HITACHI

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 08-293

Docket No. 52-010

April 3, 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. 106 – Related to ESBWR Design Certification Application – RAI Numbers 4.2-12 Supplement 2 and 4.3-2 Supplement 2

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) sent by the Reference 1 NRC letter. GEH's responses to RAI Numbers 4.2-12 Supplement 2 and 4.3-2 Supplement 2 are addressed in Enclosures 1, 2 and 3. The responses to RAI 4.2-12 S02 Part 22, RAI 4.3-2 S02 Part A, Part C2 and Part G are not included in this response. GEH's response to these items will be provided by July 7, 2008 in a separate transmittal.

Enclosure 1 contains GEH proprietary information as defined by 10 CFR 2.390. 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 10 CFR 9.17.

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

References:

1. MFN 07-497, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, GEH, *Request For Additional Information Letter No. 106 Related To ESBWR Design Certification Application*, dated September 6, 2007
2. MFN 06-492, Response to Portion of NRC Request for Additional Information Letter No. 66 Related to ESBWR Design Certification Application - DCD Chapter 4 and GNF Topical Reports - RAI Numbers 4.2-11 and 4.2-12, December 1, 2006.
3. MFN 06-492 Supplement 1, Response to Portion of NRC Request for Additional Information Letter No. 66 Related to ESBWR Design Certification Application - RAI Number 4.2-12 S01, June 20, 2007.
4. MFN 06-350, Response to Portion of NRC Request for Additional Information Letter No. 53 Related to ESBWR Design Certification Application - DCD Chapter 4 and GNF Topical Reports - RAI Numbers 4.3-2, 4.3-5, 4.4-25, 4.4-30, 4.4-35, 4.4-39, 4.4-51, September 29, 2006.
5. MFN 06-350 Supplement 3, Response to Portion of NRC Request for Additional Information Letter No. 53 Related to ESBWR Design Certification Application - DCD Chapter 4 and GNF Topical Reports - RAI Number 4.4-25 S01, June 15, 2007.

Enclosures:

1. MFN 08-293 – Response to Portion of NRC Request for Additional Information Letter No. 106 – Related to ESBWR Design Certification Application – RAI Numbers 4.2-12 S02 and 4.3-2 S02 – GEH Proprietary Information
2. MFN 08-293 – Response to Portion of NRC Request for Additional Information Letter No. 106 – Related to ESBWR Design Certification Application – RAI Numbers 4.2-12 S02 and 4.3-2 S02 – Non-Proprietary Version
3. MFN 08-293 – Response to Portion of NRC Request for Additional Information Letter No. 106 – Related to ESBWR Design Certification Application – RAI Numbers 4.2-12 S02 and 4.3-2 S02 – Affidavit

cc:	AE Cubbage	USNRC (with enclosure)
	GB Stramback	GEH/San Jose (with enclosure)
	RE Brown	GEH/Wilmington (with enclosure)
	DH Hinds	GEH/Wilmington (with enclosure)
	eDRF	0000-0082-9075

Enclosure 2

MFN 08-293

Response to Portion of NRC Request for

Additional Information Letter No. 106

Related to ESBWR Design Certification Application

RAI Numbers 4.2-12 S02 and 4.3-2 S02

Non-Proprietary Version

NRC RAI 4.2-12 S02

Parts 1 and 2 will remain open items until these issues are acceptably resolved by RAI 4.3-2

Part 6: Provide any relevant data that would be indicative of discharge exposure. Namely, provide the core thermal power level, core size, and cycle duration. Using any additional relevant information, provide an estimate of the average cycle exposure. Alternatively qualitatively assess any design features of K5 relative to the ESBWR to determine if the discharge exposures are expected to be significantly different.

Part 8: Please provide greater clarification of what is meant by the "interim methodology." Does this interim methodology correspond to the interim methodology for expanded operating domain BWRs?

Part 10 The insight that the staff needs is to understand the impact on predicted power distributions for each adaption technique. Additionally, the staff was not aware that the uncertainty analysis for GT instrumentation is predicated on the [[ ]] *methodology as opposed to the proposed methodology for the ESBWR (PANAC11). The ESBWR uncertainty analysis, it appears to the staff, may depend on the core simulator and the adaption technique employed. This adaption technique will also depend on the number of AFIPs or other* [[ ]] *methods.*

Since the information regarding the K5 reactor is sparse, the core monitoring software was different, the number of AFIPs proposed for ESBWR and those employed at K5 are different, and no final adaption technique has been proposed, the staff does not have sufficient information regarding the numerical uncertainty analysis to make a determination regarding the applicability of the K5 data to the proposed ESBWR application.

To provide insight into the effects of adaption on power distribution uncertainty, please provide an analysis using a relevant reactor plant from the experience database. Using purely predictive methods (no adaption) perform a core follow analysis for a relevant (high power density, large core) reactor plant. The plant and cycle selected for reanalysis should be challenging from a reactor power distribution standpoint. [[
]]

Produce a MOC and an EOC radial power map (axially integrated four bundle power) and axial power shape curve. Please provide these curves in figures that are substantially similar in format to Figures 27-1 through 27-68 of MFN-05-029. Using LPRM adaption, perform the same core follow analysis and produce a MOC and an EOC radial power map and axial power shape curve. Provide additional figures using TIP adaption. Specify whether absolute or shape adaption is used.

When an adaption technique is finalized for the ESBWR, [[ ]] *readings based on local TIP readings, perform a cycle follow analysis and associated radial and axial power distributions for the same plant using* [[ ]] *adaption with an arrangement that is similar to the ESBWR (i.e.* [[ ]] *instruments per string with similar spatial arrangement).*

The staff understands that this will not help assess the [[ ]] *uncertainty, but it will provide a quantitative comparison of core monitoring performance using discrete vs. continuous* *adaption. Comment on the differences in the radial and axial power distributions based on each adaption technique. Please also provide quantitative comments in regards to the expected uncertainty when using PANAC11 methods (including updates to TGBLA06) relative to the uncertainty analysis that is based on* [[ ]] *methods.*

Part 11: The staff requires additional information in regards to the uncertainty analysis in order to determine the acceptability of the design to ensure SAFDLs are not exceeded. The OLMCPR and the MLHGR limits are predicated on uncertainty assessments (a demonstration that the pin power uncertainty is less than [[ ]] *for the latter).*

Part 12: Provide the core thermal power and core flows for the other reactors described in NEDC-33197P, namely [[ ]] *for the times of the respective tests. Compare the power to flow ratios for these plants during the tests to that for the ESBWR.*

Part 16: The ESBWR uncertainty analysis, it appears to the staff, may depend on the adaption technique employed. This adaption technique will also depend on the number of AFIPs or other [[ ]] *methods. If the adaption technique is not finalized, provide separate uncertainty analyses for each available technique, or each unique available combination of measurements, calibrations,* [[ ]], *intervals, and adaption techniques. For example using different adaption techniques, or* [[ ]] *for the* [[ ]] *cycle follow would generate different values for the* [[ ]].

Part 17: Update the NEDC-33197P topical report to include an appendix that summarizes the available techniques described in the supplemental information request Part 16. In the appendix describe the uncertainty assessment methods that are used to obtain uncertainties which are used in downstream safety and operating limit determinations based on each available technique.

Part 19: The response states that the adaption technique is still under development. If a single adaption technique (as opposed to many alternatives) is developed, provide the information requested in Parts 16 and 17 for only that one technique.

Part 20: The staff does not find the response acceptable. If the adaption technique is based on discrete axial signals, perhaps 4 LPRM signals or [[ ]] *GT signals, the axial power shape uncertainty would likely be a function of the resolution provided by those signals.* [[ ]]. *Once a single, or perhaps several alternative adaption techniques, are selected, provide a basis for each technique that the number of GTs is sufficient such that the uncertainty analysis results are applicable even if there are power shapes other than cosine, bottom-, or top- peaked.*

Part 22: Provide the results of GE14 corroborative MCNP/[[ ]] *analyses that were performed for a representative* [[ ]] *lattice. Include at least one case that considered a spacer.*

Part 25: See the supplemental request in Part 17

Part 6: *Provide any relevant data that would be indicative of discharge exposure. Namely, provide the core thermal power level, core size, and cycle duration. Using any additional relevant information, provide an estimate of the average cycle exposure. Alternatively qualitatively assess any design features of K5 relative to the ESBWR to determine if the discharge exposures are expected to be significantly different.*

<u>GEH Response to Part 6</u>

In 2003, a paper was published as part of GENES4/ANP2003. The paper titled "*Verification of Core Monitoring System with Gamma Thermometer*" describes test results for Kashiwazaki-Kariwa-5 nuclear reactor (K-5, a BWR/5). The paper shows that the core has 764 fuel bundles, the reactor has an approximated electrical power of 1,100 MWe, and cycle a length (approximately 10,400 MWd/mT) that resembles the ones of Tokai and Limerick nuclear plants. MLHGR values during the cycle are of the order of 35-40 kW/m that are similar values for US-based BWRs. Public information presented in the article "Top Technologies of ABWR Part 2: BWR Core and Fuel Technologies" by Ito et al, suggested that fuel bundle array is 8x8 with an average discharge exposure of 40 GWd/mT. The discharge exposure is lower than the 44 GWd/mT expected for the equilibrium cycles of the ESBWR.

The paper establishes that K-5 reactor has a large rated power, number of bundles and number of instrumentation strings that satisfied the GEH self-imposed test criteria. The most significant differences of the K-5 gamma scan results is that the calculated bundle powers were obtained using a one-group diffusion core monitoring system with fuel depletion obtained with the adaptive mode. Nevertheless, the K-5 gamma scan results are considered valid for the purpose of demonstrating an application of the core monitoring system based on GT data, independently of the difference with GEH methodology that obtains the fuel depletion in a non-adaptive mode and uses the adapted bundle powers for only the calculation of the thermal limits.

Part 8: *Please provide greater clarification of what is meant by the "interim methodology." Does this interim methodology correspond to the interim methodology for expanded operating domain BWRs?*

<u>GEH Response to Part 8</u>

This interim methodology does correspond to the interim methodology for expanded operating domain BWRs. The response to RAI 4.2-12S01 mentioned an interim methodology that is based on [[

]] Its nature was interim since it required [[
]] In that regard, a [[ ]] study is described in Part 10 of this response [[
]]

Part 10: *The insight that the staff needs is to understand the impact on predicted power distributions for each adaption technique. Additionally, the staff was not aware that the uncertainty analysis for GT instrumentation is predicated on the* [[ ]] *methodology as opposed to the proposed methodology for the ESBWR (PANAC11). The ESBWR uncertainty* *analysis, it appears to the staff, may depend on the core simulator and the adaption technique employed. This adaption technique will also depend on the number of AFIPs or other* [[ ]] *methods.*

Since the information regarding the K5 reactor is sparse, the core monitoring software was different, the number of AFIPs proposed for ESBWR and those employed at K5 are different, and no final adaption technique has been proposed, the staff does not have sufficient information regarding the numerical uncertainty analysis to make a determination regarding the applicability of the K5 data to the proposed ESBWR application.

To provide insight into the effects of adaption on power distribution uncertainty, please provide an analysis using a relevant reactor plant from the experience database. Using purely predictive methods (no adaption) perform a core follow analysis for a relevant (high power density, large core) reactor plant. The plant and cycle selected for reanalysis should be challenging from a reactor power distribution standpoint. [[ ]]

Produce a MOC and an EOC radial power map (axially integrated four bundle power) and axial power shape curve. Please provide these curves in figures that are substantially similar in format to Figures 27-1 through 27-68 of MFN-05-029. Using LPRM adaption, perform the same core follow analysis and produce a MOC and an EOC radial power map and axial power shape curve. Provide additional figures using TIP adaption. Specify whether absolute or shape adaption is used.

When an adaption technique is finalized for the ESBWR, [[ ]] *readings based on local TIP readings, perform a cycle follow analysis and associated radial and axial power distributions for the same plant using* [[ ]] *adaption with an arrangement that is similar to the ESBWR (i.e.* [[ ]] *instruments per string with similar spatial arrangement).*

The staff understands that this will not help assess the [[ ]] *uncertainty, but it will provide a quantitative comparison of core monitoring performance using discrete vs. continuous adaption. Comment on the differences in the radial and axial power distributions based on each adaption technique. Please also provide quantitative comments in regards to the expected uncertainty when using PANAC11 methods (including updates to TGBLA06) relative to the uncertainty analysis that is based on* [[ ]] *methods.*

GEH Response to Part 10

Various [[ ]] schemes for the implementation of GT system were studied. The study uses [[ ]] as the basis for comparison and discusses GT-related uncertainties in the framework of [[ ]]. The study addresses expected ESBWR conditions, namely, the [[ ]]. The study provides quantitative evidence that can be used to evaluate the performance of [[ ]] and the proposed ESBWR adaption schemes.

The study used unadapted power distributions to perform an off-line core follow analysis. The reactors selected have a power density greater than [[ ]]. One of the selected reactors was used in [[ ]] (see Figure 27-55 with the RMS values as a function of Cycle 9 exposure) and has [[ ]]. Beginning Of Cycle (BOC), Middle Of Cycle (MOC) and End Of Cycle (EOC) calculated power distributions were obtained with [[ ]] and compared to measured power distributions [[ ]]. The second reactor selected is a [[ ]] referred to as [[ ]]. Its MOC calculated power distribution was compared to the measured power distribution [[ ]] was also used as the [[ ]] was utilized for both reactor power distributions. The GT readings were first assumed as equal to the corresponding TIP reading (either nTIP or gamma-TIP) at the interpolation nodes for the core-wide simulations. However, a conservative [[ ]] at the knots between sensor readings was also simulated in order to obtain a [[ ]].

The interpolation was designed to [[ ]]. The [[ ]] configuration consists of signals at [[ ]]. The [[ ]] has values at [[ ]]. The [[ ]] is a combination of the previous two. [[ ]] adds sensors [[ ]]. The rest of configurations add more sensors in the empty spots between LPRMs.

[[ ]] The latter proved to be more stable for all configurations tested. The following figure and table present the final interpolation results [[ ]] and the standard deviations for the plant and exposure points tested. Table 10-1 presents the results [[ ]]. This method confirms that the radial uncertainty is [[ ]]. Also, exposure [[ ]] because the average of variations due to exposure in one plant [[ ]] in the other plant. Figure 10-1 presents the comparison of [[ ]].

[[ ]]

The GT-adaption method was studied under [[ ]] that require [[

]] The adaptive schemes are summarized as follows:

[[

]]

Interpolation [[ ]] sensors was used to obtain a [[ ]]that was inserted as part of [[

]]

This study was prepared by emulation of the [[ ]] methodology and its conclusions are the basis for the modification to [[ ]] code for the implementation of GT-based adaption proposed for the ESBWR.

[[

]] The GT system will assist [[ ]] for the ESBWR as the TIP system does for the current fleet. The power uncertainty analysis is updated in Part 11.

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Part 11: *The staff requires additional information in regards to the uncertainty analysis in order to determine the acceptability of the design to ensure SAFDLs are not exceeded. The OLMCPR and the MLHGR limits are predicated on uncertainty assessments (a demonstration that the pin power uncertainty is less than* [[ ]] *for the latter).*

GEH Response to Part 11

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The conclusion of the previous analysis is that the ESBWR core monitoring system based [[
]] the calculation of either OLMCPR or SLMCPR.

For LHGR impact, [[ ]] That is, [[

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It is appropriate [[

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A [[ ]] is applied in the development of the LHGR limit. As shown in Table 11-1, [[ ]] (from [[ ]] to [[ ]] and the [[ ]] (from [[ ]] results in total power distribution uncertainty [[ ]] that is currently applied to the development of the LHGR limit. Note that the gradient effect's uncertainty decreased from [[ ]] based on [[ ]].

[[

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[[				
				]]

***Part 12**: Provide the core thermal power and core flows for the other reactors described in NEDC-33197P, namely* [[ ]] *for the times of the respective tests. Compare the power to flow ratios for these plants during the tests to that for the ESBWR.*

<u>GEH Response to Part 12</u>

[[

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***Part 16**: The ESBWR uncertainty analysis, it appears to the staff, may depend on the adaption technique employed. This adaption technique will also depend on the number of AFIPs or other* [[ ]] *methods. If the adaption technique is not finalized, provide separate uncertainty analyses for each available technique, or each unique available combination of measurements, calibrations,* [[ ]]*, intervals, and adaption techniques. For example using different adaption techniques, or* [[ ]] *for the* [[ ]] *cycle follow would generate different values for the* [[ ]].

<u>GEH Response to Part 16</u>

For the GT system implementation in ESBWR core, [[ ]]

Please see the detailed response to Parts 10 and 11 where the [[ ]] is described and [[ ]] are presented, respectively.

Further simulations of [[ ]] for determination of the [[ ]]. The [[ ]] is a legitimate tool for analyzing [[ ]] test results, however, it is of limited value when evaluating a [[

]]

***Part 17**: Update the NEDC-33197P topical report to include an appendix that summarizes the available techniques described in the supplemental information request Part 16. In the appendix describe the uncertainty assessment methods that are used to obtain uncertainties which are used in downstream safety and operating limit determinations based on each available technique.*

GEH Response to Part 17

The uncertainty analysis presented in the [[

]]

***Part 19**: The response states that the adaption technique is still under development. If a single adaption technique (as opposed to many alternatives) is developed, provide the information requested in Parts 16 and 17 for only that one technique.*

GEH Response to Part 19

For the GT system implementation in ESBWR core, [[

]]

Please see the detailed response to Parts 10 and 11 where the [[ ]] is described and [[ ]] are presented, respectively.

***Part 20**: The staff does not find the response acceptable. If the adaption technique is based on discrete axial signals, perhaps 4 LPRM signals or* [[ ]] *GT signals, the axial power shape uncertainty would likely be a function of the resolution provided by those signals.* [[

]]. *Once a single, or perhaps several alternative adaption techniques, are selected, provide a basis for each technique that the number of GTs is sufficient such that the uncertainty analysis results are applicable even if there are power shapes other than cosine, bottom-, or top- peaked.*

GEH Response to Part 20

[[

]] For study details and ESBWR uncertainty update please refer to responses to Parts 10 and 11 of this document. For additional description of the reactor power shapes used in the study, please refer to the response of the RAI 7.2-51S01 provided in GEH letter MFN 07-321 Supplement 1.

***Part 22**: Provide the results of GE14 corroborative MCNP/[[ ]] analyses that were performed for a representative [[ ]] lattice. Include at least one case that considered a spacer.*

GEH Response to Part 22

[[ ]]. The results will be incorporated into the power uncertainty chapter of the NEDE-33197P. A separate response to this part will be provided to the NRC by July 7, 2008.

***Part 25**: See the supplemental request in Part 17*

GEH Response to Part 25

The uncertainty analysis presented in the [[

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DCD Impact

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

LTR NEDE-33197P, Rev 1 will be revised with the responses provided in this document. Chapter 8 and 9 will be revised and Table 10-3 will be incorporated. The revised LTR will be provided by September 1, 2008.

NRC RAI 4.3-2 S02

A. Confirm that the [[ ]] peak rod power uncertainty bounds not only those lattices in the equilibrium ESBWR core, but also those in the initial core.

B. The response indicates that a SLMCPR analysis was performed for the ESBWR. Was this SLMCPR analysis performed according to the approved SLMCPR methodology for operating reactors? If so, please provide this analysis.

C. As discussed in the staff's RAI 4.2-12 and MFN-05-029, the uncertainty in gamma instrument measurement increases with increasing power to flow ratios.

1. The ESBWR power to flow ratio is substantially higher than that for [[ ]]. Describe what approach is being taken to account for this phenomenon in the overall assessment of power distribution uncertainties. In other words the determination of the [[ ]] and may not be representative of a similar quantity determined for conditions of operation similar to the ESBWR.

2. The response to RAI 4.4-39 S01 [[ ]], comment on the effect of bypass voiding due to high power to flow ratios on the sensitivity of the GT and the ability of the methodology as proposed to account for changes in sensitivity arising from bypass voiding. Please consider effects such as heat transfer from the jacket tube to the two-phase mixture (given the predicted bypass flow patterns) as well as gamma attenuation and streaming.

D. The footnote in Table 9-2 states that more data is required for application. Explain why [[ ]] results in Table 7-2 were not combined with the [[ ]] data in Tables 7-3 and 7-4 to assess this uncertainty. The information in Table 9-8 seems to indicate that the [[ ]]data would be applicable.

E. How are the [[ ]] uncertainties in Table 4.3-2S01-2 weighted to determine the total estimated uncertainty per GT string?

F. The GT strings used to assess the bundle power uncertainties each include [[ ]] instruments per string. The ESBWR design includes [[ ]] instruments per string. The staff does not understand how the same uncertainties will apply if there are [[ ]] instruments. In response to RAI 7.5-58 (MFN-07-162) the response states that it is "not realistic to conclude that the uncertainty is not dependent on the number of GT sensors per string... Table 9-8 indicates that having fewer GT sensors per string results in smaller uncertainties, this result arose only because the study was not realistic and based only on simulated GT readings. In practice, the uncertainty will be larger with fewer GT sensors per string." This statement does not appear to be consistent with the numerical values provided in the uncertainty analysis in the response to RAI 4.3-2. Please update the uncertainty analysis to include a term that addresses the [[ ]] sensors. If the basis for determining this uncertainty is provided in a separate RAI response, please provide a specific reference.

G. The response indicates that the ESBWR generic R-factor uncertainty was determined in a manner that is conservative relative to the prescription in the interim methods. Please provide an update to NEDC-33239P that confirms that the R-factor uncertainty is consistent with

ESBWR pin power peaking and power allocation uncertainties as determined in a manner consistent with the prescription in the approved interim methods (NEDC-33173P-A). The staff understands that GE will supplement this topical report with additional data for review to support the historical R-uncertainty analysis inputs. The update may make reference the most recently approved version of NEDC-33173P-A.

Part A. *Confirm that the* [[ ]] *peak rod power uncertainty bounds not only those lattices in the equilibrium ESBWR core, but also those in the initial core.*

GEH Response to Part A

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

Part B. *The response indicates that a SLMCPR analysis was performed for the ESBWR. Was this SLMCPR analysis performed according to the approved SLMCPR methodology for operating reactors? If so, please provide this analysis.*

GEH Response to Part B

The ESBWR SLMCPR methodology is documented in NEDC-33237P rev 3 (December 2007) and is different than the conventional BWR SLMCPR methodology. Please see NEDC-33237P Section 6 and the response to RAI 15.0-16, S01 (submitted via MFN 07-071 Supplement 1, dated September 14, 2007), where the OLMCPR and SLMCPR values for the ESBWR are discussed.

Part C. *As discussed in the staff's RAI 4.2-12 and MFN-05-029, the uncertainty in gamma instrument measurement increases with increasing power to flow ratios.*

1. The ESBWR power to flow ratio is substantially higher than that for [[ ]]. *Describe what approach is being taken to account for this phenomenon in the overall assessment of power distribution uncertainties. In other words the determination of the* [[ ]] *and may not be representative of a similar quantity determined for conditions of operation similar to the ESBWR.*

2. The response to RAI 4.4-39 S01 [[ ]], *comment on the effect of bypass voiding due to high power to flow ratios on the sensitivity of the GT and the ability of the methodology as proposed to account for changes in sensitivity arising from bypass voiding. Please consider effects such as heat transfer from the jacket tube to the two-phase mixture (given the predicted bypass flow patterns) as well as gamma attenuation and streaming.*

GEH Response to Part C

1. [[ ]] The ESBWR core is 30 inches shorter and the core inlet enthalpy is lower than other BWRs (e.g. 527.7 lb/BTU for a BWR/6 and 527.6 lb/BTU for a ABWR versus 508.7-514.7 lb/BTU for the ESBWR from table 4.4-1b of the DCD). [[ ]]

   However, in attendance to the request, new information on the adaption process [[ ]]. Details of the study are contained in this letter in the response to NRC RAI 4.2-12S02, Parts 10 and 11.

2. Bypass Void fraction is not included in this response. The response to this item will be provided by July 7, 2008 in a separate transmittal.

***Part D**. The footnote in Table 9-2 states that more data is required for application. Explain why [[ ]] results in Table 7-2 were not combined with the [[ ]] data in Tables 7-3 and 7-4 to assess this uncertainty. The information in Table 9-8 seems to indicate that the [[ ]]data would be applicable.*

GEH Response to Part D

Test results present comparisons of detector signals at certain axial location whereas the information in Chapter 9 of the NEDC-33197 was prepared to determine the bundle power uncertainty. The footnote that states that additional information is required is presented in Tables 9-14 and 9-13 of revisions 0 and 1 of NEDC-33197P, respectively. [[

]] To respond to this need, a study was prepared with [[ ]] as explained in the response to RAI 4.2-12S02 Parts 10 and 11 (contained in this letter).

Table 9-8, Core Monitoring Bundle Power Uncertainty with Simulated GTs (with respect to n-TIP) of NEDC-33197P rev 0 has been removed from latest revision of NEDE-33197P (September 2007) and the bundle power uncertainty analysis will be presented in the next revision using a proposed methodology applicable to ESBWR monitored with AFIP.

***Part E.** How are the [[ ]] uncertainties in Table 4.3-2S01-2 weighted to determine the total estimated uncertainty per GT string?*

GEH Response to Part E

[[

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***Part F**. The GT strings used to assess the bundle power uncertainties each include [[ ]] instruments per string. The ESBWR design includes [[ ]] instruments per string. The staff does not understand how the same uncertainties will apply if there are [[ ]] instruments. In response to RAI 7.5-58 (MFN-07-162) the response states that it is "not realistic to conclude that the uncertainty is not dependent on the number of GT sensors per string... Table 9-8 indicates that having fewer GT sensors per string results in smaller uncertainties, this result arose only because the study was not realistic and based only on simulated GT readings. In practice, the uncertainty will be larger with fewer GT sensors per string." This statement does not appear to be consistent with the numerical values provided in the uncertainty analysis in the response to RAI 4.3-2. Please update the uncertainty analysis to include a term that addresses the [[ ]] sensors. If the basis for* *determining this uncertainty is provided in a separate RAI response, please provide a specific reference.*

GEH Response to Part F

[[

]] Please see the response to RAI 4.2-12-S02 Parts 10 and 11 9contained in this letter) for detailed discussion as well as updated bundle power uncertainties.

Part G*. The response indicates that the ESBWR generic R-factor uncertainty was determined in a manner that is conservative relative to the prescription in the interim methods. Please provide an update to NEDC-33239P that confirms that the R-factor uncertainty is consistent with ESBWR pin power peaking and power allocation uncertainties as determined in a manner consistent with the prescription in the approved interim methods (NEDC-33173P-A). The staff understands that GE will supplement this topical report with additional data for review to support the historical R-uncertainty analysis inputs. The update may make reference the most recently approved version of NEDC-33173P-A.*

GEH Response to Part G

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

DCD Impact

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

As stated in the response to Part D, a revision of NEDC-33197P will be provided on September 1, 2008.

Enclosure 3

MFN 08-293

Response to Portion of NRC Request for

Additional Information Letter No. 106

Related to ESBWR Design Certification Application

RAI Numbers 4.2-12 S02 and 4.3-2 S02

Affidavit

GE Hitachi Nuclear Energy

AFFIDAVIT

I, David H. Hinds, state as follows:

(1) I am 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's letter, MFN 08-293, Mr. James C. Kinsey to U.S. Nuclear Energy Commission, entitled "*Response to Portion of NRC Request for Additional Information Letter No. 106 Related to ESBWR Design Certification Application – RAI Numbers 4.2-12 Supplement 2 and 4.3-2 Supplement 2,*" dated April 3, 2008. The proprietary information in enclosure 1, which is entitled "*Response to Portion of NRC Request for Additional Information Letter No. 106 Related to ESBWR Design Certification Application – RAI Numbers 4.2-12 S02 and 4.3-2 S02 – GEH Proprietary Information,*" is 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 or licensee, 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 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 contains details of GEH's evaluation methodology.

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 and obtaining 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 3rd day of April 2008.

David H. Hinds
GE Hitachi Nuclear Energy