



HITACHI

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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 12-086

Docket number: 05200010

July 19, 2012

Attn: David Misenhimer
US Nuclear Regulatory Commission
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 – Second Draft Response for RAI 3.9-277

References:

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
2. MFN 12-040, Letter from Jerald G. Head to USNRC, 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 Versions, dated May 8, 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 05200010, please find attached the second draft response for RAI 3.9-277. This response revises the first draft response, provided in GEH Letter MFN 12-040, Reference 2.

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.

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Designate as original
David Misenhimer, PM
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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,



Jerald G. Head
Senior Vice President, Regulatory Affairs

Commitments: No commitments are made.

Enclosures:

1. Draft Response to RAI 3.9-277 – Proprietary version
2. Draft Response to RAI 3.9-277 – Non-Proprietary version
3. Affidavit for MFN 12-086

cc: Glen Watford, GEH
Tim Enfinger, GEH
Peter Yandow, GEH
Patricia Campbell, GEH
Mark Colby, GEH
Scott Bowman, GEH
Draft eDRF Section 0000-0147-3894

Enclosure 2

MFN 12-086

Draft Response for RAI 3.9-277

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.

DRAFT RESPONSE FOR REVIEW

NRC RAI 3.9-277

Summary

The staff's question is in regard to the use of specific types of welds in the ESBWR steam dryer and the justification for fatigue and quality factors for each weld type.

Full RAI

GEH is requested to discuss the use of specific types of welds in the ESBWR steam dryer and the justification for fatigue and quality factors for each weld type. In addition, GEH is requested to discuss the [[]] in the ESBWR steam dryer as described in NEDE 33313P, Rev 2. During the audit, the staff asked GEH to address the [[]] in the ESBWR steam dryer design, and how the [[]] will be conducted. At the audit, GEH made a definitive statement that the ESBWR steam dryer design [[]]. The staff noted that this is inconsistent with NEDE 33313P, Rev 2. Please provide clarification if [[]] in the ESBWR steam dryer.

GEH Draft Response

1.0 References

- 1.) AWS A3.0:2001 "Standard Welding Terms and Definitions"
- 2.) Letter from Richard E. Kingston, (GEH), to NRC, "Response to Portion of NRC RAI Letter No. 220 Related to ESBWR Design Certification Application - DCD Tier 2, Section 3.9 - Mechanical Systems and Components; RAI Number **3.9-214**," January 30, 2009. (ADAMS Accession No. ML090340672).
- 3.) Letter from Richard E. Kingston, (GEH), to NRC, "Response to Portion of NRC RAI Letter No. 392 Related to ESBWR Design Certification Application - DCD Tier 2, Section 3.9 - Mechanical Systems and Components; RAI Number **3.9-214S02**," December 4, 2009.
- 4.) Letter from Richard E. Kingston, (GEH), to NRC, "Subject: Response to NRC Report of the August 25, 2009, and September 9, 2009, Regulatory **Audit** of Reactor Pressure Vessel Internals of the Economic Simplified Boiling Water Reactor," October 8, 2009 (ADAMS Accession No. ML092860177).
- 5.) NEDE-33313P-A rev. 2, "ESBWR Steam Dryer Structural Evaluation", October 2010.
- 6.) Letter from Richard E. Kingston, (GEH), to NRC, "Subject: 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 Number **3.9-215S01** Parts A, B, C & D (revised) and 3.9-244S01 (revised)," July 10, 2009 (ADAMS Accession No. ML091950502).

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2.0 Types of Welds

2.1 ESBWR Steam Dryer Welds

The specific types of welds (ref. 1) used in ESBWR steam dryer design are groove welds and fillet welds. Note the other two basic types of welds; plug or slot welds, and intermittent welds; are not used in ESBWR steam dryer design. This does not include the vanes used for moisture removal which may contain [[

]]. The types of joints (ref. 1) used in design may include butt joint, corner joint, T joint, and lap joint; although an edge joint will not be considered as will be explained below.

In the response to RAI 3.9-214 (ref. 2), GEH stated that the ESBWR steam dryer design maximizes the use of full penetration welds. In response to RAI 3.9-214S02 (ref. 3) GEH provided examples where joints were redesigned that increased the use of full penetration welds from BWR/6 to ABWR, and then to ESBWR and BWR replacement steam dryers. In line with this type of design development philosophy, the ESBWR steam dryer [[

]]. This design development philosophy is consistent across all ESBWR reactor internals (response to comment 1 in ref. 4).

With respect to weld joint design philosophy for fatigue applications, the following is an explanation of how weld joints are considered for ESBWR design:

a.) Butt joints, NG-3352 Type I joints. Butt welds are full penetration groove welds. [[

]].

b.) Corner joints, NG-3352 Type III joints. As indicated in DCD section 3L.2.3, joints are designed [[

]].

c.) T-joint, NG-3352 Type V joints. T-joints will use [[

]].

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d.) Lap joint, NG-3352 Type V joints. All lap joints will be [[

]].

e.) Edge joint, NG-3352 Type IV and VI joints. Not used, the edge joint [[
]].

In summary, the welds used in ESBWR steam dryer design are full penetration groove welded butt joints, and [[

]].

2.2 Discussion of Partial Penetration Welds in Steam Dryer Licensing Topical Reports

2.2.1 GEH discussed partial penetration welds in LTR NEDE-33313P-A one place.

In NEDE-33313P-A section 4.2 "Weld Quality Factor" provides justification for the SCF used for static applications. The 3rd paragraph discusses the difficulty of inspecting the root side weld joints. As part of the justification for SRF = 1 (quality factor of n=1) GEH stated, [[

]]. In this example, partial penetration welds were listed to provide an encompassing group of welds where the root side cannot be easily inspected. Listing partial penetration welds here does not imply their use in the ESBWR steam dryer. See section 3.0 below for more information on application of fatigue and quality factors.

2.2.2 NRC staff discussed partial penetration welds three places in LTR NEDE-33313P-A, attachment 1, final safety evaluation.

The NRC Staff discusses the GEH response to RAI 3.9-214 (ref. 2) where GEH discusses [[

]] in high stress locations.

The NRC staff references RAI 3.9-214 where GEH discussed partial penetration welds in reference to fillet welds. In RAI 3.9-214, the fillet weld was [[

]]. The effective weld area is based on the effective throat or joint penetration times the effective weld length. For full penetration, the joint penetration is the thickness of the thinner member being joined (see figure 1).

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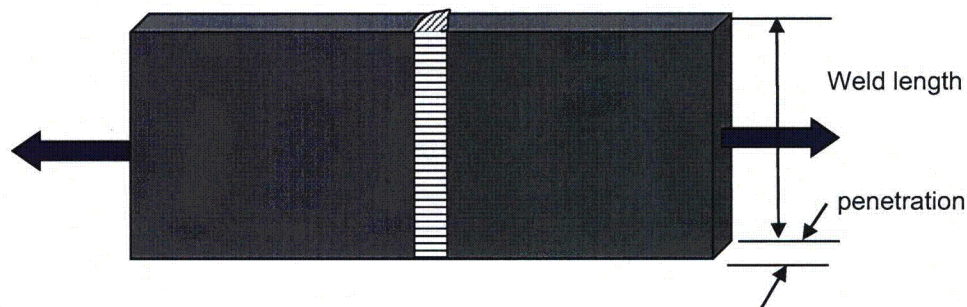


Figure 1 - Full penetration groove welded butt joint

For partial penetration welds and fillet welds, the effective throat or joint penetration is based on the actual penetration (see figure 2 below). In automatic or mechanized welding processes, the weld penetration can be controlled through weld qualification and weld process controls. However, in manual welding the heat input and other welding variables can vary which will affect joint penetration. Regardless of welding process, the fabricator is required to achieve fusion at the edge of the joint face, the minimum root fusion, without consuming this edge will lead to incomplete fusion. Therefore, in design, when the welding process is not defined to control penetration beyond the initial root, the fillet weld throat is based on the theoretical throat and partial penetration weld is based on the joint preparation depth. As depicted in figure 2, when achieving minimum root fusion the fillet weld partially penetrates the faying surface between the members.

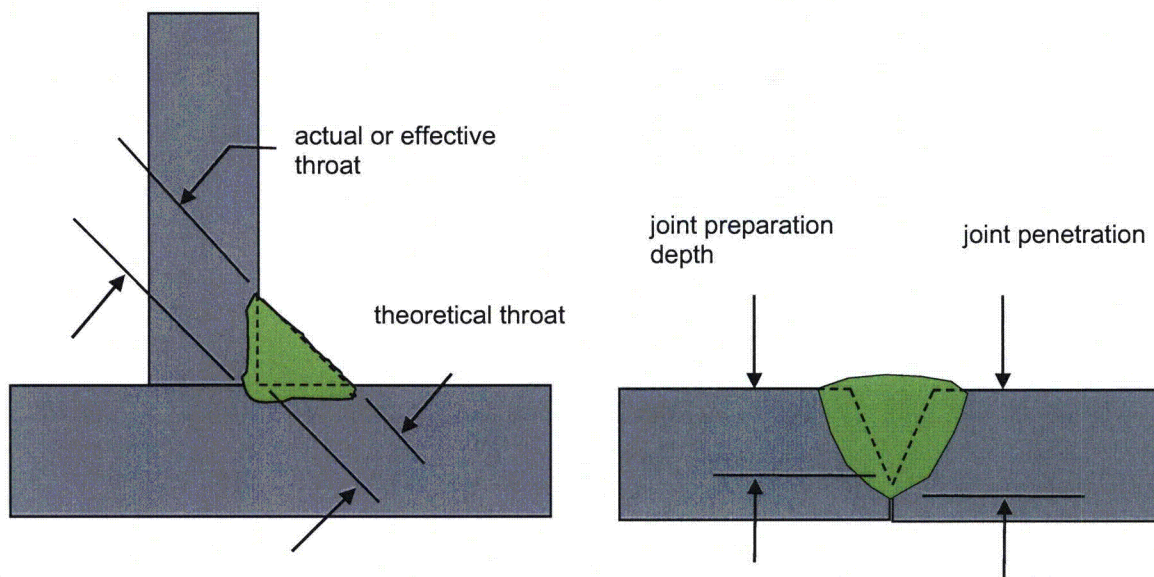


Figure 2 - Fillet welded T-joint and partial penetration groove welded butt joint.

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In NEDE-33313P-A, attachment 1, the NRC Staff discusses partial penetration welds in the final safety evaluation of the topical, where the weld [[

]].

[[

]]

Figure 3 - Full penetration groove welded butt joint [[

]].

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In NEDE-33313P-A, attachment 1, the NRC Staff referenced partial penetration welds when discussing GEH's response to RAI 3.9-215S01 (A)(ii), (ref. 6). The discussion is with respect to weld qualifications and process control for steam dryer welds with limited backside access and measures taken to avoid root defects. The reason for using the term partial penetration welds when discussing welds with limited backside access is explained in section 2.2.1 above.

Although [[

]].

3.0 Justification for Fatigue and Quality Factors

The SCFs (stress concentration factors), fatigue factors (f) and quality factors (n), used for the ESBWR steam dryer welds are described in LTR 33313P-A section 4.1 and Figure 4-1. The fatigue factors are also known as fatigue strength reduction factors (FSRF). Per ASME BPV Code Section III NG-3213.13, a FSRF is a "stress intensification factor which accounts for the effect of a local structural discontinuity (stress concentration) on the fatigue strength."

Full penetration groove welded butt joints, corner joints and T-joints: NG-3352 Types I and III.

- for static applications [[

]].

- for fatigue applications where traditional strength of materials formulas are applied [[
with ASME BPV Section III Subsection NG requirements.]]. This is consistent
- for fatigue applications where FEA is used, [[

]].

Fillet welded T-joints and lap joints: NG-3352 Type V.

- quality factors for static applications [[

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]].

- for fatigue applications where traditional strength of materials formulas are applied [[]]. This SCF is consistent with ASME BPV Section III Subsection NG requirements.
- for fatigue applications for FEA [[

]].

- for fatigue applications for FEA [[

]].

- Note: In RAI 3.9-215S01(C), (ref. 6), a BWR replacement steam dryer document referenced a SCF = 2.7 for a parallel fillet welds in which the ends are not covered. The question was concerning two-sided fillet welds where the weld is not wrapped around the ends. In the response, GEH stated "[[

]] in structural analysis document NEDE-33313P-A Figure 4-1 "Weld Fatigue Factor Flow Diagram".

As stated in LTR 33313P-A section 4.1, if [[

]].

The specific types of welds used in ESBWR steam dryer design and the approach for analysis has not changed since responding to NRC staff RAI 3.9-214 with supplements, therefore the NRC staff's conclusion in the final safety evaluation of NEDE-33313P-A (ref. 2) remains valid in regard to weld types.

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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). This RAI response provides justification for continued applicability of the LTR.

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Enclosure 3

MFN 12-086

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 12-086, Jerald G. Head (GEH) to David Misenhimer (NRC), "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 – Second Draft Response for RAI 3.9-277," dated July 19, 2012. The GEH proprietary information in Enclosure 1 of MFN 12-086, is identified by a [[dark red font with 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 19th day of July 2012.



Jerald G. Head
GE-Hitachi Nuclear Energy Americas LLC