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MFN 09-754 Revision 1

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U.S. Nuclear Regulatory Commission
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Subject: **Revised Response to Portion of NRC RAI Letter No. 388 Related to ESBWR Design Certification Application – DCD Tier 2 Section 2.5 – Site Characteristics; RAI Number 2.5-11 (Revision 1)**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) revised response to a portion of the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) letter number 388 sent by NRC letter dated November 2, 2009 (Reference 1). RAI Number 2.5-11 (Revision 1) is addressed in Enclosure 1. This RAI revision is the result of GEH/NRC interactions to address comments received on the original response transmitted by Reference 2.

Enclosure 2 contains the revised DCD changes to Tier 1 and Tier 2 as a result of the revised response to this RAI. Verified DCD changes associated with this RAI response are identified in the enclosed DCD markups by enclosing the text within a black box.

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

Sincerely,

Richard E. Kingston
Vice President, ESBWR Licensing

References:

1. MFN 09-689 Letter from U.S. Nuclear Regulatory Commission to J. G. Head, GEH, *Request For Additional Information Letter No. 388 Related to ESBWR Design Certification* dated November 2, 2009
2. MFN 09-754 Letter from R. E. Kingston, GEH, to the U.S. Nuclear Regulatory Commission, *Response to Portion of NRC RAI Letter No. 388 Related to ESBWR Design Certification Application – DCD Tier 2 Section 2.5 – Site Characteristics; RAI Number 2.5-11* dated December 7, 2009

Enclosures:

1. Revised Response to Portion of NRC RAI Letter No. 388 Related to ESBWR Design Certification Application - DCD Tier 2 Chapter 2 – Site Characteristics; RAI Number 2.5-11 (Revision 1)
2. Revised Response to Portion of NRC RAI Letter No. 388 Related to ESBWR Design Certification Application – DCD Markups for RAI Number 2.5-11 (Revision 1)

cc:	AE Cabbage	USNRC (with enclosures)
	JG Head	GEH/Wilmington (with enclosures)
	DH Hinds	GEH/Wilmington (with enclosures)
	HA Upton	GEH/San Jose (with enclosures)
	eDRF Section	0000-0109-3134 R1(RAI 2.5-11 R1)

ENCLOSURE 1

MFN 09-754 Revision 1

Revised Response to a Portion NRC RAI Letter No. 388

Related to ESBWR Design Certification Application

DCD Tier 2 Chapter 2 – Site Characteristics

RAI Number 2.5-11 (Revision 1)

NRC RAI 2.5-11

In Table 5.1-1(Tier 1) and Table 2.0-1 (Tier 2) of the ESBWR DCD Revision 6, the maximum static bearing demands and the maximum dynamic bearing demands were specified for seismic category I structures founded on soft, medium and hard soil sites. The DCD uses these parameters to define the capability of foundation supporting materials to resist any seismic or non-seismic input generically (the subsurface materials must have minimum bearing capacity greater than the maximum bearing demand with a factor of safety). The DCD parameters are not targeting any particular site-specific soil type or any particular demand and the definition of the soil properties in terms of "demand" is not consistent with other regulatory documents and other DCDs, which define them in terms of "capacity." GEH is requested to update the tables in terms of the minimum bearing capacity for both static and dynamic, and also revise footnote (7) to indicate that the minimum bearing capacity should be greater than the maximum bearing demand with a factor of safety.

Revised GEH Response

DCD Tier 1 Table 5.1-1 and DCD Tier 2 Table 2.0-1 will be revised in Revision 7 to add the terms minimum static bearing capacity and minimum dynamic bearing capacity. The minimum bearing capacity is obtained from the maximum bearing demand multiplied by a factor of safety appropriate for the design load combination and is compared with the site-specific allowable bearing pressure.

DCD Tier 1 Table 5.1-1, Note (2) and DCD Tier 2 Table 2.0-1, Note (7) will be revised in Revision 7 for consistency with the above discussion.

[DCD Tier 1 Table 5.1-1, Note \(2\) and DCD Tier 2 Table 2.0-1, Note \(7\) will be revised in Revision 7 to clarify the use of the maximum dynamic bearing demand or a linearly interpolated value when comparison is made with the site-specific allowable dynamic bearing pressure.](#)

DCD Impact

DCD Tier 1 Table 5.1-1 will be revised in Revision 7 as noted in the attached markups.

DCD Tier 2 Table 2.0-1 will be revised in Revision 7 as noted in the attached markups.

Enclosure 2

MFN 09-754 Revision 1

Revised Response to a Portion of NRC Request for

Additional Information Letter No. 388

Related to ESBWR Design Certification Application

DCD Markups for RAI Number 2.5-11 (Revision 1)

**Table 5.1-1
Envelope of ESBWR Standard Plant Site Parameters (continued)**

Meteorological Dispersion (X/Q): (continued)	Technical Support Center X/Q:*		
	Reactor Building		
	0-2 hours:	1.00E-03 s/m ³	1.00E-03 s/m ³
	2-8 hours:	6.00E-04 s/m ³	6.00E-04 s/m ³
	8-24 hours:	3.00E-04 s/m ³	3.00E-04 s/m ³
	1-4 days:	2.00E-04 s/m ³	2.00E-04 s/m ³
	4-30 days:	1.00E-04 s/m ³	1.00E-04 s/m ³
	Turbine Building		
	0-2 hours:	2.00E-03 s/m ³	2.00E-03 s/m ³
	2-8 hours:	1.50E-03 s/m ³	1.50E-03 s/m ³
	8-24 hours:	8.00E-04 s/m ³	8.00E-04 s/m ³
	1-4 days:	6.00E-04 s/m ³	6.00E-04 s/m ³
	4-30 days:	5.00E-04 s/m ³	5.00E-04 s/m ³
	Passive Containment Cooling System / Reactor Building Roof		
	0-2 hours:	2.00E-03 s/m ³	2.00E-03 s/m ³
	2-8 hours:	1.10E-03 s/m ³	1.10E-03 s/m ³
	8-24 hours:	5.00E-04 s/m ³	5.00E-04 s/m ³
	1-4 days:	4.00E-04 s/m ³	4.00E-04 s/m ³
	4-30 days:	3.00E-04 s/m ³	3.00E-04 s/m ³

Notes:

(1) The site parameters defined in this table are applicable to Seismic Category I, II, and Radwaste Building structures, unless noted otherwise.

(2) At the foundation level of Seismic Category I structures. The static bearing pressure is the average pressure. The dynamic bearing pressure is the toe pressure. ~~To compare with the maximum bearing demand, the allowable bearing pressure is developed from the site-specific bearing capacity divided by a factor of safety appropriate for the design load combination.~~ The maximum static bearing demand is multiplied by a factor of safety appropriate for the design load combination and is compared with the site-specific allowable static bearing pressure. The maximum dynamic bearing demand is multiplied by a factor of safety appropriate for the design load combination and is to be compared with the site-specific allowable dynamic bearing pressure is the larger value or a linearly interpolated value of the applicable range of shear wave velocities at the foundation level. When a site-specific shear wave velocity is between soft soil and medium soil the larger of the soft or medium maximum dynamic bearing demand will be used. When a site-specific shear wave velocity is between medium soil and hard soil the larger of the medium or hard maximum dynamic bearing demand will be used. Alternatively, for soils with a site-specific shear wave velocity a linearly interpolated dynamic bearing demand between soft and medium soil or between medium and hard soil can be used. The shear wave velocities of soft, medium and hard soils are 300 m/sec (1000 ft/sec), 800 m/sec (2600 ft/sec) and greater than or equal to 1700 m/sec (5600 ft/sec), respectively.

(3) This is the minimum shear wave velocity of the supporting foundation material and material surrounding the embedded walls associated with seismic strains for lower bound

Notes for Table 2.0-1:

- (1) The site parameters defined in this table are applicable to Seismic Category I, II, and Radwaste Building structures, unless noted otherwise.
- (2) Probable maximum flood level, as defined in Table 1.2-6 of Volume III of Reference 2.0-4.
- (3) Maximum speed selected is based on Attachment 1 of Reference 2.0-5, which summarizes the NRC Interim Position on Regulatory Guide 1.76. Concrete structures designed to resist Spectrum I missiles of SRP 3.5.1.4, Rev. 2, also resist missiles postulated in Regulatory Guide 1.76, Revision 1. Tornado missiles do not apply to Seismic Category II buildings. For the Radwaste building, the tornado missiles defined in Regulatory Guide 1.143, Table 2, Class RW-IIa apply.
- (4) Based on probable maximum precipitation (PMP) for one hour over 2.6 km² (one square mile) with a ratio of 5 minutes to one hour PMP of 0.32 as found in Reference 2.0-3. See also Table 3G.1-2.
- (5) See Reference 2.0-9 for the definition of normal winter precipitation and extreme winter precipitation events. The maximum ground snow load for extreme winter precipitation event includes the contribution from the normal winter precipitation event. See also Table 3G.1-2.
- (6) Zero percent exceedance values are based on conservative estimates of historical high and low values for potential sites. Consistent with Reference 2.0-4, they represent historical limits excluding peaks of less than two hours. One and two percent annual exceedance values were selected in order to bound the values presented in Reference 2.0-4 and available Early Site Permit applications.
- (7) At the foundation level of Seismic Category I structures. The static bearing pressure is the average pressure. The dynamic bearing pressure is the toe pressure. ~~To compare with the maximum bearing demand, the allowable bearing pressure is developed from the site-specific bearing capacity divided by a factor of safety appropriate for the design load combination.~~ The maximum static bearing demand is multiplied by a factor of safety appropriate for the design load combination and is compared with the site-specific allowable static bearing pressure. The maximum dynamic bearing demand is multiplied by a factor of safety appropriate for the design load combination, and is to be compared with the site-specific allowable dynamic bearing pressure. When a site-specific shear wave velocity is between soft soil and medium soil the larger of the soft or medium maximum dynamic bearing demand will be used. When a site-specific shear wave velocity is between medium soil and hard soil the larger of the medium or hard maximum dynamic bearing demand will be used. Alternatively, for soils with a site-specific shear wave velocity a linearly interpolated dynamic bearing demand between soft and medium soil or between medium and hard soil can be used is the larger value or a linearly interpolated value of the applicable range of shear wave velocities at the foundation level. The shear wave velocities of soft, medium and hard soils are 300 m/sec (1000 ft/sec), 800 m/sec (2600 ft/sec) and greater than or equal to 1700 m/sec (5600 ft/sec), respectively.