



HITACHI

GE Hitachi Nuclear Energy

Jerald G. Head
Senior Vice President, Regulatory Affairs

PO Box 780 M/C A-18
Wilmington, NC 28402-0780
USA

T 910 819 5692
F 910 362 5692
jerald.head@ge.com

Proprietary Notice

This letter forwards proprietary information in accordance with 10 CFR 2.390. Upon the removal of Enclosure 1, the balance of this letter may be considered non-proprietary.

MFN 12-077

Docket number: 05200010

June 20, 2012

US Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555-0001

Attn: David Misenhimer

Subject: 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 – Draft Response for RAI 3.9-286

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 05200010, please find attached draft response for RAI 3.9-286.

Enclosure 1 contains the complete draft response, with proprietary information identified within brackets [[]], and designated in red and dotted underline text, to assist in identification. The proprietary information, as identified by GE Hitachi Nuclear Energy, 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.

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

Sincerely,

A handwritten signature in cursive script that reads "Patricia L. Campbell". Below the signature, the word "for" is written in a smaller, simpler script.

Jerald G. Head
Senior Vice President, Regulatory Affairs

Commitments: None

Reference:

1. 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

Enclosures:

1. Draft Response for RAI 3.9-286 - Proprietary Version
2. Draft Response for RAI 3.9-286 - Non-Proprietary Version
3. Affidavit for MFN 12-077

cc: Glen Watford, GEH
Peter Yandow, GEH
Patricia Campbell, GEH
Mark Colby, GEH
Tim Enfinger, GEH
Gerald Deaver, GEH
eDRF Section: 0000-0146-9743

Enclosure 2

MFN 12-077

Draft Response for RAI 3.9-286

Non-Proprietary Version

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 3.9-286

Summary: The staff's question is in regard to developing alternating peak stress intensity predictions using the solid element submodel approach for a representative set of cases, and to compare the results with the corresponding method (1) and method (2) results.

During the audit, the staff and GEH also discussed the solid element submodel approach identified in Section 4.1 and Figure 4-1 of Reference 1, for predicting the alternating peak stress intensity for the fatigue evaluation of fillet welds. This method is applied when [REDACTED] (top of page 6 of 37).

In prior RAI responses, GEH has stated that the submodel approach is used when [REDACTED], and that the submodel approach leads to reduced stresses. The staff inquired how many submodels are typically developed. GEH indicated that for GGNS, there are [REDACTED] developed. Alternating peak stress intensity at all of her locations are based on the shell model results. In a solid element submodel, the fillet is added. The fillet representation in the submodel is textbook – triangular with the design leg length. While multiple solid elements are used [REDACTED]. As stated in Reference 1, top of page 6 of 37, "... [REDACTED] [REDACTED]."

As an adjunct to the parametric study comparing methods (1) and (2) for shell models (see Question 4), the staff requests GEH to develop alternating peak stress intensity predictions using the solid element submodel approach for a representative set of cases, and to compare the results with the corresponding method (1) and method (2) results. Include one example calculation that demonstrates the procedure defined in the statement quoted in the preceding paragraph.

GEH Response

References:

- 1.) Letter from Richard E. Kingston, (GEH), to NRC, "Response to Portion of NRC RAI Letter No. 339 Related to ESBWR Design Certification Application - DCD Tier 2, Section 3.9 - Mechanical Systems and Components; RAI Numbers 3.9-215 S01 Parts A, B, C & D (revised) and 3.9-244 S01 (revised)," July 10, 2009 (ADAMS Accession No. ML091950502).
- 2.) NEDE-33313P-A rev. 2, "ESBWR Steam Dryer Structural Evaluation", October 2010.

Enclosure 2

For this T-joint weld stress study, comparing methods 1, 2 and 3, method 2 with [] with LTR 33313P-A section 4.1.

BACKGROUND

The discussion about submodels during the 2012 NRC staff audit was with respect to RAI 3.9-215S01 Part B (ref. 1). In RAI 3.9- 215S01 response GEH stated relatively few places needed the application of [[
]].

Licensing topical report NEDE- 33313P-A (ref. 2) states if the

11.

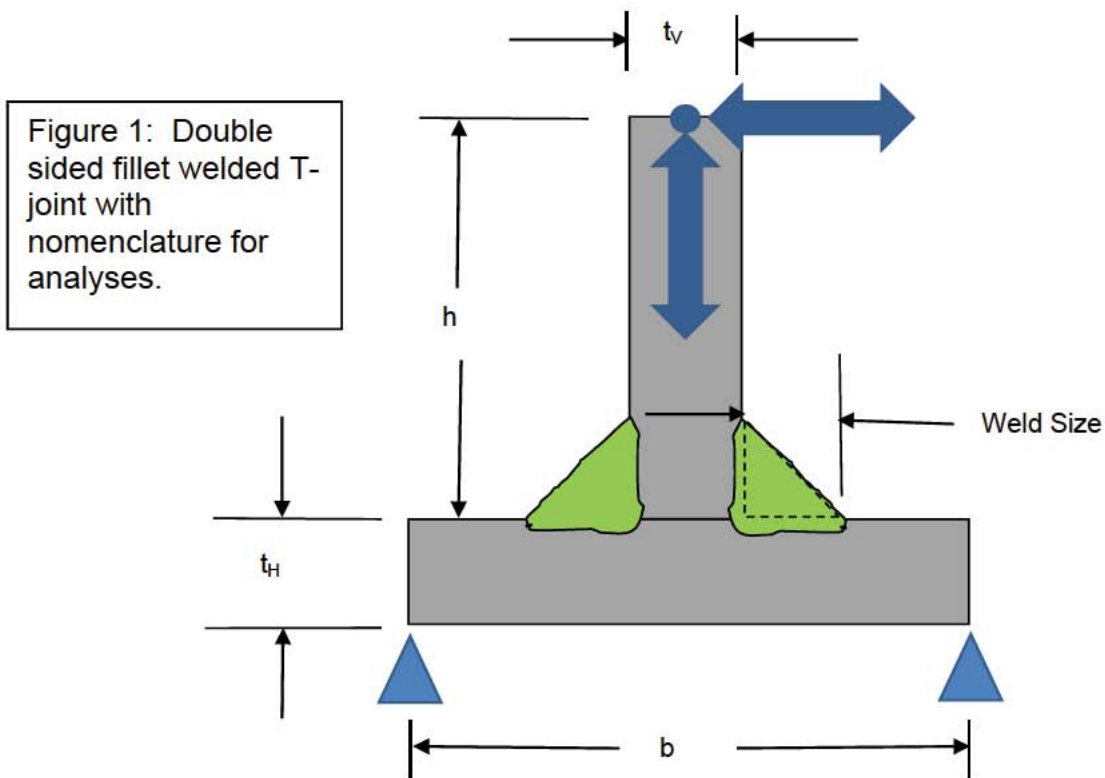
The staff member requested background on GEH's (3) approaches to determining stress in steam dryer welds. These (3) approaches are described in RAI 3.9-215S01 Part B:

- 1) $[[\text{SCF}]]$, the SCF of 4 is applied $[[\text{SCF}]]$.
- 2) $[[\text{SCF}]]$, the SCF of 1.8 is applied $[[\text{SCF}]]$.
- 3) $[[\text{SCF}]]$, the SCF of 1.8 is applied $[[\text{SCF}]]$.

These approaches were previously accepted by the NRC Staff as documented in NEDE-33313P-A. The RAI requests some of the cases from RAI 3.9-285 be compared to method (3).

ANALYSIS INPUT

To provide information to conclude that method (2) provides a more conservative result than method (3) the NRC Staff requested GEH to perform additional analyses. A typical double sided fillet welded T-joint used for ESBWR steam dryer design is shown in figure 1 (same as RAI 3.9-285), an ASME BPV Code Section III NG-3352 Type V weld joint.



ANALYSIS SET-UP AND MODELS

For solid model see figure 2 below, for shell model, please see figure 2 in RAI 3.9-285.

The following conditions were set up for the analysis:

- a.) t_H , t_v and w . These are horizontal and vertical plate thicknesses and weld fillet sizes, t_H , t_v and w respectively, were selected to be representative of ESBWR steam dryer T-joint design. See table 1.
- b.) Horizontal plate length "b" $[[$
- c.) Vertical plate height "h" and joint length "l" was set equal to "b".
- d.) Solid (for method 3) and shell (for method 2) models were created using $[[$ mesh sizes.

[[

]]

Table 1: Model Dimensions (inches)

[[

]]

ANALYSIS PROCEDURE – METHOD 3

- a.) A force was simultaneously applied parallel and perpendicular to the free end of the model's vertical plate, see figure 2.

$$F_X = F_V = 100 \text{ lb}$$

$$F_Z = F_H = 100 \text{ lb}$$

[[

Figure 3: Solid-T Models arranged according to mesh density (left to right: 0.5x, 0.25x, 0.125x) showing boundary conditions and loading applications.]]

- b.) The peak (i.e. highest stress) was obtained the weld's maximum stress intensity and multiplied by the FSRF = 1.8. This method is more conservative than the method as explained in NEDE-33313P-A, where the maximum stress is obtained from linearizing the stress along a path through the weld throat and then multiplied by 1.8.
- c.) For the shell model (method 2), the weld size reduction factor (W_R) was not applied. See RAI 3.9-285 for evaluation.
- d.) After running each model, [[

]].

ANALYSIS RESULTS

Table 2: Weld stress (psi) from methods 1, 2 and 3 for varying plate lengths, plate thicknesses, weld sizes and mesh sizes.

[[

]]

Legend:

Dimensions in inches (t_H , t_V , w and b)

$M(x)$, where x = method 1, 2 or 3

$M(x)1$ = method 2 with 1" mesh size

[[

]]

Weld stress for T-joint model using method 2:

was [[

-

]] (see RAI 3.9-285).

Weld stress for T-joint model using method 3:

was [[

-

]].

Figure 4 provides a graphical representation of the Table 2 results.

[[

Figure 4: Weld Stress results comparing methods 1, 2 and 3 with different plate sizes and weld sizes.]]

CONCLUSIONS

For this T-joint weld stress study, when using [[]] weld stress.

DCD Impact

No change will be made to the DCD.

Licensing Topical Report Impact

No change will be made to LTR NEDE-33313P-A (ref. 2).

MFN 12-077, Enclosure 3

GE-Hitachi Nuclear Energy Americas LLC AFFIDAVIT

I, **Patricia L. Campbell**, state as follows:

- (1) I am the Vice President, Washington 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 12-077, Mr. Jerald G. Head to U.S. Nuclear Regulatory Commission, entitled "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 –Draft Response for RAI 3.9-286," dated June 20, 2012. The proprietary information in enclosure 1, entitled "Draft Response for RAI 3.9-286" (Proprietary Version), 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 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 20th day of June 2012.

A handwritten signature in cursive script that reads "Patricia L. Campbell". The signature is written in dark ink and is positioned above a horizontal line.

Patricia L. Campbell
GE-Hitachi Nuclear Energy Americas LLC