HITACHI

GE Hitachi Nuclear Energy

James C. Kinsey
Vice President, ESBWR Licensing

PO Box 780 M/C A-55
Wilmington, NC 28402-0780
USA

T 910 675 5057
F 910 362 5057

Proprietary Information Notice
This letter forwards proprietary information in accordance with 10 CFR 2.390. The balance of this letter may be considered non-proprietary upon the removal of Enclosure 1.

MFN 08-053

Docket No. 52-010

January 25, 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. 68 Related to ESBWR Design Certification Application - Emergency Core Cooling Systems - RAI Numbers 6.3-54 and 6.3-55**

Enclosures 1 and 2 contain the GE Hitachi Nuclear Energy (GEH) responses to the subject NRC RAIs transmitted via the Reference 1 letter.

Enclosure 1 contains proprietary information as defined in 10 CFR 2.390. 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 GEH responses, 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,

James C. Kinsey

James C. Kinsey
Vice President, ESBWR Licensing

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NRO

Reference:

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

Enclosures:

1. MFN 08-053 - 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 - GEH Proprietary Information
2. MFN 08-053 - 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 - Non-Proprietary Information
3. Affidavit - James C. Kinsey - dated January 25, 2008

cc:		
	AE Cubbage	USNRC (with enclosures)
	DH Hinds	GEH/Wilmington (with enclosures)
	GB Stramback	GEH/San Jose (with enclosures)
	RE Brown	GEH/Wilmington (with enclosures)
	eDRF	0000-0072-2132

Enclosure 2

MFN 08-053

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

Non-Proprietary Information

NRC RAI 6.3-54:

Section C.1.4.1 of NEDE-32176P, "TRACG Model Description, "Revision 3, states that the correlation for thermal conductivity used in TRACG04 for UO2 with and without Gadolinia has been updated to be compatible with the model used in PRIME03. PRIME03 has not been reviewed and approved by the NRC staff. Provide justification for using this model.

GEH Response:

The PRIME03 computer code is not currently being used to provide input to any of the TRACG04 ESBWR applications. GEH understands and has acknowledged that NRC review and approval for licensing applications of PRIME03 is required. Fuel file inputs to TRACG04 are being provided by the approved GSTRM computer code.

Section C.1.4.1 of NEDE-32176P, Revision 3 serves to document the improved fuel thermal conductivity model in TRACG04. The fact that this model is compatible with the PRIME03 model does not constitute a request or a requirement that PRIME03 be reviewed and approved by the NRC. The PRIME03 code is not being used to provide input to any TRACG04 ESBWR calculations.

The improved thermal conductivity model in TRACG04 introduces two real dependencies that are not present in the TRACG02 model: (1) degradation of thermal conductivity due to the presence of gadolinium; (2) change in thermal conductivity with exposure. At zero exposure and when there is no gadolinium, the TRACG04 thermal conductivity is [[ ]] as the thermal conductivity from the TRACG02 model as illustrated in Figure 6.3-54-1. All of the figures that follow are based on the TRACG04 model because the TRACG02 model is dominated by the temperature dependency shown in Figure 6.3-54-1. The TRACG02 model has no dependency on gadolinium [[

]].

Increasing gadolinium in the TRACG04 model results in lower thermal conductivity as shown in Figure 6.3-54-2. Increasing fuel exposure also results in lower thermal conductivity as seen in Figure 6.3-54-3. Thus the new model will produce higher, more conservative fuel temperatures relative to the model previously approved. The combination of high amounts of gadolinium and increasing exposure produces the lowest fuel thermal conductivity as seen in Figure 6.3-54-4. The three previous figures all show that the effects on fuel thermal conductivity [[ ]] are negligibly small at the higher temperatures where one might postulate an impact on the design basis.

The greater impact of gadolinium and exposure on fuel thermal conductivity occur for lower fuel temperatures that are expected for normal operation. Figure 6.3-54-5 depicts the calculated thermal conductivities versus exposure for the two extremes of gadolinium for two temperatures in the normal operational range. The figure shows that the largest variation in fuel thermal conductivity occurs for the lower exposures [[ ]] before there has been an appreciable release of fission gases from

the fuel pellet. The exposure range from between 10 to 30 GWd/t is the range of most interest with regards to transient, stability, anticipated transient without scram (ATWS) and loss-of-coolant accident (LOCA) analyses for which TRACG is applied because these are the exposure ranges where the limiting cases occur. The impact of fission gas release and thermal conductivity of those gases in the pellet-clad gap that is captured via the fuel files is of [[ ]] importance. The [[ ]] impact is on the calculated temperature for the fuel pellet since the temperature gradient will vary inversely proportional to the thermal conductivity. In other words, pellet average temperature will increase when the fuel thermal conductivity is decreased. For steady conditions, the fuel pellet temperature impacts the stored energy and the gap size. For transient conditions the gap size impacts the overall thermal time constant for the fuel rod in addition to the direct impact on time constant that results from thermal conductivity. In all the events of interest, the fuel thermal conductivity will tend to be lower when the effects of gadolinium and exposure are considered. The following paragraphs discuss how the realistic treatment of these effects in the improved TRACG04 model impact licensing calculations.

One common factor to all the event scenarios is the determination of the initial gap size. A lower thermal conductivity results in a higher fuel temperature and results in a smaller gap or results in pellet-clad gap closure at a lower exposure. [[

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For transients, a smaller gap produces a more dynamic response, which tends to increase the calculated change in critical power ratio (CPR). [[

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For stability events, the decreased initial gap size resulting from a higher overall pellet temperature provides initially for a larger mismatch in the heat flux relative to the flow reduction making it easier to trigger the oscillation. This may result in a larger amplitude power response to a particular flow reduction [[

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For ATWS events, the increased dynamic response changes the oscillation signature early in the event [[

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For LOCA analyses in operating BWRs, more stored energy initially in the fuel pellet together with a smaller calculated gap for lower exposures tends to increase the probability of an initial boiling transition as the core flow decreases rapidly during the first few seconds of a design-basis accident (DBA) LOCA. [[

]] The ESBWR LOCA calculations used a constant gap conductance so the dynamic gap model in TRACG was not used. The justification for this simplification for ESBWR LOCA calculations was provided in the response to RAI 6.3-53.

The improved TRACG04 fuel thermal conductivity model realistically accounts for the degradation of thermal conductivity due to the presence of gadolinium and the change in thermal conductivity with exposure. Accounting for these dependencies removes the bias in TRACG02 modeling that would be present except when the fuel was at zero exposure and contained no gadolinium.

In summary, the principle justifications for using the improved thermal conductivity model in TRACG04 are as follows: (1) the TRACG04 model is technically more correct in that it accounts for known dependencies that are not modeled in TRACG02; (2) the TRACG04 model will produce calculated results for all applications that are [[ ]] relative to the TRACG02 model; (3) the model can be and is being used with the GSTRM fuel files and does not require NRC review and approval of PRIME03 since the calculated results from PRIME03 are not being used in licensing calculations.

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Figure 6.3-54-1. Comparison of TRACG04 and TRACG02 Models

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Figure 6.3-54-2. Impact of Gadolinium in the TRACG04 Model

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Figure 6.3-54-3. Impact of Exposure in the TRACG04 Model with 0% Gadolinium

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Figure 6.3-54-4. Impact of Exposure in the TRACG04 Model with 10% Gadolinium

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Figure 6.3-54-5. Thermal Conductivity Variations for Operational Fuel Temperatures

DCD Impact:

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

No changes to the subject LTR will be made in response to this RAI

NRC RAI 6.3-55:

Provide justification for using gas gap conductivity and fuel thermal conductivity from two different analysis codes (GSTRM for gap conductivity and PRIME03 for fuel thermal conductivity).

GEH Response:

The requested justification was provided in the response to RAI 6.3-54. The most salient portion of the justification is repeated here. [[

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DCD Impact:

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

No changes to the subject LTR will be made in response to this RAI

GE Hitachi Nuclear Energy

AFFIDAVIT

I, James C. Kinsey, state as follows:

(1) I am the Vice President, ESBWR Licensing, 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 08-053, Mr. James C. Kinsey 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. GEH proprietary information is identified in Enclosure 1, *MFN 08-053 - 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 - 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. {3}]] 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 08-053 - 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 - 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 cost of over one million dollars.

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 25th day of January 2008.

James C. Kinsey

James C. Kinsey
GE Hitachi Nuclear Energy