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U.S. Nuclear Regulatory Commission
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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 66 Related to ESBWR Design Certification Application, RAI Number 14.3-68**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) sent by NRC letter dated October 10, 2006 (Reference 1). The GEH response to RAI Number 14.3-68 is addressed in Enclosure 1.

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

Sincerely,

James C. Kinsey

James C. Kinsey
Vice President, ESBWR Licensing

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NRO

Reference:

1. MFN 06-377, Letter from U.S. Nuclear Regulatory Commission to David H. Hinds, *Request for Additional Information Letter No. 66 Related to ESBWR Design Certification Application,* October 10, 2006

Enclosures:

1. Response to Portion of NRC Request for Additional Information Letter No. 66 Related to ESBWR Design Certification Application, RAI Number 14.3-68

cc:	AE Cubbage	USNRC (with enclosure)
	GB Stramback	GEH/San Jose (with enclosure)
	RE Brown	GEH/Wilmington (with enclosure)
	DH Hinds	GEH/Wilmington (with enclosure)
	eDRF	0000-0068-2159 – RAI 14.3-68

Enclosure 1

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Response to Portion of NRC Request for

Additional Information Letter No. 66

Related to ESBWR Design Certification Application

RAI Number 14.3-68

NRC RAI 14.3-68

Question Summary:

Need for ITAAC or startup test program to validate local core flow characteristics.

Reviewer Summary:

DCD Tier 1, Revision 1, Section 2.8 does not specify any ITAACs for the ESBWR fuel design. Further, DCD Tier 2, Revision 1, Chapter 14 does not specify any test programs directed at validating local core flow characteristics. The ESBWR reactor vessel design, with the absence of jet pumps (and significantly lower core mass flow rate), represents a departure from the current fleet of BWRs in the United States. The staff has concerns regarding the uncertainty in predicted local core flow characteristics due to (1) the absence of jet pumps, (2) the potentially higher sensitivity of local flow characteristics to local power conditions, (3) the ESBWR's 1132 fuel bundle core configuration, and (4) the lack of prototypical operational experience. An increase in the uncertainty to predict local flow characteristics would further challenge CPR fuel design limits during normal operation and AOOs. Justify the lack of an ITAAC or test program to address this potentially larger uncertainty in predicted local core flow characteristics. Alternatively, develop an ITAAC or test program which either directly or indirectly confirms core flow characteristics in different regions of the core.

GEH Response

The startup test program will validate the predicted core flow. The core flow is determined by heat balance, utilizing the core inlet temperature measured in each LPRM (see DCD Tier 2 subsection 7.2.2.2.5.3), reactor dome pressure, steam flow, FW flow and temperature, RWCU flow and inlet/outlet temperatures, and CRD flow and temperature. Steam separator performance data is applied to determine the steam carry-under fraction, and pressure vessel heat losses are considered. GEH has provided a description of this heat balance method of core flow determination in the response to NRC RAI 14.2-44 (MFN 07-425 dated August 9, 2007).

Procurement of instruments will apply individual accuracy specifications, sufficient to provide a maximum one-sigma uncertainty in the total core flow measurement. The total core flow measurement uncertainty for the ESBWR is shown in Table 5-1 and discussed in section 5.6 of LTR GE-Hitachi Nuclear Energy, "GE14 for ESBWR – Critical Power Correlation, Uncertainty, and OLMCPR Development," NEDC-33237P, Class III (Proprietary), Revision 3, December 2007, and NEDO-33237, Class I (non-proprietary), Revision 1, December 2006.

This validation is part of the Core Performance Test (see DCD Tier 2 subsection 14.2.8.2.7) performed during startup testing. Because this validation cannot be performed in preoperational tests, it is not appropriate to create an ITAAC to confirm the local core flow characteristics. Consistent with operating BWRs, the individual fuel channel flows are not measured, so there is no possibility of local flow validation. The lower plenum is designed to provide a uniform pressure at the inlet, and the fuel entry orifice is sized to provide a significant pressure drop,

which provides a more uniform flow distribution. Differences between individual channel flows are accounted for in the 3D MONICORE ® thermal limits monitoring, which considers total core flow, channel power, and axial shape in determining (or back calculating) channel flow.

DCD Impact

No DCD changes will be made in response to this RAI