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MFN 08-883

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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. 208 – Related To NEDO-33338, "ESBWR Feedwater Temperature Operating Domain for Transient and Accident Analysis" – RAI Number 4.3-32**

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 and 2 NRC letters. GEH response to RAI Number 4.3-32 is addressed in Enclosures 1, 2, 3 and 4.

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 4 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

References:

1. MFN 08-508 Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, GEH, *Request For Additional Information Letter No. 208 Related To NEDE-33338P, "ESBWR Feedwater Temperature Operating Domain for Transient and Accident Analysis"*, dated June 8, 2008

Enclosures:

1. MFN 08-883 – Response to Portion of NRC Request for Additional Information Letter No. 208 - Related To NEDO-33338, "ESBWR Feedwater Temperature Operating Domain for Transient and Accident Analysis" - RAI Number 4.3-32 – GEH Proprietary Information

2. MFN 08-883 – Response to Portion of NRC Request for Additional Information Letter No. 208 - Related To NEDO-33338, "ESBWR Feedwater Temperature Operating Domain for Transient and Accident Analysis" - RAI Number 4.3-32 – Non-Proprietary Version

3. MFN 08-883 – Response to Portion of NRC Request for Additional Information Letter No. 208 - Related To NEDO-33338, "ESBWR Feedwater Temperature Operating Domain for Transient and Accident Analysis" - RAI Number 4.3-32 – DCD Markups

4. MFN 08-883 – Response to Portion of NRC Request for Additional Information Letter No. 208 - Related To NEDO-33338, "ESBWR Feedwater Temperature Operating Domain for Transient and Accident Analysis" - RAI Number 4.3-32 – Affidavit

cc: AE Cubbage   USNRC (with enclosures)
     RE Brown   GEH/Wilmington (with enclosures)
     DH Hinds   GEH/Wilmington (with enclosures)
     eDRF   0000-0090-4566

Enclosure 2

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Response to Portion of NRC Request for

Additional Information Letter No. 208

Related To NEDO-33338, "ESBWR Feedwater Temperature
Operating Domain for Transient and Accident Analysis"

RAI Number 4.3-32

Non-Proprietary Version

NRC RAI 4.3-32

Describe the algorithm for selected control rod run-in/select rod insert (SCRRI/SRI) actuation when the feedwater temperature changes by more than 30F. Can the algorithm reset itself and fail to operate if the feedwater temperature transient is very slow?

GEH Response

A SCRRI/SRI is initiated by the ATLM (Reference 4.3-32-1, Subsection 7.7.2.2.7.7) if the current feedwater temperature (T_{FW}) is more than 30°F less than the reference feedwater temperature ($T_{FW,REF}$) for core powers above 50%. The algorithm will appropriately adjust $T_{FW,REF}$ to accommodate intentional changes in operating feedwater temperature, while not precluding or excessively delaying SCRRI/SRI on a loss of feedwater heating event. A simplified block diagram of the algorithm is shown in Figure 4.3-32-1.

In Figure 4.3-32-1:

P is core power in %;

$FWTR_{MIN}(P)$ is the minimum allowed feedwater temperature as a function of core power from Figure 4.2-1 of Reference 4.3-32-2 (SP1M to SP5);

ΔT_1 is a threshold temperature change (*e.g.*, [[   ]][1]) to consider reducing $T_{FW,REF}$;

τ is the time period (*e.g.*, [[   ]][1]) with T_{FW} at least ΔT_1 below $T_{FW,REF}$ required to consider reducing $T_{FW,REF}$;

Note that the reference feedwater temperature will not reset downwards prior to SCRRI/SRI actuation for a fast feedwater temperature reduction, due to the timer requirement ("fast" is defined as at least a [[   ]] reduction in less than [[   ]] following the initial [[   ]] reduction for the example parameter values[1]). It is possible that the reference feedwater temperature will reset downwards for a slow loss of feedwater heating transient since intentional feedwater temperature reductions will be slow ("slow" is defined as not "fast"). However, the requirements on core power and MCPR ensure that the slow event will still remain within the analyzed space.

References:

4.3-32-1   GE Hitachi Nuclear Energy, "ESBWR Design Control Document, Tier 2," 26A6642, Revision 5, May 2008.

4.3-32-2   GE Hitachi Nuclear Energy, "ESBWR Feedwater Temperature Operating Domain Transient and Accident Analysis," NEDO-33338, October 2007.

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[1] The precise value of this parameter will be determined in the detailed design. However, the function of the algorithm will not be altered.

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Figure 4.3-32- 1 Feedwater Temperature Drop SCRRI/SRI Algorithm Simplified Block Diagram

DCD Impact

No changes to NEDO-33338 will be made in response to this RAI.

Changes to DCD Tier 2 Subsection 7.7.2.2.7.7 are shown in Enclosure 3.

Enclosure 3

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Response to Portion of NRC Request for

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DCD Markups

Bypass conditions allow continuation of normal rod movement capability by bypassing failed equipment in one RC&IS channel. After repair or replacement of the failed equipment is completed, the operator can restore the system or subsystem to a full two-channel operability. The operator has the capability to establish single-channel bypass conditions within the following systems / subsystems:

- RSPC channel A or B,

- FCM channel A or B,

- ATLM channel A or B,

- RWM channel A or B, or

- RAPI channel A or B.

7.7.2.2.7.7 Automated Thermal Limit Monitor Algorithm Description

The ATLM is a microprocessor-based subsystem of the RC&IS that executes two different algorithms for enforcing fuel operating thermal limits when reactor power is above the ATLM enable setpoint. One algorithm enforces Operating Limit Minimum Critical Power Ratio (OLMCPR), and the other enforces the Operating Limit Maximum Linear Heat Generation Rate (OLMLHGR). For the OLMCPR algorithm, the core is divided into multiple regions, each consisting of 16 fuel bundles. For the OLMLHGR algorithm, each region is further vertically divided into four segments. During a calculation cycle, ATLM Rod Block Setpoints (RBS) are calculated for OLMCPR monitoring and for OLMLHGR monitoring. The calculated setpoints are compared with the real time averaged LPRM readings for each region/segment. The ATLM issues a trip signal if any regionally averaged LPRM reading exceeds the calculated RBS. This trip signal causes a rod block within the RC&IS. The ATLM provides a FW temperature control valve one-way block and a rod withdrawal block if the reactor thermal power versus FW temperature combination is outside of the area allowed by the reactor power versus FW temperature map, or if the FW temperature decrease causes thermal limit violations. The ATLM calculates a reference FW temperature for the purpose of detecting a loss of feedwater heating event. During each pass through the algorithm, the reference temperature is set to the maximum of: the current FW temperature, the existing reference temperature, or the minimum allowed FW temperature for the current reactor power. The reference temperature is only allowed to decrease for a slow FW temperature decrease for which reactor power is at or below 100% and MCPR limits are met. The ATLM provides a FW temperature control valve one-way block, rod withdrawal block, and SCRRI/SRI initiation, if the FW temperature decreases by more than 16.7°C (30°F) from the ~~current value within a predefined time~~reference FW temperature.

The ATLM algorithm is also based upon control rod positions and status data and other plant data from the RAPI. The ATLM operating limit setpoints can be updated based upon calculated inputs from the core monitoring function of the N-DCIS. Updates of the ATLM setpoints can occur either automatically or by operator request.

Enclosure 4

MFN 08-883

Response to Portion of NRC Request for

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Related To NEDO-33338, "ESBWR Feedwater Temperature
Operating Domain for Transient and Accident Analysis"

RAI Number 4.3-32

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 08-883, Mr. Richard E. Kingston to U.S. Nuclear Energy Commission, entitled *"Response to Portion of NRC Request for Additional Information Letter No. 208 – Related To NEDO-33338, "ESBWR Feedwater Temperature Operating Domain for Transient and Accident Analysis" – RAI Number 4.3-32,"* dated November 17, 2008. The proprietary information in enclosure 1, which is entitled *"MFN 08-883 – Response to Portion of NRC Request for Additional Information Letter No. 208 - Related To NEDO-33338, "ESBWR Feedwater Temperature Operating Domain for Transient and Accident Analysis" - RAI Number 4.3-32 – 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, <u>Critical Mass Energy Project v. Nuclear Regulatory Commission,</u> 975F2d871 (DC Cir. 1992), and <u>Public Citizen Health Research Group v. FDA,</u> 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 17th day of November 2008.

David H. Hinds
GE-Hitachi Nuclear Energy Americas LLC