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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 12-065

Docket number: 05200010

August 31, 2012

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

Subject: NRC Requests for Additional Information Related to the Audit of the Economic Simplified Boiling Water Reactor (ESBWR) Steam Dryer Design Methodology Supporting Chapter 3 of the ESBWR Design Control Document – Draft Response for RAI 3.9-293

Reference:

1. MFN 12-037 Letter from USNRC to Jerald G. Head, GEH, Subject: Request for Additional Information Letter No. 414 related to ESBWR Design Certification Application (DCD) Revision 9, received May 1, 2012

In regard to the Requests for Additional Information transmitted in your May 1, 2012 Letter, Reference 1, to support the NRC ESBWR Steam Dryer Methodology Audit conducted March 21 – 23, 2012 Docket 5200010, please find attached the draft response for RAI 3.9-293.

Enclosure 1 contains proprietary information. The proprietary information is contained within brackets [[]] and is designated in red font with dotted underline to assist in identification. This RAI contains proprietary information identified by GE Hitachi Nuclear Energy, Americas LLC, and should be protected accordingly.

Enclosure 2 contains the draft response with the proprietary information redacted, and is acceptable for public release. Enclosure 3 provides an affidavit which sets forth the basis for requesting that Enclosure 1 be withheld from the public.

DOB
NRD

If you have any questions concerning this letter, please contact Peter Yandow at 910-819-6378.

Sincerely,



Jerald G. Head
Senior Vice President, Regulatory Affairs

Commitments: No commitments are made.

Enclosures:

1. Draft Response to RAI 3.9-293 – Proprietary version
2. Draft Response to RAI 3.9-293 – Non-Proprietary version
3. Affidavit for MFN 12-065

cc: David Misenhimer, NRC
Glen Watford, GEH
Peter Yandow, GEH
Patricia Campbell, GEH
Mark Colby, GEH
Scott Bowman, GEH
eDRF Section 0000-0147-3922

Enclosure 2

MFN 12-065

Draft Response for RAI 3.9-293

Non-Proprietary Version

This is a non-proprietary version of Enclosure 1, from which the proprietary information has been removed. Portions of the document that have been removed are identified by white space within double brackets, as shown here [[]].

IMPORTANT NOTICE REGARDING CONTENTS OF THIS DOCUMENT

Please Read Carefully

The information contained in this document is furnished solely for the purpose(s) stated in the transmittal letter. The only undertakings of GEH with respect to information in this document are contained in the contracts between GEH and its customers or participating utilities, and nothing contained in this document shall be construed as changing that contract. The use of this information by anyone for any purpose other than that for which it is intended is not authorized; and with respect to any unauthorized use, GEH makes no representation or warranty, and assumes no liability as to the completeness, accuracy, or usefulness of the information contained in this document.

NRC RAI 3.9-293

GEH is requested to describe the conservatisms in the steam dryer assessment methodology in support of the ESBWR design certification application. For example, GEH should address conservatisms such as described in a letter from Entergy dated October 10, 2010 [actual date: October 10, 2011], in support of the Grand Gulf EPU license amendment request.

GEH Response

Summary

The RAI-referenced letter regarding the GGNS EPU license amendment request (Reference 1, Entergy letter dated October 10, 2011) explains many of the same conservatisms associated with the ESBWR steam dryer assessment methodology, because the GGNS replacement steam dryer assessment methodology is based largely on the ESBWR methodology, adapted as necessary for a replacement dryer in an operating plant as compared to the ESBWR steam dryer for new reactor deployment. The conservatisms that are inherent in the ESBWR steam dryer assessment methodology identified in the DCD and referenced Licensing Topical Reports are described below.

Detailed Response

References 2 through 6 provide a comprehensive description of the fatigue calculations and associated methodology for assessing the ESBWR prototype and non-prototype steam dryers. These references describe the detailed development of the dryer analysis methodology and, where applicable, identify where conservatism is introduced into specific models and correlations. For example, Section 2.4.2 of Reference 6 describes how [[

]]. However, in most cases, the impact of these individual models or design choices is quantified through the benchmark comparisons, which represent an integral assessment of predictive capability in terms of key parameters (i.e., stress and strain). Given this premise, rather than evaluating the merits of individual models, the discussion presented here focuses on two aspects of the analysis: (1) a brief discussion of the benchmarking results, which provides an expectation of accuracy when the Plant Based Load Evaluation (PBLE) and structural Finite Element (FE) based method is

applied to other plants; and, (2) conservatisms associated with the analysis technique that are expected, but not quantified, through the benchmark analysis.

End-to-End Benchmarking:

GEH conducted an evaluation of PBLE and FE analysis bias and uncertainty based on a comparison of predicted versus measured data from the Susquehanna Steam Electric Station (SSES) steam dryer. See Enclosure 2 of Reference 7, Table 6, pg. 23 of 27. Below in Table 1, GEH has updated the original summary of the FE model bias and uncertainty evaluation from Reference 7 to include the results of the recent strain gage calibration studies described in Reference 8.

Table 1 – GEH FE Model Bias and Uncertainty

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Analysis Approach:

The items below represent conservatisms in the steam dryer analysis methodologies.

- Fatigue Design Limit – The GEH steam dryer methodology utilizes the design fatigue curve and fatigue life evaluation guidance for austenitic steels as described in Regulatory Guide 1.207 (Reference 10) as the acceptance criterion for the predicted alternating stress. The limit from the design fatigue curve is 13.6 ksi based on 10^{11} cycles assumed over the 60-year design life of the dryer. In determining the acoustic pressures acting on the dryer, [[
]] so that the FIV loads determined by the stress analysis will have considered the peak stress intensities that occur at frequencies as low as 1 cycle per 100 seconds, or less than 2×10^7 cycles over the life of the dryer. Therefore, the design limit is conservative in that the peak load cycles are assumed to occur at a much higher rate than actual in-service conditions would indicate (i.e., compared to on the on-dryer measurements). Based on plant measurements, the fatigue usage is expected to accumulate at a lower rate over the 60-year design life of the ESBWR steam dryer. Therefore, there is margin available to accommodate higher loading and still remain within a fatigue usage factor of 1.0 over the life of the steam dryer.

A rain-flow cycle counting analysis was performed using the strain amplitudes measured on the instrumented SSES and Quad Cities Unit 2 replacement steam dryers. Figure 1 shows the upper (hood region) and lower (skirt region) dryer instrument histograms (cycles versus strain amplitude) for both dryers. While the upper and lower sensors show consistent curve characteristics, there is marked difference between QC2 (dominated by high frequencies) and SSES (dominated by low frequencies). Figure 2 shows the highest 20% of the strain range from Figure 1. While the analysis was performed assuming the 40 year design life for the replacement dryers, the distribution of the number of cycles versus strain amplitude is determined by the pressure loading and structural response of the dryer, which is not affected by the number of years of operation.

Therefore, the trends shown and conclusions are applicable to the 60 year design life of the ESBWR dryer.

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Figure 1 – Strain Histogram SSES and QC2 Replacement Dryers

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Figure 2 – Strain Histogram SSES and QC2 Replacement Dryers High Amplitude Strain

For low frequency plants such as SSES, GGNS, and ESBWR, [[

]].

Other conservatisms in the methodology include:

- Combining individual uncertainties (due to different parameters or groups of parameters) into a single uncertainty by taking the square root of the sum of the squares (if the parameters or groups of parameters are not independent from each other, the combined uncertainty is conservative). See NEDC-33408P-A, Section 4.4.4.4, Reference 5.
- [[

]]. Also see NEDE-33312P-A, Section 4.1, Reference 3.

- As described in Reference 3, the acoustic load definition that will be used in the design of the ESBWR dryer includes [[

]]. The ESBWR main steamline geometry will be designed to preclude these loads. These design changes are further described in the response to RAI 3.9-290 in Reference 9.

DCD/LTR Changes:

No change is proposed for the DCD or referenced License Topical Reports.

References:

1. GNRO-2011/00088, Entergy Operations, Inc., to U.S. Nuclear Regulatory Commission, "Request for Additional Information Regarding Extended Power Uprate, Grand Gulf Nuclear Station, Unit 1, Docket No. 50-416, License No. NPF-29," October 10, 2011.
2. 26A6642AK Rev. 9 "ESBWR DCD Tier 2, Chapter 3 Design of Structures, Components, Equipment and Systems", Sections 3.9 – 3.11, and Appendix 3L.
3. NEDE-33312P-A Rev. 2, "Steam Dryer - Acoustic Load Definition," October 2010.
4. NEDE-33313P-A Rev. 2, "Steam Dryer - Structural Evaluation," October 2010.
5. NEDC-33408P-A Rev. 1, "ESBWR Steam Dryer - Plant Based Load Evaluation Methodology," October 2010.
6. NEDC-33408, Supplement 1P-A, "ESBWR Steam Dryer - Plant Based Load Evaluation Methodology Supplement 1," October 2010.
7. MFN 09-509, "Response to Portion of NRC RAI Letter No. 220 and 339 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," Richard Kingston to USNRC Document Control Desk, July 31, 2009.
8. MFN 12-046 Revision 1, "NRC Requests for Additional Information Related to the Audit of the Economic Simplified Boiling Water Reactor (ESBWR) Steam Dryer Design Methodology Supporting Chapter 3 of the ESBWR Design Control Document – RAI 3.9-272," Jerald Head (GEH) to David Misenhimer (NRC), June 5, 2012.
9. MFN 12-066, "NRC Requests for Additional Information (RAI) Related to the Audit of the Economic Simplified Boiling Water Reactor (ESBWR) Steam Dryer Design Methodology Supporting Chapter 3 of the ESBWR Design Control Document –Final Responses for RAIs 3.9-289, 3.9-290 and 3.9-291," Jerald Head (GEH) to David Misenhimer (NRC), June 7, 2012.
10. Regulatory Guide 1.207, "Guidelines for Evaluating Fatigue Analyses Incorporating the Life Reduction of Metal Components Due to the Effects of the Light-Water Reactor Environment for New Reactors," March 2007.

Enclosure 3

MFN 12-065

Affidavit

GE-Hitachi Nuclear Energy Americas LLC

AFFIDAVIT

I, **Jerald G. Head**, state as follows:

- (1) I am the Senior Vice President, Regulatory Affairs 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's letter MFN 12-065, J. Head (GEH) to USNRC, "NRC Requests for Additional Information Related to the Audit of the Economic Simplified Boiling Water Reactor (ESBWR) Steam Dryer Design Methodology Supporting Chapter 3 of the ESBWR Design Control Document – Draft Response for RAI 3.9-293," August 31, 2012. The GEH proprietary information in Enclosure 1 of MFN 12-065, is identified by a [[dark red, 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 and determination 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 GEH and/or 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, that may include potential products of 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 the 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 communicates sensitive business information regarding commercial communications, plans, and strategies associated with future actions related to GEH's extensive body of ESBWR technology, design, and regulatory information and its protection is important to the design certification process.

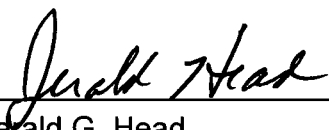
- (9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GEH's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GEH's comprehensive BWR safety and technology base, and its commercial 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 31st day of August, 2012.



Jerald G. Head
GE-Hitachi Nuclear Energy Americas LLC