HITACHI

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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 08-711

Docket No. 52-010

October 6, 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. 223 and Letter No. 229 – Related to ESBWR Design Certification Application – RAI Numbers 4.4-69 through 4.4-87 and 4.4-90

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 and Reference 2 NRC letters. GEH response to RAI Numbers 4.4-69 through 4.4-87 and 4.4-90 is addressed in Enclosures 1, 2 and 3. These RAI responses include revision to NEDC-33413P, "Full Scale Testing of GE14E and Validation of GEXL14". Revision 1 of NEDC-33413P will be submitted by December 22, 2008.

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. Enclosure 2 is the non-proprietary version, which does not contain proprietary information and is suitable for public disclosure.

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 in 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,

Richard E Kingston

Richard E. Kingston
Vice President, ESBWR Licensing

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NRO

References:

1. MFN 08-572 Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, GEH, *Request For Additional Information Letter No. 223 Related To NEDC-33413P, "Full Scale Critical Power Testing of GE14E and Validation of GEXL14"*, dated July 2, 2008
2. MFN 08-811 – Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, GEH, *Request For Additional Information Letter No. 229 Related To Design Control Document (DCD) Revision 5,* dated July 30, 2008

Enclosures:

1. MFN 08-711 – Response to Portion of NRC Request for Additional Information Letter No. 223 – Related to ESBWR Design Certification Application – RAI Numbers 4.4-69 through 4.4-84 and Request for Additional Information Letter No. 229 – Related to ESBWR Design Certification Application – RAI Numbers 4.4-85, 86 87 and 90 – GEH Proprietary Information
2. MFN 08-711 – Response to Portion of NRC Request for Additional Information Letter No. 223 – Related to ESBWR Design Certification Application – RAI Numbers 4.4-69 through 4.4-84 and Request for Additional Information Letter No. 229 – Related to ESBWR Design Certification Application – RAI Numbers 4.4-85, 86 87 and 90 – Non-Proprietary Version
3. MFN 08-711 – Response to Portion of NRC Request for Additional Information Letter No. 223 – Related to ESBWR Design Certification Application – RAI Numbers 4.4-69 through 4.4-84 and Request for Additional Information Letter No. 229 – Related to ESBWR Design Certification Application – RAI Numbers 4.4-85, 86 87 and 90 – Affidavit

cc: AE Cubbage USNRC (with enclosure)
RE Brown GEH/Wilmington (with enclosure)
DH Hinds GEH/Wilmington (with enclosure)
eDRF 0000-0089-9207

Enclosure 2

MFN 08-711

Response to Portion of NRC Request for

Additional Information Letter No. 223

Related to ESBWR Design Certification Application

RAI Numbers 4.4-69 through 84

and

Request for Additional Information Letter No. 229

Related to ESBWR Design Certification Application

RAI Numbers 4.4-85, 86, 87 and 90

Non-Proprietary Version

NRC RAI 4.4-69

Provide a summary of the statistics used to justify adequacy of testing a single (cosine) axial power shape.

NEDC-33413P, page 2-1, Section 2.2, the statement is made in justifying only cosine axial power shape based on prior experience with the GEXL correlation that [[

]] Provide a summary of the statistics used to substantiate this statement and the statement on the next page that [[

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GEH Response

The summary of the GEXL correlation statistics for 9x9 (GE11 and GE13) and 10x10 (GE12, GE14, GNF2, and GE14E) fuel designs is provided in Table 4.4-69-1. The part-length rod designs (number of part-length rods, heated length) and the spacer designs (number of spacers, type, pitch) for each fuel are also presented in the Table. As shown in the Table, the power shape effects were well predicted by the GEXL correlation for a number of different spacer and part-length rod designs.

The GE14E critical power testing was performed in order to confirm the application of the GEXL14 correlation to the ESBWR version of GE14 (GE14E) fuel. The GE14E fuel is identical to GE14 fuel, except for those features related to the axial length of the fuel, i.e., 1) the total fuel axial length, 2) the number and axial location of the fuel rod spacers, and 3) the axial length of the part-length rods. The application of the GEXL14 correlation to calculate the trend with axial power shape was demonstrated from the comparison to the GE14 data as discussed in the LTR NEDC-32851P-A, Rev.4.

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DCD or 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 4.4-70

Provide justification for not including transient tests in the GE14E test matrix.

NEDC-33413P, Section 2.2, there is no mention of transient tests included in the GE14E test matrix. Provide a justification for excluding transient testing.

GEH Response

Transient tests were performed during the GE14E critical power testing. The analyses of the transient test results, however, were not included in the subject report, NEDC-33413P, "Full Scale Critical Power Testing of GE14E and Validation of GEXL14" March 2008. GEXL14 is considered adequate to predict the transient critical power response of GE14E fuel in ESBWR because:

(1) GEXL14 has been qualified against transient tests of GE14 and the shorter length of GE14E is not expected to affect the transient response as the sensitivity of the onset of boiling transition to changes in boiling length has been shown to be unaffected by the shorter fuel length in the GE14E steady state tests;

(2) the applicability of the GEXL14 correlation to the GE14E fuel is adequately demonstrated from the GEXL14 correlation statistics and trend characteristics for the GE14E steady-state critical power database;

(3) the established GEXL14 licensing basis statistics for GE14E are conservative as demonstrated in response to RAI 4.4-80; and

(4) the limiting transients in the ESBWR such as Inadvertent Isolation Condenser Initiation or Loss of Feedwater Heating events are slow transients or quasi-steady state events, therefore, the GEXL14 correlation qualified for the GE14 fast transients and confirmed for the GE14E steady-state data is expected to adequately predict the GE14E slow transients.

Justification for excluding transient test analyses in the subject report will be provided in Section 5 of the next NEDC-33413P revision as shown below:

5. SUMMARY AND CONCLUSION

The statistical evaluation of the GEXL14 is performed for the Stern GE14E critical power data. It has been confirmed that the GEXL14 correlation accurately predicts critical power performance of the GE14E fuel. The R-factor methodology accepted by the NRC (Reference 4) is applied to evaluate the R-factor for the GE14E fuel, and the R-factor methodology is confirmed by virtue of the adequacy of the GEXL14 correlation statistics and trend characteristics for the GE14E critical power database. The established GEXL14 statistics for the GE14E fuel in Reference 1 is confirmed to be conservative.

The qualification of the GEXL14 correlation to transients was accomplished by comparing the predicted change in critical power ratio with full-scale GE14 transient

tests (Reference 2). GEXL14 is considered qualified to predict the transient critical power response of GE14E fuel as 1) the original GEXL14 is qualified to transient tests of GE14, 2) the adequacy of the GEXL14 statistics and trend characteristics for the GE14E steady-state database is confirmed, 3) the established GEXL14 licensing basis statistics for the GE14E are conservative, and 4) the limiting transients in the ESBWR such as Inadvertent Isolation Condenser Initiation or Loss of Feedwater Heating events are slow transients, or quasi-steady state events, therefore, the GEXL14 correlation qualified for the GE14 fast transients and confirmed for the GE14E steady-state data is expected to adequately predict the GE14E transients in ESBWR.

DCD or LTR Impact

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

Section 5 will be updated as described above in next NEDC-33413P revision.

NRC RAI 4.4-71

Explain the criteria used to limit most tests to one or two standard critical power peaking patterns.

NEDC-33413P, Table 2-2, "GE14E STERN Test Matrix", only the first test configuration appears to have been performed for all 15 unique rod positions. Provide an explanation of the criteria used to limit the remaining test conditions to one or two standard critical power peaking patterns.

GEH Response

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DCD or 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 4.4-72

Explain the selection of the number of test points and permutations of pressure, mass flux, inlet subcooling, and R-factor.

Provide the basis for the selection of the number of test points and permutations of pressure, mass flux, inlet subcooling, and R-factor. NEDC-33413P, Figure 3-5, for example, indicates only limited testing at pressures less than [[ ]].

GEH Response

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DCD or 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 4.4-73

Under what conditions can the part length rods reach boiling transition?

The final test type in NEDC-33413P, Table 2-2 indicates "Part Length Rod Critical Power". Under what ESBWR conditions (steady state or transient) can the part length rods reach boiling transition?

GEH Response

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DCD or 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 4.4-74

State whether the operating conditions in Table 3-2 based on DCD, Rev. 1 are still valid considering the design and assumption changes in DCD, Rev. 5.

The footnote to NEDC-33413P, Table 3-2 indicates that the GE14E estimated range is based on nominal operating conditions and the anticipated operational occurrences which are presented in Section 15.2 of the ESBWR DCD, Tier 2, Revision 1. Considering that the current DCD, Tier 2, Revision 5, reflects many changes to the design and assumptions, have any of the specified ranges in the table been affected, and if so, are the changes within the tested range?

GEH Response

The GE14E ranges for pressure, mass flux, and inlet subcooling for the ESBWR DCD, Tier 2, Revision 5 are within the GE14E tested ranges.

The ESBWR initial core bundle designs are within the R-Factor estimated range. Administrative controls are in place in the bundle design process to assure that future core designs satisfy the GEXL14 application range.

From the ESBWR DCD, Tier 2, Revision 5, the calculated minimum pressure and maximum subcooling were slightly outside the estimated ranges specified in the Table 3-2 of NEDC-33413P, Revision 0; minimum pressure of 6.75 MPa instead of 6.9 MPa and maximum subcooling of 216 kJ/kg instead of 188 kJ/kg. However, they remain well within the GE14E tested ranges.

For clarification, the GE14E estimated ranges and footnote in the Table 3-2 of NEDC-33413P will be revised to bound the ranges from DCD, Tier 2, Revision 5 as marked up below:

NEDC-33413P, Table 3-2 GEXL14 Correlation Application Range and GE14E Ranges

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DCD or LTR Impact

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

Table 3-2 will be updated as described above in next NEDC-33413P revision.

NRC RAI 4.4-75

Which part length rod(s) is/are considered and how is boiling transition attained in the tests?

NEDC-33413P, Section 3.4 discusses the analysis for part length rod peaking data. Which part length rod(s) is/are considered (e.g., one or both closest to the water rods, or others) and how is boiling transition determined for the part length rods in the tests?

GEH Response

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DCD or 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 4.4-76

Basis for 25-node axial power shape

NEDC-33413P, Section 4.3 - What is the basis for the 25-node axial power shape used in calculating R-factors?

GEH Response

24 or 25 axial nodes are used in nearly all GNF coupled nuclear/thermal-hydraulic 3D simulations of BWR performance and safety characteristics. Hence the use of 25 nodes to represent the axial profiles used in the R-factor calculation method is consistent with other simulation processes. Also, the R-factor calculation is not sensitive to the number of nodes because the R-factor depends on the integrated rod powers. It is believed that fewer axial nodes could be justified for the R-factor calculations, but with negligible improvement in computation time.

DCD or 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 4.4-77

Explain the normalized exposure and power shape greater than 1.0 in Figure 4-1 and Table 4-2.

Provide an explanation for the normalized exposure and power shape curve in NEDC-33413P, Figure 4-1 and Table 4-2 exceeding 1.0.

GEH Response

The axial power shape and exposure plots in Figure 4-1 in the subject LTR are normalized to the number of axial nodes, i.e., the average value for the axial shape is one.

Also, the axial power shapes with zero-node controlled and the relative exposure in Table 4-2 of NEDC-33413P are normalized to the number of axial nodes. However, axial power shapes with non-zero nodes controlled in Table 4-2 are prepared to show how the actual power shapes are distorted compared to the zero-node controlled shape as the number of nodes controlled increases. Therefore, these shapes are not normalized to the number of nodes in the Table but the normalization process takes place in the R-factor calculation method.

DCD or 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 4.4-78

In Table 4-2, which locations represent the part length rods?

NEDC-33413P, Table 4-2, which locations represent the part length rods?

GEH Response

Axial node #1 and #25 represent the bottom and top of the fueled full-length rod, respectively. The fueled length of the full-length rods is divided into 25 equal-length nodes in Table 4-2. Therefore, nodes [[ ]] represent the part-length rods.

DCD or 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 4.4-79

Update to Reference 2 – Revision Number and date

NEDC-33413P, the staff understands that Reference 2 is being updated. Please incorporate the latest revision.

GEH Response

The latest revision of Reference 2 (NEDC-32851P-A, GEXL14 Correlation for GE14 Fuel) in the subject report will be referenced in the next revision of NEDC-33413P.

DCD or LTR Impact

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

The latest revision of Reference 2 will be referenced in next NEDC-33413P revision.

NRC RAI 4.4-80

ECPR (Experimental Critical Power Ratio) data compared to the normal distribution

NEDC-33413P, Page 3-7, Figure 3-6. ECPR data histogram is compared to the normal distribution. This information can be used to decide whether normal tolerance limits or nonparametric tolerance limits should be used. Thus: Was the data tested for normality? If so, which test was used, and what were the results of the test?

GEH Response

References:

4.4-80-1. General Electric Company, NEDO-10958A and NEDE-10958P-A, *General Electric BWR Thermal Analysis Basis (GETAB): Data, Correlation and Design Basis*, January 1977.

4.4-80-2. Global Nuclear Fuel, NEDC-32851P-A, *GEXL14 Correlation for GE14 Fuel*, Revision 4, September 2007.

The GEXL14 ECPR distribution for the GE14E data was tested for normality using the Anderson-Darling Normality test. [[

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DCD or 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 4.4-81

Tolerance limits for each ECPR profile

NEDC-33413P, please provide the tolerance limits for each ECPR profile for GE14E.

GEH Response

Two-sided 90% probability/95% confidence tolerance limits for ECPR profiles with mass flux (G, Mlbm/hr-ft^2), inlet subcooling (dHsub, BTU/lbm) and system pressure (P, psia) are provided in Tables 4.4-81-1 through 4.4-81-3:

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DCD or 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 4.4-82

Statistical test to confirm no bias trends

In the May 1, 2008 presentation on the Critical Power testing (MFN 08-489, June 25, 2008), it was stated that no bias trends were exhibited. Please provide the statistical test(s) which confirm(s) this statement.

GEH Response

Historically, the bias trends have been judged by comparing the mean ECPR for each parameter range to the mean ECPR for all data. Absence of bias is generally accepted when the mean ECPR for a given subset of data is within overall mean +/- one standard deviation. The mean ECPR for each subset of mass flux, inlet subcooling, and pressure are plotted in the Figures 4.4-82-1 through 4.4-82-3 along with a solid line of overall mean and two dotted lines of overall mean +/- one standard deviation. The error bar represents the standard deviation of each subset. It is shown that all subsets except mass flux of 0.1 Mlbm/hr-ft^2 satisfy the acceptance criterion. The very small deviation from the criterion for the smallest mass flux condition is considered acceptable because it is conservative.

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In response to the request for statistical tests, the two-sample pooled t-test is conducted for the entire GE14E database and each subset of data. This test assumes independent observations and the same population standard deviation for two samples. Even though the entire GE14E database includes the given subset of data, they are assumed independent for this purpose. The two-sample pooled t-test also assumes the normal distribution of two samples or the large number of samples. Considering that the distribution of the entire GE14E database is not normal, subsets with relatively large number of data points are selected for the two-sample pooled t-test. For inlet subcooling and pressure trends, three subsets (Nominal, Hi, and Lo) of data are defined. For mass flux trend, five subsets (Nominal, Hi, Hi-Hi, Lo, and Lo-Lo) are selected to better characterize the complicated mass flux trend. It should be noted that the Hi-Hi and Lo-Lo mass flux ranges are outside the ESBWR estimated range as provided in Table 3-2 in the subject LTR. ECPR statistics and p-values from the statistical test for each subset of data with mass flux (G, Mlbm/hr-ft^2), inlet subcooling (dHsub, BTU/lbm) and system pressure (P, psia) are provided in Tables 4.4-82-1 through 4.4-82-3. The p-value is the probability of an observed results happening by chance under the null hypothesis. Generally, the null hypothesis is rejected if the p-value is smaller than or equal to the significance level. The typical significance level of 0.05 is applied to this test. The null hypothesis of this test is that two population means are same; in other words, there is no bias trend between two samples. If the p-value is smaller than or equal to 0.05 the null hypothesis is rejected and the given subset of data is considered biased.

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DCD or 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 4.4-83

Provide ECPR counts for both GE14 and GE14E in the specified ranges.

Please provide for both GE14 and GE14E the count of ECPR values:

- between 0.95 and 1.05
- between 1.05 and 1.10
- greater than 1.10
- between 0.9 and 0.95
- smaller than 0.90

GEH Response

Tables 4.4-83-1 and 4.4-83-2 provide the ECPR counts and fraction of the ECPR counts for both GE14 and GE14E critical power data.

Table 4.4-83-1. ECPR Counts for GE14 and GE14E Data

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Table 4.4-83-2. Fraction of ECPR Counts for GE14 and GE14E Data

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DCD or 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 4.4-84

Demonstrate that the non-cosine profile uncertainty is no larger than the cosine profile uncertainty.

In Reference 2 of the topical report (NEDC-32851P-A, "GEXL14 Correlation for GE14 Fuel"), it was shown that non-cosine profiles have uncertainties that are no larger than the uncertainty in the cosine profile. In NEDC-33413P, it is also shown that the GEXL14 cosine profile for GE14E fuel is at least as good as that of GE14. Please demonstrate why the COBRAG-calculated GE14E non-cosine profiles also have uncertainties that are no larger than the corresponding GE14E cosine profile.

GEH Response

References:

4.4-84-1 General Electric Company, NEDO-10958A and NEDE-10958P-A, *General Electric BWR Thermal Analysis Basis (GETAB): Data, Correlation and Design Basis*, January 1977.

4.4-84-2 Global Nuclear Fuel, NEDC-32851P-A, *GEXL14 Correlation for GE14 Fuel*, Revision 4, September 2007.

It was shown in the topical report NEDC-32851P-A that non-cosine profiles have uncertainties comparable to the uncertainty in the cosine profile. For example, the GEXL14 uncertainties for inlet and outlet database were slightly larger than the uncertainty for the original cosine database. However, the uncertainties for the non-cosine profiles were within the original correlation uncertainty, which was evaluated using the General Electric Thermal Analysis Basis (GETAB) method (Reference 4.4-84-1). Therefore, it was concluded from the close agreement between data and GEXL14 that the GEXL correlation accurately predicted the sensitivity with axial power shapes.

It was shown in the subject report NEDC-33413P that the GEXL14 correlation accurately predicted the GE14E critical power data with the cosine profile and R-factor methodology was confirmed by virtue of the adequacy of the GEXL statistics and trend characteristics. Even though the GEXL14 uncertainty for the GE14E cosine database was slightly larger than the original GEXL14 correlation uncertainty, it was judged that the GEXL14 statistics, mean and standard deviation, for the GE14E cosine database were adequate to validate the use of the GEXL14 correlation for the GE14E fuel. In addition, it was of importance that the ESBWR licensing basis statistics were conservative. Further information for the conservatism is provided in the response to RAI 4.4-80.

In response to the request to demonstrate that the non-cosine profile uncertainty is no larger than the cosine profile uncertainty, clarifications are provided in previous paragraphs. Please also note that no COBRAG analysis for the GE14E bundle with non-cosine profile has been performed and the GEXL14 justification for non-cosine profile was based on data only as described in Reference 4.4-84-2. A summary of the statistics to justify GEXL correlation capability with different axial power shapes is provided in the response to RAI 4.4-69.

DCD or 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 4.4-85

Add reference to the GE14E Test Report

In DCD Revision 5, Tier 2, Section 4.4.8, "References", please add NEDC-33413P, "Full Scale Critical Power Testing of GE14E and Validation of GEXL14", March 2008, to the list of references.

GEH Response

The report, NEDC-33413P will not be added in DCD, Section 4.4.8. Please see the response to RAI 4.4-86.

DCD or LTR Impact

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

No changes to any LTR will be made in response to this RAI.

NRC RAI 4.4-86

Add reference to the GE14E Test Report

In DCD Revision 5, Tier 2, Section 4.4.2.1.1, please add a reference to the GE14E critical power test Report, NEDC-33413P.

GEH Response

Reference:

4.4-86-1. Global Nuclear Fuel, "GE14 for ESBWR – Critical Power Correlation, Uncertainty, and OLMCPR Development", NEDC-33237P, Revision 3, December 2007.

4.4-86-2. Global Nuclear Fuel, "GE14 for ESBWR – Critical Power Correlation, Uncertainty, and OLMCPR Development", NEDC-33237P, Revision 4, July 2008.

The licensing topical report, NEDC-33237P (Reference 4.4-86-1) is currently referenced in the DCD Revision 5, Tier 2 to address the bundle critical power performance method of GE14E for ESBWR, uncertainties used in the OLMCPR analyses, OLMCPR/SLMCPR evaluation methodology, and so on.

The subject GE14E critical power test report, NEDC-33413P was prepared to provide the details of the full-scale critical power testing with a simulated GE14E bundle and to validate the use of the GEXL14 correlation for the GE14E fuel by demonstrating that the established GEXL14 statistics for the GE14E fuel in Reference 4.4-86-1 are adequate. NEDC-33237P Revision 4 (Reference 4.4-86-2) was issued to address and reference the subject report, NEDC-33413P.

In response to the request to add the reference in DCD Section 4.4.2.1.1, it is judged better to refer NEDC-33413P in NEDC-33237P than in the DCD Section because the DCD Section does not contain any text referencing the GE14E test report and NEDC-33413P provides supporting and confirmatory information of the NEDC-33237P.

Therefore, NEDC-33237P Revision 4 (Reference 4.4-86-2) instead of the LTR NEDC-33413P will be updated in next DCD revision.

DCD or LTR Impact

The ESBWR DCD Subsection 4.4.8 Reference 4.4-12 will be revised to reference NEDC-33237P Revision 4.

No changes to any LTR will be made in response to this RAI.

NRC RAI 4.4-87

Provide clarification of hydraulic diameter description

Please explain what is meant by the sentence in DCD Revision 5, Tier 2, Section 4.4.2.3 "The geometry of heated surfaces consists of the number of fuel rods and the fuel rod diameter in a fuel assembly". Is this intended to say that the hydraulic diameter calculation includes consideration of all fuel rods and their heated surfaces?

GEH Response

As described in DCD Revision 5, Tier 2, Section 4.4.2.3, the hydraulic diameter is defined as four times the axial flow area divided by the wetted perimeter, which includes the fuel rod, channel inner wall, and water rod perimeters. Therefore, the hydraulic diameter calculation considers the heated surfaces of all fuel rods as well as the non-heated surfaces of water rods and channel inner wall in the wetted perimeter calculation. The specific sentence, *"The geometry of heated surfaces consists of the number of fuel rods and the fuel rod diameter in a fuel assembly",* is intended to say that only the heated surfaces of the fuel rods are considered in the heated perimeter and thermal diameter calculation.

DCD or LTR Impact

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

No changes to any LTR will be made in response to this RAI.

NRC RAI 4.4-90

Add Topical Report reference in Table 1.6-1

In DCD Revision 5, Tier 2, Table 1.6-1, please add Topical Report NEDC-33413P, "GE14E CPR Test Report."

GEH Response

The report, NEDC-33413P will not be added in DCD, Table 1.6-1. Please see the response to RAI 4.4-86.

DCD or LTR Impact

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

No changes to any LTR will be made in response to this RAI.

Enclosure 3

MFN 08-711

Response to Portion of NRC Request for

Additional Information Letter No. 223

Related to ESBWR Design Certification Application

RAI Numbers 4.4-69 through 84

and

Request for Additional Information Letter No. 229

Related to ESBWR Design Certification Application

RAI Numbers 4.4-85, 86, 87 and 90

Affidavit

GE-Hitachi Nuclear Energy Americas LLC

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 08-711, Mr. Richard E. Kingston to U.S. Nuclear Energy Commission, entitled "*Response to Portion of NRC Request for Additional Information Letter No. 223 and Letter No. 229 – Related to ESBWR Design Certification Application – RAI Numbers 4.4-69 through 4.4-87 and 4.4-90,*" dated October 6, 2008. The proprietary information in enclosure 1, which is entitled "*MFN 08-711 – Response to Portion of NRC Request for Additional Information Letter No. 223 – Related to ESBWR Design Certification Application – RAI Numbers 4.4-69 through 4.4-84 and Request for Additional Information Letter No. 229 – Related to ESBWR Design Certification Application – RAI Numbers 4.4-85, 86 87 and 90 – 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) is classified as proprietary because it contains details of GEH's fuel design and licensing methodology. The development of the methods used in these analyses, along with the testing, development and approval of the supporting methodology was achieved at a significant cost to GEH.

(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.

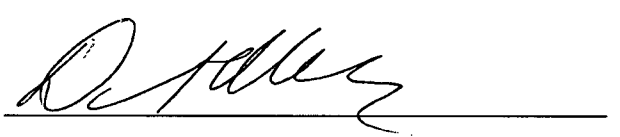
The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

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 6th day of October 2008.



David H. Hinds
GE-Hitachi Nuclear Energy Americas LLC