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MFN 07-496

Docket No. 52-010

September 14, 2007

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

Subject: **Response to Portion of NRC Request for Additional Information Letter No. 100 – Related to ESBWR Design Certification Application – RAI Number 4.4-61**

Enclosure 1 contains GEH's response to the subject NRC RAI 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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NRO

References:

1. MFN 07-327, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 100 Related to the ESBWR Design Certification Application*, May 30, 2007.

Enclosures:

1. MFN 07-496 – Response to Portion of NRC Request for Additional Information Letter No. 100 – Related to ESBWR Design Certification Application – RAI Number 4.4-61

cc:

AE Cubbage	USNRC (with enclosures)
DH Hinds	GEH Wilmington (with enclosures)
RE Brown	GEH Wilmington (with enclosures)
eDRF	73-9619

Enclosure 1

MFN 07-496

Response to Portion of NRC Request for

Additional Information Letter No. 100

Related to ESBWR Design Certification Application

RAI Number 4.4-61

NRC RAI 4.4-61

Applicability of CPR Correlation for start-up and LOCA conditions

In DCD Tier 2 Rev. 3 Figures 6.3-7, 6.3-15, 6.3-23, 6.3-31, 4D-22, 4D-23 related to LOCA analyses and start-up, you display the MCPR for these events. For these figures, do you use the GEXL correlation to calculate the MCPR? If so, provide a discussion justifying the use of this correlation since it is being used outside its range of applicability. If GEXL is not being used, what correlation is used? What is the applicability range of this correlation?

GE Response

The second paragraph of Section 6.6.6 (Boiling Transition Criteria) of the TRACG Model Description, Rev. 3 (Reference 4.4-61-1), explains that the TRACG channel component uses a combination of the GEXL correlation for dryout in annular flow, the Biasi correlation for departure from nucleate boiling and the Modified Zuber pool boiling critical heat flux correlation for low flow conditions to determine the transition between nucleate boiling and film boiling. The range of applicability of these correlations is discussed in Subsection 6.6.6.3 of Reference 4.4-61-1. The Modified Zuber correlation is applied below the lower mass-flux limit (100 kg/m^2-s) of the Biasi correlation for bubbly or churn flow, which occurs before the transition to annular flow. The TRACG algorithm for determining the 'Critical Power' or 'Thermal Margin' is such that the GEXL correlation is picked for annular flow at higher mass-fluxes (within its range of applicability) and the Modified Zuber or Biasi correlation or their interpolation is picked at lower mass-fluxes, i.e., outside the range of GEXL database, but within the range of their applicability.

The specific cases of LOCA and start-up analyses, mentioned in this RAI, are discussed below.

LOCA Analyses

Figures 6.3-7, 6.3-15, 6.3-23 and 6.3-31 of DCD Tier 2, Rev. 3, correspond to the Feedwater Line Break (FWLB), Main Steam Line Break (MSLB), Bottom Drain Line Break (BDLB) and the GDCS Injection Line Break (GDLB), respectively. Other related figures on Static Head Inside Chimney (Figures 6.3-8a, 6.3-16a, 6.3-24a and 6.3-32a) and Peak Cladding Temperature (Figures 6.3-14a, 6.3-22a, 6.3-30a and 6.3-38a) show that for all LOCA cases, the ESBWR core is always covered with water and the cladding never heats up. This is consistent with the MCPR values being significantly greater than unity for all LOCA cases as shown in Figures 6.3-7, 6.3-15, 6.3-23 and 6.3-31.

Start-up Analyses

Three different heat-up rates (50 MW, 85 MW and 125 MW) were used for the startup analyses corresponding to Figures 4D-22 and 4D-23. Initially, there were no voids in the channels, even in the hot bundle. As the heat-up proceeds, the RPV pressure (Figure 4D-11) increases; voids start to appear at the exit of the hot bundle (Figures 4D-17, 4D-18 and 4D-19), and the hot bundle exit flow rate (Figure 4D-20) starts to increase. MCPR is not evaluated until voids appear in the channel or fuel bundle. When the MCPR evaluation starts, TRACG effectively uses the Modified Zuber or Biasi correlation or their interpolation for low mass-fluxes. As the

flow rate and pressure increase, TRACG uses the GEXL correlation, as intended, within its range of applicability.

DCD Impact

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

References:

4.4-61-1 GE Energy Nuclear, "TRACG Model Description," NEDE-32176P, Revision 3, Class III, April 2006.