



## **GE Nuclear Energy**

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MFN 03-056  
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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,



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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)  
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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*

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