

RESOLUTION OF SOUTH TEXAS PROJECT NUCLEAR OPERATING COMPANY  
COMMENTS ON DRAFT SAFETY EVALUATION FOR TOPICAL REPORT WCAP-17065-P  
“WESTINGHOUSE ABWR SUBCOMPARTMENT ANALYSIS USING GOTHIC”  
SOUTH TEXAS PROJECT NUCLEAR OPERATING COMPANY UNITS 3 AND 4  
PROJECT NUMBER 772

By email dated August 13, 2011 (ADAMS No. ML120520070), South Texas Project Nuclear Operating Company STP provided 14 comments on draft Safety Evaluation (SE) for Topical Report (TR) WCAP-17065-P, “Westinghouse ABWR Subcompartment Analysis Using Gothic”. Some information in the draft SER for this TR was identified by the applicant as proprietary and will be marked with brackets “[ ]” accordingly and the bracketed material will be removed from the public version of this SE.

Draft SE comments for TR WCAP-17065-P:

1. The second sentence of Section 1.0, Paragraph 3, reads:

*The NRC has previously approved the use of GOTHIC for boiling-water reactor containment analysis on a case-by-case basis.*

STP commented that WCAP-16608 was reviewed/approved by NRC for a generic BWR Mark I containment model, therefore approval “on a case-by-case basis” should be removed. The NRC staff agreed with the applicant’s assessment, and the sentence was revised as follows:

*The NRC has previously approved the use of GOTHIC for boiling-water reactor containment analysis.*

2. The last sentence of Section 3.2, Paragraph 1, reads:

*As a conservative measure lumped CVs are typically used as they provide higher pressures, thus introduce safety margins into the design.*

STP commented that a safety margin is the difference between the design limit and failure limit recommended “analysis margins”. The NRC staff agreed with the applicant’s assessment, and the sentence was revised as follows:

*As a conservative measure lumped CVs are typically used as they provide higher pressures, thus introduce analysis margins into the design.*

3. The last sentence of Section 3.2, Paragraph 2 reads:

*The NRC staff found this response to be acceptable because the staff has reviewed containment analysis applications in the past that used GOTHIC 7.2a and found them to be acceptable (ADAMS Accession No. ML0911005210) on a case by case basis.*

Per item #1 above, STP had the same comment. The NRC staff agreed and the sentence was revised as follows:

*The NRC staff found this response to be acceptable because the staff has reviewed containment analysis applications in the past that used GOTHIC 7.2a and found them to be acceptable (ADAMS Accession No. ML0911005210).*

4. Sentences 2 and 3 of Section 3.3, Paragraph 1 reads:

*The three benchmark models consist of the DCD volume model, [ ] volume (of the DCD volume model) without additional losses (DCD flow path coefficients used without including additional mechanical losses), and [ ] volume with additional losses (DCD flow path coefficients used, including additional mechanical losses).*

STP identified the above bracketed information as proprietary. The NRC staff agreed and these items were removed from the public version of the SER.

5. The beginning of the second paragraph of Section 3.2 reads:

*The GOTHIC DCD benchmark model is based on the model provided in the certified ABWR DCD and is composed of six control volumes with two boundary conditions. Figure 5-1 in the topical report displays the node diagram. The benchmark nodding consists of the following:*

- *reactor building steam tunnel (RBST)—two separate lumped control volumes*
- *control building steam tunnel (CBST)—one lumped control volume*
- *turbine building—four separate lumped control volumes.*

STP clarified that this description was for their proprietary representative model and not the model shown in Figure 5-1. NRC Staff agreed and this was rewritten as follows:

*The GOTHIC DCD benchmark model is based on the model provided in the certified ABWR DCD and is composed of six control volumes with two boundary conditions. Figure 5-1 in the topical report displays the node diagram. The benchmark nodding consists of the following:*

- *reactor building steam tunnel (RBST)—one lumped control volume*
- *control building steam tunnel (CBST)—one lumped control volume*
- *turbine building—one lumped control volume.*
- *turbine building steam tunnel (TBST) - two separate control volumes and*
- *atmosphere - one lumped control volume*

6. The third sentence of Section 3.3.1 reads:

*Temperature was conservatively chosen as 140 degrees Fahrenheit (F), initial pressure was set to atmospheric, and the initial humidity was set to zero percent.*

STP clarified that 10 percent was the benchmark in the DCD. NRC Staff agreed.

*Temperature was conservatively chosen as 140 degrees Fahrenheit (F), initial pressure was set to atmospheric, and the initial humidity was set to 10 percent.*

7. The second sentence of Section 3.3.2, Paragraph one reads:

*Cases 2 and 3 of Section 5.0 calculate volume from drawings in the certified ABWR DCD and then conservatively reduce it by.....*

STP cited that Section 6.2 of the DCD was a clearer reference. NRC Staff agreed

*Cases 2 and 3 of Section 5.0 calculate volume from drawings in Section 6.2 of the certified ABWR DCD and then conservatively reduce it by.....*

8. STP identified the following bracketed information as proprietary in Section 3.3.2. The NRC staff agreed and these items were removed from the public version of the SER.

*In WCAP-17065, Section 5, Case 1, the DCD benchmark case uses volume information available in Table 6.2. Cases 2 and 3 of Section 5.0 calculate volume from drawings in the certified ABWR DCD and then conservatively reduce it by [ ]. This reduction in volume is done to account for major equipment and piping. Control volume information for the representative steam tunnel analysis in Section 6.0 is developed using detailed design information.*

*The NRC staff questioned the use of the [ ] reduction factor for Cases 2 and 3 of Section 5.0 during an audit on November 9, 2010, asking whether the [ ] factor creates uncertainty about the actual margin, since the amount of equipment was unknown at the time that WCAP-17065 was written. In the NRC audit report dated February 8, 2011 (ADAMS Accession No. ML110330133), the staff found that the applicant did account for equipment and piping. The calculations were not an exact comparison to the certified ABWR DCD result. These calculations were only a supplement to Case 1 in Section 5.0 of WCAP-17065. The use of the [ ] reduction factor for each room is considered to be acceptable for Cases 2 and 3 of Section 5.0 because the reduction helps determine the appropriate volumes for the case when using drawing information in the certified DCD.*

9. The last sentence of Section 3.3.2, Paragraph 2 reads as follows:

*Reduction factor was used for the representative steam tunnel case in Section 6.0 of WCAP-17065.*

STP suggested the following clarification to this sentence and the NRC Staff agreed:

*The volume reduction factor was used for the representative steam tunnel case in Section 6.0 of WCAP-17065.*

10. STP identified the following bracketed information as proprietary in Section 3.3.3. The NRC staff agreed and these items were removed from the public version of the SER.

The GOTHIC input for [ ] in the associated high-energy line break flow can be adjusted [ ].

The specified droplet [ ]. The staff finds the use of the [ ] to be acceptable because it [ ] and adheres to SRP Section 6.2.1.2 guidance that vent flow behavior through all flow paths and nodalized compartments should be based on a homogeneous mixture in thermal equilibrium with 100-percent entrainment.

[ ]. The staff finds this option to be acceptable because it will [ ] in the break flow and allow more energy to be transported into the break room. It also adheres to an earlier NRC staff finding that the validation of the GOTHIC drop-to-liquid conversion model, as described in the GOTHIC qualification report, is not sufficiently comprehensive to support its use for subcompartment high-energy line break licensing calculations.

However, if an analysis of a room produces subcooled break flow, such as in a reactor water cleanup (CUW) filter demineralizer room, the applicant shall evaluate the use of the nonequilibrium model in GOTHIC in parallel with the drop-to-liquid conversion [ ]. A past NRC SE identified this measure as conservative for breaks with subcooled break flow (ADAMS Accession No. ML041410566). The applicant shall apply the more conservative assumptions after performing an analysis of a break room with subcooled break flow.

11. STP identified the following bracketed information as proprietary in the last paragraph of Section 3.3.4. The NRC staff agreed and these items were removed from the public version of the SER.

All flow paths, with the exception of those attached to boundary conditions, account for compressibility effects within the flow paths. [ ]. This assumption increases the calculated pressure drop through the vent system. The NRC staff considers the use of the [ ] to be an acceptable vent critical flow correlation, which is considered to be conservative in accordance with SRP Section 6.2.1.2.

12. STP identified the following bracketed information as proprietary in the first paragraph of Section 3.3.4.1. The NRC staff agreed and these items were removed from the public version of the SER.

During the audit on November 9, 2010, the NRC staff raised concerns about the acceptability of the use of the [ ] inertia length equation (Equation 2-2 in WCAP-17065). The concern was addressed by the fact that the applicant successfully reproduced already approved certified ABWR DCD results using the GOTHIC model. However, it was noted during the audit that the [ ] inertia length equation was developed as a best estimate equation.

13. STP identified the following bracketed information as proprietary in the first paragraph of Section 3.4. The NRC staff agreed and these items were removed from the public version of the SER.

Section 5 of WCAP-17065 presents the GOTHIC benchmark model and results. Figure 5-1 of WCAP-17065 provides the GOTHIC node diagram for the DCD benchmark analyses. This node diagram is based on Figure 6.2-37b of the certified ABWR DCD. The applicant also provided its results from the DCD benchmark models (DCD volume model, [ ] volume model without additional losses, and [ ] volume model with additional losses) and compared them to certified ABWR DCD results and TMD results.

14. STP identified the following bracketed information as proprietary in the first paragraph of Section 3.5. The NRC staff agreed and these items were removed from the public version of the SER.

Section 6 of WCAP-17065 presents the GOTHIC representative steam tunnel model for STP Units 3 and 4. Figure 6-1 of WCAP-17065 presents the nodalization diagram for the model. This diagram is based on detailed design drawings of STP Units 3 and 4. The Figure 6-1 nodalization diagram is more refined than the diagram presented in Figure 5-1 of WCAP-17065.

[ ]. Figures 6-2 through 6-5 provide the results for an MSLB and a feedwater line break for the representative steam tunnel model.