCD Tier 2, Section 12.3 figures. The title for Tables 3H-6 and 3H-7 as well as the corresponding cross-referencing will be corrected in the next revision of the DCD. Text changes for clarification will also be added to the DCD.

DCD Impact

DCD Tier 2, Sections 3H.3.1 and 3H.3.2 will be revised as noted in the attached markup.

DCD Tier 2, Tables 3H-6 and 3H-7 will be revised as noted in the attached markup.

NRC RAI 3.11-20 S01

NRC Summary:

Provide details about the method used for determining the environmental conditions in Tables 3H-6 and 3H-7.

NRC Full Text:

In GEH response to RAI 3.11-20 in MFN 08-296 dated March 27, 2008, GEH stated that GEH mislabeled Tables 3H-6 and 3H7 as "Environment for Normal Operating Conditions," and that these tables now provide radiation environmental conditions under reactor accidents.

1. *Please provide reactor accident source term used to calculate integrated gamma doses inside the Reactor Building and Control Building as shown in the ESBWR DCD Revision 4, Tables 3H-6 and 3H-7.*

2. *Please provide a sample calculation GEH performed to calculate integrated gamma doses inside the Reactor Building and Control Building as shown in Tables 3H-6 and 3H-7.*

3. *If GEH used a computer code(s), please state name(s) of the code and provide its input and output files.*

GEH Response

The information in Tables 3H-6 and 3H-7 is based on typical EQ qualification doses for equipment located in the reactor and control buildings at operating reactors. The values in these tables are considered representative and equipment will be qualified in accordance with the environmental qualification program described in DCD Tier 2 section 3.11.3 using the methodology contained in Regulatory Guide 1.183, Appendix I. The integrated doses will be developed for specific locations in the reactor and control buildings in accordance with DCD Tier 1 Table 3.8-1, Environmental Qualification of Mechanical and Electrical Equipment.

DCD Impact

DCD Tier 2, Revision 5, Appendix 3H Subsection 3H.3.2 and Appendix 3H Tables 3H-6 and 3H-7 were revised to clarify the source of information for Tables 3H-6 and 3H-7 and changes incorporated in Revision 5 of the DCD.

NRC RAI 3.11-25

NRC Summary:

For Table 3H-6, explain how the integrated gamma doses were calculated and, for the areas where these doses exceed the integrated dose that the equipment is qualified for, describe how the equipment will be protected from these high integrated doses during normal operating conditions.

NRC Full Text:

The following apply to DCD Tier 2, Revision 4, Table 3H-6;

a) *using the average operating dose rates shown in Figures 12.3-1 through 12.3-8 for each of the areas listed in Table 3H-6, the 60-year integrated doses calculated by the staff appear to be well below the integrated doses listed in Table 3H-6 for most of these areas. Show how the integrated gamma dose values listed in the second column of Table 3H-6 were calculated and, for one of the plant zones listed in Table 3H-6, provide a sample calculation showing how the zone area dose rate and integrated dose were calculated.*

b) *explain why Table 3H-6 lists two different integrated doses for some areas and only a single integrated dose value for other areas,*

c) *on the basis of the normal operation dose rates shown in Figures 12.3-1 through 12.3-8, the 60-year integrated doses for some of the areas listed in Table 3H-6 exceed the 104 rad qualification criteria for electronic equipment stated in the footnote for Table 3H-6. For each of these areas (those areas where the plant radiation zone designation is Zone D (25 mRem/hr) or greater), describe what plant design features (e.g. shielding, equipment location) will be used to ensure that the electronic equipment in these areas will not be exposed to integrated radiation doses that will exceed the equipment qualification for radiation,*

d) *the integrated gamma dose listed in Table 3H-6 for the Main Steam Tunnel is listed as less than 107 rads. Since this value exceeds the equipment qualification values for both electronic equipment (104 rads) and other equipment (106 rads) as stated in the footnote for this table, describe the plant design features which will be used in the Main Steam Tunnel to ensure that the radiation qualification limits of the equipment in this area will not be exceeded.*

GEH Response

a) See response to RAI 3.11-20 S01. The information in Tables 3H-6 and 3H-7 is not based on Figures 12.3-1 through 12.3-8. The data provided is based on typical integrated doses used for qualification of safety related equipment in existing operating reactors.

b) If two values are listed in Table 3H-6, the first value is for electronic equipment and the second value is for other non-electronic equipment located in the same area.

c) Specific plant design features to maintain radiation exposure to electronic equipment less than the equipment qualification levels in the reactor building will be evaluated during the detailed design process and in accordance with DCD Tier 1 Table 3.8-1. These analyses will evaluate each specific equipment location and determine design features needed to maintain integrated doses less than the qualification criteria. If the integrated dose exceeds the equipment qualification values after the detailed calculations, shielding or other methods (e.g., equipment replacement program) to reduce the dose will be incorporated during the detailed design.

   A detailed description of the radiation environment qualification process is in DCD Tier 2 Subsection 3.11.3 and in regard to equipment exceeding integrated dose levels. (MFN 08-086 S42)

d) Specific plant design features to maintain radiation exposure to equipment less than the equipment qualification levels in the main steam tunnel will be evaluated during the detailed design process and in accordance with DCD Tier 1 Table 3.8-1. These analyses will evaluate each specific equipment location and determine design features needed to maintain integrated doses less than the qualification criteria for electronic equipment. If the integrated dose exceeds the equipment qualification values after the detailed calculations, shielding or other methods (e.g., equipment replacement program) to reduce the dose will be incorporated during the detailed design.

A detailed description of the radiation environment qualification process is addressed in DCD Tier 2 Subsection 3.11.3 and in regard to equipment exceeding integrated dose levels. (MFN 08-086 S42)

DCD Impact

DCD Tier 2, Revision 5, Appendix 3H Subsection 3.H.3.2 and Appendix 3H Tables 3H-6 and 3H-7 were revised to clarify source of information and changes incorporated in Revision 5 of the DCD.