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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 43 Related to ESBWR Design Certification Application - ESBWR Probabilistic Risk Assessment - RAI Numbers 19.2-56, 19.2-63, and 19.2-65**

Enclosure 1 contains GE's response to the subject NRC RAIs transmitted via the Reference 1 letter.

If you have any questions or require additional information regarding the information provided here, please contact me.

Sincerely,

Kathy Sedney for

James C. Kinsey
Project Manager, ESBWR Licensing

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Reference:

1. MFN 06-237, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 43 for the ESBWR Design Certification Application*, July 18, 2006

Enclosures:

1. MFN 06-523, Response to Portion of NRC Request for Additional Information Letter No. 43Related to ESBWR Design Certification Application, ESBWR Probabilistic Risk Assessment, RAI Numbers 19.2-56, 19.2-63, and 19.2-65

cc: AE Cubbage USNRC (with enclosures)
GB Stramback GE/San Jose (with enclosures)
eDRF 60-7405
60-7408
60-7409

Enclosure 1

MFN 06-523

Response to Portion of NRC Request for

Additional Information Letter No. 43

Related to ESBWR Design Certification Application

ESBWR Probabilistic Risk Assessment

RAI Numbers 19.2-56, 19.2-63, and 19.2-65

NRC RAI 19.2-56

In PRA, Section 21.3, GE described that the DCH events to induce damage of the containment are physically unreasonable, based on: a) the initiating events for DCH is 2.8x10-9 per year, b) the DCH generated superheated gases (>1000 ^{o}K) failing the inlets to SRV, DPV, and IC lines, leading to natural depressurization of the RPV, and c) vent clearing from UDW into a huge heat sink of the WW in less than 1 second. Provide the following information:

a) *Provide a discussion of a scenario that, given the locations of the inlets to SRV, DPV, and IC lines in UDW, it is reasonable to assume that the containment liner is also exposed to a 1000oK temperature during the same time frame, which is required to fail the inlets to SRV, DPV, and IC lines, and if so, the liner integrity could be breached, especially near penetrations.*

b) *Although GE stated that vent clearing was modeled with a high degree of fidelity, there is still a possibility, albeit small, that the vent may be cleared beyond the time frame required to redirect the superheated gases from UDW to WW suppression pool. What is the impact of the vent clearing failure or delay on the containment integrity?*

GE Response

NEDO-33201 Rev 1 Section 21 evaluated the DCH threat independently of (a) the low frequency of the high-pressure scenario, and (b) of "natural" depressurization due to steam line failure prior to melt ejection.

(a) The RPV and all lines are thermally insulated, so high temperatures in all these components could have no impact on the containment liner temperature or integrity. Moreover, the distances and heat transfer pathways in this geometry are such that even in the absence of insulation there could be no ill effects on the containment liner.

(b) Vent clearing is a straightforward phenomenon, which has been characterized in great detail as it pertains to design basis accidents. As we show in NEDO-33201 Rev 1 Section 21.3, even with a simple, but fundamental, accounting of key physics we are able to do as well or even better than analysis tools used for design basis LOCA event evaluations. Vent clearing is a passive event, there is absolutely no way that it can "fail", and there is absolutely no basis to arbitrarily delay the vent clearing time as suggested by this question. Vent clearing is probably the best known of all events analyzed in NEDO-33201 Rev 1 Section 21. As shown by the results, in Regime III, the vent clearing process is not the controlling factor for the magnitude of the peak pressures reached.

DCD Impact

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

NRC RAI 19.2-63

In PRA, Revision 0, Section 21.4.5, GE described the prediction of failure probability for EVE-induced failures of pedestal and liner, as well as the BiMAC device. GE did not provide a detailed description of how these failure probabilities were calculated. Provide:

a) a description of the calculations performed to obtain the failure probability, based on the LS-DYNA3D analyses, for EVE-induced pedestal failure, liner failure, and BiMAC device failure, and RPV support failure;

b) a description of the structural performance of pedestal and RPV support, given failure of BiMAC and continued core-concrete interactions.

GE Response

The information requested is provided in Section 21 of NEDO-33201 Rev 1. A description of the calculations performed to support an estimate of reactor pedestal and BiMAC pipes fragility to steam explosion loads, based on DYNA3D analyses, are provided in Section 21.4.4.4 of NEDO-33201 Rev 1. The estimations of failure probability for pedestal and BiMAC pipes are described in Section 21.4.4.5 of NEDO-33201 Rev 1.

DCD Impact

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

NRC RAI 19.2-65

In PRA, Revision 0, Section 8.3.3 [and PRA Revision 1 Appendix A.8.2.4?],GE described the containment phenomenology event trees. The sequence EVE-DAM EVE relates to the failure of the pedestal for water levels between 0.7 m and 1.5 m; the probability of pedestal failure is stated as 1E-3 for physical unreasonable events. Provide the detailed calculation that was used to arrive at this probability value.

GE Response

The information requested is provided in Section 21 of NEDO-33201 Rev 1. Related details on quantification of loads are described in Section 21.4.4.3, quantification of fragility is described in Section 21.4.4.4 and the prediction of failure probability is described in Section 21.4.4.5 of NEDO-33201 Rev1. This physically unreasonable term (EVE-DAM) we will set it to Zero in Rev 2 of NEDO-33201 and will include a sensitivity study to show the effects of other values. The range of these values will be based on the proximity of the load and fragility curves presented in Section 21 of NEDO-33201 Rev 1.

DCD Impact

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