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Subject: Response to Portion of NRC Request for Additional Information Letter No. 194 Related to ESBWR Design Certification Application ESBWR RAI Numbers 22.5-5 S01, 22.5-9 S01

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) dated May 13, 2008 (Reference 1). The previous RAI and response are in References 2 and 3. The GEH response to RAI Numbers 22.5-5 S01 and 22.5-9 S01 are in Enclosure 1.

If you have any questions or require additional information, please contact me.

Sincerely,

Richard E. Kingston
Vice President, ESBWR Licensing

DOB
KRO

Reference:

1. MFN 08-477, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, GEH, *Request For Additional Information Letter No. 194 Related To ESBWR Design Certification Application*, dated May 13, 2008.
2. MFN 07-357. Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request For Additional Information Letter No. 101 Related To ESBWR Design Certification Application*, June 21, 2007.
3. MFN 08-336, *Response to Portion of NRC Request for Additional Information Letter No. 101 Related to ESBWR Design Certification Application*, RAI Numbers 22.5-5 & 22.5-9, dated April 17, 2008.

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 194 Related to ESBWR Design Certification Application Regulatory Treatment of Non-Safety Systems (RTNSS) RAI Numbers 22.5-9 S01 and 22.5-9 S01

cc: AE Cabbage USNRC (with enclosure)
RE Brown GEH/Wilmington (with enclosure)
DH Hinds GEH/Wilmington (with enclosure)
eDRF Section 0000-0089-1730 NRC RAI 22.5-5 S01
0000-0089-1733 NRC RAI 22.5-9 S01

ENCLOSURE 1

MFN 08-366, Supplement 1

**Partial Response to NRC RAI Letter No. 194
Related to ESBWR DesignRegulatory Treatment of Non-
Safety Systems (RTNSS) Certification Application**

RAI Numbers 22.5-5 S01 and 22.5-9 S01

¹ **Original Responses previously submitted under MFN 08-336 are included without DCD updates to provide historical continuity during review.**

NRC RAI 22.5-5 (original)

Section 19.A.8.3 addresses design standards associated with RTNSS systems. However, the staff found that, in general, protection for RTNSS systems from potential internal flooding due to seismic events, external flooding due to seismic events, missiles generated during seismic events and high wind, and piping failures in fluid systems outside containment have not been addressed. Please describe how RTNSS systems will be protected as described in Criterion B to address long term (i.e., beyond 72 hours) safety and seismic events:

- A. How RTNSS systems will be protected from flood-related effects associated with both high and moderate-energy fluid piping and component failures inside and outside containment.*
- B. How RTNSS systems will be protected from flood-related effects associated with both natural phenomena and system and component failures.*
- C. How RTNSS systems will be protected against postulated piping failures in fluid systems outside containment.*
- D. How RTNSS systems will be protected against the aforementioned missiles.*

GEH Response (original)

The following Table shows RTNSS Criterion B Systems location and seismic classification based on Table 19A-2 and Table 3.2-1:

System	RTNSS Criterion	Location	Building Category
CB HVAC	B2	Control Building (CB)	Seismic Cat. I
Control Room Area Ventilation	B1	Control Building (CB)	Seismic Cat. I
External Connections	B1	Reactor Building (RB)	Seismic Cat. I
PAM Instruments (DCIS)	B2	Reactor Building (RB) Control Building (CB)	Seismic Cat. I Seismic Cat. I
RB HVAC	B2	Reactor Building (RB)	Seismic Cat. I
Diesel Fire Pump	B1	Fire Pump Enclosure Building (FPE)	Seismic Cat. I
Diesel Generators	B2, C	Electrical Building (EB)	NS
EB HVAC	B2, C	Electrical Building (EB)	NS
PIP Buses	B2, C	Electrical Building (EB)	NS
RCCWS	B2, C	Reactor Building (RB) Turbine Building (TB)	Seismic Cat. I NS
Chilled Water System	B2, C	Reactor Building (RB) Containment Vessel (CV) Control Building (CB) Fuel Building (FB) Turbine Building (TB) Electrical Building (EB)	Seismic Cat. I Seismic Cat. I Seismic Cat. I Seismic Cat. I NS NS
TB HVAC	B2, C	Turbine Building (TB)	NS
PSW	B2, C	Reactor Building (TB) Service Water Building (SF) Outdoors Onsite (OO)	Seismic Cat. I NS NS

Note:

RTNSS components that support the RTNSS functions for the systems in the table above are designed/installed with similar protection from missiles and flooding described in the following table.

The next Table addresses the questions raised by RAI 22.5-5 in columns labeled A, B C and D against the RTNSS Systems located in different buildings.

Only Criterion B1 RTNSS is required to be protected from internal missiles and postulated piping failures in fluid systems outside containment. Criterion B1 addresses those functions (core cooling, decay heat removal and control room habitability) that are designed to Seismic Category II standards so there is reasonable assurance that they can perform their functions following a seismic event. Criterion B2 addresses components that provide additional information for operators to diagnose plant conditions, (post-accident monitoring) and thus have a less direct effect on the success of key safety functions. Reasonable assurance for long-term functionality of monitoring components is provided by other augmented seismic design criteria.

System Location	A. (Internal flooding)	B. (External flooding)	C. (Internal missiles) (For Criterion B1)	D. (Extreme wind and missiles)
Reactor Bldg. (RB) Control Bldg. (CB) Fuel Bldg. (FB) Fire Pump Enclosure Bldg. (FPE) Containment Vessel (CV)	The design/installation of RTNSS equipment includes protection from the effects of internal flooding. The Chilled Water System components inside the CV are environmentally qualified per DCD Tier 2, Rev. 4, Table 3.11-1.	Seismic Category I structures are designed to withstand the flood level and groundwater level specified in DCD Tier 2, Rev. 4, Table 2.0-1 and described in Subsection 3.4.1.2. All exterior access openings are above flood level and exterior penetrations below design flood and groundwater levels are appropriately sealed as described in DCD Tier 2, Rev. 4, Subsection 3.4.1.1. On-site storage tanks are designed and constructed to minimize the risk of catastrophic failure and are located to allow drainage without damage to site facilities in the event of a tank rupture per DCD Tier 2, Rev. 4, Subsection 3.4.1.2.	There are no credible sources of internal missiles per DCD Tier 2, Rev. 4, Section 3.5.	Seismic Category I structures designed for tornado and extreme wind phenomena are described in DCD Tier 2, Rev. 4, Section 3.3 and Section 3.5.1.4.
Electrical Bldg. (EB) Service Water Bldg. (SF) Turbine Bldg. (TB)	The design/installation of RTNSS equipment includes protection from the effects of internal flooding.	All exterior access openings are above flood level and exterior penetrations below design flood and groundwater levels are appropriately sealed; basemat and walls are designed for hydrostatic loading, therefore protected from external flooding.	N/A	The EB and SF are RTNSS Structures designed for Category 5 Hurricane wind and missiles that meet requirement of DCD Tier 2, Rev. 4, Subsection 19A.8.3. The TB structure is designed for tornado wind speed which envelops Category 5 Hurricane speed. The design/ installation of the RTNSS systems in the TB includes protection to comply with the requirement of DCD Tier 2,

				Rev. 4, Subsection 19A.8.3 to withstand winds and missiles generated from Category 5 hurricanes.
PSW System located Outdoors Onsite (OO)	N/A	The design/installation of the RTNSS system includes protection from the effects of flooding.	N/A	The design/installation of the RTNSS system complies with the requirement of DCD Tier 2, Rev. 4, Subsection 19A.8.3 to withstand winds and missiles generated from Category 5 hurricanes.

DCD Tier 2, Subsection 19A.8.4 will be revised and the above information will be added as Tables 19A-3 and 19A-4.

DCD Impact

DCD Tier 2, Section 19A.8.4 will be revised and Tables 19A-3 and 19A-4 will be added as noted in the attached markups

NRC RAI 22.5-5 Supplement 1

GEH's response to RAI 22.5-5 did not provide sufficient details to demonstrate that RTNSS systems have been adequately protected from flood-related effects associated with both natural phenomena and system and component failures.

Specifically, GEH indicated that for RTNSS systems located in Reactor Bldg (RB), Control Bldg (CB), Fuel Bldg (FB), Fire Pump Enclosure Bldg (FPE), Electrical Bldg (EB), Service Water Bldg (SF), and Turbine Bldg (TB), the design/installation of RTNSS equipment included protection from the effects of internal flooding. However, GEH did not provide description/discussion for the design/installation of the RTNSS equipment or discuss how this design/installation will protect RTNSS from the effects of internal flooding.

Similarly, for the plant service water (PSW) system located outdoors onsite (OO), GEH did not describe/discuss how the design/installation of RTNSS equipment will be protected from the effects of external flooding.

Provide detailed description of the design/installation requirements for RTNSS SSCs and discuss how this design/installation will provide the protection for the RTNSS SSCs from the effects of internal flooding and/or external flooding.

GEH Response

RTNSS components are located and installed above the maximum analyzed flood levels in each of the buildings referenced. This requirement is incorporated in the Design Specifications and implemented during the detailed design to ensure protection of the RTNSS components against internal flooding.

The maximum flood level for the ESBWR is 1 ft below the finished grade per DCD Tier 2 Rev. 5 Table 2.0-1. The maximum groundwater level is 2 ft below the finished grade. The PSW system located outdoors is designed with protection from water intrusion if installed below the maximum flood and groundwater levels. This includes designing for hydrostatic loading and provision of cell enclosures. These requirements are incorporated in the Design Specifications and implemented during detailed design.

DCD Impact

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

NRC RAI 22.5-9

Section 19A.8.3, Augmented Design Standards, states that in addition to seismic standards, Criterion B systems must meet design standards to withstand winds and missiles generated from a category 5 hurricane. It further states that: "the plant design for protection of SSCs from the effects of flooding considers the relevant requirements of General Design Criterion 2, Design Bases for Protection Against Natural Phenomena, and 10 CFR Part 100, Appendix A, Seismic and Geologic Siting Criteria for Nuclear Power Plants, Section IV.C as related to protecting safety-related SSC from the effects of floods, tsunamis and seiches. The design meets the guidelines of Regulatory Guide 1.59 with regard to the methods utilized for establishing the probable maximum flood (PMF), probable maximum precipitation (PMP), seiche and other pertinent hydrologic considerations; and the guidelines of Regulatory Guide 1.102 regarding the means utilized for protection of safety-related SSC from the effects of the PMF and PMP. "

Please provide a discussion including key examples for demonstrating how the stated deterministic evaluation requirements were implemented for the RTNSS systems.

GEH Response

Please see response to RAI 22.5-5.

DCD Impact

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

NRC RAI 22.5-9 Supplement 1

GEH's response to RAI 22.5-9 did not provide sufficient details about the design of RTNSS SSCs with respect to hurricanes. Additionally, the information provided in GEH's response to RAI 22.5-5 requires additional clarifications. The staff requests the following information to be provided in the DCD:

- a - Identify the 3-second gust wind speed used in the design for the Category 5 hurricane.*
- b - Confirm that the procedures used for calculating and distributing the wind pressure and all the associated parameters that account for the physical and geometrical conditions of the structures are in accordance with the DCD Tier 2, Rev. 4, Section 3.3.1. Otherwise, fully describe the alternative procedure used.*
- c - Confirm that the hurricane missile spectrum is consistent with the tornado missile spectrum identified in DCD Tier 2, Rev. 4, Table 2.0-1. Otherwise, fully describe the alternative missile spectrum used.*
- d - Explain how the design of the Turbine Building for tornado winds without missiles will envelop the demands of a Category 5 hurricane wind with missiles. If hurricane missiles are assumed to penetrate the building, describe the protection provisions implemented to protect RTNSS systems from missile damage as stated in Table 19A-4.*

GEH Response

- a. The Category 5 Hurricane wind speed used in the design is 195 mph, 3-second gust.
- b. The Seismic Category I and II structures that house Criterion B systems are designed in accordance with DCD Tier 2 Rev. 5 Section 3.3.1. For non-seismic (NS) structures that house Criterion C systems, the wind design procedure is in accordance with ANSI/ASCE 7-02, which is consistent with US NRC Standard Review Plan 3.3.1 Rev. 3.
- c. The standard missile used to determine impact resistance is a 6.8 kg (15 lbs) 2x4 (nominal) wood stud in accordance with FEMA 361. The missile impact velocity is equal to the hurricane wind speed of 195 mph, 3-second gust, times the shape factor. The shape factor is 0.4 for horizontal travel and 0.27 for vertical travel. Missile angle of impact is 90 degrees to the surface.
- d. The Turbine Building (TB) is designed for Tornado winds, hurricane Category 5 winds and missiles generated by hurricane. The TB enclosure or barrier design against hurricane generated missiles meets the requirements of FEMA 361, Section 6. These requirements are incorporated in the Design Specifications and implemented in the detailed design.

DCD Impact

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