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Proprietary Information Notice  
*This letter forwards proprietary information in accordance with 10CFR2.390. The balance of this letter may be considered non-proprietary upon the removal of Enclosure 1.*

MFN 08-713

Docket No. 52-010

September 22, 2008

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. 156 Related to ESBWR Design Certification Application - Emergency Core Cooling Systems - RAI Number 6.3-54 S01**

Enclosures 1 and 2 contain the GE Hitachi Nuclear Energy (GEH) response to the subject NRC RAI originally transmitted via the Reference 1 letter and supplemented by an NRC request for clarification in Reference 2.

Enclosure 1 contains proprietary information as defined in 10CFR2.390. The affidavit contained in Enclosure 3 identifies that the information contained in Enclosure 1 has been handled and classified as proprietary to GEH. GEH hereby requests that the proprietary information in Enclosure 1 be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 9.17. Enclosure 2 is the non-proprietary version of the RAI response, which does not contain proprietary information and is suitable for public disclosure.

If you have any questions or require additional information, please contact me.

Sincerely,

Richard E. Kingston  
Vice President, ESBWR Licensing

DO68  
NRO

References:

1. MFN 06-379, Letter from U.S. Nuclear Regulatory Commission to David H. Hinds, *Request for Additional Information Letter No. 68 Related to ESBWR Design Certification Application*, October 10, 2006
2. MFN 08-138, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 156 Related to ESBWR Design Certification Application*, February 15, 2008

Enclosures:

1. MFN 08-713 - Response to Portion of NRC Request for Additional Information Letter No. 156 Related to ESBWR Design Certification Application - Emergency Core Cooling Systems - RAI Number 6.3-54 S01 - GEH Proprietary Information
2. MFN 08-713 - Response to Portion of NRC Request for Additional Information Letter No. 156 Related to ESBWR Design Certification Application - Emergency Core Cooling Systems - RAI Number 6.3-54 S01 - Non-Proprietary Information
3. Affidavit - David H. Hinds - dated September 22, 2008

cc: AE Cabbage      USNRC (with enclosures)  
BE Brown          GEH/Wilmington (with enclosures)  
DH Hinds          GEH/Wilmington (with enclosures)  
eDRF                0000-0090-7513

**Enclosure 2**

**MFN 08-713**

**Response to Portion of NRC Request for  
Additional Information Letter No. 156  
Related to ESBWR Design Certification Application**

**Emergency Core Cooling Systems**

**RAI Number 6.3-54 S01**

**Non-Proprietary Information**

**NRC RAI 6.3-54 S01:**

*Provide experimental data and benchmarks to support the improved TRACG04 pellet conductivity model. Provide a sensitivity study using the TRACG02 and TRACG04 conductivity models with fuel files.*

**GEH Response:**

The TRACG04 fuel pellet conductivity model is based on the PRIME03 fuel pellet conductivity model. The implementation of this model in TRACG04 is described in Appendix C of NEDC-33256P (Reference 6.3-54-1). A detailed description of this model is provided in Section 3.3.1 of Reference 6.3-54-2. In addition, the detailed basis of this model and comparisons with NRC identified open literature data has been discussed with the NRC related to the response to PRIME RAI-20 Supplement 1. The response to PRIME RAI-20 Supplement 1 will be provided separately.

A sensitivity study is performed on the two UO<sub>2</sub> (fuel pellet) conductivity models available in TRACG04, and the gap conductance fuel files. Please note that the conductivity model referred to as the TRACG02 model in the RAI above is referred to as the GESTR UO<sub>2</sub> conductivity model in this response. Likewise, the TRACG04 default model is referred to as the PRIME UO<sub>2</sub> conductivity model. TRACG04 is used for all the cases in this study. The base case for the sensitivity study is the analysis of record in DCD Tier 2, Revision 5. These cases are run with the PRIME UO<sub>2</sub> conductivity model and with fuel rod gap conductance inputs from the GESTR computer code. Details can be found the TRACG Model Description (Reference 6.3-54-1). For each event evaluated two sensitivity cases are performed. Case 1: This case is the same as the base case except that the GESTR UO<sub>2</sub> conductivity model is selected. Case 2: This case is the same as the base case except that the fuel rod gap conductance inputs are from the PRIME computer code.

The details of the effect of the PRIME versus GESTR UO<sub>2</sub> conductivity model can be seen in the response to RAI 6.3-54 (Reference 6.3-54-3). [[

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Three events are selected for the study: 1) The generator load rejection with total bypass failure (traditionally abbreviated LRNBP), in DCD Tier 2 Subsection 15.3.5. This is the transient event (Anticipated Operational Occurrences (AOO) and Infrequent Events) expected to be the event most affected by UO<sub>2</sub> conductivity and fuel rod gap conductance changes, because it is a fast event with the most severe flux peak. 2) The Anticipated Transients without Scram (ATWS) Main Steam Isolation Valve Closure (MSIVC) bounding case in DCD Tier 2 Subsection 15.5.2. This is the ATWS event expected to be the event most affected by UO<sub>2</sub> conductivity and fuel rod gap conductance changes. The effect on the ATWS loss of condenser vacuum event is expected to be similar; however, only one event is needed to demonstrate the sensitivity. 3) The stability Loss of Feedwater Heating (LOFWH) regional stability

evaluation at (Middle of Cycle) MOC exposure in DCD Tier 2 Subsection 4D.1.5. This event is selected because it is the limiting stability event. No Loss-of-Coolant Accident (LOCA) event is evaluated. Because the water level remains above top of active fuel in the LOCA analysis there is no fuel heat-up; therefore, the UO<sub>2</sub> conductivity and fuel rod gap conductance changes are much less important than in cases where fuel heat-up is calculated, as discussed in the response to RAI 6.3-53 (Reference 6.3-54-4).

LRNBP Study: Table 6.3-54-1 shows the results of the LRNBP study. [[

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**Table 6.3-54-1**

	Base Case – LRNBP*	Case 1 – LRNBP	Case 2 – LRNBP
UO <sub>2</sub> Conductivity Model	PRIME	GESTR	PRIME
Gap Conductance Input	GESTR	GESTR	PRIME
Maximum Neutron Flux, % NBR	425	[[ ]]	[[ ]]
Maximum Dome Pressure, MPaG (psig)	8.23 (1194)	[[ ]]	[[ ]]
Maximum Vessel Bottom Pressure, MPaG (psig)	8.36 (1212)	[[ ]]	[[ ]]
Maximum Steamline Pressure, MPaG (psig)	8.22 (1192)	[[ ]]	[[ ]]
Maximum Simulated Thermal Power, % of Initial	108.7	[[ ]]	[[ ]]
ΔCPR/ICPR	0.138	[[ ]]	[[ ]]
*Data From DCD Tier 2, Table 15.3-1a.			

ATWS MSIVC Study: Table 6.3-54-2 shows the results of the ATWS MSIVC study. [[

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**Table 6.3-54-2**

	Base Case – ATWS MSIVC*	Case 1 – ATWS MSIVC	Case 2 – ATWS MSIVC
UO <sub>2</sub> Conductivity Model	PRIME	GESTR	PRIME
Gap Conductance Input	GESTR	GESTR	PRIME
Sensed Maximum Neutron Flux, %	265.3	[[ ]]	[[ ]]
Maximum Vessel Bottom Pressure, MPaG (psig)	9.47 (1374)	[[ ]]	[[ ]]
Maximum Bulk Suppression Pool Temperature, °C (°F)	72.8 (163)	[[ ]]	[[ ]]
Associated Containment Pressure, kPaG (psig)	205.6 (29.8)	[[ ]]	[[ ]]
Peak Cladding Temperature, °C (°F)	849.1 (1560)	[[ ]]	[[ ]]
*Data From DCD Tier 2, Table 15.5-5a.			

Stability LOFWH Study: Table 6.3-54-3 shows the results of the stability LOFWH study. All cases are run at MOC (peak hot excess). [[

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**Table 6.3-54-3**

	Base Case – LOFWH Regional Stability*	Case 1 – LOFWH Regional Stability	Case 2 – LOFWH Regional Stability
UO <sub>2</sub> Conductivity Model	PRIME	GESTR	PRIME
Gap Conductance Input	GESTR	GESTR	PRIME
Power (% of Rated)	106	[[ ]]	[[ ]]
Regional Decay Ratio	0.66	[[ ]]	[[ ]]
*Data From DCD Tier 2, Table 4D-4.			

**Figure 6.3-54-1**

**GE14 UO<sub>2</sub> Peak Gap Conductance at 7.5 kW/ft Power Level**

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**Figure 6.3-54-2**

**GE14 UO<sub>2</sub> Peak Gap Conductance at 13.4 kW/ft Power Level**

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**References**

- 6.3-54-1 MFN 08-072, Letter from GE Hitachi Nuclear Energy (GEH) to U.S. Nuclear Regulatory Commission, "Transmittal of GE Hitachi Nuclear Energy (GEH) Licensing Topical Report, NEDE-32176P, Revision 4, *TRACG Model Description*, January 2008," dated February 6, 2008.
- 6.3-54-2 FLN-2007-001, Letter from Global Nuclear Fuel (GNF) to U.S. Nuclear Regulatory Commission, "GNF Licensing Topical Report, 'The PRIME Model for Analysis of Fuel Rod Thermal – Mechanical Performance,' NEDC-33256P, NEDC-33257P, and NEDC-33258P, January 2007," dated January 19, 2007.
- 6.3-54-3 MFN 08-053, Letter from GE Hitachi Nuclear Energy (GEH) to U.S. Nuclear Regulatory Commission, "Response to Portion of NRC Request for Additional Information Letter No. 68 Related to ESBWR Design Certification Application - Emergency Core Cooling Systems - RAI Numbers 6.3-54 and 6.3-55," dated January 25, 2008.
- 6.3-54-4 MFN 07-218, Letter from GE Hitachi Nuclear Energy (GEH) to U.S. Nuclear Regulatory Commission, "Response to Portion of NRC Request for Additional Information Letter No. 68 - Engineered Safety Features - RAI Numbers 6.2-100, 6.3-44, 6.3-53, 6.3-58, and 6.3-59," dated May 15, 2007.



**DCD Impact:**

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

**Enclosure 3**

**MFN 08-713**

**Affidavit**

**David H. Hinds**

**Dated September 22, 2008**

# GE- Hitachi Nuclear Energy Americas LLC

## AFFIDAVIT

I, **David H. Hinds**, state as follows:

- (1) I am the General Manager, New Units Engineering, GE Hitachi Nuclear Energy ("GEH") and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.
- (2) The information sought to be withheld is contained in Enclosure 1 of GEH letter MFN 08-713, Mr. Richard E. Kingston to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 156 Related to ESBWR Design Certification Application - Emergency Core Cooling Systems - RAI Number 6.3-54 S01*, dated September 22, 2008. GEH proprietary information is identified in Enclosure 1, *MFN 08-713 - Response to Portion of NRC Request for Additional Information Letter No. 156 Related to ESBWR Design Certification Application - Emergency Core Cooling Systems - RAI Number 6.3-54 S01 - GEH Proprietary Information*, by a dotted underline inside double square brackets. The electronic version includes a dark red font inside the brackets. For black-grayscale printed copies, the red font and dotted underline appears similar to normal text. [[This sentence is an example.<sup>{3}</sup>]] Figures and large equation objects are identified with double square brackets before, and after the object. In each case, the superscript notation {3} refers to paragraph (3) of this affidavit, which provides the basis of the proprietary determination. Specific information that is not so marked is not GEH proprietary. A non-proprietary version of this information is provided in Enclosure 2, *MFN 08-713 - Response to Portion of NRC Request for Additional Information Letter No. 156 Related to ESBWR Design Certification Application - Emergency Core Cooling Systems - RAI Number 6.3-54 S01 - Non-Proprietary Information*.
- (3) In making this application for withholding of proprietary information of which it is the owner, GEH relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.790(a)(4) for "trade secrets" (Exemption 4). The material for which exemption from disclosure is here sought also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).
- (4) Some examples of categories of information which fit into the definition of proprietary information are:

- a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GEH's competitors without license from GEH constitutes a competitive economic advantage over other companies;
- b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;
- c. Information which reveals aspects of past, present, or future GEH customer-funded development plans and programs, resulting in potential products to GEH;
- d. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a., and (4)b, above.

- (5) To address 10 CFR 2.390(b)(4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GEH, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GEH, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.
- (6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or subject to the terms under which it was licensed to GEH. Access to such documents within GEH is limited on a "need to know" basis.
- (7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GEH are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.
- (8) The information identified in paragraph (2), above, is classified as proprietary because it identifies the models and methodologies GEH will use in evaluating the consequences of design basis accidents (DBAs) for the ESBWR. GEH and its

partners performed significant additional research and evaluation to develop a basis for these revised methodologies to be used in evaluating the ESBWR over a period of several years at a significant cost.

The development of the evaluation process along with the interpretation and application of the analytical results is derived from the extensive experience database that constitutes a major GEH asset.

- (9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GEH's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GEH's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GEH.

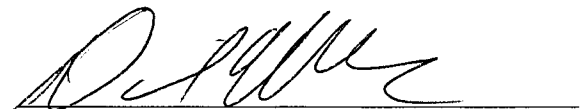
The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GEH's competitive advantage will be lost if its competitors are able to use the results of the GEH experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GEH would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GEH of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed on this 22<sup>nd</sup> day of September, 2008.



David H. Hinds  
GE- Hitachi Nuclear Energy Americas LLC