GE Energy

*Proprietary Information Notice*
*This letter forwards proprietary information in accordance with 10CFR2.390. The balance of this letter may be considered non-proprietary upon the removal of Enclosure 1.*

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MFN 06-498

Docket No. 52-010

December 7, 2006

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. 53 Related to ESBWR Design Certification Application – DCD Chapter 4 - RAI Number 4.4-20**

Enclosure 1 contains GE's response to the subject NRC RAIs transmitted via the Reference 1 and 2 letters.

Enclosure 1 contains proprietary information as defined in 10CFR2.390. The affidavit contained in Enclosure 3 identifies that the information contained in Enclosure 1 has been handled and classified as proprietary to GE. GE hereby requests that the proprietary information in Enclosure 1 be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 9.17. A non proprietary version is contained in Enclosure 2.

If you have any questions about the information provided here, please let me know.

Sincerely,

David H. Hinds
Manager, ESBWR

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References:

1. MFN 06-288, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 53 Related to ESBWR Design Certification Application*, August 10, 2006

Enclosures:

1. MFN 06-498 – Response to Portion of NRC Request for Additional Information Letter No. 53 – DCD Chapter 4 – RAI Number 4.4-20 – GE Proprietary Information
2. MFN 06-498 – Response to Portion of NRC Request for Additional Information Letter No. 53 – DCD Chapter 4 – RAI Number 4.4-20 – Non Proprietary Version
3. Affidavit – David H. Hinds – dated December 7, 2006

cc: AE Cubbage USNRC (with enclosures)
GB Stramback GE/San Jose (with enclosures)
eDRFs 0060-5448

# ENCLOSURE 2

# MFN 06-498

# Partial Response to RAI Letter No. 53 Related to ESBWR

# Design Certification Application

# DCD Chapter 4

# RAI Number 4.4-20

# Non-Proprietary Version

## Non-Proprietary Notice

## IMPORTANT NOTICE

This is a non-proprietary version of the Enclosure 1 of MFN 05-350, 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 [[ ]].

**NRC RAI 4.4-20:**

*DCD Tier 2, Sections 4.4.1.3, 4.4.2.3, and 4.4.3.3 discuss the bases, methods, and evaluation of the core pressure drop and hydraulic loads but do not provide sufficient detail for staff review. Provide a discussion of the calculation of the reactor internals pressure drop and associated loads for normal and transient operation, including the model, input data, assumptions, and results. Discuss the applicability of the referenced TRACG topical report to the ESBWR design.*

**GE Response:**

Subsections 4.4.1.3, 4.4.2.3, and 4.4.3.3 of the DCD Tier 2 adequately discuss the bases, methods and evaluation of the core pressure drop. More information on the core pressure drop has also been provided through the GE responses to NRC RAIs 4.4-6, 4.4-15, 4.4-16 and 4.4-17, contained in Reference 4.4-20-1.

Hydraulic loads are determined based on the reactor internal pressure differences (RIPDs) as discussed in Subsection 3.9.5 of the DCD Tier 2. The TRACG computer code is used to analyze the transient conditions within the reactor vessel following the anticipated operational occurrences (AOOs), infrequent events (IE) and accidents (e.g., LOCA). The input model of the reactor vessel consists of axial and radial nodes, which are connected to the necessary adjoining nodes by flow paths having the required resistance and inertial characteristics. TRACG solves the mass and energy conservation equations for each node, along with the equation of motion, to give the depressurization rates and pressures in the various regions of the reactor vessel. Thus the reactor internal pressure differences (RIPDs) are calculated.

In order to determine the maximum pressure differences across the reactor internals, a two-sigma statistical uncertainty study is performed to calculate the upper bound pressure difference adders that are applied to the nominal pressure differences.

Table 4.4-20-1 shows the results of the maximum reactor internal pressure differences for various categories of events, i.e., AOOs, IE and LOCA. The last column shows the maximum RIPD from all events and the same results are also presented in Table 3.9-3 of the DCD Tier 2.

**Table 4.4-20-1 Summaries of Maximum ESBWR RIPD Results**

| Components | AOO (kPaD) | IE (kPaD) | LOCA (kPaD) | Maximum (kPaD) |
|---|---|---|---|---|
| Core Plate | 66 | 74.9 | 59.0 | 74.9 |
| Shroud Support | 20 | 24.1 | 51.3 | 51.3 |
| Chimney Head | 62 | 74.0 | 76.5 | 76.5 |
| Upper Shroud | 100 | 107.1 | 76.1 | 107.1 |
| Average Bundle Bottom | 33 | 30.6 | 44.8 | 44.8 |
| Average Bundle Top | 4.5 | 2.7 | 66.6 | 66.6 |
| Hot Bundle Bottom | 36 | 33.9 | 71.1 | 71.1 |
| Top Guide | 12 | 8.6 | 74.6 | 74.6 |
| Chimney Head (Irreversible) | 60 | 39.9 | 55.9 | 60.0 |
| Chimney Head (Elevation) | 50 | 11.3 | 48.3 | 50.0 |
| Steam Dryer | 9 | 7.5 | 11.2 | 11.2 |

The discussion in Subsection 3.9.5 of the DCD Tier 2 pertains to reactor internals. The fuel assembly including the fuel rods is not considered a reactor internal; however, the pressure differences determined in the section are also used to determine the hydraulic loads on the fuel assembly. The hydraulic loads and the resulting stresses for the fuel channel are discussed in Subsection 4.2.3 of the DCD Tier 2. Details of this evaluation can be found in Subsection 3.4.1.8 of Licensing Topical Report (LTR) "GE14E Fuel Assembly Mechanical Design Report," NEDC-33240P (Reference 4.2-4 of DCD Tier 2 Section 4.2). A more conservative value of [[ ]] kPa instead of 71.1 kPa, as shown in Table 4.4-20-1 (for Hot Bundle Bottom), is used for the channel stress analysis in NEDC-33240P. The resulting effective stress is still well below the yield strength of the channel wall material. The fuel lift force is discussed in Subsection 3.4.1.11 of the same LTR (NEDC-33240P).

For reactor vessel internals, the mechanical design bases are discussed in Subsection 3.9.5.4 of the DCD Tier 2, and the maximum pressure differential values, as shown in the last column of Table 4.4-20-1, are used in the design analysis.

NRC has already approved the LTR on TRACG Application for ESBWR, NEDE-33083P-A, Rev. 0 (Reference 4.4-9 of DCD Tier 2), for ESBWR LOCA application. NRC has also approved TRACG for the ESBWR stability analysis and approval of TRACG for the ESBWR AOO application is part of the ESBWR Design Certificate Application. The LTR on TRACG Model Description, NEDE-32176 (Reference 4.4-10 of the DCD Tier 2) was also included in the NRC review of "TRACG Application for ESBWR" by reference.

**DCD Impact:**

GE will add the following texts to Subsections 4.4.1.3, 4.4.2.3 and 4.4.3.3 of the DCD Tier 2 to further clarify the reactor internals pressure drop and associated loads for normal and transient operations:

**Add the following as the last sentence of Subsection 4.4.1.3:**

Further details are given in Subsection 4.4.2.3.

**Add the following new Subsection after the existing Subsection 4.4.2.3.5:**

4.4.2.3.6 Hydraulic Loads

Hydraulic loads for reactor internals are determined based on the reactor internal pressure differences as discussed in Subsection 3.9.5.3. The TRACG computer code is used to analyze the transient conditions within the reactor vessel following AOOs, infrequent events and accidents (e.g., LOCA).

**Add the following sentence at the end of Subsection 4.4.3.3:**

Evaluations of hydraulic loads for the reactor internals and the fuel assembly are discussed in Subsections 3.9.5.4 and 4.2.3, respectively.

GE will correct a typo (replace "Figure 5.3-2" with "Figure 5.3-3" in the DCD Tier 2 Subsection 3.9.5) and revise Figure 3.9-5 as shown below to resemble the ESBWR.

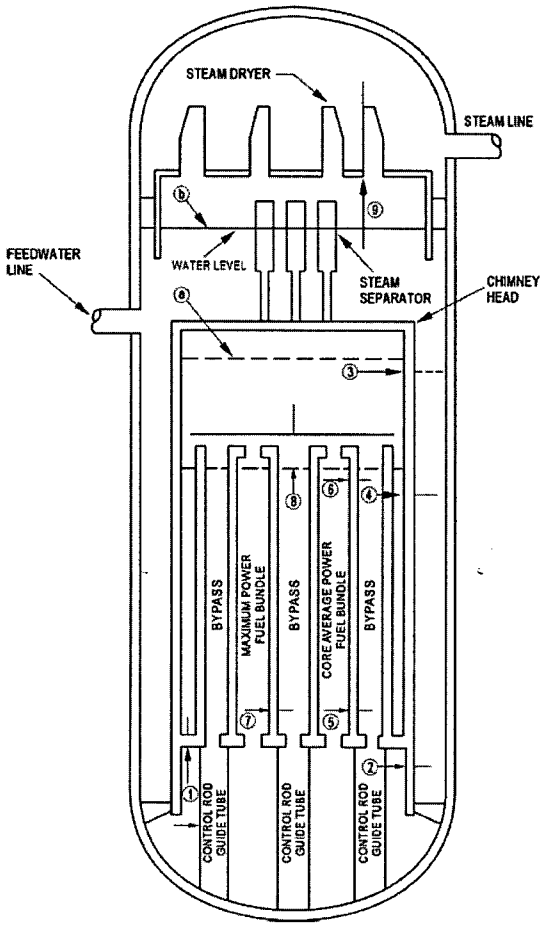


**Figure 3.9-5 Pressure Nodes for Reactor Internal Pressure Difference Analysis**

**Reference:**

4.4-20-1 "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 Numbers 4.2-2 through 4.2-7, 4.3-3, 4.3-4, 4.4-2, 4.4-5, 4.4-6, 4.4-15 through 4.4-17, 4.4-19, 4.4-24, 4.4-27, 4.4-31 through 4.4-34, 4.4-36 through 4.4-38, 4.4-42 through 4.4-50, 4.4-52 through 4.4-56, 4.8-1 through 4.8-16," GE Energy Letter dated August 23, 2006, to USNRC, MFN 06-297.

# ENCLOSURE 3

# MFN 06-498

# Affidavit

# General Electric Company

# AFFIDAVIT

**I, David H. Hinds,** state as follows:

(1) I am Manager, ESBWR, General Electric Company ("GE") 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 GE letter MFN 06-498, David H. Hinds to NRC, *Response to Portion of NRC Request for Additional Information Letter No. 53 – DCD Chapter 4 – RAI Number 4.4-20* dated December 7, 2006. The proprietary information in Enclosure 1, *Response to Portion of NRC Request for Additional Information Letter No. 53 – DCD Chapter 4 – RAI Number 4.4-20,* is delineated by a double underline inside double square brackets. 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, GE 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 2.790(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 General Electric's competitors without license from General Electric 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 General Electric customer-funded development plans and programs, resulting in potential products to General Electric;

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 GE, 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 GE, 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. Access to such documents within GE 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, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GE 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 the results of TRACG analytical models, methods and processes, including computer codes, which GE has developed, and applied to perform accident evaluations for the ESBWR. GE has developed this TRACG code for over fifteen years, at a total cost in excess of three million dollars. The reporting, evaluation and interpretations of the results, as they relate to accident evaluations for the ESBWR was achieved at a significant cost, in excess of one quarter million dollars, to GE.

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

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GE's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GE'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 GE.

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.

GE's competitive advantage will be lost if its competitors are able to use the results of the GE 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 GE 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 GE of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing 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 7th day of December 2006.

David H. Hinds
General Electric Company