October 27, 2010

Mr. Jerald G. Head
Senior Vice President, Regulatory Affairs
GE-Hitachi Nuclear Energy Americas LLC
P.O. Box 780, M/C A-18
Wilmington, NC 28401-0780

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION RE: GE-HITACHI NUCLEAR ENERGY AMERICAS TOPICAL REPORT NEDC-33173P, REVISION 2 AND SUPPLEMENT 2, PARTS 1-3 – ANALYSIS OF GAMMA SCAN DATA AND REMOVAL OF SAFETY LIMIT CRITICAL POWER RATIO MARGIN (TAC NO. ME1891)

Dear Mr. Head:

By letter dated August 14, 2009 (Agencywide Documents Access and Management System Accession No. ML092300243), GE-Hitachi Nuclear Energy Americas (GEH), submitted for U.S. Nuclear Regulatory Commission (NRC) staff review, topical report NEDC-33173P, Revision 2 and Supplement 2, Parts 1-3 – Analysis of Gamma Scan Data and Removal of Safety Limit Critical Power Ratio Margin. Upon review of the information provided, the NRC staff has determined that additional information is needed to complete the review. On October 14, 2010, James F. Harrison, Vice President - Fuel Licensing and I agreed that the NRC staff will receive your response to the enclosed Request for Additional Information (RAI)

Enclosure 2 transmitted herewith contains SUNSI. When separated from Enclosure 2, this transmittal document is decontrolled.

questions by November 30, 2010. If you have any questions regarding the enclosed RAI questions, please contact me at 301-415-2365 or Stephen.Philpott@nrc.gov.

Sincerely,

/RA/

Stephen S. Philpott, Project Manager
Licensing Processes Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Project No. 710

Enclosures:
1. RAI questions (Non-proprietary)
2. RAI questions (Proprietary)

cc w/ Enclosure 1 only: See next page

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Anthony Attard
Stephen Philpott

ADAMS Accession No: ML102880433 (Package); ML102880386 (Cover letter w/ Encl. 1); ML102880407 (Enclosure 2/Proprietary) NRR-106

OFFICE	PLPB/PM	PLPB/LA	PLPB/BC	PLPB/PM
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DATE	10/19/2010	10/22/10	10/27/10	10/27/10

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cc:

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REQUEST FOR ADDITIONAL INFORMATION

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REGARDING REVISION 2 AND SUPPLEMENT 2, PARTS 1-3

"ANALYSIS OF GAMMA SCAN DATA AND REMOVAL OF

SAFETY LIMIT CRITICAL POWER RATIO MARGIN"

FOR LICENSING TOPICAL REPORT NEDC-33173P, "APPLICABILITY OF GE

METHODS TO EXPANDED OPERATING DOMAINS"

GE-HITACHI NUCLEAR ENERGY AMERICAS, LLC

PROJECT NO. 710

The Nuclear Regulatory Commission (NRC) staff's request for additional information (RAI) is divided into three sub-sections: the Cofrentes gamma scans; the FitzPatrick gamma scans; and revisions to the interim methods licensing topical report (NEDC-33173P, "Applicability of GE Methods to Expanded Operating Domains," hereafter referred to as the "IMLTR").

IMLTR, Supplement 2 - Parts 1 and 3 (Cofrentes Gamma Scans)

RAI 1
For the maps providing the locations of the scanned bundles in NEDC-33173P, Supplement 2, Part 1, "Applicability of GE Methods to Expanded Operating Domains – Power Distribution Validation for Cofrentes Cycle 13," (hereafter referred to as Supplement 2 - Part 1) and NEDC-33173P, Supplement 2, Part 3, "Applicability of GE Methods to Expanded Operating Domains – Power Distribution Validation for Cofrentes Cycle 15," (hereafter referred to as Supplement 2 - Part 3), please provide the location of the traversing in-core probe (TIP) strings.

RAI 2
Supplement 2 - Part 1 and Supplement 2 - Part 3 do not consider all of the bundle scan data in the determination of the [ ] uncertainty. For the individual bundles [ ] because the four bundle power (P4B) is known from the integrated TIP measurement? Please explain.

ENCLOSURE 1

RAI 3
To assist the staff in comparing Cofrentes to the expanded extended power uprate (EPU) database, please provide one or two plots similar to Figure 25-19 from the response to RAI 25 in GE Energy letter, MFN 05-029, to the NRC, "Responses to RAIs – Methods Interim Process (TAC No. MC5780)," dated April 8, 2005 (ADAMS Accession Number ML051050023), characterizing the trends in TIP error with [ ]. Please compare the Cofrentes cycle 13 and cycle 15 data to the expanded database.

RAI 4
Supplement 2 - Part 3, Appendix A appears to contain several errors.
(a) The TIP comparison figures in this appendix are labeled "Cycle 19." Please reconcile this inconsistency.
(b) The units specified in the label for Figure A.2-20 are in error. Please correct this error.

<u>IMLTR, Supplement 2 - Part 2 (FitzPatrick Gamma Scans)</u>

RAI 5
In Figures 2.3-1 and 2.4-1 of NEDC-33173P, Supplement 2 - Part 2, "Applicability of GE Methods to Expanded Operating Domains – Pin-by-Pin Gamma Scan at FitzPatrick October 2006," (hereafter referred to as Supplement 2 - Part 2), please indicate where the nearest instrument tube is located relative to the scanned bundles.

RAI 6
Please provide a figure that depicts the axial elevations where scans were performed relative to the axial geometric features of the GE14 bundles. This figure should illustrate the location of spacers and part length rods.

RAI 7
In Section 2.7 of Supplement 2 - Part 2, should "Cycle 7" read "Cycle 17"?

RAI 8
Please provide a series of figures that are substantially similar to Figures 2.7-1 through 2.7-4, except please plot the key operating parameters for bundle JLD505 during cycle 16.

RAI 9
Please clarify how the statistics are determined for regions of the bundle where there are empty and vanished pin locations. That is, in Section 6.1, please provide a better description of how J is used if J is axially dependent.

RAI 10
Please clarify what is meant by "Axial Averaged RMS for Bundle…" in Section 6.5. The figures in this section appear to depict the measured and calculated axial power distributions that are radially averaged. Please describe the differences between the figures in Section 6.5 and Figure 2.9.2.

RAI 11
To assist the NRC staff in comparing Supplement 2 - Part 2 to the traditional gamma scan qualification, please provide the following reference:

L. M. Shiraishi, *Gamma Scan Measurements of the Lead Test Assembly at The Duane Arnold Energy Center Following Cycle 8*, NEDC-31569-P, dated April 1988.

RAI 12
Please clarify Table 7.2-1. In particular, are the standard deviations quoted in this table consistent with the traditional basis for the pin power peaking uncertainty? In other words, are these averaged root-mean-squared differences for the different axial levels?

RAI 13
Please add a section to Supplement 2 - Part 2 that is substantially similar to Section 8.3, but based on the JLD505 gamma scan data.

RAI 14
The [ ] appears to be biased. However, this is based on a limited data sample. Please perform transport calculations to assess if the magnitude of the observed trend in [ ]. If the [ ] please explain the observed trend in [ ].

RAI 15
Please update Section 8.4.1 of Supplement 2 - Part 2 to include a disposition of the [ ] for plants with thermal TIPs.

RAI 16
Please update Section 8.4.1 of Supplement 2 - Part 2 with a discussion addressing nodal power uncertainty in addition to P4B uncertainty.

RAI 17
Please update Section 8.4.1 of Supplement 2 - Part 2 with a discussion of the extrapolation of potential biases to MELLLA+ operating conditions.

RAI 18
The P4B errors for the second to last exposure point provided in Appendix A for the TIP comparisons are very large compared to the expected differences (~6 percent observed vs. ~2-3 percent expected). From visual inference, this error appears to be a result of large radial power differences observed for TIP strings 10 and 16. TIP string 10 is adjacent to JLM420. Please discuss the implications of these results.

RAI 19
Please explain how the average corrected standard deviation in the tables in Section 5 of Supplement 2 - Part 2 is calculated.

IMLTR, Revision 2 (Revisions to the IMLTR)

RAI 20

Table 2-11 of IMLTR, Revision 2, includes a correction to the update uncertainty. The staff notes that the corrected Revision 0 linear heat generation rate (LHGR) uncertainty is [ ] percent. The update uncertainty is expected to be a function of the exposure interval between local power range monitor (LPRM) calibrations.

(a) Please provide descriptive details regarding the basis for the quantification of this uncertainty component. This description should address the component of the update uncertainty attributed to instrument failure.

(b) Upon cursory review of NEDC-32694P-A, "Power Distribution Uncertainties for Safety Limit MCPR Evaluations," Appendix B, the basis appears to be based on [ ]. Please justify how these results are representative for the entire fleet.

(c) Upon cursory review of NEDC-32694P-A, Appendix B, it would appear that if [ ]. Please justify the applicability of these data to quantify an uncertainty associated with calibration intervals of [ ] MWD/T or higher.

(d) Please specify the maximum LPRM calibration interval (in terms of exposure) to which the generic NEDC-32694P-A, Appendix B update uncertainty value is applicable.

(e) Please justify the LPRM calibration interval provided in response to (d). In this justification, please consider the standard technical specifications surveillance requirement 3.0.2, which allows a 25 percent extension of the calibration interval to address potential plant conditions impairing calibration.

(f) Several plants have applied for LPRM calibration interval extensions. If a plant with an extended LPRM calibration interval applies for an EPU, please describe how the plant-specific LPRM calibration interval is accounted for in the uncertainty analysis.

(g) Several plants that have applied for LPRM calibration interval extensions have referenced improved LPRM devices (e.g., NA300 series devices). Please describe how the plant-specific hardware is considered in the safety analyses for plants referencing the IMLTR.

(h) Several plants have applied for LPRM calibration interval extensions and justified the approach relative to the nodal uncertainty analysis provided under the GE Thermal Analysis Basis (NEDE-10958P-A, "General Electric Thermal Analysis Basis Data, Correlation and Design Application"). When these plants reference the IMLTR, component uncertainties are reduced, such as [ ]. These reduced uncertainties are consistent with the improved 3D MONICORE system. Therefore, conservatism credited in the safety evaluation for the initial LPRM calibration interval does not exist when these plants reference the IMLTR as the basis for their safety

limit uncertainties. Please explain how the extended LPRM calibration interval is considered in the safety analysis for these plants.

(i) Several plants define the LPRM calibration interval in units of effective full power hours (EFPH). Plants that define the interval using units of EFPH and apply for an EPU are likewise applying for an extension of the LPRM calibration interval in terms of accumulated exposure between calibrations. Please explain how these plants are addressed in the IMLTR-based LHGR uncertainty analysis?