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MFN 06-349 Supplement 2

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Subject: **Response to Portion of NRC Request for Additional Information  
Letter No. 56 – Safety Analysis – RAI Numbers 4.4-7 S02, 4.4-8 S02,  
4.4-9 S02**

Enclosure 1 contains GHNEA'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,



James C. Kinsey  
Project Manager, ESBWR Licensing



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Reference:

1. MFN 06-316, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 56 Related to the ESBWR Design Certification Application*, September 7, 2006

Enclosures:

1. MFN 06-349 Supplement 2 – Response to Portion of NRC Request for Additional Information Letter No. 56 – Related to ESBWR Design Certification Application – Loose Parts Monitoring System – RAI Numbers 4.4-7 S02, 4.4-8 S02, 4.4-9 S02
2. MFN 06-349 Supplement 2 – Response to Portion of NRC Request for Additional Information Letter No. 56 – Related to ESBWR Design Certification Application – Loose Parts Monitoring System – RAI Numbers 4.4-7 S02, 4.4-8 S02, 4.4-9 S02 – Tier 2 DCD Markup Pages

cc: AE Cabbage USNRC (with enclosures)  
DH Hinds GHNEA Wilmington (with enclosures)  
BE Brown GHNEA Wilmington (with enclosures)  
eDRF 0000-0069-8215

**Enclosure 2**

**MFN 06-349 Supplement 2**

**Response to Portion of NRC Request for**

**Additional Information Letter No. 56**

**Related to ESBWR Design Certification Application**

**Loose Parts Monitoring System**

**RAI Numbers 4.4-7 S02, 4.4-8 S02, 4.4-9 S02**

**DCD Tier 2 Markup Pages**

#### 4.4.5 Loose-Parts Monitoring System

The Loose Parts Monitoring System (LPMS) has been withdrawn from the ESBWR design certification; therefore Regulatory Guide 1.133 is no longer applicable to the ESBWR design. This decision is supported by information documented in the License Topical Report, "Regulatory Relaxation for BWR Loose Parts Monitoring Systems", written by the BWR Owner's Group (Reference 4.4-17). This report provides justification for the removal of LMPS from current operating plants.

The ESBWR design and operation minimizes the potential for loose parts in the reactor pressure vessel. The ESBWR design takes into consideration material selection for critical components, and utilizes Flow Induced Vibration (FIV) testing and temporary strainers during startup to prevent loose parts from entering the reactor vessel. Licensees are expected to employ rigorous Foreign Materials Exclusion (FME) programs and underwater vessel inspections to prevent loose parts from entering the reactor vessel. The ESBWR is capable of performing its safety-related functions without the LPMS.

#### 4.4.6 Testing and Verification

The testing and verification techniques to be used to assure that the planned thermal and hydraulic design characteristics of the core have been provided, and remain within required limits throughout core lifetime, are discussed in Chapter 14.

#### 4.4.7 COL Unit-Specific Information

##### 4.4.7.1 Reactor Core Thermal and Hydraulic Design

This section contains no requirement for additional information to be provided in support of the combined license. Combined Operating License applicants referencing the ESBWR certified design would address changes to the thermal-hydraulic design of the reactor coolant system, if different from that presented in this document.

#### 4.4.8 References

- 4.4-1 General Electric Company, "Core Flow Distribution in a Modern Boiling Water Reactor as Measured in Monticello," NEDO-10299A, October 1976.
- 4.4-2 General Electric Company, "Core Flow Distribution in a General Electric Boiling Water Reactor as Measured in Quad Cities Unit 1," NEDO-10722A, August 1976.
- 4.4-3 General Electric Company, "Brunswick Steam Electric Plant Unit 1 Safety Analysis Report for Plant Modifications to Eliminate Significant In-Core Vibrations," NEDO-21215, March 1976.
- 4.4-4 R. C. Martinelli and D.E. Nelson, "Prediction of Pressure Drops During Forced Convection Boiling of Water," ASME Trans., 70, 695-702, 1948.
- 4.4-5 C. J. Baroczy, "A Systematic Correlation for Two-Phase Pressure Drop," Heat Transfer Conference (Los Angeles), AIChE, reprint No. 37, 1965.

- 4.4-6 N. Zuber and J. A. Findlay, "Average Volumetric Concentration in Two-Phase Flow Systems," Transactions of the ASME Journal of Heat Transfer, November 1965.
- 4.4-7 W. H. Jens and P. A. Lottes, "Analysis of Heat Transfer, Burnout, Pressure Drop and Density Data for High Pressure Water," USAEC Report ANL-4627, 1951.
- 4.4-8 General Electric Company, "General Electric BWR Thermal Analysis Basis (GETAB): Data Correlation and Design Application," NEDO-10958-A, January 1977.
- 4.4-9 GE Nuclear Energy, "TRACG Application for ESBWR," NEDE-33083P-A Revision 0, Class III (proprietary), March 2005.
- 4.4-10 GE Nuclear Energy, "Licensing Topical Report TRACG Model Description", NEDE-32176P, Revision 3, Class III (proprietary), April 2006.
- 4.4-11 GE Nuclear Energy, "Licensing Topical Report TRACG Qualification," NEDE-32177P Revision 2, Class III (proprietary), January 2000.
- 4.4-12 GE Nuclear Energy, "GE14 for ESBWR-Critical Power Correlation, Uncertainty, and OLMCPR Development", NEDC-33237P, Revision 1, Class III (proprietary), December 2006.
- 4.4-13 GE Nuclear Energy, "Methodology and Uncertainties for Safety Limit MCPR Evaluations", NEDC-32601P-A, Class III (proprietary), August 1999.
- 4.4-14 GE Nuclear Energy, "GE14 Pressure Drop Characteristics", NEDC-33238P, Class III (proprietary), December 2005.
- 4.4-15 "TASC-03A, A Computer Program for Transient Analysis of a Single Channel", NEDC-32084P-A, Revision 2, Class III (proprietary), July 2002.
- 4.4-16 Letter, J.S. Charnley (GE) to C. O. Thomas (NRC), Amendment 15 to General Electric Licensing Topical Report NEDE-24011-P-A, January 25, 1986.
- 4.4-17 GE Nuclear Energy, "Regulatory Relaxation for BWR Loose Parts Monitoring Systems," BWR Owner's Group Licensing Topical Report NEDC-32975P-A, Class III (Proprietary), Revision 0, February 2001.

Table 1.9-21

## NRC Regulatory Guides Applicability to ESBWR

RG No.	Regulatory Guide Title	Appl. Rev.	Issued Date	ESBWR Applicable?	Comments
1.133	Loose-Part Detection Program for the Primary System of Light-Water-Cooled Reactors	1	05/1981	No	A loose-parts monitoring system is not included in the ESBWR design.
1.134	Medical Evaluation of Licensed Personnel at Nuclear Power Plants	3	03/1998	—	COL
1.135	Normal Water Level and Discharge at Nuclear Power Plants	0	09/1977	Yes	
1.136	Materials, Construction, and Testing of Concrete Containments (Articles CC-1000, -2000, and -4000 through -6000 of the "Code for Concrete Reactor Vessels and Containments")	2	06/1981	Yes	
1.137	Fuel-Oil Systems for Standby Diesel Generators	1	10/1979	No	No safety-related Diesel Generators for ESBWR. URD intent – see Table 1.9-21a
1.138	Laboratory Investigations of Soils and Rocks for Engineering Analysis and Design of Nuclear Power Plants	2	12/2003	—	COL
1.139	Guidance for Residual Heat Removal	0	05/1978	Yes	URD optimization – see Table 1.9-21a