<u>*Proprietary Information Notice*</u>
This letter forwards proprietary information in accordance with 10 CFR 2.390. Upon removal of Enclosure 1, the balance of this letter may be considered non-proprietary.

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MFN 06-264 Supplement 1

Docket No. 52-010

June 22, 2007

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

Subject: **Response to Portion of NRC Request for Additional Information Letter No. 18 - Reactor Building Subcompartment Pressurization Analysis - RAI Number 6.2-46 S01**

Enclosure 1 contains GHNEA's response to the subject NRC RAI originally transmitted via the Reference 1 letter and supplemented by an NRC request for clarification.

Please note that Enclosure 1 contains proprietary information of the type that GHNEA maintains in confidence and withholds from public disclosure. The information has been handled and classified as proprietary to GHNEA as indicated in the enclosed affidavit, which also is included in the report. The affidavit contained in Enclosure 3 identifies that the information contained in Enclosure 1 has been handled and classified as proprietary to GHNEA. GHNEA hereby requests that the information in Enclosure 1 be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 9.17. Enclosure 2 is a non-proprietary version of Enclosure 1.

If you have any questions or require additional information, please contact me.

Sincerely,

James C. Kinsey

James C. Kinsey
Project Manager, ESBWR Licensing

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NRO

Reference:

1. MFN 06-113, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 18 Related to ESBWR Design Certification Application*, April 24, 2006

Enclosures:

1. MFN 06-264 Supplement 1 - Response to Portion of NRC Request for Additional Information Letter No. 18 - Related to ESBWR Design Certification Application - Reactor Building Subcompartment Pressurization Analysis - RAI Number 6.2-46 S01 - GHNEA Proprietary Information
2. MFN 06-264 Supplement 1 - Response to Portion of NRC Request for Additional Information Letter No. 18 - Related to ESBWR Design Certification Application - Reactor Building Subcompartment Pressurization Analysis - RAI Number 6.2-46 S01 - Non-Proprietary Version
3. Affidavit - James C. Kinsey - dated June 22, 2007

cc: AE Cubbage USNRC (with enclosures)
BE Brown GHNEA/Wilmington (with enclosures)
GB Stramback GHNEA/San Jose (with enclosures)
eDRF 0000-0056-7613R1

Enclosure 2

MFN 06-264 Supplement 1

Response to Portion of NRC Request for

Additional Information Letter No. 18

Related to ESBWR Design Certification Application

Reactor Building Subcompartment Pressurization Analysis

RAI Number 6.2-46 S01

Non-Proprietary Version

IMPORTANT NOTICE

This is a non-proprietary version of Enclosure 1, which has the proprietary information removed. Portions of the enclosure that have been removed are indicated by open and closed double square brackets as shown here [[ ]].

NRC RAI 6.2-46 S01:

A. *In GE's response to RAI 6.2-46, MFN 06-264, GE provided a generalized CONTAIN input file of the reactor building subcompartments. Please explain the following discrepancies that exist between the information provided in this file and DCD Tier 2, Rev. 3:*

   (1) *Vent flow path No. 13 is active in the input file but DCD Table 6.2-12 notes that it is deleted.*

   (2) *The inertial length for the vent flow paths (area of the flow path divided by its length) do not match. For example, the inertial length of flow path no. 4 is given as 0.44 m in the input file but the staff calculated it as 5.7 m using an area of 4 m^2 and a length of 0.7 m listed for this flow path in DCD Table 6.2-12.*

   (3) *The volumes of cell nos. 12 through 15 are given as 197 m^3 in the input file but 565 m^3 in DCD Table 6.2-12a.*

   (4) *The volume of cell no. 11 is listed as 151.49 m^3 in the input file but 94 m^3 in DCD Figure 6.2-18 and 152 m^3 in DCD Table 6.2-12a.*

   (5) *Flow path nos. 23 through 31 are listed in DCD Table 6.2-12 but not in the input file.*

B. *The input file shows that the heat transfer to the heat sinks were credited, which was not stated in the DCD. Revise the DCD to state this.*

C. *DCD, Tier 2, Rev. 3, DCD Tables 6.2-12 and 6.2-12a provides input values used for GENE's the reactor building subcompartment analysis. However, the key assumptions used for deriving the input values and in performing the analysis is not provided. For example, (1) the initial parameters for each flow path, area and length are listed in DCD Tables 6.2-12 without noting how they were derived and (2) whether the liquid dropout is modeled is not mentioned in the DCD.*

D. *DCD, Tier 2, Rev. 3, Section 6.2.3.1 states "[b]lowout panels between compartments provide flow paths to relieve pressure." Please identify whether the blowout panels are passive or active. If they are active, please describe the maintenance and surveillance that are planned to assure that they function properly over the life of the plant.*

E. *DCD, Tier 2, Rev. 3, DCD Table 6.2-12 lists the blowout pressure of blowout panels of the subcompartments in the reactor building. In response to a staff's question at a teleconference on March 15, 2007, GENE stated that the blowout pressure listed is the upper bound. Please add this information to the DCD.*

F. *DCD Tier 2, Rev. 3, Section 3G.1.5.2.1.11 states that [f]or ESBWR, the Reactor Water Cleanup/Shutdown Cooling (RWCU/SDC) system is considered high energy during normal operation. The maximum design pressure inside the affected subcompartments from the high energy line break (HELB) of the system is 34.5 kPag (5.0 psig). Please clarify what you mean by affected subcompartments in the DCD.*

GHNEA Response:

A. The CONTAIN model input file supplied in response to RAI 6.2-46 is valid for break cases 1 to 4 (Sub-Model 1 with only 17 cells). There is an extended CONTAIN model for case 5, which includes the volumes corresponding to Sub-Model 2 with a total 24 cells.

   Two models were built in order to avoid overly high computer central-processing unit (CPU) usage (it should be noted that breaks 1 to 4 do not affect Sub-Model 2 cells).

   The CONTAIN input file for the extended model is attached and can be used to reproduce break cases 1 to 5.

   (1) In both the short input model as well as in the extended one, flow path no. 13 (which unites cell 11 with cell 10) is a fictitious flow path and has been maintained for the sole purpose of keeping the numbering of the flow paths consecutive. It has no impact on either of the models, due to the high vdpb value (1.0e8). Therefore, flow path no. 13 in the replacement DCD Tier 2, Table 6.2-12, has been maintained (albeit tagged as "deleted") to avoid skips in the numbering.

   (2) The inertial terms were calculated in accordance with Equation 4.3-1 of ANSI/ANS-56.10-1982, considering both the longitudes and areas of the adjacent cells and of the flow path. For the example referred to by the staff (flow path no. 4), the calculation would be:

   $A/L=1/(L1/F1+Lp/Fp+L2/F2)=1/(11/10.40+0.70/4+11/10.63)=0.44$ m

   DCD Tier 2, Table 6.2-12, will be replaced in its entirety to add information related to the inertia parameter for each flow path (A/L).

   (3) DCD Tier 2, Figure 6.2-18, will be revised to change the volumes of cells 12, 13, 14 and 15 from 565 m^3 to 197 m^3.

   (4) The volume of cell 11(extended model) is 94 m^3 as shown in DCD Tier 2, Revision 3, Figure 6.2-18 (Sub-Model 2). In the short CONTAIN model, cell 11 is fictitious.

   DCD Tier 2, Table 6.2-12a, will be revised to change the volumes of cells 12, 13, 14 and 15 from 565 m^3 to 197 m^3, and the volume of cell 11 from 152 m^3 to 94 m^3.

   (5) The CONTAIN input file for the extended model is consistent with the proposed revision to DCD Tier 2, Figure 6.2-18, attached to this response.

B. Heat sinks were taken into account when modeling with the CONTAIN code. A new DCD Tier 2, Table 6.2-12c, will be added to address the heat sinks considered in the extended model.

C. The key assumptions used for deriving the input values and in performing the analysis will be addressed as described below.

   (1) DCD Tier 2, Table 6.2-12, will be replaced in its entirety to provide more of the requested information concerning how the initial parameters for each flow path, area, and length were derived. In addition, footnotes will be added to the replacement Table 6.2-12 for clarification.

   (2) The replacement DCD Tier 2, Table 6.2-12, will include a footnote describing how the liquid dropout is modeled. Per Section 4.2.1 of SMSAB-02-04, CONTAIN Code

Qualification Report/User Guide for Auditing Subcompartment Analysis Calculations, dropout is activated since the power volumetric rates are less than 5 MW/m^3.

A sensitivity analysis has been performed to verify the conservatism of the option used in the model versus the recommended use of the cubic root of the smallest interconnected volume as the effective pathway length.

A sensitivity analysis has been performed to verify the effect on the model of water entrainment deactivating the dropout option.

A sensitivity analysis has been performed after eliminating heat sinks, in order to determine their possible impact.

A sensitivity analysis has been performed with refined mass and energy blowdown (see RAI 6.2-36).

Refined mass and energy blowdown data for ESBWR configuration (see response to RAI 6.2-36 for details) are provided in Table 6.2-46S01-1 (only a selection of points).

Table 6.2-46S01-1 – Mass and Energy Release Rate for ESBWR Configuration (refined)

TIME (sec)	MASS FLOW (kg/sec)	ENTHALPY (kJ/kg)	ENERGY (W)
Break Case 1 - RWCU/SDC System Break in NRHX Room [[ ]]			
0.000	0.000	4.53E+02	0.00E+00
0.405	618.200	4.53E+02	2.80E+08
2.701	257.000	7.33E+02	1.89E+08
21.500	206.500	1.07E+03	2.22E+08
54.900	183.400	1.20E+03	2.20E+08
56.000	201.600	1.16E+03	2.34E+08
58.300	117.300	1.27E+03	1.50E+08
70.300	24.040	2.46E+03	5.90E+07
Break Case 2 - RWCU/SDC System Break in NRHX Valve Room [[ ]]			
0.000	0.000	4.52E+02	0.00E+00
0.107	524.200	4.52E+02	2.37E+08
0.206	412.100	4.66E+02	1.92E+08
4.101	232.400	7.94E+02	1.85E+08
25.010	195.500	1.08E+03	2.12E+08
54.710	175.800	1.18E+03	2.08E+08
56.810	180.100	1.16E+03	2.09E+08
58.010	113.000	1.27E+03	1.44E+08
70.310	24.510	2.59E+03	6.35E+07

Table 6.2-46S01-1 – Mass and Energy Release Rate for ESBWR Configuration (refined)

TIME (sec)	MASS FLOW (kg/sec)	ENTHALPY (kJ/kg)	ENERGY (W)
89.310	3.559	7.84E+02	2.79E+06
99.910	0.485	5.93E+02	2.87E+05
Break Case 3 - RWCU/SDC System Break in RHX Room ‖ ‖			
0.000	0.000	1.18E+03	0.00E+00
0.115	485.400	1.18E+03	5.73E+08
0.405	787.100	1.18E+03	9.27E+08
2.405	699.300	1.21E+03	8.46E+08
30.000	676.300	1.20E+03	8.10E+08
31.100	761.400	1.19E+03	9.10E+08
32.110	670.500	1.20E+03	8.07E+08
48.410	662.500	1.20E+03	7.95E+08
63.400	10.560	1.05E+03	1.11E+07
99.910	0.001	5.04E+02	6.72E+02
Break Case 4 - RWCU/SDC System Break in RWCU/SDC Pump Rooms ‖ ‖			
0.000	0.000	2.29E+02	0.00E+00
0.105	201.700	2.29E+02	4.63E+07
3.204	198.900	3.19E+02	6.34E+07
4.004	423.600	4.09E+02	1.73E+08
4.204	282.700	4.38E+02	1.24E+08
4.704	349.200	4.92E+02	1.72E+08
5.814	177.700	6.00E+02	1.07E+08
10.410	179.300	7.71E+02	1.38E+08
54.410	137.400	1.13E+03	1.56E+08
63.110	119.200	1.13E+03	1.35E+08
78.410	17.190	2.27E+03	3.91E+07
99.900	5.341	7.79E+06	1.16E+07
Break Case 5- RWCU/SDC System Break in Filter/Demineralizer Room ‖ ‖			
0.000	0.000	2.32E+02	0.00E+00
0.107	376.200	2.32E+02	8.72E+07
0.803	136.700	2.32E+02	3.17E+07
1.407	206.700	2.32E+02	4.79E+07
3.707	219.400	2.32E+02	5.09E+07

Table 6.2-46S01-1 – Mass and Energy Release Rate for ESBWR Configuration (refined)

TIME (sec)	MASS FLOW (kg/sec)	ENTHALPY (kJ/kg)	ENERGY (W)
10.220	231.200	2.32E+02	5.36E+07
12.720	386.400	2.48E+02	9.59E+07
15.710	423.900	4.51E+02	1.91E+08
18.410	202.300	5.03E+02	1.02E+08
18.510	205.100	5.06E+02	1.04E+08
34.220	218.800	6.39E+02	1.40E+08
64.410	140.600	6.01E+02	8.45E+07
73.510	232.400	6.24E+02	1.45E+08
78.210	331.300	5.90E+02	1.95E+08
78.910	168.600	7.58E+02	1.28E+08
83.010	186.600	7.71E+02	1.44E+08
83.410	291.100	8.68E+02	2.53E+08
84.910	135.400	7.81E+02	1.06E+08
87.010	174.700	7.44E+02	1.30E+08
87.410	161.600	7.71E+02	1.25E+08
93.410	75.660	1.01E+03	7.61E+07
99.910	49.170	1.07E+03	5.25E+07

In addition, the attached Figure 6.2-46S01-1 demonstrates the results of the sensitivity analyses for the following cases:

- Without heat sinks
- Without dropout
- Inertias calculated per SMSAB-02-04, CONTAIN Code Qualification Report/User Guide for Auditing Subcompartment Analysis Calculations
- Refined mass and energy blowdown (see RAI 6.2-36)

[[

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Figure 6.2-46S01-1: ESBWR Subcompartment Pressurization Sensitivity Analysis

It was concluded from the sensitivity analysis that the maximum peak pressure calculated (DCD Case) is enveloping (10% margin as per RAI 6.2-35 is not included).

D. Blowout panels between compartments are passive.

E. DCD Tier 2, Subsection 6.2.3.3, will be revised to state that the blowout pressure of blowout panels of the subcompartments in the reactor building is the upper bound.

F. Affected subcompartments are RWCU/SDC Valve Rooms A and B, RWCU Heat Exchanger Rooms A and B, Corridors A through D and Commodity Chases A through D.

DCD Impact:

A. DCD Tier 2, Table 6.2-12, will be replaced in DCD Tier 2, Revision 4, as shown in the attached markup. DCD Tier 2, Table 6.2-12a, and DCD Tier 2, Figure 6.2-18, will be revised in DCD Tier 2, Revision 4, as shown in the attached markup.

B. A new DCD Tier 2, Table 6.2-12c, will be added in DCD Tier 2, Revision 4, as shown in the attached markup.

C. DCD Tier 2, Table 6.2-12, will be replaced in DCD Tier 2, Revision 4, as shown in the attached markup.

D. No DCD changes will be made in response to this RAI.

E. DCD Tier 2, Subsection 6.2.3.3, will be revised in DCD Tier 2, Revision 4, as shown in the attached markup.

F. No DCD changes will be made in response to this RAI.

6.2.3.3 Design Evaluation

Compartment Pressurization Analysis

RWCU pipe breaks in the Reactor Building and outside the containment were postulated and analyzed. For compartment pressurization analyses, HELB accidents are postulated due to piping failures in the RWCU system where locations and size of breaks result in maximum pressure values. Calculated pressure responses have been considered in order to define the peak pressure, of the RB compartments, for structural design purposes. The calculated peak compartment pressures, which include a 10% margin, are listed in Table 6.2-12a, out of which the maximum is 32.6 kPag which is below the reactor building compartment pressurization design requirement as discussed in Subsection 3G.1.5.2.1.11.

Values of the mass and energy releases produced by each break are in accordance with ANSI/ANS-56.4. The break fluid enthalpy for energy release considerations is equal to the stagnation enthalpy of the fluid in the rupture pipe. The mass and energy blowdown from the postulated broken pipe terminates when system isolation valves are fully closed after receiving the pertinent isolation closure signal. Mass and energy blowdown data are given in Table 6.2-12b.

Subcompartment pressurization effects resulting from the postulated breaks of high-energy piping have been performed according to ANSI/ANS-56.10. In order to calculate the pressure response in the Reactor Building and outside the containment due to high-energy line break accidents, CONTAIN 2.0 code was used according to the nodalization schemes shown in Figure 6.2-18. The nodalization contains the rooms where breaks occur, and all interconnected rooms/regions through flow paths such as doors, hatches, etc. Flow path and blow out panel characteristics are given in Table 6.2-12, and subcompartment nodal description are given in Table 6.2-12a. Blow out panels are passive, and blow out pressure listed in Table 6.2-12 is the upper bound. Heat sinks are credited and the characteristics are given in Table 6.2-12c.

The selected nodalization maximizes differential pressure. Owing to the geometry of the regions, each room-region was assigned to a node of the model. No simple or artificial divisions of rooms were considered to evaluate the sensitivity of the model to nodalization. A sensitivity study of pressure response was performed to select the time step. Additional sensitivity studies were performed to evaluate the impact of the heat sinks, dropout, and inertia term. Modeling follows the recommendations given by SMSAB-02-04, "CONTAIN Code Qualification Report/User Guide for Auditing Subcompartment Analysis Calculations."

Table 6.2-12

Subcompartment Vent Path Designation

Flow Path No.	Type	Cell From	Cell To	P (m)	DH (m)	L/DH	T	K FORW	K REVER	K AVERA	K CONTAIN	Flow Condition	Flow Direction	Blow Out Pressure (k Pa)	Comments
1	DOOR	1	2	8.00	2.00	1.00	0.24	1.56	1.61	1.58	0.79	SUBSONIC	BOTH	NO	TWO WAY PATH
2	DOOR	2	3	8.00	2.00	0.50	0.97	1.51	1.24	1.38	0.69	SUBSONIC	FORWARD	10.34	
3	DOOR	2	3	8.00	2.00	0.50	0.97	1.52	1.26	1.39	0.70	SUBSONIC	FORWARD	10.34	
4	DOOR	3	4	8.00	2.00	0.35	1.13	1.25	1.24	1.24	0.62	SUBSONIC	FORWARD	10.34	
5	DOOR	3	5	8.00	2.00	0.25	1.19	1.31	1.32	1.31	0.66	SUBSONIC	FORWARD	10.34	
6	DOOR	6	7	8.00	2.00	1.00	0.24	1.56	1.61	1.58	0.79	SUBSONIC	FORWARD	NO	TWO WAY PATH
7	DOOR	7	5	8.00	2.00	0.50	0.97	1.52	1.26	1.39	0.70	SUBSONIC	FORWARD	10.34	
8	DOOR	7	5	8.00	2.00	0.50	0.97	1.51	1.24	1.38	0.69	SUBSONIC	FORWARD	10.34	
9	DOOR	8	4	8.00	2.00	1.00	0.24	1.43	1.47	1.45	0.72	SUBSONIC	FORWARD	10.34	
10	DOOR	9	10	8.00	2.00	1.00	0.24	1.49	1.48	1.49	0.74	SUBSONIC	FORWARD	10.34	
11	DOOR	10	5	8.00	2.00	0.35	1.13	1.25	1.24	1.24	0.62	SUBSONIC	FORWARD	10.34	
12	DOOR	10	4	8.00	2.00	0.25	1.19	1.24	1.24	1.24	0.62	SUBSONIC	FORWARD	10.34	
13	DELETED														
14	OPEN SPACE	12	16	10.00	2.00	0.50	0.97	0.90	0.47	0.69	0.34	SUBSONIC	BOTH	NO	TWO WAY PATH
15	OPEN SPACE	13	16	10.00	2.00	0.50	0.97	0.90	0.47	0.69	0.34	SUBSONIC	BOTH	NO	TWO WAY PATH
16	OPEN SPACE	14	16	10.00	2.00	0.50	0.97	0.93	0.48	0.71	0.35	SUBSONIC	BOTH	NO	TWO WAY PATH
17	OPEN SPACE	15	16	10.00	2.00	0.50	0.97	0.93	0.48	0.70	0.35	SUBSONIC	BOTH	NO	TWO WAY PATH
18	OPEN SPACE	3	12	10.00	2.00	0.50	0.97	0.47	0.90	0.69	0.34	SUBSONIC	BOTH	NO	TWO WAY PATH

Table 6.2-12

Subcompartment Vent Path Designation

Flow Path No.	Type	Cell From	Cell To	P (m)	DH (m)	L/DH	T	K FORW	K REVER	K AVERA	K CONTAIN	Flow Condition	Flow Direction	Blow Out Pressure (k Pa)	Comments
19	OPEN SPACE	5	14	10.00	2.00	0.50	0.97	0.48	0.93	0.71	0.35	SUBSONIC	BOTH	NO	TWO WAY PATH
20	OPEN SPACE	10	15	10.00	2.00	0.50	0.97	0.48	0.93	0.70	0.35	SUBSONIC	BOTH	NO	TWO WAY PATH
21	OPEN SPACE	4	13	10.00	2.00	0.50	0.97	0.47	0.90	0.69	0.34	SUBSONIC	BOTH	NO	TWO WAY PATH
22	BLOW-OUT PANEL	16	17	16.00	4.00	0.50	0.97	2.46	2.44	2.45	1.23	SUBSONIC	FORWARD	10.34	TO ATMOSPHERE
23	HATCH	11	18	13.60	3.40	0.29	1.16	2.09	1.41	1.75	0.87	SUBSONIC	FORWARD	10.34	
24	DOOR	18	19	8.00	2.00	0.30	1.16	1.97	1.97	1.97	0.98	SUBSONIC	FORWARD	10.34	
25	DOOR	19	20	8.00	2.00	0.15	1.25	2.07	2.07	2.07	1.04	SUBSONIC	FORWARD	10.34	
26	DOOR	20	5	8.00	2.00	1.00	0.24	1.22	0.82	1.02	0.51	SUBSONIC	FORWARD	10.34	
27	DOOR	20	21	8.00	2.00	0.15	1.25	2.07	2.07	2.07	1.04	SUBSONIC	FORWARD	10.34	
28	DOOR	21	22	8.00	2.00	0.30	1.16	1.97	1.97	1.97	0.98	SUBSONIC	FORWARD	10.34	
29	DOOR	18	22	8.00	2.00	0.15	1.25	2.07	2.07	2.07	1.04	SUBSONIC	FORWARD	10.34	
30	DOOR	22	23	8.00	2.00	1.00	0.24	1.49	1.63	1.56	0.78	SUBSONIC	FORWARD	10.34	
31	DOOR	23	24	8.00	2.00	1.00	0.24	1.59	1.48	1.53	0.77	SUBSONIC	FORWARD	10.34	

Table 6.2-12 (Continued)

Subcompartment Vent Path Designation

Flow Path No.	Cell From	Volume (m^3)	Cell To	Volume (m^3)	F1 (m^2)	L1 (m)	F0 (m^2)	Lp (m).	F2 (m^2)	L2 (m)	A/L per ANSI/ANS-56.10-1982	A/L per SMSAB-02-04	EL. In (m)	EL. Out (m)
1	1	348	2	272	106.03	2.00	4.00	2.00	54.38	2.50	1.77	0.62	-10.50	-10.50
2	2	271	3	334	9.64	5.00	4.00	1.00	19.37	5.20	0.96	0.62	-10.50	-10.50
3	2	271	3	334	9.84	5.50	4.00	1.00	19.37	3.20	1.03	0.62	-10.50	-10.50
4	3	334	4	472	10.40	11.00	4.00	0.70	10.63	11.00	0.44	0.58	-10.50	-10.50
5	3	334	5	342	10.97	9.50	4.00	0.50	10.73	12.00	0.47	0.58	-10.50	-10.50
6	6	353	7	271	106.03	2.00	4.00	2.00	54.38	2.50	1.77	0.62	-10.50	-10.50
7	7	271	5	342	9.84	5.50	4.00	1.00	19.37	5.00	0.94	0.62	-10.50	-10.50
8	7	271	5	342	9.64	5.50	4.00	1.00	19.37	4.00	0.97	0.62	-10.50	-10.50
9	8	151	4	472	43.79	1.00	4.00	2.00	32.92	2.50	1.67	0.75	-10.50	-10.50
10	9	151	10	519	42.50	1.00	4.00	2.00	45.79	2.50	1.73	0.75	-10.50	-10.50
11	10	519	5	342	10.40	11.00	4.00	0.70	10.63	9.50	0.47	0.57	-10.50	-10.50
12	10	519	4	472	10.25	11.50	4.00	0.50	10.25	11.50	0.42	0.51	-10.50	-10.50
13	DELETED													
14	12	197	16	26163	5.00	19.50	5.00	1.00	95.86	2.00	0.24	0.86	33.00	34.00
15	13	197	16	26163	5.00	19.50	5.00	1.00	98.13	2.00	0.24	0.86	33.00	34.00
16	14	197	16	26163	5.00	19.50	5.00	1.00	148.93	2.00	0.24	0.86	33.00	34.00
17	15	197	16	26163	5.00	19.50	5.00	1.00	135.41	2.00	0.24	0.86	33.00	34.00
18	3	334	12	197	95.86	2.00	5.00	1.00	5.00	19.50	0.24	0.86	-7.40	-6.40
19	5	342	14	197	148.93	2.00	5.00	1.00	5.00	19.50	0.24	0.86	-7.40	-6.40
20	10	519	15	197	135.41	2.00	5.00	1.00	5.00	19.50	0.24	0.86	-7.40	-6.40

Table 6.2-12 (Continued)

Subcompartment Vent Path Designation

Flow Path No.	Cell From	Volume (m^3)	Cell To	Volume (m^3)	F1 (m^2)	L1 (m)	F0 (m^2)	Lp (m)	F2 (m^2)	L2 (m)	A/L per ANSI/ANS-56.10-1982	A/L per SMSAB-02-04	EL. In (m)	EL. Out (m)
21	4	472	13	197	98.13	2.00	5.00	1.00	5.00	19.50	0.24	0.86	-7.40	-6.40
22	16	26163	17	1.00E+08	1739.00	9.00	16.00	1.00	99999.00	100.00	14.56	0.54	51.70	51.70
23	11	94	18	458	25.00	2.20	11.56	1.00	1078.65	1.80	5.68	2.55	-2.00	-1.00
24	18	458	19	458	23.00	12.00	4.00	0.60	23.00	12.00	0.84	0.52	0.00	0.00
25	19	458	20	153	24.27	8.00	4.00	0.30	24.27	1.10	2.22	0.75	0.00	0.00
26	20	153	5	342	8.00	2.80	4.00	2.00	42.22	1.25	1.14	0.75	-10.50	-10.50
27	20	153	21	458	24.27	1.10	4.00	0.30	24.27	8.00	2.22	0.75	0.00	0.00
28	21	458	22	458	23.00	12.00	4.00	0.60	23.00	12.00	0.84	0.52	0.00	0.00
29	18	458	22	458	24.27	8.00	4.00	0.30	24.27	8.00	1.36	0.52	0.00	0.00
30	22	458	23	122	206.40	3.30	4.00	2.00	35.80	1.25	1.82	0.81	0.00	0.00
31	23	122	24	29000	35.80	1.25	4.00	2.00	107.00	3.85	1.75	0.81	0.00	0.00

Notes to Table 6.2-12

F0	Path Area
F1	Cross-Section Area of From Cell
F2	Cross-Section Area of To Cell
P	Path Perimeter
Lp	Passage Length
DH	Hydraulic Diameter
T	Flow Coefficient per Diagram 4-11 of Idel'Chik Handbook
KFORWARD	Direct Loss Pressure Coefficient per Diagram 4-11 of Idel'Chik Handbook
KREVERSE	Inverse Loss Pressure Coefficient per Diagram 4-11 of Idel'Chik Handbook
KAVERAGED	(KFORWARD+KREVERSE)/2
KCONTAIN	KAVERAGED/2
Inertia Term	A/L per ANSI/ANS-56.10-1982 has been used in the pressurization analyses.
Water entrainment	Dropout is activated since volumetric power is less than 5 MW/m^3 (according to Section 4.2.1 of SMSAB-02-04, CONTAIN Code Qualification Report/User Guide for Auditing Subcompartment Analysis Calculations.

Table 6.2-12a

Subcompartment Nodal Designation

Figure	Cell Number	Postulated Break (See Table 6.2-11 for Break Case Description)	Description	Room No.	Net Volume (m^3)	Calculated Peak Pressure (kPa g) [1]	Initial Conditions		
							Pressure (Pa a)	Temperature (°C)	Relative Humidity (%)
6.2-18	1	CASE 1 CASE 3	RWCU /Shutdown Cooling Heat Exchanger Room A	1151	348	25.2	1.013e5	43	0
6.2-18	2	CASE 2	RWCU /Shutdown Cooling Valve Room A	1150	271	15.3	1.013e5	43	0
6.2-18	3	NO	Corridor A El. -11500 mm	1100	334	13.5	1.013e5	43	0
6.2-18	4	NO	Corridor B El. -11500 mm	1101	472	12.4	1.013e5	43	0
6.2-18	5	NO	Corridor D El. -11500 mm	1103	342	21.7	1.013e5	43	0
6.2-18	6	CASE 1 CASE 3	RWCU /Shutdown Cooling Heat Exchanger Room B	1161	353	32.6	1.013e5	43	0
6.2-18	7	CASE 2	RWCU /Shutdown Cooling Valve Room B	1160	271	24.2	1.013e5	43	0
6.2-18	8	CASE 4	RWCU /Shutdown Cooling Pump Room A	1152	151	12.5	1.013e5	43	0
6.2-18	9	CASE 4	RWCU /Shutdown Cooling Pump Room B	1162	151	12.6	1.013e5	43	0
6.2-18	10	NO	Corridor C El. -11500 mm	1102	519	12.4	1.013e5	43	0
6.2-18	11	CASE 5	RWCU /Shutdown Cooling Filter/Demin. Vault A1	1251	~~15~~294	13.7	1.013e5	43	0
6.2-18	12	NO	Non-Divisional Commodity Chase A	1293	~~565~~197	12	1.013e5	43	0
6.2-18	13	NO	Non-Divisional Commodity Chase B	1294	~~565~~197	11.9	1.013e5	43	0
6.2-18	14	NO	Non-Divisional Commodity Chase D	1296	~~565~~197	14.2	1.013e5	43	0
6.2-18	15	NO	Non-Divisional Commodity Chase C	1295	~~565~~197	12	1.013e5	43	0
6.2-18	16	NO	UPPER PLENUM	-----	26163	11.4	1.013e5	43	0
6.2-18	17	NO	Atmosphere	-----	1.0E8	-----	1.013e5	40	0
6.2-18	18	NO	Filter/Demin Access Room	1306	458	13.2	1.013e5	43	0

Table 6.2-12a

Subcompartment Nodal Designation

Figure	Cell Number	Postulated Break (See Table 6.2-11 for Break Case Description)	Description	Room No.	Net Volume (m^3)	Calculated Peak Pressure (kPa g) (1)	Initial Conditions		
							Pressure (Pa a)	Temperature (°C)	Relative Humidity (%)
6.2-18	19	NO	RWCU /Shutdown Cooling Heat Exchanger Access Room A	1304	458	12.6	1.013e5	43	0
6.2-18	20	NO	Interior Stairwell A	1195	153	12.2	1.013e5	43	0
6.2-18	21	NO	RWCU /Shutdown Cooling Heat Exchanger Access Room B	1305	458	12.2	1.013e5	43	0
6.2-18	22	NO	Control Rod Drive Pump Access Room	1307	458	12.9	1.013e5	43	0
6.2-18	23	NO	Controlled Equipment Removal Access Room	1308	122	12.6	1.013e5	43	0
6.2-18	24	NO	FUEL BUILDING	-----	29000	12.4	1.013e5	43	0

(1) Includes a 10% margin

Table 6.2-12c

Heat Sink Descriptions

Cell	Heat Sink	Description	Name	Type	Shape	Surface (m^2)	Thickness (m)	Compound	Initial Temperature (°C)
1	1	roof of 600 mm	roof1	roof	slab	77.33	0.6	concrete	43
	2	M1 wall of 2000 mm (25°)	S1-1	wall	slab	37.31	1	concrete	43
	3	M2 wall of 2000 mm (47°)	S2-1	wall	slab	70.18	1	concrete	43
	4	M3 of 1400 mm	S3-1	wall	slab	18.90	1.4	concrete	43
	5	M4 of 1400 mm	S4-1	wall	slab	20.70	1.4	concrete	43
	6	M5 Containment of 1400 mm	S5-1	wall	slab	75.57	1.4	concrete	43
	7	floors CELL 1	floor1	floor	slab	101.82	4	concrete	43
2	1	roof of 1000 mm	roof2	roof	slab	77.74	1	concrete	43
	2	wall of 1000 mm common with cell 3	S1-2	wall	slab	90.83	0.5	concrete	43
	3	wall of 2.0 m common with V1 (arc of 26°)	S2-2	wall	slab	38.80	1	concrete	43
	4	floors CELL 2	floor2	floor	slab	77.74	4	concrete	43
3	1	roof of 1000 mm	roof3	roof	slab	95.87	1	concrete	43
	2	wall of 2000 mm with outside	S1-3	wall	slab	191.70	2	concrete	43
	3	wall of 1000 mm common with cell 2	S2-3	wall	slab	102.96	0.5	concrete	43

Table 6.2-12c
Heat Sink Descriptions

Cell	Heat Sink	Description	Name	Type	Shape	Surface (m^2)	Thickness (m)	Compound	Initial Temperature (°C)
	4	wall of 2.0 m common with V1 (arc of sum 39°)	S3-3	wall	slab	53.02	1	concrete	43
	5	floors CELL 3	floor3	floor	slab	95.87	4	concrete	43
4	1	roof of 1000 mm	roof4	roof	slab	121.16	1	concrete	43
	2	wall of 2000 mm with outside	S1-4	wall	slab	74.70	2	concrete	43
	3	wall of 2000 mm with fuel building	S2-4	wall	slab	86.10	2	concrete	43
	4	wall of 2000 mm common with cell 8	S3-4	wall	slab	27.19	1	concrete	43
	5	wall of 2000 mm common with sump pumps	S4-4	wall	slab	33.99	2	concrete	43
	6	wall of 750 mm common with valve room	S5-4	wall	slab	81.16	0.75	concrete	43
	7	floors CELL 4	floor4	floor	slab	135.41	4	concrete	43
5	1	roof of 1000 mm	roof5	roof	slab	83.64	1	concrete	43
	2	wall of 2000 mm with outside	S1-5	wall	slab	181.31	2	concrete	43
	3	wall of 1000 mm with cell 7	S2-5	wall	slab	103.79	0.5	concrete	43
	4	wall of 2000 mm common with cell 6	S3-5	wall	slab	53.02	1	concrete	43
	5	Floors CELL 5	floor5	wall	slab	98.13	4	concrete	43
6	1	roof of 600 mm	roof6	roof	slab	67.69	0.6	concrete	43

Table 6.2-12c

Heat Sink Descriptions

Cell	Heat Sink	Description	Name	Type	Shape	Surface (m^2)	Thickness (m)	Compound	Initial Temperature (°C)
	2	M1 wall of 2000 mm (arc of 25°)	S1-1	wall	slab	107.44	1	concrete	43
	3	M2 wall of 900 mm	S2-6	wall	slab	18.90	0.9	concrete	43
	4	M3 of 1000 mm	S3-6	wall	slab	20.75	1	concrete	43
	5	M5 CONTAINMENT of 1400 mm	S4-6	wall	slab	83.06	1.4	concrete	43
	6	floors CELL 6	floor6	floor	slab	92.17	4	concrete	43
7	1	roof of 1000 mm	roof7	roof	slab	77.74	1	concrete	43
	2	wall of 1000 mm common with cell 5	S1-7	wall	slab	90.83	0.5	concrete	43
	3	wall of 2.0 m common with cell 2 (arc of 26°)	S2-7	wall	slab	38.80	1	concrete	43
	4	Floors Cell 7	floor7	floor	slab	77.74	4	concrete	43
8	1	roof of 1000 mm	roof8	roof	slab	43.43	1	concrete	43
	2	wall of 250 mm	S1-8	wall	slab	43.13	0.25	concrete	43
	3	wall of 2.0 m common with V5 (arc of 20°)	S2-8	wall	slab	27.19	1	concrete	43
	4	wall of 2000 mm with internal room (arc of 11°)	S3-8	wall	slab	14.95	2	concrete	43
	5	Containment of 600 mm	S4-8	wall	slab	34.38	0.6	concrete	43
	6	floors CELL 8	floor8	floor	slab	43.43	4	concrete	43

Table 6.2-12c

Heat Sink Descriptions

Cell	Heat Sink	Description	Name	Type	Shape	Surface (m^2)	Thickness (m)	Compound	Initial Temperature (°C)
9	1	roof of 1000 mm	roof9	roof	slab	43.43	1	concrete	43
	2	wall of 250 mm	S1-9	wall	slab	43.13	0.25	concrete	43
	3	wall of 2.0 m common with cell 5 (arc of 20°)	S2-9	wall	slab	27.19	1	concrete	43
	4	wall of 2000 mm with internal room (arc of 11°)	S3-9	wall	slab	14.95	2	concrete	43
	5	CONTAINMENT WALL of 600 mm	S4-9	wall	slab	34.38	0.6	concrete	43
	6	floors CELL 9	floor9	floor	slab	43.43	4	concrete	43
10	1	roof of 1000 mm	roof10	roof	slab	148.93	1	concrete	43
	2	wall of 2000 mm with outside and stairs	S1-10	wall	slab	93.19	2	concrete	43
	3	wall of 2000 mm with fuel building	S2-10	wall	slab	77.70	2	concrete	43
	4	wall of 2000 mm common with cell 9/11	S3-10	wall	slab	57.10	1	concrete	43
	5	wall of 750 mm common with valve room	S4-10	wall	slab	82.44	0.75	concrete	43
	6	Floors CELL 10	floor10	floor	slab	148.93	4	concrete	43
11	1	M1 wall of 2000 mm	S1-11	wall	slab	28.48	2	concrete	43
	2	M2 wall of 700 mm	S2-11	wall	slab	19.36	0.7	concrete	43
	3	M3 wall of 1500 mm	S3-11	wall	slab	21.51	1.5	concrete	43

Table 6.2-12c

Heat Sink Descriptions

Cell	Heat Sink	Description	Name	Type	Shape	Surface (m^2)	Thickness (m)	Compound	Initial Temperature (°C)
	4	M4 of 1000 mm	S4-11	wall	slab	19.36	1	concrete	43
	5	floors CELL 11	floor11	floor	slab	25.00	1	concrete	43
12	1	wall of 2000 mm with outside	S1-16	wall	slab	85.64	2	concrete	43
	2	wall of 1500 mm with outside	S2-16	wall	slab	195.54	1.5	concrete	43
	3	wall of 1000 mm with outside	S3-16	wall	slab	48.00	1	concrete	43
13	1	wall of 2000 mm with outside	S1-13	wall	slab	85.64	2	concrete	43
	2	wall of 1500 mm with outside	S2-13	wall	slab	195.54	1.5	concrete	43
	3	wall of 1000 mm with outside	S3-13	wall	slab	48.00	1	concrete	43
14	1	wall of 2000 mm with outside	S1-14	wall	slab	85.64	2	concrete	43
	2	wall of 1500 mm with outside	S2-14	wall	slab	195.54	1.5	concrete	43
	3	wall of 1000 mm with outside	S3-14	wall	slab	48.00	1	concrete	43
15	1	wall of 2000 mm with outside	S1-15	wall	slab	85.64	2	concrete	43
	2	wall of 1500 mm with outside	S2-15	wall	slab	195.54	1.5	concrete	43
	3	wall of 1000 mm with outside	S3-15	wall	slab	48.00	1	concrete	43
16	No heat sinks								

Table 6.2-12c

Heat Sink Descriptions

Cell	Heat Sink	Description	Name	Type	Shape	Surface (m^2)	Thickness (m)	Compound	Initial Temperature (°C)
17	No heat sinks								
18	1	roof of 2000 mm	roof18	roof	slab	147.76	2	concrete	43
	2	wall of 2000 mm	S1-18	wall	slab	95.54	2	concrete	43
	3	wall of 600 mm	S2-18	wall	slab	68.31	0.6	concrete	43
	4	floors CELL 18	floor18	floor	slab	147.76	0.6	concrete	43
19	1	roof of 2000 mm	roof19	roof	slab	147.76	2	concrete	43
	2	wall of 2000 mm	S1-19	wall	slab	95.54	2	concrete	43
	3	wall of 600 mm	S2-19	wall	slab	68.31	0.6	concrete	43
	4	Floors CELL 19	floor19	floor	slab	147.76	0.6	concrete	43
20	1	roof of 2000 mm	roof20	roof	slab	14.74	2	concrete	43
	2	wall of 1400 mm	S1-20	wall	slab	114.24	0.7	concrete	43
	3	wall of 300 mm	S2-20	wall	slab	48.91	0.15	concrete	43
	4	wall of 2000 mm	S3-20	wall	slab	30.47	2	concrete	43
	5	Floors CELL 20	floor20	floor	slab	12.32	4.3	concrete	43
21	1	roof of 2000 mm	roof21	roof	slab	147.76	2	concrete	43

Table 6.2-12c

Heat Sink Descriptions

Cell	Heat Sink	Description	Name	Type	Shape	Surface (m^2)	Thickness (m)	Compound	Initial Temperature (°C)
	2	wall of 2000 mm	S1-21	wall	slab	95.54	2	concrete	43
	3	wall of 600 mm	S2-21	wall	slab	68.31	0.6	concrete	43
	4	Floors CELL 21	floor21	floor	slab	147.76	0.6	concrete	43
22	1	roof of 2000 mm	roof22	roof	slab	147.76	2	concrete	43
	2	wall of 2000 mm	S1-22	wall	slab	95.54	2	concrete	43
	3	wall of 600 mm	S2-22	wall	slab	68.31	0.6	concrete	43
	4	Floors CELL 22	floor22	floor	slab	147.76	0.6	concrete	43
23	1	roof of 1000 mm	roof23	roof	slab	30.92	1	concrete	43
	2	wall of 2000 mm common with other rooms	S1-23	wall	slab	31.15	1	concrete	43
24	No heat sinks								

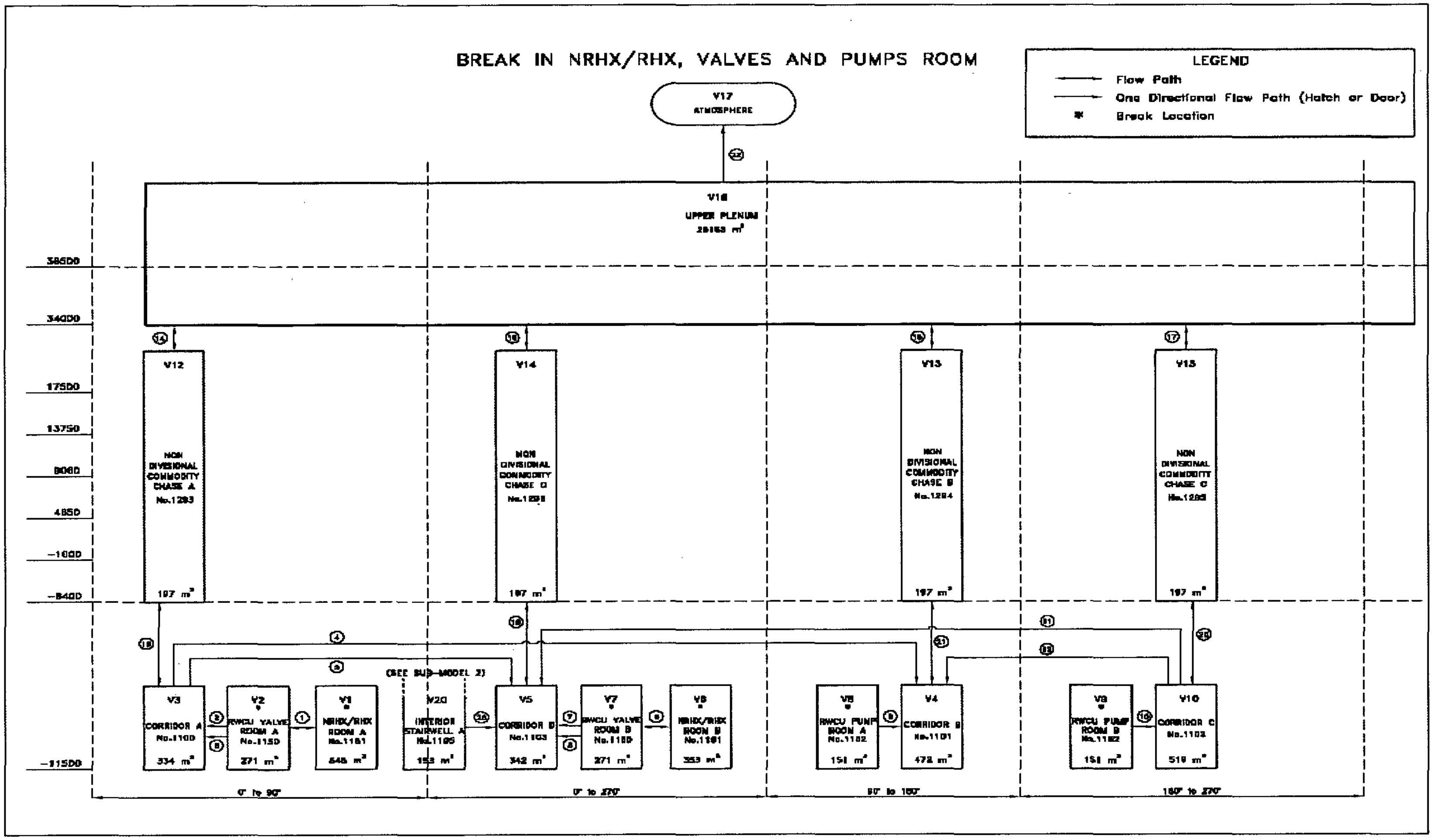

Figure 6.2-18. RWCU/SDC System Subcompartment Pressurization Analysis (Sub-Model 1)

ENCLOSURE 3

MFN 06-264 Supplement 1

AFFIDAVIT

GE-Hitachi Nuclear Energy Americas LLC

AFFIDAVIT

I, James C. Kinsey, state as follows:

(1) I am Project Manager, ESBWR Licensing, GE-Hitachi Nuclear Energy Americas LLC ("GHNEA") 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 GHNEA letter MFN 06-264 Supplement 1, Mr. James C. Kinsey to U.S. Nuclear Regulatory Commission, *MFN 06-264 Supplement 1 - Request for Additional Information Letter No. 18 - Reactor Building Subcompartment Pressurization Analysis - RAI Number 6.2-46 S01* dated June 22, 2007. The proprietary information in Enclosure 1, *MFN 06-264 Supplement 1 - Information Supporting NRC Request for Additional Information Letter No. 18 Related to ESBWR Design Certification Application - Reactor Building Subcompartment Pressurization Analysis - RAI Number 6.2-46 S01 - GHNEA Proprietary Information*, is delineated by a [[dotted underline inside double square brackets.{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 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, GHNEA 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 GHNEA's competitors without license from GHNEA 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 GHNEA customer-funded development plans and programs, resulting in potential products to GHNEA;

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 GHNEA, 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 GHNEA, 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, or subject to the terms under which it was licensed to GHNEA. Access to such documents within GHNEA 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 GHNEA 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 identifies the models and methodologies GHNEA will use in evaluating the consequences of design basis accidents (DBAs) for the ESBWR. GHNEA and its partners performed significant additional research and evaluation to develop a basis for these revised methodologies to be used in evaluating the ESBWR over a period of several years at a cost of over one 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 GHNEA asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GHNEA's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GHNEA'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 GHNEA.

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.

GHNEA's competitive advantage will be lost if its competitors are able to use the results of the GHNEA 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 GHNEA 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 GHNEA 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 22nd day of June 2007.

James C. Kinsey

James C. Kinsey
GE-Hitachi Nuclear Energy Americas LLC