



Entergy Operations, Inc.  
P. O. Box 756  
Port Gibson, MS 39150

**Michael A. Krupa**  
Director, Extended Power Uprate  
Grand Gulf Nuclear Station  
Tel. (601) 437-6694

**Attachment 1 contains proprietary information.**

GNRO-2011/00107

November 28, 2011

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

SUBJECT: Request for Additional Information Regarding  
Extended Power Uprate

Grand Gulf Nuclear Station, Unit 1  
Docket No. 50-416  
License No. NPF-29

- REFERENCES:
1. Entergy Operations, Inc. letter to the NRC (GNRO-2010/00056), *License Amendment Request - Extended Power Uprate*, September 8, 2010 (ADAMS Accession No. ML102660403)
  2. NRC Steam Dryer Audit (September 19 - 20, 2011), NRC Audit Report, October 19, 2011 (ADAMS Accession No. ML112790370)
  3. Entergy Operations, Inc. letter to the NRC (GNRO-2011/00088), *Request for Additional Information Regarding Extended Power Uprate*, October 10, 2011 (ADAMS Accession No. ML112840174)
  4. Entergy Operations, Inc. letter to the NRC (GNRO-2011/00101), *Request for Additional Information Regarding Extended Power Uprate*, November 14, 2011 (ADAMS Accession No. ML113190403)
  5. Entergy letter "Request for Additional Information Regarding Extended Power Uprate", dated November 25, 2011

Dear Sir or Madam:

In Reference 1, Entergy submitted a license amendment request (LAR) to the Nuclear Regulatory Commission (NRC), which proposes an extended power uprate for Grand Gulf Nuclear Station, Unit 1 (GGNS). As part of the uprate, Entergy is replacing the current steam dryer, as discussed in the LAR.

**When Attachment 1 is removed, the entire letter is non-proprietary.**

The NRC conducted an audit of the replacement steam dryer design activities on September 19 and 20, 2011. In their report of this audit (Reference 2), they requested additional information regarding the steam dryer. Responses to those Requests for Additional Information (RAIs) were provided in Reference 3. The NRC has requested additional information based on those responses. Reference 4 provided responses to RAI items 1, 3, 4, 7, and 8 requested by the Mechanical and Civil Engineering Branch. Reference 5 provided responses to items 5, 6, and 9. Response to remaining RAI 2 is provided in Attachment 1 to this letter.

GE-Hitachi Nuclear Energy Americas, LLC (GEH) considers portions of the information provided in support of the responses to the RAIs in Attachment 1 to be proprietary and, therefore, exempt from public disclosure pursuant to 10 CFR 2.390. An affidavit for withholding information, executed by GEH, is provided in Attachment 3. The proprietary information was provided to Entergy in a GEH transmittal that is referenced in the affidavit. Therefore, on behalf of GEH, Entergy requests the NRC withhold Attachment 1 from public disclosure in accordance with 10 CFR 2.390(b)(1). A non-proprietary version of the RAI response is provided in Attachment 2, with the exception of its enclosure, which is proprietary in its entirety.

No change is needed to the no significant hazards consideration included in the initial LAR (Reference 1) as a result of the additional information provided. There are no new commitments made in this letter.

If you have any questions or require additional information, please contact Jerry Burford at 601-368-5755.

I declare under penalty of perjury that the foregoing is true and correct. Executed on November 28, 2011.

Sincerely,



MAK/FGB

- Attachments:
1. Response to RAI 2, Mechanical and Civil Engineering Branch, Steam Dryer (Proprietary)
  2. Response to RAI 2, Mechanical and Civil Engineering Branch, Steam Dryer (Non-Proprietary)
  3. GEH Affidavit for Withholding Information from Public Disclosure

cc: Mr. Elmo E. Collins, Jr.  
Regional Administrator, Region IV  
U. S. Nuclear Regulatory Commission  
612 East Lamar Blvd., Suite 400  
Arlington, TX 76011-4125

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

U. S. Nuclear Regulatory Commission  
ATTN: Mr. A. B. Wang, NRR/DORL  
**ATTN: ADDRESSEE ONLY**  
ATTN: Courier Delivery Only  
Mail Stop OWFN/8 B1  
11555 Rockville Pike  
Rockville, MD 20852-2378

State Health Officer  
Mississippi Department of Health  
P. O. Box 1700  
Jackson, MS 39215-1700

**Attachment 2**

**GNRO-2011/00107**

**Grand Gulf Nuclear Station  
Extended Power Uprate**

**Response to RAI 2**

**Mechanical and Civil Engineering Branch, Steam Dryer**

**(Non-Proprietary)**

**Non-Proprietary Information**

**Response to RAI 2**

**Mechanical and Civil Engineering Branch, Steam Dryer**

By letter dated September 8, 2010, Entergy Operations, Inc. (Entergy) submitted a license amendment request (LAR) for an Extended Power Uprate (EPU) for Grand Gulf Nuclear Station, Unit 1 (GGNS). By letters dated March 30, 2011 and July 6, 2011 (ADAMS Accession Nos. ML110900275 and ML111880138, respectively), Entergy submitted responses to requests for additional information (RAI) from the Mechanical and Civil Engineering Branch related to the steam dryer. Subsequently, on September 19-20, 2011 the NRC staff conducted an audit of the replacement steam dryer calculations, in which several open items were identified. Entergy provided responses to those items in a letter to the staff dated October 10, 2011. The NRC has requested further clarification; responses to RAIs 1, 3, 4, 7, and 8 were provided in a letter dated November 14, 2011 and the response to RAIs 5, 6, and 9 were provided in a letter dated November 25, 2011. A response to remaining RAI 2 is provided below.

**RAI 2**

In response to the audit action item 3, the licensee has assessed the potential errors and uncertainties associated with its load mapping algorithm, which projects pressures from its acoustic models to loads applied to its structural models. GEH subdivided their GGNS dryer model into [[

]] GEH computed [[

]]

However, it is unclear whether the analyses include model regions where the load mapping procedure fails. The staff notes that [[ ]]] may not capture the impacts of load mapping errors on the high-stress regions. The licensee has also not supplied some of the tables and figures discussed in their response. In addition, the licensee has not provided an assessment of load mapping errors on [[

]]

Further, the staff is concerned that if load mapping errors are endemic to the current load mapping code, their effects may not be fully captured by a [[ ]]]

The licensee is requested to provide:

- [[ ]]] bias errors and uncertainties for their [[ ]]]
- Table 1 (cited on page 12 of 46, but not provided)
- Figures 5 and 6 (cited on page 13 of 46, but not provided)

### **Non-Proprietary Information**

- Contours of local load mapping errors (worst-case at peak loading frequencies) over the [[ ]]] and corresponding discussions of the potential impacts of the errors on high stress locations (from Table 2 on page 36 or 46).
- An assessment of load mapping errors on their [[ ]]]

]] This should be based on projected effects on [[ ]]]

- A quantitative description of the load mapping errors – their root cause(s) and potential impacts on dryer components, and proof that the assessments made on the GGNS dryer [[ ]]] capture the worst-case potential impacts. The staff notes that the corrective action report (CAR) seen by the staff during the audit specifically pointed out errors near the [[ ]]]. Therefore, the licensee is further requested to demonstrate that the [[ ]]] that were described in their internal CAR which seem to lead to the worst load mapping errors.
- The licensee is requested to provide GEH's plans on how they will resolve the load mapping error issue for GGNS and/or future plants.

### **Response**

The following paragraphs provide direct answers to specific aspects of this RAI. A report has also been compiled to present the various plots and tables that provide the technical support for the response. Specific statements from the RAI are noted and addressed and then each of the seven bullets of the RAI is individually addressed. References to the enclosed report are cited where appropriate to direct the reviewer to additional detail.

**RAI Statement:** It is unclear whether the analyses include model regions where the load mapping procedure fails. The staff notes that [[ ]]] may not capture the impacts of load mapping errors on the high-stress regions.

**Subresponse:** The [[ ]]] selected for evaluation in the previous response were specifically selected to include [[ ]]] to quantify the resultant mapping errors in the [[ ]]]. As demonstrated in the contour plots included in this response, the mapping errors are primarily along [[ ]]]. The [[ ]]] encompass all FIV loaded regions that affect the regional dryer response. Three components where FIV pressure is applied but are not included in the [[ ]]]

**Non-Proprietary Information**

]]

The submodels discussed in this assessment are sub-sections of the acoustic and FE model used to define [[ ]]] for mapping comparisons. They are not the detailed solid submodels described in the SDAR that use solid elements to address areas of local stress.

In this response the baseplate and cover plate are included as local panel models to quantify the impact of the mapping error on local component responses. The support ring is [[ ]]] and is not affected by small local load variations. The support ring is included in the contour comparisons included in Appendix B of the Enclosure. The contour plots demonstrate that [[ ]]]

]]

The comparison of [[ ]]] for the [[ ]]] is a good method for characterizing the impact of mapping areas for high stress regions where the stress is driven by regional loads. In this response submodels have been added to quantify the impact of mapping errors on local panels that can directly affect local stress. This enclosed report presents contour maps to characterize and show the extent of mapping errors and quantifies the mapping errors using regional and local panel submodels. [[ ]]]

]]

Therefore, evaluating the regional and local panel [ ]]] is a reasonable approach for characterizing the error.

The enclosed report also describes the high stress regions of the dryer and evaluates the impact of regional and panel mapping errors at load frequencies that are primary contributors to peak stress.

**RAI Statement:** The licensee has also not supplied some of the tables and figures discussed in their response.

**Subresponse:** Table 1 and Figures 5 and 6 were inadvertently omitted in Reference 4. This information was included in the Enclosure to Attachment 1 in Reference 5. In this response, the [[ ]]] are now calculated with a consistent reference as described in the enclosed report. The revised data is included in Table 4 and Figure 7 of the report.

**Non-Proprietary Information**

**RAI Statement:** The licensee has not provided an assessment of load mapping errors on their  
[[ ]]

**Subresponse:** A load mapping assessment for [[ ]], along with a comparison to  
the assessment for GGNS, is provided in the enclosed report. [[ ]]

]]

**RAI Statement:** The staff is concerned that if load mapping errors are endemic to the current  
load mapping code, their effects may not be fully captured by a [[ ]]

**Subresponse:** [[ ]]

]]

Each of the seven requests (i.e., bulleted items) from the NRC RAI is addressed individually  
below.

1. [[ ]] plots of the [[ ]] bias errors and uncertainties for  
their [[ ]]

Appendices C, D, E, and F of the Attachment 1 report include [[ ]] bias error  
plots for all [[ ]]. Composite [[ ]]  
]] mean bias and uncertainty data are also included.

2. Table 1 (cited on page 12 of 46, but not provided)

Table 1 and Figures 5 and 6 were inadvertently omitted in Reference 4. This information  
was included in the Enclosure to Attachment 1 in Reference 5. This data has been

**Non-Proprietary Information**

revised during the development of this response; the revised data is included in Table 4 and Figure 7 of the enclosed report.

3. Figures 5 and 6 (cited on page 13 of 46, but not provided

Table 1 and Figures 5 and 6 were inadvertently omitted in Reference 4. This information was included in the Enclosure to Attachment 1 in Reference 5. This data has been revised during the development of this response; the revised data is included in Table 4 and Figure 7 of the enclosed report.

4. Contours of local load mapping errors (worst-case at peak loading frequencies) over the [[ ]] and corresponding discussions of the potential impacts of the errors on high stress locations (from Table 2 on page 36 or 46)

Contours of local load mapping errors (worst-case at peak loading frequencies) over the [[ ]] are provided in Appendix B of the enclosed report. The corresponding discussion of the potential impacts of the errors on high stress locations is included in the report section 'Assessment of Mapping Error on GGNS High Stress Locations'.

5. An assessment of load mapping errors on their [[

]] This should be based on projected effects on [[

]]

The enclosed report provides an assessment of mapping errors on GGNS and [[ ]] and provides an example of the potential impact to stresses on GGNS. This assessment also addresses regional errors that affect the overall response of the dryer and the impact on local panels where mapping errors could have a direct impact. The [[ ]] mapping assessment demonstrates that [[

]] The error was enveloped by the more comprehensive benchmark assessments done for GGNS. [[ ]] Furthermore, it should be noted that the [[

]] Therefore, neither the predicted stress on GGNS nor the FE bias and uncertainty values require adjustment for this mapping error.

### **Non-Proprietary Information**

6. A quantitative description of the load mapping errors – their root cause(s) and potential impacts on dryer components, and proof that the assessments made on the GGNS dryer [[ ]] capture the worst-case potential impacts. The staff notes that the corrective action report (CAR) seen by the staff during the audit specifically pointed out errors near the [[ ]] Therefore, the licensee is further requested to demonstrate that the [[ ]] chosen encompass the [[ ]] that were described in their internal CAR which seem to lead to the worst load mapping errors.

The enclosed report demonstrates that the sub-regions chosen encompass the areas where the mapping methodology has errors (primarily [[ ]]). This report also includes a quantitative description of the load mapping errors as well as the root cause and potential impacts on dryer components.

7. The licensee is requested to provide GEH's plans on how they will resolve the load mapping error issue for GGNS and/or future plants.

[[

]]

### **REFERENCES**

1. Letter Entergy to NRC, "License Amendment Request - Extended Power Uprate", dated September 8, 2010 (GNRO-2010/00056). See Attachment 11, "Grand Gulf Replacement Steam Dryer Fatigue Stress Analysis Using PBLE Methodology".
2. Nuclear Energy Corrective Action Request, CAR 49314, Evaluation of ANSYS load mapping error on steam dryer FIV analysis
3. Letter GEH to NRC, "Response to Portion of NRC RAI Letter No. 220 and 399 Related to ESBWR Design Certification Application -- DCD Tier 2 Section 3.9 --Mechanical Systems and Components, RAI Numbers 3.9-213 and 3.9-217 S01," July 31, 2009 (MFN 09-509).
4. Letter Entergy to NRC, "Request for Additional Information Regarding Extended Power Uprate", dated October 10, 2011 (GNRO-2011/00088)
5. Letter Entergy to NRC, "Request for Additional Information Regarding Extended Power Uprate", dated November 14, 2011 (GNRO-2011/00101))

**Non-Proprietary Information**

**Enclosure to Attachment 2**

**GNRO-2011/00107**

**Grand Gulf Nuclear Station Extended Power Uprate**

**Information Supporting the Response to RAI 2**

**Mechanical and Civil Engineering Branch, Steam Dryer**

**Note**

The entire contents of this Enclosure are proprietary;  
therefore, a non-proprietary version is not provided.

**Attachment 3**

**GNRO-2011/00107**

**Grand Gulf Nuclear Station  
Extended Power Uprate**

**GEH Affidavit for Withholding Information from Public Disclosure**

# GE-Hitachi Nuclear Energy Americas LLC

## AFFIDAVIT

I, **Edward D. Schrull, PE** state as follows:

- (1) I am the Vice President, Regulatory Affairs, Services Licensing, 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, 173280-JB-051, “Grand Gulf Steam Dryer: Transmittal of Steam Dryer Request for Additional Information 2,” dated November 26, 2011. The GEH proprietary information in Enclosure 1, which is entitled “GEH Responses to Request for Additional Information 2, Mechanical and Civil Engineering Branch - Steam Dryer, GEH Proprietary Information - Class III (Confidential)” is identified by a dotted underline inside double square brackets. [[This sentence is an example.<sup>{3}</sup>]] Figures and tables containing GEH proprietary information are identified with double square brackets before and after the object. Attachments 1 and 2 to Enclosure 1 are proprietary in total, thus, they carry the notation “GEH Proprietary Information - Class III (Confidential)<sup>{3}</sup>” in the header. In each case, the superscript notation <sup>{3}</sup> 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 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 F2d 871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704 F2d 1280 (DC 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;

## GE-Hitachi Nuclear Energy Americas LLC

- 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 and/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 and/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. Access to such documents within GEH is limited to 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 and/or confidentiality agreements.
- (8) The information identified in paragraph (2), above, is classified as proprietary because it contains detailed GEH design information of the methodology used in the design and analysis of the steam dryers for the GEH Boiling Water Reactor (BWR). Development of these methods, techniques, and information and their application for the design, modification, and analyses methodologies and processes was 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 major GEH asset.

## GE-Hitachi Nuclear Energy Americas LLC

- (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 26<sup>th</sup> day of November 2011.



Edward D. Schrull, PE  
Vice President, Regulatory Affairs  
Services Licensing  
GE-Hitachi Nuclear Energy Americas LLC  
3901 Castle Hayne Rd.  
Wilmington, NC 28401  
Edward.Schrull@ge.com