



**GE Nuclear Energy**

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Project 717

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U.S. Nuclear Regulatory Commission  
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Attention: Chief, Information Management Branch  
Program Management  
Policy Development and Analysis Staff

Subject: **Response to Request for Additional Information (RAI) numbers (322 and 406) for ESBWR Pre-application Review - Supplementary Information**

In response to a request from the NRC, GE Nuclear Energy is submitting, in enclosures 1 and 2, supplementary information in support of our response to Requests for Additional Information (RAI) numbers 322 and 406, which were originally provided in the referenced letters.

Enclosure 1 contains the supplementary information with GE proprietary information as defined by 10CFR2.790. GE customarily maintains this information in confidence and withholds it from public disclosure. A non-proprietary version of the information is provided in Enclosure 2.

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 information of Enclosure 1 be withheld from public disclosure in accordance with the provisions of 10 CFR 2.790 and 9.17.

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

Sincerely,

Atambir Rao  
Project Manager, ESBWR

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References:

1. MFN 03-070, Letter From Atam S. Rao (GE) to NRC, August 18, 2003, SUBJECT: RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI) NUMBERS (13, 14, 28-30, 33, 34, 36-44, 46, 49-53, 55, 57-59, 61-64, 66, 68, 69, 72-76, 78, 80, 81, 83-85, 88, 93, 96, 98, 99, 102-104, 107, 108, 110-112, 147-150, 153-158, 163, 165, 166, 168-175, 178-182, 185, 186, 188, 189, 192-194, 196-201, 203-212, 215-219, 221-224, 226-230, 233, 235, 237-256, 263, 265, 267-270, 273, 274, 278, 280, 283-285, 287-289, 291, 300, 302, 303, 318, 320, 322, 328, 332, 340-344, 348, 361, 362, 364-370, 377, 386, 407, 409-413) FOR ESBWR PRE-APPLICATION REVIEW
2. MFN 03-083, Letter From Atam S. Rao (GE) to NRC, September 5, 2003, SUBJECT: RETRANSMITTAL OF RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI) NUMBERS (6, 15, 35, 45, 47, 48, 60, 65, 67, 77, 89-92, 94, 95, 97, 105, 159, 264, 271, 298, 299, 304, 305, 307, 310, 317, 321, 324, 326, 329, 331, 387, 388, 406, and 408) FOR ESBWSR PRE-APPLICATION REVIEW

Enclosures:

1. MFN 03-127 - Response to NRC RAI number (322 and 406) – Supplementary Information - Proprietary Information
2. MFN 03-127 - Response to NRC RAI numbers (322 and 406) – Supplementary Information - Non-proprietary Information
3. Affidavit, George B. Stramback, dated October 23, 2003

cc: A. Cubbage USNRC (with enclosure)  
J. Lyons USNRC (w/o enclosure)  
G.B. Stramback GE (with enclosure)

# General Electric Company

## AFFIDAVIT

I, **George B. Stramback**, state as follows:

- (1) I am Manager, Regulatory Services, 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 the Enclosure 1 of GE letter MFN 03-127, Atambir Rao to NRC, *Response to Request for Additional Information (RAI) numbers (322 and 406) for ESBWR Pre-application Review – Supplementary Information*, dated October 23, 2003. The proprietary information is in Enclosure 1, *Response to NRC RAI numbers (322 and 406) – Supplementary Information*. For text and text contained in tables, GE proprietary information is identified 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<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, 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 2.790 (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 details for licensing application of TRACG to the ESBWR passive safety system design of the BWR. This TRACG code has been developed by GE 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 the ESBWR, was achieved at a significant cost, to GE.

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 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.

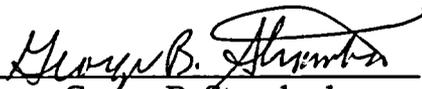
The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

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 23rd day of October 2003

  
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George B. Stramback  
General Electric Company

MFN 03-127  
Enclosure 2

ENCLOSURE 2

MFN 03-127

Response to NRC RAI numbers (322 and 406) – Supplementary  
Information

**Supplement to RAI 322 Response**

A sensitivity study was performed to assess the impact on containment pressure of injecting all available hot water from the ESBWR feedwater system into the RPV during a LOCA. The Baseline Main Steam Line Break (MSLB) was used in this study. In a sensitivity case, feedwater flow is assumed to be available until all the hot water from the feedwater system is consumed. The results of this study show that the impact on peak drywell pressure is [[ ]].

The Baseline case injected a total of [[ ]] of feedwater [[ ]], or a total volume of [[ ]]. For the sensitivity case, the total hot water volume in the feedwater system (including all the volumes from the feedwater piping and heaters [[ ]) is [[ ]]. To simulate the injection of this additional feedwater mass in the sensitivity case, the TRACG component FILL05 (which simulates the feedwater injection in the TRACG nodalization) is modified as summarized in Table 322.1. The injection velocity is kept constant at the initial value for a period of [[ ]] before the flow coastdown.

Figure 322.1 compares the Feedwater flows between the sensitivity case and the Baseline case. The sensitivity case injected a total of [[ ]], or a total volume of [[ ]].

Figures 322.2 to 322.6 compare the pressures and temperatures in the Drywell and Wetwell between the sensitivity case and the Baseline case.

Table 322.1 Comparison of Feedwater Simulation between  
the Sensitivity and Baseline Cases

**Baseline Case: FILL05 Fill velocity versus time**

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**Sensitivity Case: FILL05 Fill velocity versus time**

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Figure 322.1 Comparison of Feedwater flow simulations

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Figure 322.2 Comparison of Drywell pressures

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Figure 322.3 Comparison of Wetwell pressures

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Figure 322.4 Comparison of Wetwell Temperatures (Level 7)

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Figure 322.5 Comparison of Wetwell Temperatures (Level 6)

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Figure 322.6 Comparison of Drywell Temperatures (Level 9)

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**Supplemental Information for RAI 406**

Additional parametric cases were analyzed to determine the duration of the hot channel high void flow and minimum thermal margin. GDCS Line LOCA, Main Steam Line LOCA and Bottom Drain Line LOCA cases were analyzed, accounting for the chimney drafting effect. These cases (Cases 1 to 3 in the following Table) were performed with 102% initial power and other conservative assumptions. Reactor scram was initiated on high drywell pressure, and the control rods started to move into the core after an appropriate delay time. The effect of chimney partition above the hot channel was modeled the same way as discussed in RAI 329. In these cases, the radial peaking factor for all the bundles feeding the chimney region in Ring 1 was set equal to 1.4791.

No core heatup was calculated for these three cases. The hot channel peak void fraction and minimum thermal margin during the transient for these cases are summarized in Table 406.1. The high void fraction "window" is shown graphically in the attached figures. Two other cases were re-run with the detailed thermal margin edits for the GDCS Line LOCA without the chimney drafting effect corresponding to the Baseline and Bounding Cases presented in the Application Report (NEDC-33083P, Rev. 0). The results for these cases are also summarized in Table 406.1 (Cases 4 and 5) for comparison. Note that the early thermal margin from the GEXL correlation relates to critical power ratio, while the thermal margin in the later part of the transient from either the Zuber or Biasi correlations refers to critical heat flux ratio. Significant margin to boiling transition ( $\geq 2$ ) is calculated during the high void period of depressurization for all these cases.

MFN 03-127  
Enclosure 2

Supplemental Information for RAI 406

Table 406.1 Summary and Comparison of Parametric Case Results  
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Figure 406.1 Window of high channel exit void fraction for Case 1

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Figure 406.2 Window of high channel exit void fraction for Case 2

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Figure 406.3 Window of high channel exit void fraction for Case 3

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Figure 406.4 Window of high channel exit void fraction for Case 4

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Figure 406.5 Window of high channel exit void fraction for Case 5

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