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MFN 04-070

Project 717

July 9, 2004

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20852-2738

Attention: Chief, Information Management Branch
Program Management
Policy Development and Analysis Staff

Subject: Response to Additional RAIs on TRACG Calculations for GDCS Line Break

In a recent phone discussion, the NRC staff raised a question regarding the sudden increase in SRV flow observed in the TRACG calculation of the GDCS line break. We have designated this question as RAI A4. The attached response to RAI A4 addresses this question. The ESBWR input deck for the GDCS line break analysis was revised and the results are given in Enclosure 1.

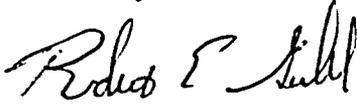
Enclosure 1 contains GE proprietary information as defined by 10CFR2.390. A non-proprietary version is provided in Enclosure 2. Enclosure 1 also includes a CD. This CD is entirely proprietary and a non proprietary version is not available. GE customarily maintains this information in confidence and withholds it from public disclosure.

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 2.390 and 9.17.

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

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Sincerely,



Robert E. Gamble
Manager, ESBWR

Enclosures

1. MFN 04-070 – Response to Additional RAIs on TRACG Calculations for GDCS Line Break (including a CD) - GE Proprietary Information
2. MFN 04-070 – Response to Additional RAIs on TRACG Calculations for GDCS Line Break - Non Proprietary Information
3. Affidavit, George B. Stramback, dated July 9, 2004

cc: A. Cabbage USNRC (with enclosures)
J. Lyons USNRC (w/o enclosure)
G.B. Stramback - GE (with enclosures)
eDRF 0000-0030-4908

ENCLOSURE 1

MFN 04-070

Response to Additional RAIs on TRACG Calculations for
GDCS Line Break

GE Company Proprietary

PROPRIETARY INFORMATION NOTICE

This enclosure contains proprietary information of the General Electric Company (GE) and is furnished in confidence solely for the purpose(s) stated in the transmittal letter. No other use, direct or indirect, of the document or the information it contains is authorized. Furnishing this enclosure does not convey any license, express or implied, to use any patented invention or, except as specified above, any proprietary information of GE disclosed herein or any right to publish or make copies of the enclosure without prior written permission of GE. The header of each page in this enclosure carries the notation "GE Proprietary Information."

GE proprietary information is identified by a double underline inside double square brackets. [[This sentence is an example.^{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 the affidavit provided in Enclosure 3, which documents the basis for the proprietary determination. Specific information that is not so marked is not GE proprietary.

MFN 04-070
Enclosure 3

ENCLOSURE 3

MFN 04-070

Affidavit

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 Enclosure 1 of GE letter MFN 04-070, Robert E. Gamble to NRC, *Response to Additional RAIs on TRACG Calculations for GDCS Line Break*, dated July 9, 2004. The proprietary information is in Enclosure 1, *Response to Additional RAIs on TRACG Calculations for GDCS Line Break*. Enclosure 1 also contains a CD which is entirely proprietary. 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⁽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 2.390(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 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 details specific information regarding application of TRACG to the ESBWR. 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 9th day of July 2004


George B. Stramback
General Electric Company

MFN 04-070
Enclosure 2

ENCLOSURE 2

MFN 04-070

Response to Additional RAIs on TRACG Calculations for
GDCS Line Break

Responses to Additional RAIs on TRACG Calculations for GDCS Line Break

RAI-A4:

Explain the sudden increase in SRV flow observed in the TRACG calculation of the GDCS line break at about 320 seconds (see Figure A4-1). If necessary, provide a revised ESBWR TRACG input deck for the GDCS line break analysis.

Response:

The “sudden spikes” in the SRV mass flow (Figure A4-1) and velocity were observed shortly after the SRVs opened fully. This was caused by an input error related to the SRV valve model. The loss coefficient at the valve location for component VLVE92 is modeled as a function of valve opening area, i.e., a data table with loss coefficient versus valve area opening fraction. In this table, loss coefficient became zero when the valve was fully opened. When there is no irreversible loss at the valve location, the flow at the restriction becomes unchoked, resulting in a high flow rate for a short period of time until it is limited by choking at a downstream location.

Normal practice is to use a loss coefficient of 1.0 at locations of large area contractions. The input deck was revised to include the following SRVs modeling changes: (1) replace the valve data table with a constant loss coefficient of 1.0 at the valve location for component VLVE92, and (2) change the loss coefficient of 0.6 to 1.0 at boundary # 7 of components VLVE92 and VLVE93. The impact of the SRVs modeling change on the minimum collapsed level in the chimney was [[]], relative to the greater than [[]] to the core uncover.

The ESBWR TRACG input deck for the GDCS line break analysis (nominal baseline case) was revised to include two other modifications.

1. The break pipe between the reactor pressure vessel (RPV) and the break location in the drywell (DW) is modeled with 4 cells instead of the earlier single cell. This issue was discussed in RAI A-1. The impact of this modeling modification on the minimum collapsed level in the chimney was [[]].

2. The discharge location for the broken GDCS line between the GDCS pool and the DW annulus was corrected.

An error was identified in the ECCS/LOCA input deck for the GDCS line break. This error was related to the discharge location for the broken GDCS line between the GDCS pool and the DW annulus. The broken line discharged to the suppression pool instead of to the DW annulus. Because the ECCS/LOCA cases are run for a short period of time (~2000 sec), the inventories in the drywell and the suppression pool are minimally impacted by the error. A run was made after correcting this input error and the impact on the minimum collapsed level in the chimney was [[]].

The revised input deck with the modifications described above was run using the TRACG04 version that was created on 17-Jan-2003 (version sent to NRC). Figure A4-2 shows the SRV mass flow rate at the valve location from component VLVE92. A comparison between Figure A4-1 and A4-2 clearly shows that the sudden increase in SRV flow at about 320 seconds (Figure A4-1) is no longer present when reasonable loss coefficients are input at the valve location.

Figures A4-3 and A4-4 show the comparison of two-phase level and the static head in the chimney. Figure A4-3 shows the results before the 3 input modifications, and Figure A4-4 shows the results after the 3 input modifications. These figures show that the impact of input modifications on the transient responses is minimal. The impact of these combined changes on the minimum collapsed level in the chimney was [[]], relative to the greater than 2 m margin to the core uncover.

The revised input deck was also run using the TRACG04 version that was created on 9-Apr-2004. The transient responses agree well between these two versions of TRACG04. The impact on the minimum collapsed level in the chimney was [[]].

The input deck and the output file (using TRACG04 version of 17-Jan-2003) are included in the attached CD, and summarized in the following table.

Item #	File Name	Description
1	GDL-NL2_K2.INP	Input deck (ASCII file) for the GDCS line break. This is a "stand-alone" input deck and no restart dump file is needed for the calculation. This input deck included 3 input modifications.
2	GDL-NL2_K2.OUT	Output file (ASCII file)
3	GDL-NL2_K2-input.pdf	PDF file format of Item # 1, with page header "GE PROPRIETARY INFORMATION"
4	GDL-NL2_K2-output.pdf	PDF file format of Item # 2, with page header "GE PROPRIETARY INFORMATION"

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Figure A4-1. SRV Mass Flow Rate from VLVE92 (Case GDL-NL2)

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Figure A4-2. SRV Mass Flow Rate from VLVE92 (Case GDL-NL2_K2, revised input)

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Figure A4-3. Two-Phase Level and Static Head in Chimney for the GDCS Line Break
(Case GDL-NL2)

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Figure A4-4. Two-Phase Level and Static Head in Chimney for the GDCS Line Break
(Case GDL-NL2_K2, revised input)