Nuclear Operating Company
South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

January 20, 2010
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U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
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South Texas Project
Units 3 and 4
Docket Nos. 52-012 and 52-013
Response to Request for Additional Information

Attached are responses to NRC staff questions included in Request for Additional Information (RAI) letter number 242 related to Combined License Application (COLA) Part 2, Tier 2 Section 6.2.

Attachments 1 through 4 address the responses to the RAI questions listed below:

RAI 06.02.01.01.C-9
RAI 06.02.01.01.C-10
RAI 06.02.01.01.C-12
RAI 06.02.01.01.C-13

There are no commitments in this letter.

If you have any questions regarding these responses, please contact me at (361) 972-7206, or Bill Mookhoek at (361) 972-7274.

D091
NRO

STI 32600733

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 1/20/2010

M A McBurnett
Mark McBurnett
Vice-President, Oversight and Regulatory Affairs
South Texas Project Units 3 & 4

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Attachments:

1. Question 06.02.01.01.C-9
2. Question 06.02.01.01.C-10
3. Question 06.02.01.01.C-12
4. Question 06.02.01.01.C-13

cc: w/o attachment except*
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RAI 06.02.01.01.C-9

QUESTION:

For the short-term Main Steam Line Break (MSLB) accident scenario discussed in WCAP-17058-P:

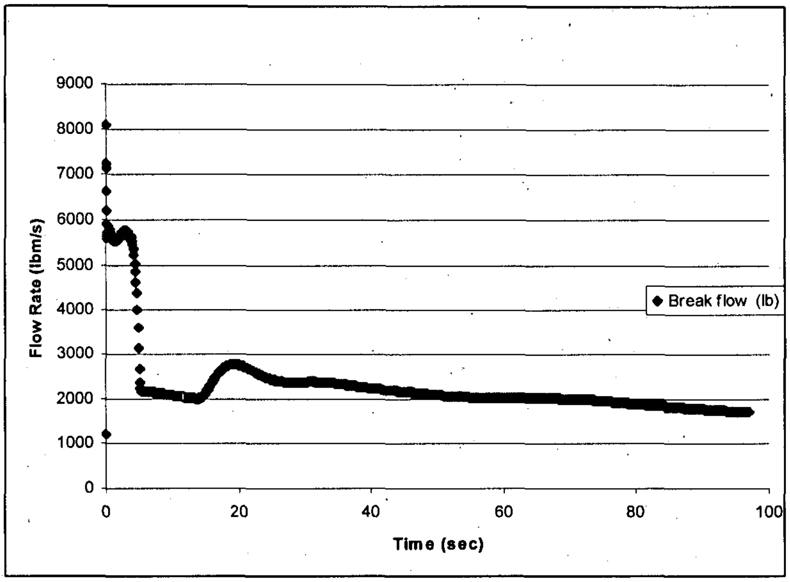
a) Explain why the GOBLIN calculated total break flow rate is lower than the ABWR DCD break flow rate during the initial time interval of 0 to 3 seconds following the accident (see Figure 6-11 of WCAP-17058-P Rev 0 (June 2009)).

b) Provide the diameter, length, and pressure loss coefficients for each pipe segment in the main steam line. This should include the Main Steam Isolation Valve (loss coefficient and the fully open flow area) and the main steam line nozzles as used in the GOBLIN input deck. In addition, provide any additional pressure losses considered for the main steam line system in the GOBLIN model.

RESPONSE:

a) An enhanced plot of Figure 6-11 of WCAP-17059-P Rev 0 is included below. The initial surge in flow reaches a peak value around 8000 lbm/s, which is comparable to the initial flow from the DCD. This could not be seen in the original figure because it drops off so quickly. Flow values for GOBLIN and the DCD match initially and at 5 seconds, when the Main Steam Isolation Valves (MSIVs) are closed. The latter point shows that the flow coming from the containment side of the break is consistent between the two models.

b) Differences are likely due to the additional Main Steam Line (MSL) piping detail present in the GOBLIN model; the DCD appears to be a simpler calculation. GOBLIN models the piping present in the steam lines so it better shows the initial blow down of steam (the first second); it also shows the subsequent drop-off in flow associated with the closure of the MSIVs.



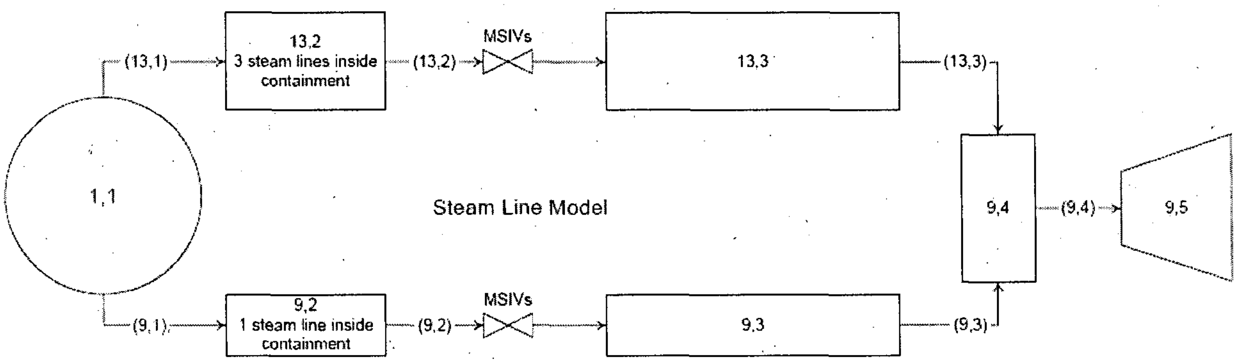
b. Below is the information requested in sub item b.

Broken Steam Line

	Hydraulic Diameter (m)	Length (m)	Loss Coefficient	Flow Area (m^2)
9,1	0.3537	0	0.50 (steam nozzle)	0.0985
9,2	0.6398	17.039	1.00 (MSIV)	0.3215
9,3	0.6398	43.757	3.00 (Inlet to header)	0.3215

Intact Steam Lines

	Hydraulic Diameter (m)	Length (m)	Loss Coefficient	Flow Area (m^2)
13,1	0.3537	0	0.50 (steam nozzle)	0.2956
13,2	0.6398	22.119	1.00 (MSIV)	0.9645
13,3	0.6398	41.282	3.00 (Inlet to header)	0.9645



There is no COLA change required as a result of this response.

RAI 06.02.01.01.C-10

QUESTION:

For the long-term Main Steam Line Break (MSLB) accident scenario discussed in WCAP-17058-P:

a) Provide ECCS mass flow rate from the pressure suppression pool after 600 seconds.

b) Explain the absence of containment drywell pressure and temperature oscillations during the 5 to 8 hours when the GOBLIN-calculated break flow is oscillatory in nature. Note that these oscillations occur in a period following the calculated peak containment pressure and temperature.

RESPONSE:

a) The ECCS system consists of the following:

- 3 low pressure flooder pumps (LPFL) (9.36 ft^3/s per available pump)
- 2 high pressure core flooder pumps (HPCF) (7.132 ft^3/s per available pump)
- 1 reactor core isolation cooling pump (RCIC), which is accounted for in GOBLIN (RCIC flow has terminated by 600 seconds)

MSLB cases begin the injection of two HPCF pumps into the vessel at 600 seconds, and continue through the entire transient. The three LPFL pumps are not initiated until 30 minutes into the transient. At this time one pump provides drywell and wetwell sprays, one pump provides suppression pool recirculation cooling, and one pump provides no flow but only adds pump heat to the suppression pool. All five pumps are assumed to begin adding pump heat to the suppression pool at the initiation of the transient. This approach is conservative for suppression pool temperature, because it maximizes the heat removal rate from the vessel to the suppression pool, and it maximizes the pump energy supplied to the suppression pool.

b) As discussed in Part 'a' of RAI 06.02.01.01.C-10, the ECCS flow is maximized to the vessel starting at 600 seconds, which will increase heat removal from the vessel to the suppression pool. By maximizing the injection flow to the vessel, the vessel quickly goes water solid. Therefore, at the time in the transient that the break flow from the vessel is oscillating, the ECCS flow is primarily subcooled water. This addition of subcooled water would not be expected to cause large oscillations in primary containment pressure and temperature. As noted in the RAI, these oscillations occur well after the peak containment pressure and temperature, and therefore have no affect on the containment performance.

There is no COLA change required as a result of this response.

RAI 06.02.01.01.C-12

QUESTION:

In order to support GOTHIC applicability for the review of the Toshiba Technical Report "Post LOCA Suppression Pool Swell Analysis for ABWR Containment Design," UTLR-0005-P Rev 0 (September 2009), please perform additional GOTHIC benchmarking calculations for at least one more PSTF air test.

RESPONSE:

Additional GOTHIC benchmarking calculations will be performed for at least one more Pressure Suppression Test Facility (PSTF) air test. These calculations will be completed by February 28, 2010 and will be subsequently available for NRC review.

There is no COLA change required as a result of this response.

RAI 06.02.01.01.C-13

QUESTION:

In the pool swell analysis (UTLR-0005-P Rev 0 (September 2009)), the wetwell node size is limited to a specific fixed value. Please provide:

a) basis for the choice of this value,

b) discussion on potential effect of different node sizes on pool swell behavior,

c) basis and/or rational for selection of the maximum bubble size,

d) discussion on potential effect of different bubble size, including the effect of the bubble size that does not coincide with the calculational node size

RESPONSE:

a) In the GOTHIC methodology for obtaining bounding values for the pool swell and swell velocity, the swell transient is tracked by noting the time that the liquid volume fraction passes through 0.5 for each node above the initial pool level. The peak swell level could be up to one node height above that indicated by this data extraction process. The reported peak values include one additional cell height to account for this data extraction uncertainty. The GOTHIC methodology for the ABWR pool swell uses a node size that was selected to provide a sufficient number of data points to establish the surface level versus time curve. Also, this limits the uncertainty in the data extraction to that selected node height. This cell height is built into the methodology that was shown to conservatively bound the swell height and swell velocity from the Pressure Suppression Test Facility (PSTF) and the previously accepted DCD values.

b) The GOTHIC model was modified to investigate the effects of using different node sizes on the pool swell and swell velocity. Node sizes of one-half and two times the selected node size were used to perform calculations for comparison with the results for the selected node size as documented in UTLR-0005-P Rev. 0. Figures 1 and 2 show the pool swell height and the surface velocity for the three cases. The results show that the pool swell and swell velocity are not very sensitive to node size within the sensitivity study range (one-half to two times node size). The variance in the maximum swell elevation is within the data extraction uncertainty (one node height).

c) In GOTHIC 7.2a, the diameter of large bubbles within a cell is limited to the smaller of 6" and the specified hydraulic diameter for the cell. In the GOTHIC model, the cell hydraulic diameter was very large to minimize frictional drag. Therefore, the large bubbles are limited to 6". This limit is a carry over from GOTHIC's precursor COBRA codes that were used and validated for two-phase in-core analysis. The 6" limit on the large bubble size within a cell does not limit the overall size of a steam/air region. If the steam/air injection rate is large enough, a contiguous block of cells can be completely filled with the air/steam mixture.

d) To investigate the influence of the large bubble size limit on the pool swell results, GOTHIC 7.2a was modified to change this limit by a factor of two (larger and smaller). Figures 3 and 4 show the pool swell and the surface velocity for the three cases using a large bubble size limit of 3", 6" and 12". These cases all used the 6" node size from the established methodology. The results show that the pool swell and swell velocity are not very sensitive to the maximum bubble size within the sensitivity study range (3" to 12"). The unmodified code gives the highest pool swell by a small margin.

There is no COLA change required as a result of this response.