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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 109 Related to ESBWR Design Certification Application – Site Characteristics - RAI Number 2.3-4 S02.**

Enclosure 1 contains GEH's response to the subject RAI transmitted via Reference 1 which is a supplemental request to the RAI transmitted via Reference 2 for which GEH provided response in Reference 3. The original RAI was transmitted via Reference 4 for which response was submitted to the NRC via Reference 5.

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

Sincerely,

Kathy Sedney for

James C. Kinsey
Vice President, ESBWR Licensing

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NRO

References:

1. MFN 07-555, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 109 Related to the ESBWR Design Certification Application,* October 12, 2007.
2. E-mail from NRC (Andrea Johnson) dated April 2, 2007.
3. MFN 06-206, Supplement 1, Letter from GE to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 37 Related to ESBWR Design Certification Application – Siting Issues – RAI Numbers 2.3-2 S01, 2.3-3 S01, and 2.3-4 S01*, May 8, 2007.
4. MFN 06-201, Letter from U.S. Nuclear Regulatory Commission to David H. Hinds, *Request for Additional Information Letter No. 37 Related to the ESBWR Design Certification Application,* June 21, 2006.
5. MFN 06-206, Letter from GE to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 37 Related to ESBWR Design Certification Application – Siting Issues, Hydrological Engineering – RAI Numbers 2.2-3, 2.3-1 through 2.3-6, 14.3-22, 15.3-1, 15.3-3, and 2.4-32,* July 31, 2006

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 109 Related to ESBWR Design Certification Application – Site Characteristics - RAI Number 2.3-4 S02.

cc:	AE Cubbage	USNRC (with enclosure)
	RE Brown	GEH/Wilmington (with enclosure)
	LE Fennern	GEH/San Jose (with enclosure)
	GB Stramback	GEH/San Jose (with enclosure)
	eDRF	0000-0077-2141

Enclosure 1

MFN 07-628

Response to Portion of NRC Request for Additional Information Letter No. 109 Related to ESBWR Design Certification Application

Site Characteristics

RAI Number 2.3-4 S02[1]

[1]Original Response and Supplement 1 previously submitted under MFNs 06-206 and 06-206 Supplement 1 without DCD updates are included to provide historical continuity during review.

NRC RAI 2.3-4

What is the basis for the maximum rainfall rate and maximum snow load for the roof design given in DCD tier 2, Table 2.0-1? Is the maximum rainfall rate assumed to be over a period of five minutes?

GE Response

The maximum rainfall rate and maximum snow loads were taken from the Advanced Light Water Reactor Utility Requirements Document (URD), Volume III, Table 1.2-6. These values are also the same as those that were applied during design certification of the Advanced Boiling Water Reactor (ABWR).

As Indicated in the text of Table 2.0-1 for Subsection 2.3.1, the maximum rainfall rate in the URD was obtained from National Weather Service Publication HMR No. 52 using the probable maximum precipitation (PMP) for 1 hour over a 2.6×10^6 m^2 (1 sq. mile) area with a PMP ratio of 5 minutes to 1 hour of 0.32.

DCD Impact

A markup of DCD Table 2.0-1 to clarify that the URD is the source of these values was provided in MFN 06-206.

NRC RAI 2.3-4 S01

E-mail from Andrea Johnson (NRC) dated April 2, 2007 - Comments on response to RAI 2.3-4:

This RAI addresses the design values and bases for winter precipitation loads to be included in the combination of (1) normal live loads and (2) extreme live loads.

Tier 1 Table 5.1-1 and Tier 2 Table 2.0-1 of DCD Revision 3 state that the maximum design roof load of 2873 Pa (60 lbf/ft2) accommodates snow load and probable maximum winter precipitation as specified in ASCE 7-02 and HMR-52. The March 24, 1975 Site Analysis Branch Position on Winter Precipitation Loads (ML050470024) states that (1) winter precipitation loads to be included in the combination of normal live loads should be based on the weight of the 100-year snowpack or snowfall, whichever is greater, recorded at ground level, and (2) winter precipitation loads to be included in the combination of extreme live loads should be based on the addition of the weight of the 100-year snowpack at ground level plus the weight of the 48-hour Probable Maximum Winter Precipitation (PMWP) at ground level for the month corresponding to the selected snowpack. Modifications to this procedure are allowed for certain areas where it can be satisfactorily demonstrated that the PMWP could neither fall nor remain entirely on top of the antecedent snowpack and/or roofs.

Consequently, please update the DCD to provide the design values and bases for winter precipitation loads to be included in the combination of (1) normal live loads and (2) extreme live loads. Note that the 48-hour PMWP should be based on data presented in HMR-53.

GE Response

The roof load design bases for concrete structures is 2873 Pa (60 psf) which is multiplied by the Load Factors indicated depending on the particular combination and is combined with other loads as shown on DCD Table 3.8-15.

The rain and snow loads are described in Section 3G.1.5.2.1.2.

The live load represents a 100-year return ground snow load of 2394 Pa (50 psf) that on the roof is 60% of that based on exposure and thermal conditions (ASCE 7 Commentary). Therefore, the basic roof snow load is 1436 Pa (30 psf). The lower lip of roof scuppers is 100 mm (4 in) above the roof and assuming all primary roof drains are clogged, this added load is 996 Pa (21 psf).

The PMWP is based on the 48-hour PMWP in HMR 53 Section 6 example calculation for December, January, February and the drainage system (roof

drains and scuppers independently) will be sized accordingly. Therefore, the total maximum conservative loading (rain + snowpack) would be 2442 Pa (51 psf), which is less than the design live load of 2873 Pa (60 psf).

DCD Impact

A markup of DCD Tier 2 Table 3G.1-2 to clarify that the ground snow load represents a 100-year recurrence interval was provided in MFN 06-206, Supplement 1.

NRC RAI 2.3-4 S02

In its response to supplemental RAI 2.3-4 dated May 8, 2007, the applicant stated that the roof design maximum 48-hr. winter rainfall standard plant site design parameter of 91.4 cm (36 in.) would result in an additional weight of 10 cm (4 in.) of water on the roof because the lower lip of the roof scuppers is 10 cm (4 in.) above the roof. Assuming all primary roof drains are clogged, the additional weight of water on the roof would be 996 Pa (21 psf). However, the applicant should also provide an additional roof design 48-hour probable maximum winter precipitation (PMWP) standard plant design parameter to account for the additional weight if at least part of the 48-hour PMWP falls as frozen precipitation (e.g., snow and/or ice) and therefore remains on the roof.

GEH Response

As stated in our response to NRC RAI 2.3-4 S01, total conservative loading for rain plus snowpack for the ESBWR Standard Plant is 2442 Pa (51 psf), which is less than the design live load of 2873 Pa (60 psf) at the roof. This design live load is specified in DCD Tier 2, Revision 4, Table 2.0-1 as the ESBWR Standard Plant Site Parameter of Maximum Roof Load. Thus, a margin of 431 Pa (9 psf) is provided for any additional increase in snow load as rain percolates through the snowpack and potential increase due to frozen precipitation.

Per Section 7.10 of ASCE 7-02, the rain-on-snow surcharge associated with rain percolating through a snowpack is 239 Pa (5 psf). Hence, a margin of 192 Pa (4 psf) remains to account for any frozen precipitation for the ESBWR Standard Plant.

The values for rain-on-snow surcharge and frozen precipitation are not shown individually in DCD Tier 2, Revision 4, Table 2.0-1 as ESBWR Standard Plant Site Parameters because the Maximum Roof Load of 2873 Pa (60 psf) is already specified in DCD Tier 2 Tables 2.0-1 and 3G.1-2. As required in DCD Tier 2, Revision 4, Subsection 2.0.1, Item 2.0.1-A, each COL applicant will demonstrate in their COL application how the site characteristics of 100-year snowpack plus 48-hour PMWP (including frozen precipitation) are combined to fall within the ESBWR DCD site parameter value for Maximum Roof Load.

DCD Impact

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