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Attachment 1 contains PROPRIETARY Information

GNRO-2014/00083

December 15, 2014

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Traversing Incore Probe (TIP) Comparisons
TIP Comparisons for Current Operating Conditions in support of the Grand Gulf Nuclear Station (GGNS) Maximum Extended Load Line Limit Analysis Plus (MELLLA+) License Amendment Request (LAR)
Grand Gulf Nuclear Station, Unit 1
Docket No. 50-416
License No. 29

REFERENCES:

1. Safety Analysis Report (SAR) for Grand Gulf Nuclear Station (GGNS) Maximum Extended Load Line Limit Analysis Plus (MELLLA+), NEDC-33612P, Revision 0, September 2013.

2. Grand Gulf Nuclear Station License Amendment Request, Maximum Extended Load Line Limit Analysis Plus (MELLLA+) License Amendment Request, dated September 25, 2013 (GNRO-2013/00012, NRC ADAMS Accession No. ML3269A140)

3. Limitation and Condition 9.3 of Methods Licensing Topical Report (LTR) NEDC-33173P-A

4. Grand Gulf Nuclear Station Request for Additional Information (RAI) Regarding Maximum Extended Load Line Limit Analysis Plus Amendment Request, July 20, 2014 (Accession No. ML14211A136).

Dear Sir or Madam:

The attached TIP report is provided to update the TIP comparisons for current operating conditions to support the Grand Gulf Nuclear Station (GGNS) Maximum Extended Load Line Limit Analysis Plus (MELLLA+) license amendment request (LAR).

When Attachment 1 is removed from this letter, the entire document is
NON-PROPRIETARY

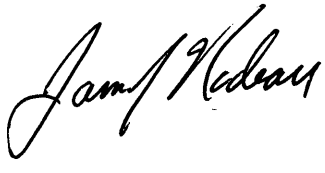
Please note that Attachment 1 contains information which is considered proprietary by General Electric- Hitachi (GEH) and should be protected in accordance with the provisions of such information pursuant to the Entergy/GEH proprietary agreement. The affidavit contained in Attachment 3 identifies that the information contained in Attachment 1 has been handled and classified as proprietary to GEH. Entergy requests that the NRC withhold the information contained in Attachment 1 from public disclosure in accordance with the provisions of 10 CFR 2.390 and 9.17. Transmittal of this proprietary information to the NRC is accompanied by the attached affidavit and proprietary notice.

Further, 10 CFR 2.390 requires that the proprietary information be incorporated, as far as possible, into a separate paper. Therefore, Attachment 1 contains the proprietary information, and the non-proprietary information is provided in Attachment 2.

This letter contains no new commitments. If you have any questions or require additional information, please contact Mr. James Nadeau at (601) 437-2103.

I declare under penalty of perjury that the foregoing is true and correct. Executed on December 15, 2014.

Sincerely,



JJN/tmc

Attachments:

1. Updated GGNS TIP Comparisons for Current Operating Conditions (Proprietary Version)
2. Updated GGNS TIP Comparisons for Current Operating Conditions (Non-Proprietary Version)
3. GEH Affidavit

cc: (see next page)

cc: U.S. Nuclear Regulatory Commission
ATTN: Mr. Mark Dapas, (w/2)
Regional Administrator, Region IV
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Arlington, TX 76011-4511

NRC Senior Resident Inspector
Grand Gulf Nuclear Station
Port Gibson, MS 39150

U. S. Nuclear Regulatory Commission
ATTN: Mr. Alan Wang, NRR/DORL (w/2)
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Dr. Mary Currier, M.D., M.P.H
State Health Officer
Mississippi Department of Health
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Attachment 2

GNRO-2014/00083

Updated GGNS Tip Comparisons for Current Operating Conditions (Non-Proprietary Version)

This is a non-proprietary version of Attachment 1 of GNRO-2014/00083 which has the proprietary information removed. Portions of the document that have been removed are indicated by an open and closed bracket as shown here [[ ]].

1. Request for Additional Information

During a phone call with the Nuclear Regulatory Commission (NRC) on Friday September 12, 2014, the NRC requested that Grand Gulf Nuclear Station (GGNS) provide an update of the Traversing In-Core Probe (TIP) comparisons for current operating conditions.

2. General

The question pertains to Limitation and Condition 9.3 of Methods Licensing Topical Report (LTR) NEDC-33173P-A (Reference 1), which states:

> "Plant-specific EPU and expanded operating domain applications will confirm that the core thermal power to total core flow ratio will not exceed 50 MWt/Mlbm/hr at any statepoint in the allowed operating domain. For plants that exceed the power-to-flow value of 50 MWt/Mlbm/hr, the application will provide power distribution assessment to establish that neutronic methods axial and nodal power distribution uncertainties have not increased."

Note that the current operating conditions do not included Maximum Extended Load Line Limit Analysis Plus (MELLLA+) conditions, only Extended Power Uprate (EPU) conditions. In responding to this request, it was necessary to gather specific off-line information in order to perform a proper comparison. The off-line core tracking is done using non-adapted thermal margins, as compared to the plant usage of 3DMonicore with shape adaption for the thermal margins. For this response, comparisons of the thermal margins will not be provided. Only the TIP statistical comparisons will be provided, as the purpose is to provide additional information for an assessment that the neutronic methods radial, axial, and nodal power distribution uncertainties have not increased with EPU and MELLLA+ conditions. Plant operating data at MELLLA+ conditions will be obtained in the future.

The GGNS plant uses neutron TIP detectors. These detectors have a larger variability in the agreement with off-line calculations than gamma TIP detectors. A full discussion comparing these two detector types is provided in Reference 2. This paper shows that for the same actual power distribution the TIP radial Root Mean Square (RMS) for a neutron TIP detector system will be larger by a significant amount as compared to a gamma TIP detector system

The larger values observed in neutron TIP plants are not a safety concern, but rather an operational concern to the utility, as the observed thermal margins will show a larger variability with a neutron TIP system as compared to a gamma TIP system.

3. Approach

While this question is specific to GGNS, it is also informative to look at the GGNS TIP data collectively with data from some other plants. After the GGNS data is presented, additional data is provided for Plants B, C, and D. The general characteristics for GGNS and Plants B, C, and D are presented in Table 1. Data for GGNS is available from 2010 to 2014, for Plant B for the

same range of dates, while for Plants C and D, the data is available over a wider range, from 2005 to 2014. Figure 1 characterizes the available TIP comparison data, showing the range of the parameter Power / Core Flow (P/F) (MWt / Mlbm / hr) vs. Time, while Figure 2 characterizes the TIP data points showing reactor power vs. Time. Note that GGNS uses neutron TIPs, as does Plant B, while plants C and D use gamma TIPs.

Table 1 Plant Characteristics

Plant	TIP System	Current Licensed Thermal Power (CLTP)	%EPU	Power Density (kw/l)	Rated Core Flow Mlbm/hr	Rated MWt/Mlbm/hr Original Licensed Thermal Power (OLTP)	Rated MWt/Mlbm/ hr CLTP
GGNS	Neutron	4408	115.0%	62.27	112.5	34.07	39.18
B	Neutron	[[					
C	Gamma						
D	Gamma						]]

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Figure 1 Power / Flow vs. Date for GGNS and Plants B, C, and D

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Figure 2 Power vs. Date for GGNS and Plants B, C, and D

4. Available GGNS TIP Data

The available GGNS TIP measurements are summarized in Table 2. These data points are shown in the power flow map in Figure 3. An increase to EPU conditions is seen in the later parts of Cycle 19.

Table 2 GGNS TIP Measurements

Cycle	Date	Cycle Exposure MWd/ST	Core Power MW(t)	WCT Mlbm/hr	MWt/Mlbm/hr	Kw/L (MWt/vcore)
18	6/4/2010	197.6	[[			55.03
18	8/17/2010	1999.7				55.03
18	10/27/2010	3722.7				55.09
18	1/19/2011	5749.9				53.22
18	3/16/2011	7058.7				52.87
18	5/25/2011	8687.8				52.79
18	8/2/2011	10251.8				52.87
18	10/19/2011	12057.3				52.88
18	1/11/2012	13907.0				52.88
19	6/21/2012	53.2				32.35
19	7/26/2012	874.5				54.99
19	10/9/2012	2797.1				62.17
19	10/31/2012	3392.2				62.33
19	2/14/2013	5377.9				62.22
19	7/10/2013	9300.7				62.26
19	1/21/2014	13982.5				62.25
20	5/7/2014	974.0				62.19
20	7/31/2014	3165.8			]]	54.69

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Figure 3 GGNS Power Flow Map Showing TIP Measurement Cases

5. Results of GGNS TIP Comparisons

To provide a basis for trending of the GGNS TIP statistics, Table 3 provides a comparison of the ratio of the case specific TIP RMS to the average TIP RMS for all GGNS cases, with values for the Bundle (radial), Axial, and Nodal TIP RMS. This data is displayed as a function of P/F flow in Figures 5, 6, and 7 for the radial, axial, and nodal RMS statistics, respectively. The ratio to the average TIP RMS value is used so as to focus on the trending; however, no specific trending can be established as a function of P/F ratio.

Table 3 GGNS TIP RMS Statistics

Date	Cycle Exposure MWd/ST	Reactor Power MW(t)	Core Flow Mlbm/hr	Ratio to Average Bundle TIP RMS	Ratio to Average Axial TIP RMS	Ratio to Average Nodal TIP RMS
6/4/2010	197.6	[[				
8/17/2010	1999.7					
10/27/2010	3722.7					
1/19/2011	5749.9					
3/16/2011	7058.7					
5/25/2011	8687.8					
8/2/2011	10251.8					
10/19/2011	12057.3					
1/11/2012	13907.0					
6/21/2012	53.2					
7/26/2012	874.5					
10/9/2012	2797.1					
10/31/2012	3392.2					
2/14/2013	5377.9					
7/10/2013	9300.7					
1/21/2014	13982.5					
5/7/2014	974.0					
7/31/2014	3165.8					]]

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Figure 4 Trending of Radial TIP RMS vs. Reactor Power / Core Flow

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Figure 5 Trending of Axial TIP RMS vs. Reactor Power / Core Flow

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Figure 6 Trending of Nodal TIP RMS vs. Reactor Power / Core Flow

As can be seen from Figures 4, 5, and 6, there is no significant trending with respect to the absolute P/F parameter. The observed TIP variations depend on a variety of factors including plant heat balance and flow calibration uncertainties, uncertainties in the basic cross sections that feed the lattice physics calculations, statistical variations in fuel dimensions and as-built isotopics, etc.

The scatter for the recent operating cycles of GGNS is similar to that observed in Figure 25-20 of MFN 05-029 (Reference 3). In this MFN, Figure 25-19 plots TIP RMS differences vs. P/F ratio for gamma TIP cycles, while Figure 25-20 provides the same information for neutron TIP cycles. As can be seen in Figure 25-20, the radial (bundle) RMS is comparable to the GGNS value. The GGNS axial RMS is better than that illustrated in Figure 25-20; except for the scatter in the highest points the nodal is also comparable.

The TIP statistical comparisons for recent cycles of GGNS are consistent with the information provided to the NRC in 2005 in Reference 3.

6. Comparisons Including Plants B, C and D

To further augment the GGNS discussion, TIP comparisons for three additional plants are also included. Table 4 summarizes the TIP RMS statistics for the four plants, in terms of absolute RMS. The plots will continue to use the P/F ratio to the ratio values for the comparative ease of evaluating the trend. As expected, the TIP radial RMS statistics for the neutron TIP based plants are larger than for the gamma TIP based plants.

Figure 7 provides the TIP radial RMS trending as a function of P/F, while Figures 8 and 9 provide the TIP axial RMS and TIP nodal RMS trending. In all cases, there is no apparent trending in the TIP comparisons between measured and calculated results as a function of the P/F metric, and the ranges of values are within the ranges of values previously communicated to the NRC. The TIP radial RMS comparisons are useful as one of the components of the Safety Limit Minimum Critical Power Ratio (SLMCPR) uncertainties. The TIP nodal RMS comparisons provide some hints regarding Linear Heat Generation Rate (LHGR) modeling uncertainties. The TIP axial comparisons, however, are not used in any evaluation of uncertainty components in any safety evaluations, but rather provide hints regarding the agreement of the off-line calculated core average axial power distribution with the measured core average axial power distribution. It should be remembered that any disagreements of the off-line axial core power distributions are removed in the on-line 3DMonicore shape adaption process. If a comparison such as Figure 8 were to be provided for the on-line monitoring system, the TIP axial RMS values would be seen to be near zero, and only a flat line would be seen as a function of P/F.

Table 4 TIP RMS Statistics for Plants A, B, C, and D (Averaged Over All Cycles)

	TIP Type	Radial TIP RMS	Axial TIP RMS	Nodal TIP RMS
GGNS	Neutron	[[		
Plant B	Neutron			
Plant C	Gamma			
Plant D	Gamma			]]

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Figure 7 TIP Radial RMS Trending As a Function of Reactor Power over Reactor Flow

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Figure 8 TIP Axial RMS Trending As a Function of Reactor Power over Reactor Flow

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Figure 9 TIP Nodal RMS Trending As a Function of Reactor Power over Reactor Flow

7. References

1 GE Hitachi Nuclear Energy, "Applicability of GE Methods to Expanded Operating Domains," NEDC-33173P-A, Revision 4, November 2012.

2 "BWR TIP Detector Operational Impacts for Thermal vs. Gamma TIP Detectors" by John P. Rea and John C. Hannah, ANS 2013 LWR Fuel Performance / TOP Fuel, September 15-19, 2013.

3 Letter from Louis M. Quintana (GE Energy) to Herbert Berkow (NRC), Subject: Responses to RAIs - Methods Interim Process (TAC No. MC5780), MFN 05-029, April 8, 2005.

Attachment 3

GNRO-2014/00083

GEH Affidavit

GE-Hitachi Nuclear Energy Americas LLC

AFFIDAVIT

I, James F. Harrison, state as follows:

(1) I am the Vice President, Regulatory Affairs, Fuels Licensing, of GE-Hitachi Nuclear Energy Americas LLC ("GEH"), and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in Enclosure 1 of GEH letter, GEH-GGNS-AEP-645, Larry King (GEH) to Richard Scarbrough (Entergy) entitled "GEH Response to the NRC Request for an Update of the TIP Comparisons for Current Operating Conditions," dated October 13, 2014. The GEH proprietary information in Enclosure 1, which is entitled "Updated TIP Comparisons for Current Operating Conditions," is identified by a dotted underline inside double square brackets. [[This sentence is an example.{3}]] Figures and large objects containing proprietary information 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 U.S.C. Sec. 552(b)(4), and the *Trade Secrets Act*, 18 U.S.C. 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 qualifies 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, 975 F.2d 871 (D.C. Cir. 1992), and Public Citizen Health Research Group v. FDA, 704 F.2d 1280 (D.C. Cir. 1983).

(4) The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b. Some examples of categories of information that 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 that, if used by a competitor, would reduce their expenditure of resources or improve their competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

c. Information that reveals aspects of past, present, or future GEH customer-funded development plans and programs, resulting in potential products to GEH;

d. Information that discloses trade secret or potentially patentable subject matter for which it may be desirable to obtain patent protection.

(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, not been disclosed publicly, and not been made available in public sources. All disclosures to third parties, including any required transmittals to the NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary or confidentiality agreements that provide for maintaining the information in confidence. The initial designation of this information as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in the following paragraphs (6) and (7).

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, who is the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or who is the person most likely to be subject to the terms under which it was licensed to GEH.

(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 or confidentiality agreements.

(8) The information identified in paragraph (2), above, is classified as proprietary because it contains the details of GEH methodology. These methods, techniques, and data along with their application to the design, modification, and analyses were achieved at a significant cost to GEH.

The development of the evaluation processes along with the interpretation and application of the analytical results is derived from the extensive experience databases that constitute 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.

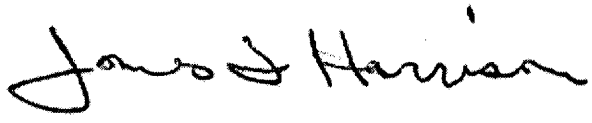
The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GEH. The precise value of the expertise to

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 is true and correct.

Executed on this 12th day of October 2014.



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