



## **GE Nuclear Energy**

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MFN 03-056  
July 24, 2003

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: **MELLLA Plus LTR RAI ATWS and Containment Data, Parts 1, 3 and 4 (TAC No. MB6157)**

During a teleconference, GE provided the NRC with the Licensing Topical Report (LTR), NEDC-33006P, Revision 1, "General Electric Boiling Water Reactor Maximum Extended Load Line Limit Plus" (M+), August 2002. During a telephone conversation on July 15, 2003, representatives of the NRC staff requested additional information to support the NRC's review of the M+ LTR.

Specifically, the NRC request is organized into four parts:

Part 1: MELLLA+ Reactor Initial Conditions

Part 2: MELLLA+ Thermal Hydraulic Data

Part 3: MELLLA+ Containment Parameters

Part 4: MELLLA+ ATWS SRV Flows for Different Plants

The requested information for Parts 1, 3 and 4 are enclosed. The requested information for Part 2 is scheduled for delivery the week of July 28, 2003.

A non-proprietary version of the response to the NRC's request is provided in Enclosure 1. A compact disk is provided in Enclosure 2. The information of the compact disk is completely proprietary, as defined by 10CFR2.790, 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 2 has been handled and classified as proprietary to GE. GE hereby requests that the information of Enclosure 2 be withheld from public disclosure in accordance with the provisions of 10 CFR 2.790 and 9.17.

If you have any questions, please contact, Mike Lalor at (408) 925-2443 or myself.

Sincerely,



George Stramback  
Manager, Regulatory Services,  
GE Nuclear Energy  
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Project No. 710

Reference:

1. MFN 02-050, Letter from George Stramback (GE) to the NRC, August 23, 2002, *Submittal of GE Proprietary Licensing Topical Report, NEDC-33006P, Revision 1, "General Electric Boiling Water Reactor Maximum Extended Load Line Limit Plus"*, August 2002.

Enclosures:

1. Response to NRC RAI – ATWS and Containment Data, Parts 1, 3 and 4 – Non-Proprietary Information
2. Response to NRC RAI - ATWS and Containment Data – Compact Disk – Proprietary Information
3. Affidavit, George B. Stramback, dated July 24, 2003

cc: AB Wang (NRC)  
JF Klapproth (GE/San Jose)  
MA Lalor (GE/San Jose)  
Tony Nakanishi (GE/San Jose)  
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ENCLOSURE 1

MFN 03-056

Response to NRC RAI – ATWS and Containment Data, Parts 1, 3 and 4

*Non-Proprietary*

**NRC RAI – ATWS and Containment Data, Part 1**

Please provide MELLLA+ initial conditions to support a confirmatory analysis in the review of the MELLLA+ Licensing Topical Report, NECD-33006P.

**GE Response**

Table 1 provides the requested information for Part 1.

**Part 1 - MELLLA Plus Initial Conditions**

The data is provided for Browns Ferry plant consistent with the inputs for the Browns Ferry MELLLA+ project. Steady state data from ODYN is provided for two conditions, 1) 100% OLTP 75% rate core flow, and 2) 120% OLTP 85% rated core flow.

**Table 1. ODYN Steady State Data**

Parameter	Unit	OLTP /MELLLA Value (Note 1)	EPU /MELLLA+ Value (Note 2)
Core Power	MWt	3293	3952
Dome Pressure	Psia	1050	1050
Total Core Flow	Mlbm	76.9	87.1
Core Bypass Flow	%	16.36	18.8
Recirculation Flow	Mlbm	76.9	87.1
Steam and Feedwater Flow	Mlbm	13.37	16.42
Feedwater Temperature	°F	377.0	394.4
Core Inlet Subcooling	Btu/lbm	38.0	38.0
Carry Under Fraction	%	0.1	0.1
Moisture Fraction at Steamline Inlet	%	0	0
Reactor Water Level	ft above TAF	16.23	16.23

Note 1: OLTP/MELLLA data based on Browns Ferry EPU ATWS Analysis (DRF A22-00125-55)

Note 2: EPU/MELLLA+ data based on Browns Ferry M+ ATWS Analysis (DRF 0000-0002-7728)

**NRC RAI – ATWS and Containment Data, Part 3**

Please provide MELLLA+ containment parameters to support a confirmatory analysis in the review of the MELLLA+ Licensing Topical Report, NECD-33006P.

**GE Response**

Tables 2 thru 4 provide the requested information for Part 3

**Part 3 - MELLLA+ Containment Parameters**

The data is provided for Brunswick plant consistent with the inputs for the Brunswick MELLLA+ project. It is noted that the GE model for ATWS containment analysis is basic and conservative, and many of the requested data are not used. The requested data used in the ATWS containment analysis is provided in Table 2. The requested data that is available from the Containment Analysis input document (OPL4a) is provided in Table 3.

**Table 2. ATWS Analysis Containment Data**

<b>Item</b>	<b>Requested Data</b>	<b>ATWS Analysis Value</b>
<b>1</b>	<b>Containment Volumes</b>	
1.a	drywell	164,100 ft <sup>3</sup>
1.b	wetwell atmosphere	125,150 ft <sup>3</sup>
1.c	wetwell liquid	86,450 ft <sup>3</sup>
<b>2</b>	<b>Torus Geometry Description</b>	
2.a	inside diameter and thickness	Not Used for ATWS Analysis
2.b	baffles dimensions, mass and location	Not Used for ATWS Analysis
2.c	initial suppression pool depth	Not Used for ATWS Analysis
2.d	initial suppression pool surface area	Not Used for ATWS Analysis
2.e	pump suction location	Not Used for ATWS Analysis
2.f	SRV discharge locations	Not Used for ATWS Analysis
<b>3</b>	<b>SRV discharge quencher geometry</b>	Not Used for ATWS Analysis
<b>4</b>	<b>Drywell Initial Conditions</b>	
4.a	relative humidity	100%
4.b	noncondensable mass	0
4.c	temperature	95°F
4.e	pressure	0 psig
<b>5</b>	<b>Initial wetwell airspace initial conditions</b>	
5.a	relative humidity	100%
5.b	noncondensable mass	0
5.c	temperature	95°F
5.d	pressure	0 psig
<b>6</b>	<b>Initial suppression pool</b>	
6.a	water mass	Suppression pool liquid volume is 86450 ft <sup>3</sup>
6.b	temperature	95°F
<b>7</b>	<b>Initial submergence of the vents from drywell to wetwell</b>	Not Used for ATWS Analysis
<b>8</b>	<b>Heat Structure Mass and Properties</b>	
8.a	drywell internal metal structures	Not Used for ATWS Analysis
8.b	drywell internal concrete structures	Not Used for ATWS Analysis

Item	Requested Data	ATWS Analysis Value
8.c	wetwell internal metal structures	Not Used for ATWS Analysis
8.d	drywell shell	Not Used for ATWS Analysis
8.e	torus shell	Not Used for ATWS Analysis
<b>9</b>	<b>Suppression Pool to Drywell Vacuum Breakers</b>	
9.a	Number present	Not Used for ATWS Analysis
9.b	Number modeled	Not Used for ATWS Analysis
9.c	Diameter	Not Used for ATWS Analysis
9.d	Differential pressure setpoint	Not Used for ATWS Analysis
9.e	Loss Coefficient	Not Used for ATWS Analysis
<b>10.</b>	<b>Rx Building to Suppression Pool Vacuum Breakers</b>	<b>Not Used for ATWS Analysis</b>
<b>11</b>	<b>Drywell Spray</b>	
11.a	mass vs time	Not Used for ATWS Analysis
11.b	enthalpy vs time	Not Used for ATWS Analysis
<b>12</b>	<b>Wetwell Spray</b>	
12.a	mass vs time	Not Used for ATWS Analysis
12.b	enthalpy vs time	Not Used for ATWS Analysis
<b>13</b>	<b>SRV Discharge</b>	
13.a	flow vs time	Mass flow history is provided.
13.b	mass vs time	See attached files
13.c	enthalpy vs time	See attached files
13.d	Integrated flows at four to five time steps	See attached files
<b>14</b>	<b>HPCI, RCIC and RHR flows</b>	
14.a	flows vs time	Not Used for ATWS Analysis
14.b	mass vs time	Not Used for ATWS Analysis
14.c	enthalpy vs time	Not Used for ATWS Analysis
<b>15</b>	<b>Suppression Pool</b>	
15.a	level vs time	Data not available (Not calculated)
15.b	temperature vs time	See attached files
<b>16</b>	<b>Wetwell airspace</b>	
16.a	pressure vs time	See attached files
16.b	temperature vs time	See attached files (The ATWS model assumes thermal equilibrium between the pool and airspace)
<b>17</b>	<b>Drywell</b>	
17.a	pressure vs time	See attached files (Drywell pressure is the same as the wetwell pressure for the ATWS model)
17.b	temperature vs time	See attached files (Drywell temperature is the same as the wetwell temperature for the ATWS model)

**Table 3. OPL4a Data Used for Containment Analysis (not ATWS Containment Analysis)**

Item	Requested Data	OPL4a Value
<b>1</b>	<b>Containment Volumes</b>	
1.a	drywell	164,100 ft <sup>3</sup>
1.b	wetwell atmosphere	125,150 ft <sup>3</sup>
1.c	wetwell liquid	86,450 ft <sup>3</sup>
<b>2</b>	<b>Torus Geometry Description</b>	
2.a	inside diameter and thickness	29 ft, 0.031 ft thick
2.b	baffles dimensions, mass and location	Data not available

Item	Requested Data	OPL4a Value
2.c	initial suppression pool depth	11.83 ft
2.d	initial suppression pool surface area	9590 sq ft
2.e	pump suction location	Data not available
2.f	SRV discharge locations	4'-11"
<b>3</b>	<b>SRV discharge quencher geometry</b>	<b>Data not available</b>
<b>4</b>	<b>Drywell Initial Conditions</b>	
4.a	relative humidity	20% min, 100% max
4.b	noncondensible mass	No direct data, calculable
4.c	temperature	135°F – nom, 150°F – max
4.e	pressure	0 to 1.35 psig
<b>5</b>	<b>Initial wetwell airspace initial conditions</b>	
5.a	relative humidity	100%
5.b	noncondensible mass	No direct data, calculable
5.c	temperature	84°F – Avg, 95°F – Max
5.d	pressure	0 to 1.35 psig
<b>6</b>	<b>Initial suppression pool</b>	
6.a	water mass	Suppression pool liquid volume is 86450 ft <sup>3</sup>
6.b	Temperature	84°F – Avg, 95°F – Max
<b>7</b>	<b>Initial submergence of the vents from drywell to wetwell</b>	<b>3 ft</b>
<b>8</b>	<b>Heat Structure Mass and Properties</b>	<b>See Table 4 below</b>
8.a	drywell internal metal structures	
8.b	drywell internal concrete structures	
8.c	wetwell internal metal structures	
8.d	drywell shell	
8.e	torus shell	
<b>9</b>	<b>Suppression Pool to Drywell Vacuum Breakers</b>	
9.a	Number present	10
9.b	Number modeled	10
9.c	Diameter	1.62 ft <sup>2</sup> (flow area)
9.d	Differential pressure setpoint	0.5 psid
9.e	Loss Coefficient	2.1
<b>10.</b>	<b>Rx Building to Suppression Pool Vacuum Breakers</b>	<b>Data not available</b>
<b>11</b>	<b>Drywell Spray</b>	
11.a	mass vs time	10925 gpm (2RHR pumps) 7300 gpm (1RHR pump)
11.b	enthalpy vs time	Data not available (Internally calculated based on suppression pool temperature)
<b>12</b>	<b>Wetwell Spray</b>	
12.a	mass vs time	575 gpm (2RHR pumps) 400 gpm (1 RHR pump)
12.b	enthalpy vs time	Data not available (Internally calculated based on suppression pool temperature)
<b>13</b>	<b>SRV Discharge</b>	
13.a	flow vs time	Not applicable
13.b	mass vs time	Not applicable
13.c	enthalpy vs time	Not applicable
13.d	Integrated flows at four to five time steps	Not applicable
<b>14</b>	<b>HPCI, RCIC and RHR flows</b>	

Item	Requested Data	OPL4a Value
14.a	flows vs time	HPCI flow rate is 4250 gpm at 150-1164 psig, RCIC data is not available, RHR flow rate is 7700 (1 RHR pump) 11500 (2 RHR pumps)
14.b	mass vs time	Data not available (Internally calculated based on suppression pool temperature)
14.c	enthalpy vs time	Data not available (Internally calculated based on suppression pool temperature)
<b>15</b>	<b>Suppression Pool</b>	
15.a	level vs time	Not applicable
15.b	temperature vs time	Not applicable
<b>16</b>	<b>Wetwell airspace</b>	
16.a	pressure vs time	Not applicable
16.b	temperature vs time	Not applicable
<b>17</b>	<b>Drywell</b>	
17.a	pressure vs time	Not applicable
17.b	temperature vs time	Not applicable

**Table 4. Containment Heat Sinks**

Sink Description	Total Exposed Surface Area (ft <sup>2</sup> )	Average Thickness (ft)	Material
Drywell heat sink Upper @ 190°F	2100	0.026	Steel
(including LOCA vent)	9600	0.026	Steel
exposed to airspace Lower @ 130°F	61000	3	Concrete
Vent @ 100°F	10100	0.026	Steel
38' Structures @ 150°F	12600	0.033	Steel
17' Structures @ 130°F	14700	0.023	Steel
Suppression chamber upper torus exposed to airspace	17000	0.031	Steel
Suppression chamber Shell	13650	0.031	Steel
lower torus exposed to pool Structures	11500	0.031	Steel



**NRC RAI ATWS and Containment Data, Part 4**

Please provide the following for Clinton and Browns Ferry ATWS analysis at rated minimum. Flow statepoint (120% Pwr, 805CF) and for pre-uprated conditions as a baseline.

1. SRV Discharge
  - a. Flow vs time
  - b. Mass vs time
  - c. Enthalpy vs time
  - d. Integrated flows at four or five time steps (e.g., to check the accuracy of the numerical integration of item 13a)

**GE Response**

The requested information is provided in the following files contained on the compact disk in Enclosure 2:

100P\_75F\_BROWNSFERRY\_ODYN.xls,  
100P\_75F\_BROWNSFERRY\_STEMP.xls,  
100P\_75F\_BRUNSWICK\_ODYN.xls,  
100P\_75F\_BRUNSWICK\_STEMP.xls,  
100P\_75F\_CLINTON\_ODYN.xls,  
100P\_75F\_CLINTON\_STEMP.xls,  
120P\_85F\_BROWNSFERRY\_ODYN.xls,  
120P\_85F\_BROWNSFERRY\_STEMP.xls,  
120P\_85F\_BRUNSWICK\_ODYN.xls,  
120P\_85F\_BRUNSWICK\_STEMP.xls,  
120P\_85F\_CLINTON\_ODYN.xls,  
120P\_85F\_CLINTON\_STEMP.xls

## ENCLOSURE 2

MFN 03-056

### Response to NRC RAI - ATWS and Containment Data, COMPACT DISK

*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 entirety of each page of the enclosure is proprietary. Therefore, the header of each page in this enclosure carries the notation "GE Proprietary Information. <sup>{3}</sup>." The superscript notation<sup>{3}</sup> refers to Paragraph (3) of the affidavit provided in Enclosure 3, which documents the basis for the proprietary determination.

ENCLOSURE 3

MFN 03-056

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 2 to GE letter MFN 03-056, George Stramback to NRC, *MELLLA Plus LTR RAI ATWS and Containment Data, Parts 1, 3 and 4 (TAC No. MB6157)*, dated July 24, 2003. The proprietary information in Enclosure 2, *Response to NRC RAI - ATWS and Containment Data, COMPACT DISK* is the entirety of each page of the enclosure; the header of each page in this enclosure carries the notation "GE Proprietary Information. <sup>{3}</sup>." 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 contains detailed results and conclusions from evaluations of the safety-significant changes necessary to demonstrate the regulatory acceptability for the expended power/flow range of MELLLA+ for a GE BWR, utilizing analytical models and methods, including computer codes, which GE has developed, obtained NRC approval of, and applied to perform evaluations of transient and accident events in the GE Boiling Water Reactor ("BWR"). The development and approval of these system, component, and thermal hydraulic models and computer codes was achieved at a significant cost to GE, on the order of several million dollars.

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.

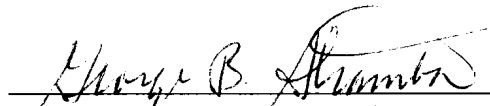
The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

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 24<sup>th</sup> day of July 2003.

  
George B. Stramback  
General Electric Company