HITACHI

GE Hitachi Nuclear Energy

Richard E. Kingston
Vice President, ESBWR Licensing

PO Box 780 M/C A-55
Wilmington, NC 28402-0780
USA

T 910 675 6192
F 910 362 6192
rick.kingston@ge.com

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 09-028

Docket No. 52-010

January 20, 2009

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

Subject: Response to Portion of NRC Request for Additional Information Letter No. 274 – Related to Design Control Document (DCD) Revision 5 – RAI Number 4.2-32 Supplement 1

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) sent by the Reference 1 NRC letter. GEH response to RAI Number 4.2-32 Supplement 1 is addressed in Enclosures 1, 2 and 3.

Enclosure 1 contains GEH proprietary information as defined by 10 CFR 2.390. GEH customarily maintains this information in confidence and withholds it from public disclosure. Enclosure 2 is the non-proprietary version, which does not contain proprietary information and is suitable for public disclosure.

The affidavit contained in Enclosure 3 identifies that the information contained in Enclosure 1 has been handled and classified as proprietary to GEH. GEH hereby requests that the information in Enclosure 1 be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 10 CFR 9.17.

If you have any questions or require additional information, please contact me.

Sincerely,

Richard E. Kingston

Richard E. Kingston
Vice President, ESBWR Licensing

D068
NRO

References:

1. MFN 08-923 Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, GEH, *Request For Additional Information Letter No. 274 Related To Design Control Document (DCD) Revision 5,* dated November 13, 2008
2. MFN 08-757 Letter from Richard E. Kingston, GEH to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 243 – Related to ESBWR Design Certification Application – RAI Numbers 4.2-24 Supplement 1, 4.2-26 Supplement 1, 4.2-31 and 4.2-32*, dated October 8, 2008

Enclosures:

1. MFN 09-028 – Response to Portion of NRC Request for Additional Information Letter No. 274 – Related to Design Control Document (DCD) Revision 5 – RAI Number 4.2-32 S01 – GEH Proprietary Information
2. MFN 09-028 – Response to Portion of NRC Request for Additional Information Letter No. 274 – Related to Design Control Document (DCD) Revision 5 – RAI Number 4.2-32 S01 – Non-Proprietary Version
3. MFN 09-028 – Response to Portion of NRC Request for Additional Information Letter No. 274 – Related to Design Control Document (DCD) Revision 5 – RAI Number 4.2-32 S01 – Affidavit

cc: AE Cubbage USNRC (with enclosures)
RE Brown GEH/Wilmington (with enclosures)
DH Hinds GEH/Wilmington (with enclosures)
eDRF 0000-0090-2281/R1

Enclosure 2

MFN 09-028

Response to NRC Request for

Additional Information Letter No. 274

Related to Design Control Document (DCD) Revision 5

RAI Number 4.2-32 Supplement 1

Non-Proprietary Version

NRC RAI 4.2-32 Supplement 1

Provide the raw data and a brief discussion of the scaling method

In RAI 4.2-32 for LTR NEDE-33244P, staff requested stress-strain plots to compare experimental test data against the as-modeled plastic behavior. Figures 4.2-32-2 and 4.2-32-3 only show the curves in the range of [[ ]], which is well below the range of model results. Staff is concerned that the as-modeled ANSYS material curve might diverge significantly from the experimental basis curve due to a potential inaccuracy of the Ramberg-Osgood relationship when applied to stainless steel. In addition, the experimental data presented in the plots is [[ ]]. Please provide the raw data and a brief discussion of the scaling method explained in the following parts.

1) *Provide stress-strain plots that compare experimentally derived test data against the as-modeled ANSYS input data for un-irradiated [[ ]] at 70F and 550F. Ensure that the strain range encompasses all model results reported in the LTR. For example, the 550F curve was used in the burst pressure calculation in LTR Section 3.6.4 and that was loaded to the point of material failure. Therefore, the 550F curves should extend all the way to the maximum strain value calculated in the burst pressure analysis.*

2) *Provide stress-strain plots of the raw experimental test data at both low strain and high strain scales. The low strain range plot should focus on the region near yield while the high strain range should extend to failure. On the same axes, plot all the scaled versions of the experimental curve. Explain how the scaled curves were derived.*

GEH Response

In the response to the original RAI, the stress-strain curves used for control rod Finite Element Analyses (FEA) were compared to experimental data for generic type 304 stainless steel. Since the material strengths of type 304 are different than type 304S, the stress-strain curves were linearly scaled based on the relative yield strengths to provide a better comparison. Since the data used in the original response for type 304 does not extend to ultimate failure, a different approach is needed.

Elastic-plastic stress-strain curves were developed for FEA based solely on GEH material specification yield and ultimate, stress and strain. The Ramberg-Osgood relationship is used in the plastic region.

In order to compare the FEA stress-strain curves to experimental data, tensile test data from several completed type 304S square absorber tubes was obtained. This data shall be referred to as 'test data' for this response. No scaling was applied to this data, although it was converted from engineering

stress and strain to true stress and strain for comparison to the true stress-strain FEA curves.

As discussed in the previous RAI response, previous material specifications for type 304S required slightly lower strengths than the current specification. Some control rod FEA used stress-strain curves based on the previous values. Since these strength values are slightly lower than the current specification, the analyses are conservative. As in the previous response, both previous and current FEA curves are shown in the following figures.

Figures 1 through 4 show a comparison of the test data to the FEA stress-strain curves. Figures 1 and 2 show the room temperature (70°F) comparison, while Figures 3 and 4 show the operating temperature (550°F) comparison.

Figure 1 (70°F) shows good correlation in the elastic range between the test data and the FEA curves. As the material begins to yield, all the test data strengths exceed the FEA curve values, which is conservative. The material specification yield requirement is shown on the graph.

Figure 2 (70°F) shows that the FEA curves are conservative in the plastic region, based on the test data. It is important to note that the actual tensile limit of the tested material far exceeds the material specification ultimate tensile limit, which is used in the Finite Element Analysis.

Figure 3 (550°F) also shows good correlation between the FEA curves and the test data, with the FEA curves being conservative as the material yields and enters the plastic region. Likewise, Figure 4 (550°F) shows that the FEA curves are conservative in the plastic region. Like the room temperature results, the test data ultimate tensile limits far exceed the material specification ultimate tensile limit used in the Finite Element Limits.

Since Figures 2 and 4 show a comparison of test data to the FEA curves to ultimate failure, this comparison encompasses all finite element analyses, including the burst pressure analysis of the LTR (NEDE-33244P Rev. 1). The FEA curves are shown to be conservative and acceptable for use.

[[

]]

Figure 1. 70°F, Un-Irradiated Stress-Strain Curve: Low Strain Scale

[[

]]

Figure 2. 70°F, Un-Irradiated Stress-Strain Curve: High Strain Scale

[[

]]

Figure 3. 550°F, Un-Irradiated Stress-Strain Curve: Low Strain Scale

[[

]]

Figure 4. 550°F, Un-Irradiated Stress-Strain Curve: High Strain Scale

DCD Impact

No DCD changes will be made in response to this RAI.

No changes to the subject LTR will be made in response to this RAI.

Enclosure 3

MFN 09-028

Response to NRC Request for

Additional Information Letter No. 274

Related to ESBWR Design Certification Application

RAI Number 4.2-32 S01

Affidavit

GE-Hitachi Nuclear Energy Americas LLC

AFFIDAVIT

I, David H. Hinds, state as follows:

(1) I am General Manager, New Units Engineering, GE Hitachi Nuclear Energy ("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 09-028, Mr. Richard E. Kingston to U.S. Nuclear Energy Commission, entitled "*Response to Portion of NRC Request for Additional Information Letter No. 274 – Related to Design Control Document (DCD) Revision 5 – RAI Number 4.2-32 Supplement 1,*" dated January 20, 2009. The proprietary information in enclosure 1, which is entitled "*MFN 09-028 - Response to Portion of NRC Request for Additional Information Letter No. 274 – Related to Design Control Document (DCD) Revision 5 – RAI Number 4.2-32 S01 – GEH Proprietary Information,*" 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 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 qualify 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, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which 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 which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

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

d. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b. above.

(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, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties, including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

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

(8) The information identified in paragraph (2) is classified as proprietary because it contains details of GEH's control rod design and licensing methodology. The development of the methods used in these analyses, along with the testing, development and approval of the supporting methodology was achieved at a significant cost to GEH.

(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 January 2009.

David H. Hinds
GE-Hitachi Nuclear Energy Americas LLC