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**Proprietary Notice**

This letter forwards proprietary information in accordance with 10CFR2.390. Upon the removal of Enclosure 2, the balance of this letter may be considered non-proprietary.

MFN 10-038

Docket No. 52-010

January 28, 2010

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

Subject: **Submission of Markups to Licensing Topical Report Related to ESBWR Design Certification Application – LTR NEDE-33244P, Revision 2**

The purpose of this letter is to submit GE Hitachi Nuclear Energy (GEH) markups to the reference 1 licensing topical report (LTR), NEDE-33244P. The markups explain how GEH addresses control rod depletion in its nuclear methods and by depletion limits. The proprietary LTR markups are provided in Enclosure 1.

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 of Enclosure 1, 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 of Enclosure 1 be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 9.17.

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

Sincerely,

Richard E. Kingston  
Vice President, ESBWR Licensing

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NR0

Reference:

1. NEDE-33244P, "ESBWR Marathon Control Rod Mechanical Design Report," Revision 1, November 2007

Enclosures:

1. MFN 10-038 - Submittal of Markups to Licensing Topical Report Related to ESBWR Design Certification Application – LTR NEDE-33244P, Revision 2 – **GEH Proprietary Information**
2. MFN 10-038 - Submittal of Markups to Licensing Topical Report Related to ESBWR Design Certification Application – LTR NEDO-33244, Revision 2 – **Public Version**
3. MFN 10-038 - Submittal of Markups to Licensing Topical Report Related to ESBWR Design Certification Application – LTR NEDE-33244P, Revision 2 – **Affidavit**

cc: AE Cabbage USNRC (with enclosures)  
JG Head GEH (with enclosures)  
DH Hinds GEH (with enclosures)  
SC Moen GEH (with enclosures)  
eDRFSection 0000-0077-1609

**Enclosure 2**

**MFN 10-038**

**Submittal of Markups to Licensing Topical Report  
Related to ESBWR Design Certification Application  
LTR NEDO-33244, Revision 2**

**Public Version**

**NON-PROPRIETARY INFORMATION NOTICE**

This is a non-proprietary version of NEDE-33244P, which has the proprietary information removed. Portions of the document that have been removed are indicated by an open and closed bracket as shown here [[ ]].

noted in the ESBWR Tier 2 DCD (Reference 4), the ESBWR Marathon control rod seismic conditions are bounded by the ABWR test.

### 4.3 CONTROL ROD MATERIAL

#### 4.3.1 Criteria

Control rod materials are shown to be compatible with the reactor environment.

#### 4.3.2 Conformance

No new materials are introduced for the ESBWR Marathon control rod that have not been used in control rods in operating BWR/2-6 plants. The ESBWR Marathon control rod is designed to be crevice-free, and uses materials resistant to corrosion and stress corrosion cracking. For example, the absorber tubes are made from the same high purity, stabilized type 304S stainless steel as BWR/2-6 Marathon control rods. This material was developed by GEH to be resistant to stress corrosion cracking.

### 4.4 REACTIVITY

#### 4.4.1 Criteria

Control rod reactivity worth shall be included in the plant core analyses.

#### 4.4.2 Conformance

As discussed in Section 1 of Reference 5, the equilibrium core design for ESBWR was performed using a BWR/6 (S lattice) original equipment control rod. As also discussed in Reference 5, the compatibility of the ESBWR Marathon control rod is ensured by matching the initial cold reactivity worth of the Marathon CRB with the BWR/6 original equipment used in the core design.

The control rod depletion limit of 10% worth reduction in any axial quarter segment is the lifetime criterion for all approved GE/GEH control rod designs. This same limit is applied to the ESBWR Marathon control rod, as discussed in Section 2.1 of Reference 5. The 10% worth reduction limit is also documented in Section 4.2.1.1.8 of the US Supplement to GESTAR II (Reference 13).

The shutdown margin (SDM) demonstration requirement in the ESBWR Technical Specifications specifies that a demonstration be performed after fuel reconfiguration to assure that the core can remain subcritical by 0.38%  $\Delta k/k$  with the strongest control rod withdrawn, as specified in Section 3.1.1 of the ESBWR Technical Specification (Reference 12). This demonstration will include any reactivity variations associated with actual control rod inventory.

GEH imposes a 1% SDM design criteria in its design and licensing process. This additional margin accommodates a number of factors that are not explicitly modeled, including the variation in control rod depletion within the allowable 10% criterion. This design margin provides assurance that sufficient SDM is present to account for the various operational and methodology uncertainties, and that the SDM demonstration when performed at the plant will

have a high degree of certainty of success. Section 2.3 of Reference 14 provides a broader discussion of this.

The reactivity effects of control rod depletion on core performance during one plant operating cycle are small and are accounted for by the critical eigenvalue normalization process performed for each plant operating cycle. The cold critical eigenvalue used to calculate shutdown margin in core design and licensing analyses is determined from the most recent plant cold critical data. This plant data includes the small reactivity variations due to rod burnup for the specific control rod inventory in the reactor. Any rod replacements performed during the subsequent refueling outage will invariably increase the rod worth at those locations and provide a small decrease in cold reactivity.

The cold critical eigenvalue behavior from SDM demonstration cases is procedurally reviewed for all reactor cores with a GNF fuel supply. [[

]] GNF has never experienced a situation where the SDM demonstration failed to meet the technical specification when using GNF fuel and design & licensing methodology. The rod worth restrictions - to match the OEM rod worth within 5% at beginning of life and to limit rod worth reduction to less than 10% of the OEM worth – ensures that the impact on cold reactivity and shutdown margin remains small compared to design margins.

## 6. REFERENCES

1. GE Nuclear Energy, "GE Marathon Control Rod Assembly," NEDE-31758P-A, GE Proprietary, October 1991.
2. GE Nuclear Energy, "Safety Evaluation of the General Electric Duralife 230 Control Rod Assembly," NEDE-22290-P-A Supplement 3, GE Proprietary, May 1988.
3. GE Nuclear Energy, "Marathon-5S Control Rod Assembly", NEDE-33284P-A Rev. 2, GE Proprietary, ~~September 2006~~October 2009.
4. GE-Hitachi Nuclear Energy, "ESBWR Design Control Document Tier 2, Chapter 4, Reactor", 26A6642AP, GEH Proprietary.
5. GE-Hitachi Nuclear Energy, "Licensing Topical Report: ESBWR Control Rod Nuclear Design", NEDE-33243 Rev. ~~1~~2, GEH Proprietary, ~~October 2007~~July 2008.
6. 1989 ASME Section III, Division 1, Appendix I, Figure I-9.2.1.
7. JA Bannantine, JJ Comer and JL Handrock, 'Fundamentals of Metal Fatigue Analysis', Prentice Hall, 1990.
8. BWR Vessel and Internals Project: Fracture Toughness and Tensile Properties of Irradiated Austenitic Stainless Steel Components Removed from Service (BWRVIP-35)," EPRI TR-108279, June 1997.
9. BWR Vessel and Internals Project: Review of Test Data for Irradiated Stainless Steel Components (BWRVBIP-66)," EPRI TR-112611, March 1999.
10. "Boiling Water Reactor Vessel and Internal Project: Crack Growth Rates in Irradiated Stainless Steels in BWR Internal Components (BWRVIP-99)", EPRI TR 1003018 Final Report, December 2001.
11. *Mechanical Behavior of Materials*, F. A. McClintock and A. S. Argon, pages 277-278, Addison-Wesley Publishing Company, Inc., 1966.
12. GE-Hitachi Nuclear Energy, "ESBWR Design Control Document Tier 2, Chapter 16, Technical Specifications", 26A6642BR.
13. Global Nuclear Fuel, "General Electric Standard Application for Reactor Fuel (GESTAR II), Supplement for United States", NEDE-24011-P-A-16-US, GNF Proprietary, October 2007.

14. GE Nuclear Energy, "Applicability of GE Methods to Expanded Operating Domains",  
NEDC-33173P, GE Proprietary, February 2006.

**Enclosure 3**

**MFN 10-038**

**Submittal of Markups to Licensing Topical Report**

**Related to ESBWR Design Certification Application**

**LTR NEDE-33244P, Revision 2**

**Affidavit**

# GE-Hitachi Nuclear Energy Americas LLC

## AFFIDAVIT

I, **Larry J. Tucker**, state as follows:

- (1) I am the Manager, ESBWR 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 10-038, Mr. Richard E. Kingston to U.S. Nuclear Energy Commission, entitled "*Submittal of Markups to Licensing Topical Report Related to ESBWR Design Certification Application – LTR NEDE-33244P, Revision 2,*" dated January 28, 2010. The proprietary information in enclosure 1, which is entitled "*MFN 10-038 - Submittal of Markups to Licensing Topical Report Related to ESBWR Design Certification Application – LTR NEDE-33244P, Revision 2 – GEH Proprietary Information,*" is indicated as the content contained between opening double brackets ([[ ]) and closing double brackets (]]). ~~[[This sentence is an example <sup>(3)</sup>]].~~ Figures and large equation objects are identified with double square brackets before and after the object. 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 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 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.

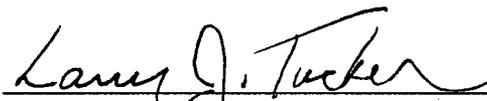
The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

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 27th day of January 2010.



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Larry J. Tucker

GE-Hitachi Nuclear Energy Americas LLC