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

GE Hitachi Nuclear Energy

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MFN 07-321
Supplement 1

Docket No. 52-010

April 4, 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. 105 Related to ESBWR Design Certification Application – RAI Numbers 7.2-20 Supplement 1, Parts A, D, E and 7.2-51 Supplement 1**

Enclosure 1 contains GEH's response to the subject NRC RAIs transmitted via the Reference 1 letter. The original RAI responses were submitted to the NRC via the Reference 2 letter.

Enclosure 1 contains GEH proprietary information. GEH customarily maintains this information in confidence and withholds it from public disclosure. A non-proprietary version is provided in Enclosure 2.

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 information of Enclosure 1 be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 9.17.

Note that the responses to 7.2-20 Supplement 1, Parts B and G are not included in this response. RAI 7.2-20 Parts B and G will be submitted by July 7, 2008 and August 22, 2008, respectively.

D068
NRO

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

Sincerely,

James C. Kinsey
Vice President, ESBWR Licensing

References:

1. MFN 07-460, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 105 Related To ESBWR Design Certification Application*, August 16, 2007

2. MFN 07-321, Letter from James Kinsey to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 78 Related to ESBWR Design Certification Application – Gamma Thermometers - RAI Numbers 7.2-19, 7.2-20, 7.2-51*, June 20, 2007

Enclosures:

1. MFN 07-321 Supplement 1 - Enclosure 1 - Response to Portion of NRC Request for Additional Information Letter No. 105 Related to ESBWR Design Certification Application – RAI Numbers 7.2-20 Supplement 1, Parts A, D, E and 7.2-51 Supplement 1 - GEH Proprietary Information

2. MFN 07-321 Supplement 1 - Enclosure 2 - Response to Portion of NRC Request for Additional Information Letter No. 105 Related to ESBWR Design Certification Application – RAI Numbers 7.2-20 Supplement 1, Parts A, D, E and 7.2-51 Supplement 1 Non-Proprietary Version

3. Affidavit – David H. Hinds

cc:	AE Cubbage	USNRC (with enclosures)	
	RE Brown	GEH/Wilmington (with enclosures)	
	GB Stramback	GEH/San Jose (with enclosures)	
	DH Hinds	GEH/Wilmington (with enclosures)	
	eDRF Section No.	0000-0082-9075	RAI 7.2-20 S01
		0000-0082-9075	RAI 7.2-51 S01

MFN 07-321

Supplement 1

Enclosure 2

Response to Portion of NRC Request for Additional Information Letter No. 105 Related to ESBWR Design Certification Application – RAI Numbers 7.2-20 Supplement 1, Parts A, D, E and 7.2-51 Supplement 1

Non-Proprietary Version

NRC RAI 7.2-20 S01

Proprietary information is in brackets.

A. The explanation provided in this response is not acceptable to the staff. The origin of the [[ ]] is NEDC-32964P-A. The measurements that the response refers to relied on using TIPs. TIPs are not included in the ESBWR design. Therefore, while a greater number of measurements were included in the determination of the NEDC-32964P-A uncertainty these measurements are not indicative of the monitoring to be performed for the ESBWR. Furthermore, the NEDC-32964P-A. A topical report requires that the applicability of the numbers be demonstrated, specifically item (3) requires that the 3D MONICORE bundle power calculational uncertainty should be verified when applied to fuel and core designs not included in the benchmark comparisons. It is worth noting that in developing the uncertainty [[

]] therefore the staff does not agree with the statement that these benchmark comparisons are necessarily indicative of the ESBWR 3D MONICORE. Please provide additional descriptive details, in light of more recent qualification against high power density plants and specific testing relevant to the ESBWR instrumentation design and core monitoring methodology.

B. The response states that [[ ]] is addressed in the response to RAI 7.2-9. The staff does not agree with the applicant because the response to RAI 7.2-9 addresses the [[ ]] only. Furthermore, the staff disagrees with the applicant's statement that the uncertainty is unexpected to change. The staff disagrees because a TIP trace provides direct measurement of the [[ ]] at every nodal level, while the GT arrangement cannot. The staff finds it counterintuitive to conclude that fewer measurements can result in the same uncertainty. Qualitatively address the unique aspects regarding the ESBWR specific core monitoring approach that would compensate for a reduced number of measurements. Comment specifically on the ramification of having an anomaly in one axial node that perturbs the power distribution locally and the efficacy of the GT arrangement to identify such an anomaly.

C. This response is acceptable.

D. The results in Table 7-18 refer to the GT core monitor study. It appears to the staff that a [[ ]] technique would have to be employed to perform core wide [[ ]]. Verify that the gamma scan comparisons were carried out based on off-line predicted barium concentrations where the power shapes input into the offline methodology were those that were determined by adapting the [[ ]]. If intermediate TIP adaption was performed, justify the direct applicability of the gamma scan RMS differences.

E. The staff requested clarification of the term [[ ]] in a supplemental request for information pursuant to RAI 7.2-58. The staff also asked for clarification regarding the value In Table 8-7 in terms of its relation to the data in Tables 7-3 and 7-4. The staff does not understand the applicability of these data considering that they are based on [[ ]] GTs per string, which is not the proposed design for the ESBWR. Provide justification for the applicability of the [[ ]] data considering the difference in the ESBWR design. This justification should consider any additional uncertainty associated with having fewer sensors including a determination of an equivalent [[ ]] value ignoring all but [[seven]] of the GT Instruments In a way that Is realistic by providing an equivalent [[ ]] uncertainty where all but [[ ]] of the GT signals per string in the [[ ]] are not considered in the adaption and RMS difference analysis.

F. This response is acceptable.

G. The staff finds this response to be inconsistent with general adaption practices and the uncertainly analysis provided in NEOe-33197P. First, the response indicates that [[ ]], is this practice proposed for the ESBWR? Second, the use of [[ ]], therefore the uncertainty analysis should consider LPRM uncertainties associated with LPRM drift between calibrations. Please clarify this response.

H. This response is acceptable.

A. The explanation provided in this response is not acceptable to the staff. The origin of the [[ ]] is NEDC-32964P-A. The measurements that the response refers to relied on using TIPs. TIPs are not included in the ESBWR design. Therefore, while a greater number of measurements were included in the determination of the NEDC-32964P-A uncertainty these measurements are not indicative of the monitoring to be performed for the ESBWR. Furthermore, the NEDC-32964P-A. A topical report requires that the applicability of the numbers be demonstrated, specifically item (3) requires that the 3D MONICORE bundle power calculational uncertainty should be verified when applied to fuel and core designs not included in the benchmark comparisons. It is worth noting that in developing the uncertainty [[

]] therefore the staff does not agree with the statement that these benchmark comparisons are necessarily indicative of the ESBWR 3D MONICORE. Please provide additional descriptive details, in light of more recent qualification against high power density plants and specific testing relevant to the ESBWR instrumentation design and core monitoring methodology.

GEH Response

GT interpolation and adaption techniques were studied using reactors with [[ ]] As a result, a [[ ]] and an adaptive technique were chosen for the proposed ESBWR monitoring system based on [[ ]] per string and the bundle power uncertainty was updated. Please refer to the response to RAI 4.2-12, S02 parts 10 and 11 (see MFN 08-293, dated April 3, 2008) for the requested additional descriptive details.

B. The response states that [[ ]] is addressed in the response to RAI 7.2-9. The staff does not agree with the applicant because the response to RAI 7.2-9 addresses the [[ ]] only. Furthermore, the staff disagrees with the applicant's statement that the uncertainty is unexpected to change. The staff disagrees because a TIP trace provides direct measurement of the [[ ]] at every nodal level, while the GT arrangement cannot. The staff finds it counterintuitive to conclude that fewer measurements can result in the same uncertainty. Qualitatively address the unique aspects regarding the ESBWR specific core monitoring approach that would compensate for a reduced number of measurements. Comment specifically on the ramification of having an anomaly in one axial node that perturbs the power distribution locally and the efficacy of the GT arrangement to identify such an anomaly.

GEH Response

Not in the current response. The response to this item will be provided by July 7, 2008 in a separate transmittal.

D. The results in Table 7-18 refer to the GT core monitor study. It appears to the staff that a [[ ]] technique would have to be employed to perform core wide [[ ]]. Verify that the gamma scan comparisons were carried out based on off-line predicted barium concentrations where the power shapes input into the offline methodology were those that were determined by adapting the [[ ]]. If intermediate TIP adaption was performed, justify the direct applicability of the gamma scan RMS differences.

GEH Response

In the response to RAI 4.2-12S02 (see MFN 08-293, dated April 3, 2008) a GT adaption study description is presented. [[

]].

In 2003, a paper was published as part of GENES4/ANP2003. The paper title is: "Verification of Core Monitoring System with Gamma Thermometer". This paper describes the gamma scans carried out to compare bundles power (measured versus predicted). The requested verification can be found in the part that states: "*Two calculated Ba-140 distributions obtained from CMSs (Core Monitoring System). The one is the evaluation from TIP-CMS, and the other is from the GT-CMS. For these evaluations, 36 datasets of TIP and GT were collected at the rated operation during the in-plant test. The data set collected one every week in the 2 months of beginning cycle, one every 2 weeks in the middle of cycles and one every week in the 3 months of end cycle. The burnup calculation was executed by off-line CMS with these TIP/GT dataset to adaptive.*"

The off-line exposure tracking performed to obtain calculated powers for the gamma scan differs from the core tracking method used by GEH (adaptive powers were used to obtain the fuel depletion distribution) and monitoring system used one-group diffusion model. However, Kashiwazaki-Kariwa-5 (K-5) gamma scan results are considered valid for ESBWR qualification since output values are bounded by documented gamma scan results (NEDC-32694P-A) obtained in better known reactor conditions and with more advanced GE core monitoring techniques.

E. The staff requested clarification of the term [[ ]] in a supplemental request for information pursuant to RAI 7.2-58. The staff also asked for clarification regarding the value In Table 8-7 in terms of its relation to the data in Tables 7-3 and 7-4. The staff does not understand the applicability of these data considering that they are based on [[ ]] GTs per string, which is not the proposed design for the ESBWR.

Provide justification for the applicability of the [[ ]] data considering the difference in the ESBWR design. This justification should consider any additional uncertainty associated with having fewer sensors including a determination of an equivalent [[ ]] value ignoring all but [[seven]] of the GT Instruments In a way that Is realistic by providing an equivalent [[ ]] uncertainty where all but [[ ]] of the GT signals per string in the [[ ]] are not considered in the adaption and RMS difference analysis.

GEH Response

The [[ ]] reported in the response to RAI 4.3-2S01 Paragraph 7 (see MFN 08-293, dated April 3, 2008) is presented as the description of the [[ ]]. This value is found in two different places in the LTR. In the response to RAI 7.2-20 (see MFN 06-350 Supplement 3, dated June 15, 2007), the [[ ]] was explained as the maximum of two average standard deviation values. One average standard deviation value [[ ]] was obtained with standard deviation values presented in Table 7-3 (corresponding to RSTK-01). The other average standard deviation value [[ ]] was obtained with standard deviation values presented in Table 7-4 (corresponding to RSTK-02). The standard deviation values used in both cases correspond to reactor powers greater than 95% of rated power. The footnote in both Section 7 tables declared that the values were obtained using relative percentage differences. This metric tends to magnify minor absolute differences. The footnotes also stated that equivalent fission detector readings was used to obtain the statistical data, that is, the [[ ]] was used as explained in subsection 7.2.5.1 of the LTR and in the response to RAI 7.2-58 (see MFN 07-162, dated May 14, 2007).

The second occurrence of the [[ ]] value is the response to RAI 7.2-58 first paragraph, sub-item 4) and it was incorrectly assigned to the [[ ]] since the value in Table 8-7 is a mean value and neither a standard deviation nor Root-Mean-Square value as is current practice in the power uncertainty analysis.

Please note that the [[ ]] was prepared to allow comparison between GT instrument readings with the thermal TIP and LPRM readings in the [[ ]] test. The [[ ]] is a legitimate tool for analyzing [[ ]] testing results, thermal TIPs are authorized monitoring instrumentation and comparison results with GT data are reconcilable. However, the correlation is [[

]].

The two reactors used for GT testing have a [[ ]], their [[ ]] and are [[ ]]. Even though the [[ ]] are fewer than ESBWR, [[ ]] of the BWR fleet.

To determine details of the uncertainty analysis required for CPR and LHGR calculations, [[ ]]is considered more appropriate [[ ]]. The effect on [[ ]] caused by the number of GT sensors is also required as part of core wide simulations. For that purpose, a [[ ]] was prepared and explained in the response to RAI 4.2-12S02 parts 10 and 11 (see MFN 08-293, dated April 3, 2008). Please refer to that response for details.

G. The staff finds this response to be inconsistent with general adaption practices and the uncertainly analysis provided in NEOe-33197P. First, the response indicates that [[ ]], is this practice proposed for the ESBWR? Second, the use of [[ ]], therefore the uncertainty analysis should consider LPRM uncertainties associated with LPRM drift between calibrations. Please clarify this response.

GEH Response

Not in the current response. The response to this item will be provided by August 22, 2008 in a separate transmittal.

DCD/LTR 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 7.2-51 S01

Proprietary information is in brackets.

The response to 7.2-14 only states that the AFIP uncertainty analysis qualification basis will address the number of required GT sensors. 7.2-64 describes the two techniques under consideration. RAI 7.2-51 requested that the qualification basis address the advantages of either technique under consideration when adapting to double-humped power shapes, or challenging power shapes such as the [[ ]].

RAI 7.2-51 also requested an update to the topical report to address core monitor performance using either technique when the core power shape is double humped. Update the LTR to quantitatively assess core monitor performance using GT adaption with either [[ ]] technique for axial power shapes with multiple local peaks. Provide a plot showing a TIP trace of a double humped power shape as well as the GT adapted axial power shape based on [[ ]] simulated instruments and the proposed [[extrapolation]] techniques. Comment on the [[ ]] uncertainty for this scenario. Determine the CPR for the bundles with the highest four bundle power based on a TIP adapted power shape as well as a simulated GT adapted power shape. If [[ ]].

GEH Response

Please note that further simulations using the [[ ]] is a legitimate tool for analyzing [[ ]] testing results, however, it is of limited value. The ESBWR GT system will assist [[ ]] in the reconciliation of the [[ ]] but the detector response is accounted using [[ ]].

Various power profiles in [[ ]] points were analyzed with the interpolation of simulated GT data. The study is summarized in the response to RAI 4.2-12S02 parts 10 (see MFN 08-293, dated April 3, 2008) and the power uncertainty update is presented in part 11 of the same response. The LTR will be updated with the information of both parts 10 and 11.

Figures 1 through 4 present the [[ ]] for [[ ]]. Figures 5 through 8 present [[ ]], respectively. Table I and Figures 9 and 10 present the result of the GT adaption schemes when applied to all 24 and 33 instrumentation strings of [[ ]] respectively. GT adaption results for both plants were summarized in part 10 of the response to RAI 4.2-12S02. The interpolation method based [[ ]] was studied and more stable results were found for the latter method. The proposed adaptive scheme is

based [[
]]. This option is known as [[

]].

[[

]]

Finally, Figures 11 and 12, present the comparison of power profiles in strings 8 and 18, respectively, for Plant E MOC9. The power profiles were obtained using [[ ]] adaptive process with input from TIP data or simulated GT data. Since Plant E utilizes thermal TIP detectors, the measured power profile showed more fluctuations in thermal neutron flux. The interpolation scheme tends to smooth the details between interpolation nodes located [[ ]].

[[

]]

DCD/LTR 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.

MFN 07-321
Supplement 1

Enclosure 3

Affidavit

GE Hitachi Nuclear Energy

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 07-321 Supplement 1, Mr. James C. Kinsey to U.S. Nuclear Regulatory Commission, "Response to Portion of NRC Request for Additional Information Letter No. 105 Related to ESBWR Design Certification Application – RAI Numbers 7.2-20 Supplement 1, Parts A, D, E and 7.2-51 Supplement 1," dated April 4, 2008. GEH Proprietary Information is identified in Enclosure 1, "Response to Portion of NRC Request for Additional Information Letter No. 105 Related to ESBWR Design Certification Application – RAI Numbers 7.2-20 Supplement 1, Parts A, D, E 7.2-51 Supplement 1 – GEH Proprietary Information," in dark red font and a dashed underline inside double square brackets. [[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, "Response to Portion of NRC Request for Additional Information Letter No. 105 Related to ESBWR Design Certification Application – RAI Numbers 7.2-20 Supplement 1, Parts A, D, E and 7.2-51 Supplement 1 Non-Proprietary Version."

(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 2.390(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 detailed GEH ESBWR methods, techniques, information, procedures, and assumptions related to its gamma thermometer system.

The development of the models and methodologies along with their application 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 4th day of April 2008.

David H. Hinds
GE Hitachi Nuclear Energy