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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 06-232 Supplement 1

Docket No. 52-010

November 19, 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. 31 Related to ESBWR Design Certification Application - RAI Number 21.6-39 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 21.6-39 S01 is addressed in Enclosures 1 and 2.

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

Sincerely,

James C. Kinsey
Vice President, ESBWR Licensing

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Reference:

1. MFN 06-203, Letter from U.S. Nuclear Regulatory Commission to James C. Kinsey, GEH, *Request For Additional Information Letter No. 31 Related To ESBWR Design Certification Application*, dated June 23, 2006

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 31 Related to ESBWR Design Certification Application - RAI Number 21.6-39/S01 – GEH Proprietary Information
2. Response to Portion of NRC Request for Additional Information Letter No. 31 Related to ESBWR Design Certification Application - RAI Number 21.6-39/S01 – Non-Proprietary
3. Response to Portion of NRC Request for Additional Information Letter No. 31 Related to ESBWR Design Certification Application - RAI Number 21.6-39/S01 – Affidavit

cc: AE Cubbage USNRC (with enclosure)
GB Stramback GEH/San Jose (with enclosure)
RE Brown GEH/Wilmington (with enclosure)
eDRF 0000-0075-9277

ENCLOSURE 2

MFN 06-232 Supplement 1

Response to NRC Request for Additional Information

Letter No. 31

Related to ESBWR Design Certification Application

RAI Number 21.6-39 S01

Non-Proprietary

This is a non-proprietary response to RAI 21.6-39 S01 that has the proprietary information removed. Portions of the document that have been removed are indicated by open and closed double brackets as shown here [[]].

NRC RAI 21.6-39 S01

The staff is concerned about GE's methodology as applied to non-isolation ATWS events since it appears that many of GE's design and modeling choices, and assumptions were based on the a failure to scram during an isolation event. GE predicts that during an isolation ATWS event, such as MSIV closure ATWS, the natural circulation patterns will develop such that the periphery of the core will be in down-flow and the center of the core will be in up-flow. Hence, GE selected the injection of the SLCS to be in the periphery core bypass. It would follow that the boron would flow down through the periphery bypass and then up through the channels as it moves to the center of the core. However during a non-isolation ATWS, these natural circulation patterns may not develop. There may be up-flow in the core periphery bypass causing the boron to flow up, in which case its mixing and transport time to get into the center channels is not as well established. The staff requests GE provide a discussion on how boron enters the core during a non-isolation ATWS. GE should describe the flow paths. GE should also discuss the nodalization and flow blocking selected, and justify that it has been demonstrated to be conservative during non-isolation ATWS events, including depressurization (if needed, see comment on RAI response 21.6-4).

GEH Response

The Non-Isolation ATWS Case Reported in MFN 06-232:

The non-isolation ATWS event evaluated in response to RAI 21.6-39 and reported in MFN 06-232 was modeled with SLCS injection at the same locations as described in the MSIVC ATWS case in Reference 21.6-39-1 (ATWS LTR). SLCS is injected into the peripheral bypass between TRACG axial levels 4 and 5 as shown in the ATWS LTR Figure 8.1-1. The non-isolation ATWS case was run starting at normal operating conditions with MSIV closure not simulated, and with the same SLCS initiation and SLCS delay time as the ATWS MSIV closure isolation case in Reference 21.6-39-1. The nodalization and flow blocking selected in this case run is the same as described and shown in figures contained in the response to RAI 21.6-40, MFN 06-232. Conservatism for the nodalization and flow blockage selected is discussed in the response to RAI 21.6-8, MFN 07-255.

Comparison of Pre-Boron Injection Bypass Flow Patterns (Isolation vs. Non-Isolation ATWS):

Comparison of Pre-SLCS injection bypass flow velocities between the ATWS non-isolation case, and the isolation case with MSIV closure, is discussed next. The time of interest in both cases is [[]] from the start of the respective events. At this time, the flow direction in the peripheral bypass region (TRACG ring 3, between axial levels 4 and 6) just prior to the boron entering the core, is [[]]

]] as indicated in the MSIV closure ATWS isolation event analysis in Reference 21.6-39-1 (ATWS LTR).

Comparison of Post-Boron Injection Bypass Flow Patterns (Isolation vs. Non-Isolation ATWS):

Subsequent to the boron entering the bypass region a comparison of bypass flows between the non-isolation ATWS case and the MSIV closure case shows that for both cases [[]] in the peripheral bypass region. This transports the injected boron towards the bottom of the peripheral bypass. In both the isolation and the non-isolation ATWS cases discussed here, the boron transported to the core plate region then spreads radially inward toward the central core region, and is available to flow into the bundles through the leakage holes and to the central bypass region. This is confirmed by the boron concentration values in the inner bypass regions calculated by TRACG. During the boron injection phase, there are some intermittent upward flow areas in the peripheral bypass at relatively low velocities. This however, has relatively minor impact on boron concentration buildup in the bypass as seen in Figures 21.6-39 S01-1a, and 21.6-39 S01-1b.

Core Shutdown Effectiveness in Non-Isolation and Isolation ATWS Cases:

As reported in MFN 06-232, in the response to RAI 21.6-39, the non-isolation ATWS case shows that with [[]], the boron entering the bypass is capable of shutting down the core in [[]]. A comparison of the MSIVC ATWS event and the non-isolated ATWS injection study shows that with the exception of shutdown time being [[]]

]]. This [[]] of the “net core shutdown time” in the MSIV closure base case, and clearly has a small effect. The “net core shutdown time” is defined as [[]].

Nodalization and Flow Blocking

Nodalization and radial/azimuthal flow blocking is discussed and justified in Section 8 of the ATWS LTR. In addition, these issues are discussed in the response to RAI 21.6-8/ RAI 21.6-41, transmitted in MFN.07-255, and established that [[]] (e.g. see Table 21.6-8-3).

Depressurization

Depressurization is being addressed in the response to RAI 21.6-4 S01.

Conclusions

The following conclusions are drawn from the discussions above:

- a. In the non-isolation ATWS case, [[]]

]] leads to
successful and timely shutdown of the core.

- b. In addition, the comparison of key ATWS parameters for the non-isolation event and the MSIV closure event that for the non-isolation event there is [[

]].

- c. Through this RAI 21.6-39 S01 response (and the response to the original RAI 21.6-39) it has been established that nodalization and flow blocking leads to conservative results for the non-isolation ATWS case compared with the MSIV closure isolation case.

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.

Reference

- 21.6-39-1 NEDE 33083P Supplement 2, "Licensing Topical Report TRACG Application for ESBWR Anticipated Transient Without Scram Analysis," GE Energy Nuclear, January 2006.

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Figure 21.6-39 S01-1a Boron Concentration in Peripheral Bypass Region

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Figure 21.6-39-S01-1b Boron Concentration in Central Bypass Region

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 06-232 Supplement 1, Mr. James C. Kinsey to U.S. Nuclear Energy Commission, entitled “*Response to Portion of NRC Request for Additional Information Letter No. 31 Related to ESBWR Design Certification Application – RAI Number 21.6-39 Supplement 1*”, dated November 19, 2007. The proprietary information in enclosure 1, which is entitled “*Response to Portion of NRC Request for Additional Information Letter No. 31 Related to ESBWR Design Certification Application – RAI Number 21.6-39S01 – 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 19th day of November 2007.



David H. Hinds
GE Hitachi Nuclear Energy