GE Energy

David H. Hinds
Manager, ESBWR

PO Box 780 M/C L60
Wilmington, NC 28402-0780
USA

T 910 675 6363
F 910 362 6363
david.hinds@ge.com

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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 40 Related to ESBWR Design Certification Application – ESBWR Probabilistic Risk Assessment – RAI Numbers 19.2-22 and 19.2-24**

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

If you have any questions about the information provided here, please let me know.

Sincerely,

Kathy Sedney for

David H. Hinds
Manager, ESBWR

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References:

1. MFN 06-222, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 40 Related to ESBWR Design Certification Application,* July 5, 2006

Enclosure:

1. MFN 06-323 – Response to Portion of NRC Request for Additional Information Letter No. 40 Related to ESBWR Design Certification Application – ESBWR Probabilistic Risk Assessment – RAI Numbers 19.2-22 and 19.2-24

cc:	AE Cubbage	USNRC (with enclosures)
	GB Stramback	GE/San Jose (with enclosures)
	eDRF	0000-0045-4145

Enclosure 1

MFN 06-323

Response to Portion of NRC Request for

Additional Information Letter No. 40

Related to ESBWR Design Certification Application

ESBWR Probabilistic Risk Assessment

RAI Numbers 19.2-22 and 19.2-24

NRC RAI 19.2-22

Describe the "final bounding state" of the core debris within BiMAC, including crust thickness, and thinning of BiMAC channels (if applicable) as a function of location within the piping array. Discuss the relationship between the final bounding state and the boundary conditions that would be evaluated in the BiMAC test program.

GE Response

The final bounding state, as explained in detail in Section 21 of NEDO-33201 Rev 1, was taken to involve the full amount of the core debris (decay heat), and thermal loading on BiMAC was obtained from calculations of natural convection inside the BiMAC boundary. Peak average heat flux was found to be less than 100 kw/m^2, and as explained above, this is a very conservative upper bound. The locally maximum load at this postulated maximum would be no more than 450 kw/m^2. Simple heat conduction temperature calculations across the pipe of BiMAC channel show that at such heat flux levels, there will be no significant heating of the outside boundary, and of course no melting of the (carbon steel) pipes. The thickness of the crust layer frozen on top of the pipes will depend on the material composition and respective thermal conductivity, and on the melt pool composition and thus temperature. In any case we can expect no less than cm-scale crusts, however as known from the IVR technology, this thickness plays no role on the outcome.

NRC RAI 19.2-24

Provide additional details regarding the BiMAC cover plate/lid arrangement, which is said to serve a dual purpose of providing a work surface during plant maintenance and trapping core debris during a high pressure melt ejection event. (The lid is indicated to be a stainless steel top plate over a zirconium oxide mat over a normal floor grating.) Include information regarding the lid materials, properties, thickness, and any seal provisions to prevent normal reactor coolant system (RCS) leakage from entering the BiMAC cavity, if applicable. Discuss the potential for the cover plate/lid to impede debris transport to the BiMAC cavity, particularly if the high velocity debris/gas jet is disrupted/dispersed by the substantial control rod drive (CRD) structures below the RPV, which appear to be neglected in the ESBWR analysis.

GE Response

Upon further evaluations of the potential DCH threat we are now of the opinion that the "trapping" quality of the plate on top of the BiMAC cavity is not needed (recall that the original concept was to provide some additional relief, even though such could not be, and was not counted on), and that this floor plate could better be used for the physical protection of BiMAC (see Section 21 of NEDO-33201 Rev 1). There is no "impedance" issue, speculated by this question, whatever is the material/structure used to cover the BiMAC. Any non-coolable geometry would penetrate such a structure, and any coolable geometry would be retained by it without further a due. The disruption of a jet from the RPV due to the CRDs and the motors at the lower ends is a good point that we ignored in Rev 1, but it is now discussed in the full ROAAM review version relative to the new purpose and design of this plate (see addenda on Basemat Melt Penetration (BMP) in full ROAAM review Severe Accident Treatment (SAT) report provided as the "Attachment to GE's response to RAI 19.2-5").