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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.

MFN 07-321

Docket No. 52-010

June 20, 2007

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. 78 Related to ESBWR Design Certification Application – Gamma Thermometers - RAI Numbers 7.2-19, 7.2-20, 7.2-51**

Enclosures 1 and 2 contain GE-Hitachi Nuclear Energy Americas LLC (GHNEA)'s response to the subject NRC supplemental RAI transmitted via Reference 1.

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 GHNEA. GHNEA 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 contains a non-proprietary version.

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

Sincerely,

Kathy Sedney for

James C. Kinsey
Project Manager, ESBWR Licensing

D068

MRO

Reference:

1. MFN 06-392 – Letter from US Nuclear Regulatory Commission (NRC) to David H. Hinds, *Request for Additional Information Letter No. 78 Related to ESBWR Design Certification Application,* dated October 11, 2006

Enclosures:

1. Response to NRC Request for Additional Information Letter No. 78 Related to ESBWR Design Certification Application, dated October 11, 2006 – Gamma Thermometers, RAI Numbers 7.2-19, 7.2-20, and 7.2-51 – GHNEA Proprietary Information
2. Response to NRC Request for Additional Information Letter No. 78 Related to ESBWR Design Certification Application, dated October 11, 2006 - Gamma Thermometers, RAI Numbers 7.2-19, 7.2-20, and 7.2-51 – GHNEA Proprietary Information – Non-Proprietary Version
3. Affidavit – David H. Hinds – dated June 20, 2007

cc: AE Cubbage USNRC (with enclosures)
GB Stramback GHNEA /San Jose (with enclosures)
RE Brown GHNEA /Wilmington (with enclosures)
eDRF 0000-0062-8799 Rev 1, for the NRC RAI 7.2-19
0000-0060-4636 Rev 3, for the NRC RAI 7.2-20
0000-0060-4103 Rev 2, for the NRC RAI 7.2-51

Enclosure 2

MFN 07-321

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 and 7.2-51

Non-Proprietary Version

NRC RAI 7.2-19

Section 4.1 of NEDE-33179P states that the [[ ]] is determined during [[ ]] and Section 4.2 states that the [[ ]].

Provide a qualitative discussion of the validity of the [[ ]] given that the [[ ]].

GHNEA Response:

[[

α

]] α [[

α

]] α [[

]]

Scandpower A/S developed a model for the GT sensor in which the GT sensitivity, S_o, is shown to be inversely proportional to the thermal conductivity of the SS, k_{ss} (see NRC RAI 7.2-13 response, MFN 07-162, dated 5/11/07). This model does not consider volumetric heating in the core tube nor heat transfer through the argon gap and thus is an approximate model.

Although α is not defined in the model, the suggested method for translating the coefficients of equation (6) in NRC RAI 7.2-13 uses the ratio of k_{ss} at the two temperatures to modify the linear coefficient and the ratio squared to modify the second order coefficient,

$$S_0(T_2)=S_0(T_1)\frac{k_{ss}(T_1)}{k_{ss}(T_2)} \quad and \quad \alpha S_0^2(T_2)=\alpha S_0^2(T_1)\left(\frac{k_{ss}(T_1)}{k_{ss}(T_2)}\right)^2$$

While S_0 is modified, α is not. Thus the α obtained by joule calibration at the factory at approximately 20°C is used to calculate the sensitivity at reactor conditions (see equation 4.3-3 in NEDE-33197P).

[[

]] α [[

]]

Affected Documents

This response does not require a change to any DCD Tier.

This response does not require a change to the LTR.

NRC RAI 7.2-20

[[ ]] uncertainties are provided in Table 9-14 and 9-15 of NEDE-33197P. Provide more discussion on how these uncertainties are determined. Specifically:

A. Explain why [[ ]] is applied in NEDC-33237P instead of [[ ]] shown in Table 9-14.

B. Explain the uncertainties for GT sensor arrangements in terms of the uncertainty in [[
]]

C. How are GT uncertainties the same as traversing incore probe (TIP) uncertainties for integral power, regardless of arrangement (Table 9-14)? The TIP power allocation uncertainty from NEDC-32601P-A is based on TIP adaption and gamma scan data, how is it the same for the GT arrangements; particularly address the difference between LPRM-only adaption versus LPRM with TIP adaption (Table 9-14)?

D. Explain the [[ ]] quoted in Table 9-15 for both integral power and four bundle allocation. Specifically explain how GT sensor signals were compared to gamma scan data in the axial spans between GT sensor locations. Explain the procedure for calculating the axial power distribution and four bundle power allocation based on the GT sensors, or alternatively, describe how the gamma scan results were compared to the GT sensor indications.

E. What is the GT to neutron TIP Bundle Uncertainty? Provide greater discussion as to how this value was determined.

F. Explain the rationale behind the GT sensor failed uncertainty.

G. Do these uncertainties change assuming LPRM adaption versus GT adaption?

H. How are the uncertainties in Table 9-13 related to the [[ ]]?

GHNEA Response

A. The uncertainties in Table 9-14 are based on limited data obtained from the comparison of GT to n-TIP data at the Tokai 2 reactor. [[
]] is based on thousands of comparisons between measurements and predictions and represents the true expected uncertainty in the ability of 3D-Monicore to predict the power distribution.

B. The uncertainty in [[
]] represent the ability of 3D Monicore to predict [[ ]] These uncertainties are based on thousands of comparisons between measurements and

predictions and are not expected to change by using GTs instead of TIPs. The ability to extrapolate from the GT detector to individual bundle power is addressed in the response to RAI 7.2-9 (MFN 07-162, dated 5/11/07).

C. Table 9-14 summarizes the bundle uncertainties as determined from limited testing at Tokai-2. The GT bundle uncertainty was calculated relative to TIP indication. Therefore, in totaling the GT uncertainty, both the TIP integral and the GT-to-TIP uncertainty are stacked together. [[ ]] is the existing TIP integral uncertainty component of the overall GT uncertainty. The TIP power allocation uncertainty from NEDC-32601P-A is the 3D Monicore modeling uncertainty based on thousands of measurements and is not expected to change by using GTs instead of TIPs.

A 7-GT AFIP design will be used in place of TIPs to calibrate LPRMs and perform steady-state power distribution monitoring.

D. The [[ ]] quoted in Table 9-15 is from gamma scan results documented in Table 7-18 of the LTR. The GT sensor signals themselves were not compared to gamma scan data. Rather, the GT signals were used to adapt the BWR core simulator solution, which in turn calculated the isotopics for comparison to the gamma scan data. Information on the adaption techniques used with gamma thermometers is discussed in the response to RAI 7.2-51 (included in this response letter Enclosure).

E. This uncertainty is obtained from Tables 7-3 and 7-4 in NEDE-33197P as the maximum average of the standard deviations for the 9 GT sensors and for rated power cases.

F. The failed GT sensor uncertainty of [[ ]] was an estimate. The rationale was as follows: The uncertainty associated with the failure of one TIP detector resulting in the loss of up to 1/3 of the core TIP data is [[ ]] (reference NEDC–32694P). The failure of one GT detector string would result in losing much less than 1/3 of the core data, by at least an order of magnitude. Therefore, it was estimated that the effect of a failed GT string would be an order of magnitude less than that of a failed TIP. For practical reasons, the allowable number of GT failures will be such that the GT failure uncertainty will be equal to or less than the [[ ]] currently used for the TIP failure uncertainty.

G. No. Since GT signals are always available, LPRM adaption will no longer be necessary during normal steady state power distribution monitoring. LPRM adaption will be used only during transients since GTs do not respond quickly to power distribution changes. [[ ]] In the case of a core power distribution calculation utilizing solely GT adaption, the total bundle power uncertainty is expected to be unchanged.

H. The expected and observed differences in Table 9-13 are not related to the [[ ]]. These values are based solely on the difference between the two methods. The Table was used to develop expected results for validation of the tests and not intended to be an indication of [[ ]].

Affected Documents

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

The following changes will be made in the next revision of the LTR NEDE-33197P: remove the sentence regarding safety analyses below Table 9-14. This LTR will be submitted to the NRC by September 28, 2007.

NRC RAI 7.2-51

Explain the [[ ]]. With only [[ ]], discuss the [[ ]]. Explain the treatment of uncertainty arising from this [[ ]]. Discuss the advantages of either [[ ]]. Is [[ ]] necessary when the number of [[ ]]? Include this information in NEDE-33197P (the LTR).

GHNEA Response

[[

]] See our response to RAI 7.2-64 (MFN 07-162, dated 5/11/07) for a description of the quadratic extrapolation technique.

The response to RAI 7.2-14 (MFN 07-162, dated 5/11/07) provides additional details regarding the curve fitting techniques.

Affected Documents

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

MFN 07-321

Enclosure 3

AFFIDAVIT

GE-Hitachi Nuclear Energy Americas LLC

AFFIDAVIT

I, David H. Hinds, state as follows:

(1) I am Manager, New Units Engineering , GE-Hitachi Nuclear Energy Americas LLC ("GHNEA"), 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 GHNEA letter MFN 07-321, Mr. James C. Kinsey to U.S. Nuclear Regulatory Commission, entitled *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, dated June 20, 2007. The proprietary information in Enclosure 1, *Response to Portion of NRC Request for Additional Information Letter No. 78 Related to ESBWR Design Certification Application - Gamma Thermometers - RAI 7.2-19, 7.2-20, 7.2-51* is in dark red font delineated by a [[dotted underline inside double square brackets.{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 for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner, GHNEA 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 GHNEA's competitors without license from GHNEA 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 GHNEA customer-funded development plans and programs, resulting in potential products to GHNEA;
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 GHNEA, 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 GHNEA, 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. Access to such documents within GHNEA 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 GHNEA 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 detailed GHNEA ESBWR methods, techniques, information, procedures and assumptions related to its Gamma Thermometer technology. Development of these methods, techniques, information, procedures and assumptions and their application for the design, modification, and analyses methodologies and processes for the Gamma Thermometers and to the design and manufacturing of other BWR internal hardware was achieved at a significant cost to GHNEA, on the order of approximately several million dollars and would result in a significant economic and competitive advantage to a competitor.

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 GHNEA asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GHNEA's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GHNEA'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 GHNEA.

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.

GHNEA's competitive advantage will be lost if its competitors are able to use the results of the GHNEA 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 GHNEA 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 GHNEA 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 20th day of June 2007.

David H. Hinds
GE-Hitachi Nuclear Energy Americas LLC