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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) Number 183 for  
ESBWR Pre-application Review - Supplementary Information with  
Parametric Long-term Calculation for GDCS Line Break**

To address the concerns expressed by NRC staff regarding the long-term water level responses after a pipe break, an additional parametric long-term calculation has been performed for GDCS Line Break (GDLB) using a revised lower drywell (LDW) volume. This information is provided to support the FSER as indicated in Reference 2. References 1 and 3 contain additional previous correspondence regarding RAI 183.

Enclosure 1 contains the supplemental response with GE proprietary information as defined by 10CFR2.390. A non-proprietary version of the response is provided in Enclosure 2. Enclosure 1 also includes a CD (input deck and output file for the parametric calculation). 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

References:

1. MFN 03-079, Letter From Atam S. Rao (GE) to NRC, August 22, 2003, SUBJECT: RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI) NUMBERS (161, 162, 164, 176, 183, 184, 286, 292, 293, 295, 301, 323, 325, 339, and 382) FOR ESBWR PRE-APPLICATION REVIEW
2. MFN 04-022, Letter From Robert E. Gamble (GE) to NRC, March 1, 2004, SUBJECT: RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI) NUMBER 183 FOR ESBWR PRE-APPLICATION REVIEW - SUPPLEMENTARY INFORMATION
3. MFN 04-029, Letter From Robert E. Gamble (GE) to NRC, March 16, 2004, SUBJECT: RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI) NUMBER 183 FOR ESBWR PRE-APPLICATION REVIEW - SUPPLEMENTARY INFORMATION WITH REVISED CALCULATION

Enclosures

1. MFN 04-039 – Supplemental Response to RAI 183 with Parametric Long-term Calculation for GDCS Line Break and CD - GE Proprietary Information
2. MFN 04-039 – Supplemental Response to RAI 183 with Parametric Long-term Calculation for GDCS Line Break – Non Proprietary Information
3. Affidavit, Ron Engel, dated April 12, 2004

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

DRF 0000-0018-8438

**Supplemental Response to RAI 183  
with Parametric Long-term Calculation for GDCS Line Break**

To address the concerns expressed by NRC staff regarding the long-term water level responses after a pipe break, an additional parametric long-term calculation has been performed for GDCS Line Break (GDLB) using a revised lower drywell (LDW) volume. As in the Bottom Drain Line (BDL) break cases (original RAI response), there is no core heatup during the entire (72 hours) GDL break transient. The long term minimum chimney collapsed level is above the Top of Active Fuel (TAF). For this case, there is no activation of equalization line valves and no fluid flow between the suppression pool and the RPV.

ESBWR design criteria are for the GDCS pools and LDW to be sized such that the drywell can be flooded to the TAF for all break and single failure combinations. At this time GE has not finalized the configuration of the LDW and the interim configuration used in the previous TRACG based decks GE has submitted did not satisfy this criteria. The initial intention was to leave this as a certification phase activity. However, after discussing the issue with NRC staff, GE has revised the TRACG input decks to meet the stated design criteria now for this parametric study. The final configuration to meet the design criteria will be determined after considering structural analyses, severe accident mitigation, arrangement issues and other design features later this year.

In this parametric calculation, the lower drywell volume in the TRACG model is reduced by 200 m<sup>3</sup> (compared to the previous BDL case for the original RAI response). This volume reduction will satisfy the design criteria that the drywell will be flooded to the elevation of (TAF+1 m) by the GDCS pool volume. This case simulates the GDCS line break with a single failure of 1 GDCS injection valve on one of the intact GDCS lines. The reactor power scram is initiated on Level 3 trip.

Figure 183S-4 shows the long-term pressure response for the GDCS Line Break (GDLB). Following the postulated LOCA, the drywell pressure increased rapidly leading to clearing of the PCC and main vents. The DW pressure then reaches the first peak. The pressure decreases when the GDCS water starts flowing into the RPV. Vacuum breaker openings occur as the steam production drops off. The GDCS pools are completely drained. Subsequently, decay heat overcomes the subcooling of the GDCS water, and steaming resumes. The drywell pressure increases and approaches a quasi-constant value. The long-term DW pressure is significantly lower than that for the MSLB case (ESBWR Application Report, NEDC-33083P) due to the additional GDCS draindown volume, which is about 2 times larger than that for the MSLB case.

Figure 183S-5 compares the two-phase levels in the RPV Chimney, RPV downcomer, Drywell Annulus and Suppression Pool. The "0.0" value in Figure 183S-5 corresponds to the RPV bottom 0 elevation. Consequently, the RPV water levels drop and the water level in the DW annulus rises. After the break, the water

from the GDCS pools and the RPV fill the DW annulus. At this time, the downcomer two-phase level drops below the elevation of the GDCS line break location. From this point on, the RPV continues to loss inventory to DW but at a much slower rate. This is because most of the steam generated by the decay heat is condensed in the PCCS and returned to the RPV, but some of the steam is condensed on the DW walls and collects in the DW annulus. This drywell condensate results in a rise of DW annulus level.

After the break, the chimney and downcomer 2-phase levels. From this point on these 2-phase levels continue to drop and reach the minimum values above the TAF at the end of the transient. For long-term the core is covered, and the 2-phase level is above the TAF. There is no core heatup during this 72 hours GDCS Line Break transient.

Figure 183S-6 shows the collapsed levels in the RPV Chimney and RPV downcomer. The "0.0" value in Figure 183S-6 corresponds to the RPV bottom 0 elevation. The RPV downcomer collapsed level reaches the minimum value. The minimum downcomer level is above the Level 0.5 setpoint. The equalization line valves are not activated and the flow path between the suppression pool and the RPV is not opened for this transient. The chimney collapsed level reaches the minimum value. At the minimum value, the chimney collapses level is above the TAF.

The input deck and output file for this parametric calculation are included in the attached Proprietary CD, and summarized in the following table.

| Item # | File name         | Description   |
|--------|-------------------|---|
| 1      | GDL_A6.INP        | Input deck (ASCII file) for the GDL transient. This is a "stand-alone" input deck and no restart dump file is needed for the calculation. |
| 2      | GDL_A6.OUT        | Output file (ASCII file) for the GDL transient calculation.   |
| 3      | GDL_A6-input.pdf  | PDF file format of Item #1, with page header "GE PROPRIETARY INFORMATION".  |
| 4      | GDL_A6-output.pdf | PDF file format of Item #2, with page header "GE PROPRIETARY INFORMATION".  |

Figure 183S-4. Containment Pressure Response – GDLB (Proprietary)

Figure 183S-5. Two-phase Level Response – GDLB (Proprietary)

Figure 183S-6. Chimney and Downcomer Collapsed Levels – GDLB (Proprietary)

# General Electric Company

## AFFIDAVIT

I, **Ronald E. Engel**, state as follows:

- (1) I am Technical Leader, Systems Engineering, 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 04-039, Robert E. Gamble to NRC, *Response to Request for Additional Information (RAI) Number 183 for ESBWR Pre-application Review – Supplementary Information with Parametric Long-term Calculation for GDCS Line Break*, dated April 12, 2004. The proprietary information is in Enclosure 1, *Supplemental Response to RAI 183 with Parametric Long-term Calculation for GDCS Line Break*. 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. Enclosure 1 also contains a CD which is entirely proprietary.
- (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 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 12th day of April 2004

  
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Ronald E. Engel  
General Electric Co.