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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 91 Related to ESBWR Design Certification Application, RAI Numbers 19.1-138 and 19.2-75.**

The purpose of this letter is to submit the GE-Hitachi Nuclear Energy Americas LLC (GEH) response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) sent by NRC letter dated January 31, 2007 (Reference 1). The responses to those questions are in Enclosure 1 as RAI Numbers 19.1-138 and 19.2-75.

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

Sincerely,

Karl Sedney for

James C. Kinsey
Vice President, ESBWR Licensing

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NRO

Reference:

1. MFN 07-104. *Request for Additional Information Letter No. 91 Related To ESBWR Design Certification Application.* January 31,2007.

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 91 Related to ESBWR Design Certification Application ESBWR Probabilistic Risk Assessment RAI Numbers 19.1-138 and 19.2-75.

cc:	AE Cubbage	USNRC (with enclosures)
	GB Stramback	GEHNEA/San Jose (with enclosures)
	RE Brown	GEHNEA/Wilmington (with enclosures)
	eDRF Section	0000-0074-9069

Enclosure 1
MFN 07- 508

Response to Portion of NRC Request for Additional Information Letter No. 91 Related to ESBWR Design Certification Application ESBWR Probabilistic Risk Assessment RAI Numbers 19.1-138 and 19.2-75

NRC RAI 19.1-138

Please provide a sensitivity study which credits only safety-related equipment for accident mitigation in the shutdown flood PRA and provide the top 100 cutsets. This information is needed to support the RTNSS process.

GEH Response

The top 100 cutsets for the sensitivity study that credits only safety-related equipment for accident mitigation in the shutdown flood PRA are provided in Revision 2 of NEDO-33201 Appendix 11B.

DCD/NEDO-33201 Impact

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

NEDO-33201 Appendix 11B, Revision 2 has been revised in response to this RAI.

NRC RAI 19.2-75

Although operator guidance for controlled venting may not be fully developed at this time, it appears that operator actions to flood containment in accordance with Step RC/F-1 or RC/F-2 of the Severe Accident Guidelines for ESBWR may result in a need to vent the primary containment. Venting as part of the containment flooding strategy does not appear to be addressed in the Level 2/3 PRA analysis. Confirm whether implementation of the containment flooding strategy may result in the need to vent the ESBWR containment. If so, provide an assessment of:

(1) the time at which this would occur in the frequency-dominant sequences,

(2) the impact of venting on the Level 2 and 3 PRA results, and

(3) the need for further revisions to the ESBWR risk model to address venting during containment flooding.

GEH Response

Actions to flood containment will be accomplished in the ESBWR using systems inside containment, i.e. GDCS Deluge. This action will flood containment to a level above the top of active fuel and this action can be accomplished without the need to vent containment expected.

If it is required to flood containment using an external source of water, it is not expected that venting would be required. The ESBWR containment has a large upper drywell free volume ~ 6000 m^3 compared to the lower drywell free volume ~ 1200 m^3 (refer to DCD Tier 2 Table 6.2-3). This expectation can be supported by estimating the containment pressure increase when flooding containment using the ideal gas formula for reversible adiabatic changes of state (reference Marks Standard Handbook for Mechanical Engineers, 9th Edition page 4-10):

$p_1 V_1^k = p_2 V_2^k$, where

p_1 = beginning pressure

p_2 = final pressure

V_1 = beginning free volume

V_2 = final free volume

k = ratio of specific heats, for air/N_2 k = 1.4 and steam k = 1.3.

If it is assumed that the containment atmosphere is air/N_2, the final pressure is calculated as follows:

$$p_2 = p_1 * V_1^k / V_2^k = p_1 * (7200)^{1.4}/(6000)^{1.4} = p_1 * 1.29$$

If it is assumed that the containment atmosphere is steam, the final pressure is calculated as follows:

$$p_2 = p_1 * (7200)^{1.3}/(6000)^{1.3} = p_1 * 1.27$$

Therefore, if containment starts at design pressure, 45 psig or 60 psia, the final pressure is estimated at 60 psia * 1.29 = 77.4 psia or 62.4 psig. This estimated final pressure is within the

containment ultimate strength and the discharge pressure of external sources of water used to flood containment. This analysis does not consider the free volume in the wetwell, ~5400 m^3, the heat input due to decay heat or the heat absorption of the water used to flood containment.

DCD/NEDO-33201 Impact

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

No changes to NEDO-33201 will be made in response to this RAI.