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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 07-667

Docket No. 52-010

December 14, 2007

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. 101 – Related to ESBWR Design Certification Application – RAI Number 21.6-104

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 21.6-104 is addressed in Enclosures 1, 2 and 3.

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

Sincerely,

James C. Kinsey

James C. Kinsey
Vice President, ESBWR Licensing

D068
NRO

Reference:

1. MFN 07-357, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, GEH, *Request For Additional Information Letter No. 101 Related To ESBWR Design Certification Application*, dated June 21, 2007

Enclosures:

1. MFN 07-667 – Response to Portion of NRC Request for Additional Information Letter No. 101 – Related to ESBWR Design Certification Application – RAI Number 21.6-104 – GEH Proprietary Information
2. MFN 07-667 – Response to Portion of NRC Request for Additional Information Letter No. 101 – Related to ESBWR Design Certification Application – RAI Number 21.6-104 – Non-Proprietary Version
3. MFN 07-667 – Response to Portion of NRC Request for Additional Information Letter No. 101 – Related to ESBWR Design Certification Application – RAI Number 21.6-104 – Affidavit

cc: AE Cubbage USNRC (with enclosure)
GB Stramback GEH/San Jose (with enclosure)
RE Brown GEH/Wilmington (with enclosure)
eDRF 0000-0075-8580

Enclosure 2

MFN 07-667

Response to Portion of NRC Request for

Additional Information Letter No. 101

Related to ESBWR Design Certification Application

RAI Number 21.6-104

Non-Proprietary Version

NRC RAI 21.6-104

Demonstrate that the time to boiling transition calculation is accurate or conservative

Figure 4.4-31 S01-2 in MFN 06-297 Supplement 7 shows that the time to boiling transition as calculated by TRACG could be non-conservative. Provide additional information demonstrating that this calculation is accurate or conservative. Explain how the uncertainty of the calculation is accounted for in all TRACG04 analyses for the ESBWR design certification (as shown in DCD Chapters 4, 6, and 15).

Reference: Letter from J.C. Kinsey (GE) to NRC, MFN 06-297 Supplement 7, "Response to Portion of NRC Request for Additional Information Letter No. 53 Related to ESBWR Design Certification Application - DCD Chapter 4 and GNF Topical Reports - RAI Number 4.4-2S01, 4.4-27S01, 4.4-31S01 and 4.4-54S01," April 10, 2007.

GEH Response

The response below shows that the calculation for time to boiling transition (BT) for ESBWR is conservative, and the PCT uncertainty studies in Reference 21.6-104-1 cover uncertainty in time to BT seen in Figure 4.4-31 S01-2 in MFN 06-297 Supplement 7.

TRACG is a best estimate code that is able to simulate boiling water reactor (BWR) operation, including the ESBWR, over a wide range of conditions. TRACG analyses of the ESBWR presented in chapters 4, 6, and 15 of the DCD show that boiling transition only occurs during Anticipated Transients Without Scram (ATWS) events. During Anticipated Operational Occurrences, infrequent events and loss of coolant accidents there is no boiling transition and the core remains covered.

The most limiting event considering boiling transition and Peak Cladding Temperature (PCT) for ESBWR ATWS is a Main Steamline Isolation Valve (MSIV) closure event. In order to ensure that the TRACG calculation is conservative for the MSIV closure event several conservative assumptions are made in order to achieve a limiting result.

Analysis is performed at the [[ ]] state point because it is the most limiting for ATWS according to Reference 21.6-104-1. A bundle power peaking factor is applied to the hot channel to operate at a Critical Power Ratio (CPR) of [[ ]] or lower, which is below the ESBWR operating limit CPR of 1.3. Additionally, the linear heat generation rate for the hot channel is set to a value higher than the value of the rated fuel used in the analysis. Further conservatisms were taken into account to bound the PCT and are outlined below and the effects can be found in Reference 21.6-104-1.

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When the bounding inputs are used in the TRACG calculations boiling transition occurs in the bounding MSIV closure event in [[ ]] seconds from the beginning of the transient and the

nominal MSIV closure event reaches boiling transition in [[ ]] seconds. The point at which the CPR for the hot channel drops below the Minimum CPR of 1.0, boiling transition occurs. The nominal event takes [[ ]] seconds longer to reach boiling transition than the bounding event. Figure 4.4-31 S01-2 from RAI 4.4-31 S01 shows that the maximum difference in time to boiling transition between the TRACG calculations and the experimental data is [[ ]] second. The difference between the times to boiling transition between the nominal ATWS MSIV closure event and the bounding ATWS MSIV closure event using Reference [1] methodology is [[ ]] seconds. The conservatism added to the TRACG input for the bounding ATWS analysis results bounds the maximum difference between the TRACG calculations and the experimental data found in Figure 4.4-31 S01-2 from RAI 4.4-31 S01. Furthermore, quenching doesn't occur in the bounding case until well after the nominal case has quenched.

Figure 21.6-104-1 shows that the rod temperature, which corresponds with the cladding temperature, increase for the limiting channels in the bounding MSIV closure event occurs before the nominal event and the bounding event reaches a higher value than the nominal event. An uncertainty in the time to BT translates to an uncertainty in the calculated PCT. It is shown below that the bounding ATWS analysis covers this non-conservatism in time to BT and thus envelopes the resulting effect on PCT uncertainty for ESBWR ATWS. The PCT uncertainty for the nominal analysis is quantified in Table 8.3-3 of Reference 21.6-104-1, which shows that for the ATWS event the [[ ]]. Consequently, covering the PCT bias in the bounding analysis ensures that the boiling transition calculation is conservative.

The conservatisms added to TRACG input ensure that the time to boiling transition is conservative in TRACG analysis. Methodology for ATWS TRACG analysis can be found in Reference 21.6-104-1. Considering that boiling transition is only achieved during the ATWS events for the ESBWR other TRACG analysis does not need to be addressed. Methodology for uncertainty in the ATWS analysis is discussed in Reference 21.6-104-1.

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Figure 21.6-104-1. Hot Channel Peak Rod Temperature

DCD Impact

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

Reference

21.6-104-1 NEDE 33083P Supplement 2, "TRACG Application for ESBWR Anticipated Transient Without Scram Analysis"

MFN 07-667

Enclosure 3

Response to Portion of NRC Request for

Additional Information Letter No. 101

Related to ESBWR Design Certification Application

RAI Number 21.6-104

Affidavit

GE Hitachi Nuclear Energy

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 07-667, Mr. James C. Kinsey to U.S. Nuclear Energy Commission, entitled "*Response to Portion of NRC Request for Additional Information Letter No. 101 Related to ESBWR Design Certification Application – RAI Number 21.6-104,*" dated December 14, 2007. The proprietary information in enclosure 1, which is entitled "*Response to Portion of NRC Request for Additional Information Letter No. 101 Related to ESBWR Design Certification Application – RAI Number 21.6-104 – 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) above is classified as proprietary because it contains details of GEH's evaluation methodology.

The development of the evaluation process along with the interpretation and application of the analytical results is derived from the extensive experience database that constitutes a major GEH asset.

(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 14th day of December 2007.

David H. Hinds
GE Hitachi Nuclear Energy