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Proprietary Information Notice
This letter forwards proprietary information in accordance with 10CFR2.390. The balance of this letter may be considered non-proprietary upon the removal of Enclosure 1.

MFN 06-225

Docket No. 52-010

July 18, 2006

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

Subject: **Response to NRC Request for Additional Information Letter No. 4 Related to ESBWR Design Certification Application – ESBWR Scaling Analysis – RAI Number 6.3-1**

Enclosure 1 contains GE's response to the subject NRC RAI transmitted via the Reference 1 letter. This completes GE's response to RAI Letter No. 4.

Enclosure 1 contains proprietary information as defined in 10CFR2.390. 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 proprietary information in Enclosure 1 be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 9.17. A non proprietary version is contained in Enclosure 2.

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

Sincerely,

Kathy Sedney for

David H. Hinds
Manager, ESBWR

D068

Reference:

1. MFN 06-025, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 4 for the ESBWR Design Certification Application*, January 11, 2006

Enclosures:

1. MFN 06-225 – Response to NRC Request for Additional Information Letter No. 4 Related to ESBWR Design Certification Application – ESBWR Scaling Analysis – RAI Number 6.3-1 – GE Proprietary Information
2. MFN 06-225 – Response to NRC Request for Additional Information Letter No. 4 Related to ESBWR Design Certification Application – ESBWR Scaling Analysis – RAI Number 6.3-1 – Non Proprietary Version
3. Affidavit – George B. Stramback – dated July 18, 2006

cc:	WD Beckner	USNRC (w/o enclosures)
	AE Cubbage	USNRC (with enclosures)
	LA Dudes	USNRC (w/o enclosures)
	GB Stramback	GE/San Jose (with enclosures)
	eDRF	0000-0054-1163

ENCLOSURE 2

MFN 06-225

Response to NRC Request for Additional Information

Letter No. 4 Related to ESBWR Design Certification

Application – ESBWR Scaling Analysis

RAI Number 6.3-1

Non Proprietary Version

NRC RAI 6.3-1

As part of the pre-application review phase of ESBWR, GE performed a scaling analysis based on a model described in Reference 1, and presented a plot in Figure 1 of Reference 2 showing core collapsed water level (CCWL) as a function of reactor pressure. The ESBWR results were compared with GIST and GIRAFFE integral test data which agreed reasonably well. This demonstrated that the phenomena which impact the most important phase of the loss-of-coolant accident (LOCA) event, and in terms of the most critical variable CCWL, are in the same regime for the ESBWR and the test facilities. This comparison provided confirmation of system similarities because numerical proximity of the values of Pi-groups for the systems in question (ESBWR vs. test facilities) alone is not a sufficient basis to ensure similarity of the systems.

The staff understands that the ESBWR design presented in the design control document (DCD) has been modified from the pre-application reference design. The staff further believes that some of those modifications, as discussed below, can impact the phenomena that influence the CCWL.

- *ESBWR core power increased from 4000 Mwt to 4500 Mwt (12.5 percent): According to Reference 1, core power is the only parameter that has a significant impact on the figure of merit (CCWL), and the CCWL subsequent to depressurization is inversely proportional to core power.*
- *Change of configuration: Changes in ESBWR design and operating parameters may revise the values of Pi-groups for inter-connected volumes and components (RPV, drywell, wetwell, GDCS, etc.). The most significant change of configuration is the GDCS gas space which is now connected to the drywell, instead of the wetwell.*
- *ESBWR limiting event: When the scaling analysis in Reference 2 was performed, the limiting accident for ESBWR was considered the GDCS line break. For the current ESBWR design, the limiting event is now considered the feedwater line break.*

The ESBWR DCD does not provide an updated scaling analysis that demonstrates the adequacy of the test program, including PANDA/PANTHERS/GIRAFFE/GIST, when applied to the current ESBWR design. The staff, therefore, requests GE to provide the following additional information:

1. *Provide an updated scaling analysis (similar to Reference 2) showing plots for CCWL vs. reactor pressure for modified ESBWR design and tests, including the revised Pi-values calculated using inter-connected volumes and components.*
2. *Provide a comparison of revised ESBWR Pi-values with that of the tests for other phases of LOCA.*
3. *Provide justification as to why confirmatory scaling analysis similar to the approach taken in Reference 2 for the blowdown and GDCS transition phases are not necessary for other phases of LOCA, such as long-term cooling phase.*

REFERENCES

1. *M. di Marzo, "A Simplified Model of the BWR Depressurization Transient," Nuclear Engineering and Design, 205 (2001), pgs. 107-114, July 28, 2000.*
2. *Letter from S. A. Delvin (GE) to US NRC, "Response to Request for Additional Information (RAI) on Scaling Responses for ESBWR Pre-application Review – Additional Supplementary Information," November 6, 2003.*

GE Response to Item 1

Response Summary
A simplified di Marzo type [1] scaling analysis has been conducted for the late blowdown and GDCS transition phases of the modified or 4500MWt ESBWR assuming a GDCS line break. We had earlier performed a similar analysis [2, 3] for the original 4000MWt ESBWR, GIRAFFE-SIT Test GS1 and GIST Test C01A in response to an earlier NRC RAI 292.

The new analyses have generated the non-dimensional RPV pressure (P^+) and water inventory (I^+) responses vs. non-dimensional time (t^+) for the 4500 MWt ESBWR, the 4000 MWt ESBWR, GIRAFFE-SIT Test GS1 and GIST Test C01A. Finally, the results have been plotted on the non-dimensional liquid inventory (I^+) vs. non-dimensional RPV pressure (P^+) plane as per the NRC request.

It is shown that the 4500 MWt ESBWR results are very similar to the analytical results and data from the test facilities and the results of the 4000 MWt ESBWR.

Analysis Methodology
Following the simplified analysis of di Marzo [1], we had earlier performed a simplified scaling analysis [2, 3] for the 4000 MWt ESBWR and compared the results with the test data obtained from the GIRAFFE-SIT and GIST facilities. Similar analyses have been carried out for the modified or 4500 MWt ESBWR and the results along with the comparisons are presented here.

The mass and energy conservation in the Reactor Pressure Vessel (RPV) finally results in two equations, one for the rate of change of pressure, dP/dt, and the other for the rate of change of water inventory, dI/dt, in the RPV. Following di Marzo [1] and the earlier GE analysis [3], the Clausius – Clapeyron relation and other simplifying assumptions such as treating the steam as a perfect gas at lower pressures [[ ]] of our interest have been used. The derivation also assumes a break in the liquid line such as GDCS injection line close to the RPV or the Bottom Drain Line Break at the bottom of the RPV.

The final simplified equations for dP/dt and dI/dt, neglecting the small mechanical energy terms [3] in comparison to the more dominant thermal energy terms, are as follows:

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(1)

]] (2)

where the following variables are used

- P = Pressure in vessel
- t = Time
- $I = M_l/M_o$ = Liquid inventory in vessel divided by initial total inventory
- M_l = Liquid inventory
- $W_{i,,l}$ = Liquid inflow/outflow (GDCS, SLCS, break, etc) rates
- W_D = Steam discharge rate through ADS
- $Q_{decheat}$ = decay heat
- Q_{stored} = stored energy release from vessel wall

In addition, the following values are held constant

- M_o = Initial inventory in vessel (steam and liquid)
- ρ_l = liquid density
- V_o = RPV non-solid or free volume
- R = Gas constant for steam
- T = temperature in vessel since the saturation temperature drops at a much slower rate compared to the pressure
- Δh_i = Liquid (in/out) subcooling relative to RPV condition
- h_{fg} = enthalpy of vaporization
- $a = h_{fg}/RT$
- c_{pl} = Specific heat of liquid or water

Equations (1) and (2) are non-dimensionalized following the procedure used in our earlier analysis [3]. The final non-dimensional forms of Equations (1) and (2) are as follows:

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(3)

]] (4)

The non-dimensional variables in Equations (3) and (4) are all in the form,

$$X^{+} = \frac{X}{X_o} \tag{5}$$

where X is the variable of interest and X_o is the reference value for the variable. For all variables except time, area and the GDCS flow rate and subcooling, the initial values at the start of the late blowdown phase are used as the reference values. For the ADS area, which may vary with time, the maximum area is used as the reference value. The rated GDCS flow rate, discussed later, is used as the reference value for non-dimensionalizing the GDCS flow rate. The "characteristic time," t_r, used to non-dimensionalize time, t, is obtained from the consideration [[

]] (6)

where,

$\Delta P_r = P_o - P_1$ (P_1 being the RPV pressure at which GDCS injection starts)

Other symbols have the usual meaning.

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]] (7)

where

P_{RPV} = RPV pressure (P in the equations above)
P_{DW} = Drywell pressure (held constant)
H_{GDCS} = Hydrostatic head for the GDCS line
$W_{GDCSrated}$ = Rated GDCS flow when the RPV and drywell are at the same pressure
g = Acceleration due to gravity

Note that Equation (7) smoothly increases the GDCS flow rate from zero (when P_{RPV} becomes equal to P_1 or ($P_{DW} + \rho_l g H_{GDCS}$)) to the rated value as P_{RPV} approaches P_{DW}. Also, the component interconnection between the GDCS pool and the RPV has been considered. This is the only relevant component interconnection in the late blowdown and GDCS transition phases.

The PI groups that appear in Equations (3) and (4) are defined as,

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Note that ΔM_{lo} is the reduction in liquid inventory due to "flashing" as the pressure drops from P_o to P_1. However, the parameters ΔP_r, $f_{2,o}$, ΔM_{lo} and Δh_{ADS} cancel out in the Pi-groups that appear in Equations (3) and (4). For the simplified analysis, the Pi-groups are defined as combinations of other Pi-groups to have direct correspondence with the Pi-groups introduced in the formal scaling studies [4]. However, for the sake of convenience, the final expressions of the Pi-groups have also been shown above.

di Marzo [1] recognized that the stored heat from the vessel structure, i.e., metal-to-water heat transfer, would affect the depressurization rate. To account for this heat transfer, he increased the value of water specific heat, c_{pl}, somewhat arbitrarily by a factor of 1.5. In reality, the vessel is comprised of metals of various thicknesses – some "thin" such as vessel internals, and some "thick" like the vessel wall. The "thin" structures would be fast responding and would quickly follow the vessel water temperature whereas the "thick" structures would be slow responding and there would be some delay in following the water temperature. In this analysis, a sensitivity study was performed for the 4500 MWt ESBWR. Three cases were considered:

Case 1: No metal to water heat transfer
Case 2: Metal to water heat transfer only due to the "thin" vessel internals
Case 3: Metal to water heat transfer due to both "thin" and "thick" vessel structures.

The factor ($F\text{-}c_{pl}$) for increasing the water specific heat is calculated based on the vessel metal heat capacity, participating in the metal to water heat transfer, as shown below:

$F\text{-}c_{pl} = (M_{lo}\, c_{pl} + M_{metal} c_{p,steel})/(M_{lo} c_{pl})$

The values of this factor for the three cases of the 4500 MWt ESBWR are:

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The real situation is somewhere between Case 2 and Case 3. However, to be conservative from the RPV water inventory point of view, the Case 3 has been considered as the base-case. This is consistent with the assumption used in the formal scaling analysis [4].

So the best estimate factor ($F\text{-}c_{pl}$) for increasing the water specific heat for the various ESBWR and test cases are as follows:

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As a result, the last term in the numerator of Equation (3) is dropped and the value of water c_{pl} is multiplied by the factor F-$c_{pl.}$

Results

Subsection 6.3.3.7 (ECCS Performance Analysis for LOCA) of Reference 5 shows that the TRACG results of the GDCS injection line break and the Bottom Drain Line (BDL) break for the 4500 MWt ESBWR are very similar. Since the GDCS injection line break was used in our earlier work [2 – 4], the same GDCS injection line break has also been used as the example in the present analysis.

The base-case for the 4500 MWt ESBWR includes [[

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Figure 1 shows the results of the 4500 MWt ESBWR for the base-case (with SLCS flow) and another case without the SLCS injection during the late blowdown and the GDCS transition phases. [[

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Figure 1. **Calculated P^+ and I^+ for 4500 MWt ESBWR With and Without SLCS Injection**

Similar analyses with no SLCS, IC and CRD flows have been performed for the earlier 4000 MWt ESBWR, GIRAFFE-SIT GS1 Test and GIST C01A Test. The calculated results along with the test data are compared with the calculated base-case results of the 4500 MWt ESBWR in Figure 2.

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Figure 2. Comparison of Calculated P^+ and I^+ for 4500 MWt ESBWR, 4000 MWt ESBWR, GIRAFFE-SIT Test GS1 and GIST Test C01A With the Test Data

It is seen from the above figure that the trends and even the values of the non-dimensional pressure and liquid inventory for the old and new ESBWR designs (4000 MWt and 4500 MWt, respectively) and the three different scales represented by the full-scale ESBWRs and the two test facilities are very similar. Comparison between the calculated results and the test data for the two different scales represented by the GIRAFFE and GIST tests are also very good. A summary comparison of all the Pi-group values that enter into the non-dimensional pressure and liquid inventory equations for the simplified model is presented in Table 1. In general, the values for the old and new ESBWR designs and the test facilities compare well and this agreement is reflected in the consistency of the results shown in Figure 2. [[

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Table 1
Comparison of Pi-Group Values

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Finally, Figure 3 shows the comparison of the four best-estimate simplified calculations for the 4500 MWt ESBWR, 4000 MWt ESBWR, GIRAFFE-SIT Test GS1 and GIST Test C01A along with the data of GIRAFFE-SIT Test GS1 and GIST Test C01A on the non-dimensional pressure (P+) vs. non-dimensional liquid inventory (I+) plane as per the NRC request.

It can be seen that the behavior of the 4500 MWt ESBWR during the late blowdown and GDCS injection phases is expected to be very similar to those observed in the GIRAFFE-SIT and GIST tests, and therefore, no additional tests are required for scaling of the 4500 MWt ESBWR for these phases.

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Figure 3. **Comparison of all simplified best-estimate calculations with experimental data of GIRAFFE-SIT Test GS1 and GIST Test C01A**

GE Response to Item 2

Response Summary
The revised Pi-group values for the 4500 MWt ESBWR have been calculated for all four phases, namely, the late blowdown, GDCS transition, Full GDCS and the long term PCCS phases of a LOCA. Comparison has been made with the earlier Pi-group values of the 4000 MWt ESBWR, GIRAFFE-SIT Test GS1, GIST Test C01A, GIRAFFE/He and PANDA tests as documented in [4].

It is shown that the 4500 MWt ESBWR Pi-group values are of the same order of magnitude of the earlier Pi-group values which indicate that the earlier tests conducted in various test facilities are applicable to the 4500 MWt ESBWR.

Analysis Methodology
The methodology is the same as described in the ESBWR scaling report [4].

Late Blowdown and GDCS Transition Phases

For the late blowdown and the GDCS transition phases, the Pi-groups based on the non-dimensional governing equations for the rate of pressure change (Equation 6.1-5 of [4] – later referred to as the P-dot equation) and the rate of change of liquid mass (6.1-1 of [4] – later referred to as the M-dot equation) in the reactor pressure vessel (RPV) have been calculated. New terms corresponding to the SLCS injection have been considered for the 4500 MWt ESBWR. There were also some changes due to the change in the containment configuration. The containment of the 4500 MWt ESBWR is now similar to that of the SBWR with the GDCS pool open to the drywell (DW).

The GDCS transition phase is similar to the late blowdown phase with the exception that some water from the GDCS pool enters the RPV by gravity. A GDCS injection line break has been taken as the representative LOCA example, because the vessel pressure and liquid inventory for the GDCS injection line break and the Bottom Drain Line break, as calculated using the TRACG code, are very similar for the 4500 MWt ESBWR as shown in Subsection 6.3.3.7 of [5]. So we continued with the same GIRAFFE-SIT and GIST tests used in the earlier work [4].

For the ESBWR, the starting point of the late blowdown phase is determined from the TRACG calculation [5] when the RPV pressure reaches [[ ]] The late blowdown phase is terminated and the GDCS transition phase begins when the RPV pressure reaches the value of ($P_{DW} + \rho_l g H_{GDCS}$).

Full GDCS Phase

Only the vessel liquid mass conservation equation (6.1-1 in [4]) is relevant in this phase.

Long Term PCCS Phase

For the long-term PCCS phase, the containment pressure, i.e., Drywell (DW) and Wetwell (WW) gas space pressure, is the main issue. Therefore, the Pi-groups of the rate of pressure change equation as given by Equation (6.1-5) of Reference 4 have been evaluated and compared with those obtained for the GIRAFFE/He and PANDA tests.

In earlier work for the 4000 MWt ESBWR [4], the Main Steam Line Break (MSLB) was used as the limiting transient for the containment pressure. However, for the 4500 MWt ESBWR, the Feed Water Line Break (FWLB) is the limiting transient for containment pressure [5] – Subsection 6.2.1.1.3. Therefore, for the scaling analysis of the 4500 MWt ESBWR, the initial conditions for the long-term phase are taken from the corresponding TRACG nominal calculation [5]. Also, in the earlier work, conditions at 6 hours after the break were taken as the initial conditions for the long term scaling analysis. The latest long-term TRACG calculations indicate opening of the Vacuum Breaker (VB) at around [[
]] Because VB opening significantly changes the concentration of non-condensable in DW and WW, it was decided to perform two analyses, one taking the conditions at 6 hours (as the earlier work) and [[ ]] Table 2 shows the comparison between the two initial conditions at these two different times. Only the minimum number of conditions is taken from the TRACG calculation; the rest are calculated using standard assumptions, such as perfect gas mixture and steam in the wetwell gas space and the drywell being at the saturated condition corresponding to the steam partial pressure.

It should be noted that during the long-term PCCS stage (i.e., following the mass and energy transfer during the blowdown), the containment pressure response depends on the [[

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Table 2

Comparison of Initial Conditions in the 4500 MWt ESBWR Containment for the Long Term/PCCS Scaling Analyses

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Results

Late Blowdown and GDCS Transition Phases

Figure 4 shows the Pi-group values for the P-dot and M-dot equations for the late blowdown phase.

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Figure 4. **Pi-Group Values for the 4500 MWt ESBWR and Comparison with those for 4000 MWt ESBWR, GIRAFFE-SIT Test GS1 and GIST Test C01A for the Late Blowdown Phase**

Figure 5 shows the Pi-group values for the P-dot and M-dot equations for the GDCS transition phase.

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Figure 5. **Pi-Group Values for the 4500 MWt ESBWR and Comparison with those for 4000 MWt ESBWR, GIRAFFE-SIT Test GS1 and GIST Test C01A for the GDCS Transition Phase**

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]] It is seen that the Pi-group values for the 4500 MWt ESBWR for various phenomena are in the same order of magnitude of the Pi-group values for the 4000 MWt ESBWR, the GIRAFFE-SIT test and the GIST test. In other words, the scaling "distortion" among these four entities or "scales" is minimal.
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Full GDCS Phase

Figure 6 shows the Pi-group values for the M-dot equation for the full GDCS phase. The Pi-groups for the P-dot equations are not evaluated for this phase since the RPV has already depressurized to almost the DW pressure.

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Figure 6. **Pi-Group Values for the 4500 MWt ESBWR and Comparison with those for 4000 MWt ESBWR, GIRAFFE-SIT Test GS1 and GIST Test C01A for the Full GDCS Phase**

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Long Term PCCS Phase

It was mentioned earlier that two calculations were carried out for the 4500 MWt ESBWR, because the opening of VB could produce different non-condensable mass fractions in the drywell at different times. [[ ]] The Pi-group magnitudes for the DW and WW P-dot equations for the 4500 MWt ESBWR is shown in Figure 7.

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Figure 7. **Pi-Group Values for the 4500 MWt ESBWR for the Long Term PCCS Phase, assuming different initial conditions (before and after VB opening)**

Figure 7 shows that the Pi-group values for the 4500 MWt ESBWR long term phase is relatively insensitive to the initial DW/WW conditions, i.e., [[ ]] Therefore, to be consistent with the earlier work [4], the 4500 MWt ESBWR Pi-group values obtained for the initial conditions at 6 hours are compared with the Pi-group values for the 4000 MWt ESBWR and the test facilities in Figure 8 below.

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Figure 8. **Pi-Group Values for the 4500 MWt ESBWR and Comparison with those for 4000 MWt ESBWR, GIRAFFE-He, PANDA-M3 and PANDA-P1 Tests for the Long Term PCCS Phase**

It is seen that the Pi-group values of the 4500 MWt ESBWR in the long term PCCS phase are quite comparable to those of the 4000 MWt ESBWR and the test facilities. So the changes made in the 4500 MWt ESBWR do not unveil any new phenomenon not found in the earlier tests.

Summary of Results

The results presented above show that the revised Pi-group values of the 4500 MWt ESBWR are very similar to and of the same order of magnitude as those obtained earlier for the 4000 MWt ESBWR and the various test facilities for all four phases (late blowdown, GDCS transition, full GDCS and long term PCCS) of a LOCA. Therefore, the data obtained from these test facilities are applicable to the 4500 MWt ESBWR during a postulated LOCA.

GE Response to Item 3

The purpose of the simplified confirmatory analysis for the late blowdown and GDCS transition phases is to show that the pair of differential equations that govern the RPV transient pressure and liquid inventory can be simplified and solved numerically to directly demonstrate similar responses for the ESBWR and the test facilities. In the process, the key phenomena that govern the relatively rapid changes in the RPV pressure and liquid inventory during these phases of the LOCA transient are identified and clarified. This situation is in marked contrast to the long term cooling (PCCS) phase of the LOCA transient where pressures in the RPV, DW and WW are essentially equal and changes are occurring in a quasi-static manner.

Figure 9 shows a schematic of the 4500 MWt ESBWR containment systems during the long term cooling phase. The steam generation rate inside the RPV is directly proportional to the decay heat and the entire amount of steam discharges into the Drywell (DW) through the break (MSLB or FWLB) and the ADS. The steam discharge rate is independent of the type of break and the RPV and the drywell are effectively uncoupled. The decay heat steam along with a small amount of residual DW noncondensable flows into the PCC, which is submerged in the PCC pool above and outside the containment. The steam is condensed in the PCC tubes and the condensate flows into the GDCS pool. The residual DW noncondensable eventually moves to the WW gas space and causes a small pressure increase. Figure 6.2-11 of [5] shows that during the long term cooling phase, the PCCS is capable of transferring all the decay heat to the PCCS pool outside the containment. Therefore, there is no further heat up of the WW pool and no WW gas space pressure increase due to steam generated in the RPV because of decay heat.
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The minimal coupling between the different regions means that the Pi groups for the wetwell and the drywell can be evaluated separately without reference to the other regions. Based on these considerations, GE believes that no additional or confirmatory scaling analysis is required for the long-term cooling phase.

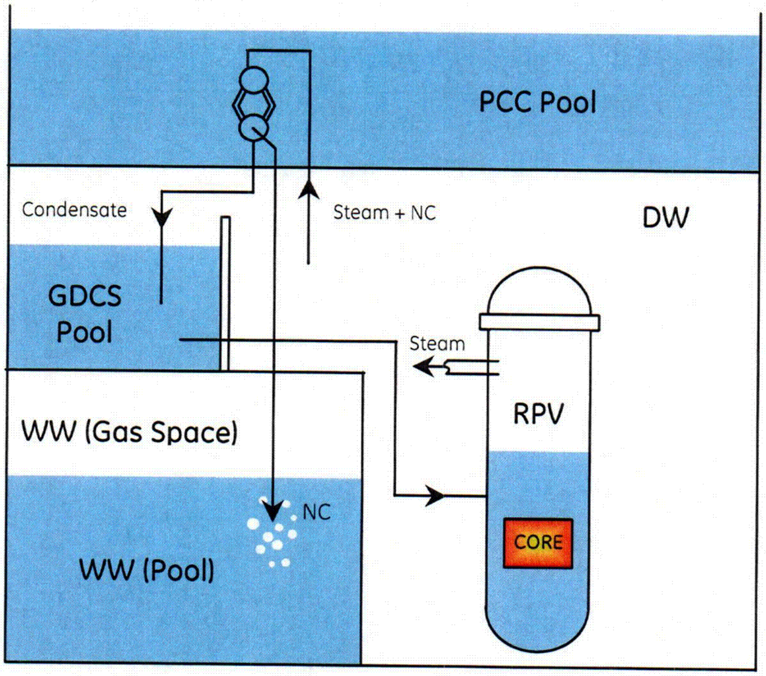

Figure 9. **Schematic of the 4500 MWt ESBWR Containment Systems during the Long Term PCCS Phase**

Also, the response to this RAI 6.3-1 does not require any revision to the ESBWR DCD, Rev. 1, January 2006 [5].

References

1. Marino di Marzo, "A simplified model of the BWR depressurization transient," *Nuclear Engineering and Design,* 205, pp. 107-114, 2001.
2. Letter from S. A. Delvin (GE Nuclear Energy) to USNRC, "Response to Request for Additional Information (RAI) on Scaling Responses for ESBWR Pre-application Review – Additional Supplementary Information," MFN 03-140, November 6, 2003.
3. GE Nuclear Energy, "Supplement Response to RAI 292," *GE Proprietary,* October 2003.
4. GE Energy, "ESBWR Scaling Report," NEDC-33082P, Revision 1, Class III (Proprietary), January 2006.
5. GE Energy, "ESBWR Design Control Document," Tier 2, Revision 1, January 2006.

ENCLOSURE 3

MFN 06-225

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 06-225, David H. Hinds to NRC, *Response to NRC Request for Additional Information Letter No. 4 Related to ESBWR Design Certification Application – ESBWR Scaling Analysis – RAI Number 6.3-1*, dated July 18, 2006. The proprietary information in Enclosure 1, *Response to NRC Request for Additional Information Letter No. 4 Related to ESBWR Design Certification Application – ESBWR Scaling Analysis – RAI Number 6.3-1,* is delineated 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 2.790(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 2.390 (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 contains detailed test results and interpretations of testing performed in different facilities and their applicability to TRACG modeling of passive safety systems in BWR designs. The reporting, evaluation, and interpretations of test results were achieved at a significant cost, on the order of several million dollars, to GE.

The development of the testing and 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 18th day of July 2006.

George B. Stramback
General Electric Company