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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 296 Related to ESBWR Design Certification Application – Electrical Power - RAI Numbers 8.3-61, 8.3-63 and 8.3-65**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) responses to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAIs) sent by NRC letter No. 296, dated January 13, 2009 (Reference 1).

GEH responses to RAIs 8.3-61, 8.3-63 and 8.3-65 are provided in Enclosure 1. Enclosure 2 provides any affected DCD Sections.

Sincerely,

Richard E. Kingston

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Vice President, ESBWR Licensing

Reference:

1. MFN 09-052 - Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, GEH, *Request For Additional Information Letter No. 296 Related To ESBWR Design Certification Application*, dated January 13, 2009

Enclosure:

1. MFN 09-100 -Response to Portion of NRC Request for Additional Information Letter No. 296 Related to ESBWR Design Certification Application – Electrical Power - RAI Numbers 8.3-61, 8.3-63, and 8.3-65.
2. MFN 09-100 -Response to Portion of NRC Request for Additional Information Letter No. 296 Related to ESBWR Design Certification Application – Electrical Power - RAI Numbers 8.3-61 DCD Markups.

cc:	AE Cubbage	USNRC (with enclosure)
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EDRF Section	0000-0098-5754 (RAI 8.3-61)
	0000-0098-6270 (RAI-8.3-63)
	0000-0098-5756 (RAI-8.3-65)

MFN 09-100

Enclosure 1

Response to Portion of NRC Request for Additional Information Letter No. 296 Related to ESBWR Design Certification Application

Electrical Power

RAI Numbers

8.3-61, 8.3-63 and 8.3-65

NRC RAI 8.3-61

RG 1.6, "Independence between Redundant Standby (Onsite) Power Sources and between their Distribution Systems", addresses the GDC 17 requirement that onsite electrical power systems have sufficient independence to perform their safety functions assuming a single failure. ESBWR DCD, Rev. 5, Section 8.3.2.2.2, indicates that this RG is not applicable to the ESBWR design. This contradicts Table 8.1-1 of the FSAR. Section 8.3.2 describes the DC Power System and RG 1.6 is applicable. Revise the section related to RG 1.6 and discuss how the RG 1.6 positions are met.

GEH Response

DCD Rev 5 Tier 2 Subsection 8.1.5.2.4, Regulatory Guide 1.6 states that, "The ESBWR Standard Plant does not need or have safety-related standby power sources; however, portions pertaining to the safety-related DC system are addressed within Subsection 8.3.2. The ESBWR offsite and onsite nonsafety-related power sources do comply with independence and redundancy between their sources and distribution systems." As described in RAI 14.3-394 SO1 (MFN 08-917), the preferred power sources are clearly described and the independence and redundancy is discussed.

The applicability statement found in Subsection 8.3.2.2.2 for RG 1.6 has an editorial error that states RG 1.6 for "Standby (Onsite) Power Sources" is not applicable to the passive ESBWR design. GEH has acknowledged in Subsection 8.1.5.2.4 that RG 1.6 is only applicable as applied to the safety-related DC power sources and to the nonsafety-related onsite and offsite power sources as related to independence and redundancy between their sources and distribution systems and does not state that RG 1.6 is not applicable. As described in RAI 14.3-394 SO1 (MFN 08-917) at Subsection 8.3.1.2.1, the requirements of GDC 17, as referenced in RG 1.6, have been met to ensure GDC 17 is met with respect to the two preferred power sources that include offsite and onsite power up to the safety-related Isolation Power Centers.

GEH will revise the applicability text at Subsection 8.3.2.2.2 for RG 1.6 to duplicate the text in Subsection 8.1.5.2.4. This deletes the misleading statement at Subsection 8.3.2.2.2 that states RG 1.6 is not applicable to the ESBWR Standard Plant.

DCD Impact

DCD Tier # 2, Subsection 8.3.2.2.2 for RG 1.6 will be revised in Revision 6, as noted in the attached markup to reflect Subsection 8.1.5.2.4 as described above.

NRC RAI 8.3-63

The ESBWR DCD, Rev. 5, Section 8.3.2.2.1 states that the safety-related batteries meet the qualification requirements of IEEE 535, "Standard for Qualification of Class 1E Lead Storage Batteries for Nuclear Power Generating Stations". Section 1.1, "Scope", of IEEE Std 535 states that the standard describes qualification methods for Class 1E vented lead acid batteries and consideration of other type batteries are beyond the scope of the standard.

Given that IEEE Std 535 does not apply to VRLA batteries, explain how these batteries are going to be qualified, including both the methods used and the process flow.

GEH Response

NRC RG 1.158 endorses IEEE Std 535-1986. The scope of IEEE Std 535-1986 is Class IE lead storage batteries. NRC has not endorsed IEEE STD 535 ™-2006, which has the scope of Class 1E vented lead acid batteries.

As noted in the response to RAI 8.3-62, GEH has decided to change the ESBWR safety-related batteries to Vented Lead Acid (VLA).

The method of qualification of the VLA batteries is discussed in the response to RAI 8.3-64 submitted in MFN 09-187.

DCD Impact

No DCD changes will be made in response to this RAI.

NRC RAI 8.3-65

The ESBWR DCD, Rev. 5, Section 8.3.2.1.1 states that the batteries have an expected 20-year service life. The surveillance frequency for SR 3.8.3.6 changes from 24 months to 12 months once the batteries reach 85 percent of the expected life. However, the expected 20 year service life has not been justified. Provide detailed information that supports this statement along with the methodology used to verify the life expectancy.

GEH Response

RAI 8.3-64 has provided the detailed process that qualifies a safety-related battery to ensure that it has greater than a 20-year service life. The DCD Subsection 8.3.2.1.1 states that, "Batteries are sized for the DC load in accordance with IEEE 485 with an expected 20 year service life and include margin to compensate for uncertainty in determining the battery state of charge."

The Surveillance Requirement mentioned in the second sentence of this RAI has no relation to the qualification procedure nor does the statement that the battery has to be "justified" for a 20-year service life. It is noted that RAI 8.3-52 SO3, MFN 07-165, Supplement 2, of 12/11/2007, provided Table 8.3-3, 250VDC Safety-related Battery Nominal Load Requirements, in revision 5. This Table reflects a sizing load calculation that was performed using lead acid batteries and the calculation was brought to the NRC to audit, prior to Revision 5 of the DCD. The qualification for large lead acid batteries will be performed as described in RAI 8.3-64 (MFN 09-187) as discussed in Section 3.11 of the DCD. The batteries will be procured from a certified Appendix B supplier to meet the specified qualification requirements. GEH believes that the word, "justified" should have been "qualified", as described above.

DCD Impact

No DCD changes will be made in response to this RAI.

MFN 09-100

Enclosure 2

Response to Portion of NRC Request for Additional Information Letter No. 296 Related to ESBWR Design Certification Application

Electrical Power

RAI 8.3-61 DCD Markups

the auxiliary voltage transformer, which results in charger shutdown. Loss of charger input voltage and charger shutdown is alarmed in the control room.

Ventilation

Battery rooms are ventilated by a system designed to remove the minor amounts of gas produced during the charging of batteries. The system is designed to preclude the possibility of hydrogen accumulation. Refer to Subsection 9.4.7.

8.3.2.2 Analysis

8.3.2.2.1 Safety-Related DC Power Systems

The 480 VAC power supplies for the divisional battery chargers are from the individual Isolation Power Centers to which the particular 250 VDC system belongs (Figure 8.1-3). These Isolation Power Centers are fed directly from the PIP nonsafety-related buses, which are backed up by the standby diesel generators. In this way, separation between the independent systems is maintained and the AC power provided to the chargers can be from either preferred or standby AC power sources.

The DC system is arranged so that the probability of an internal system failure resulting in loss of that DC power system is extremely low. A ground detection system is employed for prompt detection of grounds. Important system components are either self-alarming on failure, or capable of clearing faults, or being tested during service to detect faults. Each battery set is located in its own ventilated battery room. All abnormal conditions of important system parameters such as system grounds, charger failure and low bus voltage are alarmed in the main control room and/or locally.

8.3.2.2.2 Regulatory Requirements and Guides

The following analyses demonstrate compliance of the safety-related Divisions 1, 2, 3 and 4 DC power systems to NRC GDC, NRC Regulatory Guides, and other criteria consistent with the SRP. The analyses establish the ability of the system to sustain credible single active failure with one division already out of service and the remaining two divisions retain their capacity to function for 72 hours before requiring recharge.

The following list of criteria is addressed in accordance with Table 8.1-1, which is based on Table 8-1 of the SRP. In general, the ESBWR is designed in accordance with all criteria. Any exceptions or clarifications are so noted.

GDC:

- GDC 2, 4, 17, 18 and 50 - The DC power system complies with these GDC, which are generically addressed in Subsection 8.1.5.2.4.

Regulatory Guides:

- Regulatory Guide 1.6, "Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems." The ESBWR Standard Plant does not need or have any safety-related standby AC power sources; ~~therefore this Regulatory guide is not applicable to the ESBWR design (see Table 8.1-1). However, t~~however, portions pertaining to the safety-related DC system are addressed within

Subsection 8.3.2. The ESBWR offsite and onsite nonsafety-related power sources do comply with independence and redundancy between their sources and distribution systems.

- Regulatory Guide 1.32, "Criteria for Power Systems for Nuclear Power Plants." Safety-related DC power sources are provided to support passive core cooling and containment integrity safety functions. No offsite or diesel-generator-derived AC power is required for 72 hours.
- Regulatory Guide 1.47, "Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems."
- Regulatory Guide 1.53, "Application of the Single Failure Criteria to Safety Systems."
- Regulatory Guide 1.63, "Electric Penetration Assemblies in Containment Structures for Nuclear Power Plants."
- Regulatory Guide 1.75, "Criteria for Independence of Electrical Safety Systems." Safe shutdown relies only upon DC-derived power and meets the design requirements for physical independence.
- Regulatory Guide 1.106, "Thermal Overload Protection for Electrical Motors and Motor Operated Valves." The ESBWR does not require electric motors or motor operated valves to perform any safety-related function, therefore this regulatory guide is not applicable.
- Regulatory Guide 1.118, "Periodic Testing of Electric Power and Protection Systems." (See Subsection 13.5.2 for Operating and Maintenance Procedures and Chapter 16 for Technical Specifications.)
- Regulatory Guide 1.128, "Installation Designs and Installation of Large Lead Storage Batteries for Nuclear Power Plants." The ESBWR Valve Regulated Lead Acid (VRLA) batteries' recombination of hydrogen effectiveness is 99% while battery room temperature and charging voltage are within specified vendor limits during charging evolutions. IEEE 344, IEEE 323, and IEEE 1187 apply to VRLA batteries. IEEE 484 is not applicable for VRLA batteries.
- Regulatory Guide 1.129, "Maintenance, Testing, and Replacement of Large Lead Storage Batteries for Nuclear Power Plants." The ESBWR design allows for periodic testing, maintenance and replacement of batteries in accordance with IEEE 1188. IEEE 450 is not applicable for VRLA batteries.
- Regulatory Guide 1.153, "Criteria for Safety Systems."
- Regulatory Guide 1.155, "Station Blackout," The ESBWR uses battery power to achieve and maintain safe shutdown. Thus, the ESBWR meets the intent of Regulatory Guide 1.155. The Station Blackout evaluation is provided in Subsection 15.5.5.

Branch Technical Positions (BTPs):

- BTP ICSB 21, "Supplemental Guidance for Bypass and Inoperable Status Indication for Engineered Safety Features Systems."

The DC power system is designed consistent with this criterion.