proj. 711

Westinghouse
Electric Company

Nuclear Systems

Box 355
Pittsburgh, Pennsylvania 15230-0355

DCP/NRC 1481

July 31, 2001

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

References:

1. Letter from J. N. Wilson to M. M. Corletti, "Request for Additional Information for the AP1000 Pre-Application Review," January 30, 2001
2. Letter from A. C. Rae to M. M. Corletti, "Request for Additional Information for the AP1000 Pre-Application Review," May 7, 2001
3. Letter from A. C. Rae to M. M. Corletti, "Request for Additional Information for the AP1000 Pre-Application Review," May 31, 2001
4. Letter from A. C. Rae to M. M. Corletti, "AP1000 Pre-Application Review – Acceptance Review of Codes Submission" June 26, 2001

Attention: Mr. Alan Rae

Subject: AP1000 Pre-Application Review – Acceptance Review of Codes Submission and Responses to Requests for Additional Information pertaining to the AP1000 Pre-Certification Review

Dear Mr. Rae,

The purposes of this letter are to respond to your letter on June 26, 2001 regarding the AP1000 Pre-Application Review – Acceptance Review of Codes Submission (Reference 4) and to provide our responses to the staff's Requests for Additional Information pertaining to the AP1000 Pre-Certification Review that were provided in References 1, 2, 3 and 4. Following receipt of Reference 4, members of the staff and Westinghouse held a teleconference on June 29 to discuss the issue of the NRC's review of the applicability of the WGOTHIC code for use in performing containment analysis for AP1000. To date, Westinghouse has provided the NRC with results of scoping studies performed with a simplified WGOTHIC model and has requested the NRC to review these results to make a determination of the applicability of the WGOTHIC model for AP1000. Our intention, as stated to the NRC staff, is to use the same code for AP1000 as approved for AP600. Based on the discussions with the staff, Westinghouse has agreed to provide analysis results with a WGOTHIC evaluation model that is the same as will be used for the AP1000 safety analysis. Westinghouse will provide these results to assist the staff in making a determination of the applicability of using the WGOTHIC approved evaluation model for AP1000.

Please contact me if you have further questions regarding this issue.

Very truly yours,

M. M. Corletti
Passive Plant Projects & Development

/Attachments

cc: H. A. Sepp, Westinghouse (w/o attachment)

add alan rae to cc's
DO63

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AP1000 PRE-CERTIFICATION REVIEW

REQUEST FOR ADDITIONAL INFORMATION

RAI: P001

Question:

The NRC staff will perform audit analyses as part of its evaluation of the WGOTHIC computer program for the AP1000 design. The AP600 CONTAIN computer program model will be updated to represent the AP1000 containment. Therefore, it is requested that Westinghouse provide the following information to support this effort:

(a) A tabularized comparison of the AP600 WGOTHIC evaluation model to the AP1000 WGOTHIC model listing changes to volumes, heat structures, and junction properties. A listing of the AP1000 WGOTHIC model input files(s).

(b) A time-dependent table of the passive containment cooling system (PCS) water flow, providing (1) the actual PCS flow rate from the storage tank, (2) the evaporation-limited flow rate used in WGOTHIC, and (3) the wetted surface area fraction for the first 72 hours following accident initiation. The table should identify the delay time from the initial start of the PCS flow to the time the exterior shell of the containment is considered to be covered and credited in the analyses.

(c) Time-dependent tables (with, or, an electronically readable version) of the limiting SATAN-based LOCA and the limiting LOFTRAN-based MSLB mass and energy releases for the AP1000 licensing analyses.

Westinghouse Response:

Westinghouse has provided the information requested in this RAI in Westinghouse letters DCP/NRC1471 dated 2/16/2001, DCP/NRC1476, dated 4/17/2001, and DCP/NRC1479 dated 7/10/2001.

AP1000 PRE-CERTIFICATION REVIEW

REQUEST FOR ADDITIONAL INFORMATION

RAI: P002

Question:

The NRC staff will perform audit analyses using RELAP5 for selected design basis transients and accident scenarios for AP1000. Currently we plan to analyze a small break LOCA and a main steam line break both from full initial power. The results will be compared with the predictions of NOTRUMP and LOFTRAN as a verification that the codes are not being used outside the range of conditions for which they were evaluated during the AP600 review. Please provide the following AP1000 data:

Reactor Vessel

- Volume of lower plenum
- Height of lower plenum
- Bottom elevation of downcomer
- Inlet plenum mixing fractions for use in analysis of asymmetric loop transients and accidents

Reactor Coolant Pump

- Volume of pump
- Area
- Rated pump velocity
- Rated torque
- Moment of inertia
- Single and two-phase homologous curves
- Two-phase difference homologous curves
- Steam Generator
- Height of bottom of tube bundle above tube sheet at u-bend
- Length of longest and shortest tube
- Volumes and flow areas in downcomer and shell sides vs. elevation
- Separator flow areas and volumes
- Circulation ratio at 102% power
- K-factor, area, velocity and delta P for inlet nozzle, tube entrance, tube friction, tube bends, tube exit and outlet nozzle
- Secondary side pressure drops at full load
- Downcomer full power liquid level height above tube sheet
- Inlet and outlet plenum volumes; inlet and outlet nozzle CL elevations
- Total secondary volume
- Steam generator liquid mass at full power and hot standby
- Size of flow venturies in main steam lines

Reactor Core

- Moderator reactivity vs density (most positive MTC)
- Moderator reactivity vs density (most negative MTC)
- Doppler reactivity vs fuel temperature (least negative)
- Doppler reactivity vs fuel temperature (most negative)
- Reactivity feedback from boron for main steam line break analysis
- Scram rod reactivity vs rod position
- Scram rod position vs time
- Fuel centerline temperature, average temperature, and minimum gap conductance vs kw/ft for hot and average rod
- Rod fill gas pressure at min. gap conductance for hot and average rod
- Axial peaking factor vs position for most limiting top peaked power distribution
- Min. and Max. beta effective tables with corresponding neutron lifetime and decay constants
- Pressure drop across core; friction and geometry; spacer grid k-factors/location of spacer grids
- Core bypass volume, flow areas, and pressure drop

Pressurizer

- Pressurizer liquid volume at 102% power
- Boron Concentrations
- Initial boron concentrations in core, CMTs, and accumulators for main steam line break analysis

Westinghouse Response:

Westinghouse has provided the information requested in this RAI in Westinghouse letters DCP/NRC1471 dated 2/16/2001, DCP/NRC1476, dated 4/17/2001, and DCP/NRC1479 dated 7/10/2001.

AP1000 PRE-CERTIFICATION REVIEW

REQUEST FOR ADDITIONAL INFORMATION

RAI: P003

Question:

For the AP600 essentially no credit was allowed for heat transfer through the dome, i.e. AP600 used 115 ft^2 for the dome surface area, while AP1000 will use 5,200 ft^2. The dome size has not changed. If the increased dome area is to be used, how does Westinghouse intend to provide the additional information to justify the heat transfer models used on the dome surfaces?

Westinghouse Response:

Westinghouse does not use an input value of 115 ft^2 for the AP600 dome surface area in the WGOTHIC AP600 containment DBA evaluation model. The clime heat transfer area input values are documented in Section 4.4 of WCAP-14407, rev. 3. For the first clime (top of dome to 2^{nd} weir), the 4 wet stack areas sum to 5200 ft^2 and the 4 dry stack areas sum to 520.8 ft^2.

The AP600 single above deck volume model that was informally sent to NRC for comparison to the AP1000 single above deck volume model contained an error. The external temperature value of 115°F was inadvertently placed into the surface area input table instead of the correct clime area, 5200 ft^2. The value was never used in a calculation and should not be used for comparison to the AP1000 single above deck volume model.

AP1000 PRE-CERTIFICATION REVIEW

REQUEST FOR ADDITIONAL INFORMATION

RAI: P004

Question:

Since Westinghouse will be using a WGOTHIC model with multiple nodes inside the containment above the operating deck (consistent with the approved AP600 model and methodology) the NRC is not clear on the merit of reviewing the single node model results. Are there some insights or benefits that Westinghouse believes we would obtain by reviewing the "single node above the operating deck" WGOTHIC model? Consider the following points:

P4 (a) In the AP600 application there were 7 active climes of approximately the same height. For the AP1000 preliminary WGOTHIC model, the 7th clime was increased in height to add the additional 25.5 ft of containment height, while the height of the remaining climes was unchanged. Does Westinghouse intend to use this same approach of unequal clime height for the licensing analysis, or will approximately equal height climes be used?

P4 (b) The shell temperatures for the steam line break rather quickly exceed the boiling temperature on the outside of the shell. The results of a sensitivity study with no PCS water were shown. Does this mean that Westinghouse will take no credit for PCS water in the steam line break licensing analysis, and only credit heat transfer through the dry shell? Given the high temperature how will Westinghouse justify compliance with GDC 38?

P4 (c) The preliminary AP1000 analysis uses the AP600 337 second delay for credit of the PCS water. Given the 6% increase in flow coupled with the increased 20 to 35% increase in wetted surface area for full coverage (90% of the shell), it appears that the delay time for the AP1000 should be 20 to 60 seconds longer. Under LOCA conditions could the surface temperature exceed the boiling point? Would the WGOTHIC computed surface temperatures be different for the one node versus multi-node model?

P4 (d) It is not clear whether heat transfer through the dome or establishment of water coverage with boiling will be included in the final WGOTHIC model. If these phenomena are to be included, the NRC will need to know how these phenomena were addressed in the PIRT and why the current mass and heat transfer correlations are still appropriate.

Westinghouse Response:

Westinghouse has internal documentation that demonstrates the AP600 transient containment pressure and temperature results from a single above deck volume model are similar to the same as the results from a multiple above deck volume model. For the AP1000 containment scoping analyses, the benefits of modeling the above deck region with a single volume are:

1. It reduces the effort required to make model input changes (due to changes in the containment design),
2. It reduces the potential for introducing errors while making input changes, and
3. It reduces the computation time required for the containment pressure and temperature response analyses.

In our teleconference with the staff on 6/29/01, Westinghouse committed to provide the staff with a description of the proposed AP1000 containment evaluation model (which would be similar to the approved AP600 containment evaluation model) and preliminary analysis results from this model. Westinghouse proposed modifying the PCS water coverage delay time input value to address the NRC concern that the calculated AP1000 dry shell temperature could exceed the boiling point before steady state water coverage would occur. It was agreed that the preliminary analysis results (using the revised AP1000 evaluation model) should be sufficient to allow the staff to determine the applicability of the WGOTHIC model for use on AP1000. Therefore, there is no merit in reviewing the single node model results further.

P4a Westinghouse intends to use approximately equal height climes in the AP1000 containment evaluation model. An 8^{th} active clime (and associated volumes) will be added to represent the increase in the cylindrical shell height of the AP1000.

P4b Westinghouse will credit the PCS water flow in the AP1000 containment DBA analyses for both the LOCA and MSLB events. The purpose of the sensitivity study presented in WCAP-15612 was to demonstrate that for the MSLB event, the peak containment pressure was not very dependent on evaporation heat removal from the PCS.

Figure 3.4-9 of WCAP-15612 presents the AP1000 scoping analysis results for the shell inside surface temperature transient of a representative clime during an MSLB event. Figure P004-1 presents a comparison of the Clime 4 inside and outside shell surface temperature transients from the scoping analysis model. The application of PCS water causes the outer surface temperature to rapidly decrease and subsequently remain below the boiling point. As shown in Figure P004-2, the AP1000 wet shell temperature response for the MSLB event is similar to the AP600.

P4c The wetted area on the outside surface of the containment shell increases with time after PCS actuation as the dams fill and water spills over the weirs. Westinghouse does not model the water coverage transient and conservatively assumes no PCS flow during the estimated (337 second) time period required to establish steady state PCS flow over the weirs and water coverage on the shell surface in the AP600 containment evaluation model. This same delay time input value was used for the AP1000 scoping analysis.

As stated above, Westinghouse committed to provide the staff with a description of the proposed AP1000 containment evaluation model (which would be similar to the approved AP600 containment evaluation model) and preliminary analysis results from this model. In that model, a new delay time will be determined based on the

methodology and approach used to determine the AP600 delay time. The revised AP1000 delay time will be provided to the staff.

P4d As described in item P3 above, heat transfer through the dome was modeled in the WGOTHIC AP600 containment evaluation model. This same approach will be used for the WGOTHIC AP1000 containment evaluation model.

Currently, the water coverage transient, including the potential boiling heat transfer from the leading edge of a film that is advancing into a hot, dry area is not modeled. Continuous boiling of the PCS liquid film is not expected to occur for any potential passive containment DBA due to the relatively low heat flux. Therefore, Westinghouse does not intend to include correlations for boiling heat transfer to the PCS film in the evaluation model.

Figure 004-1

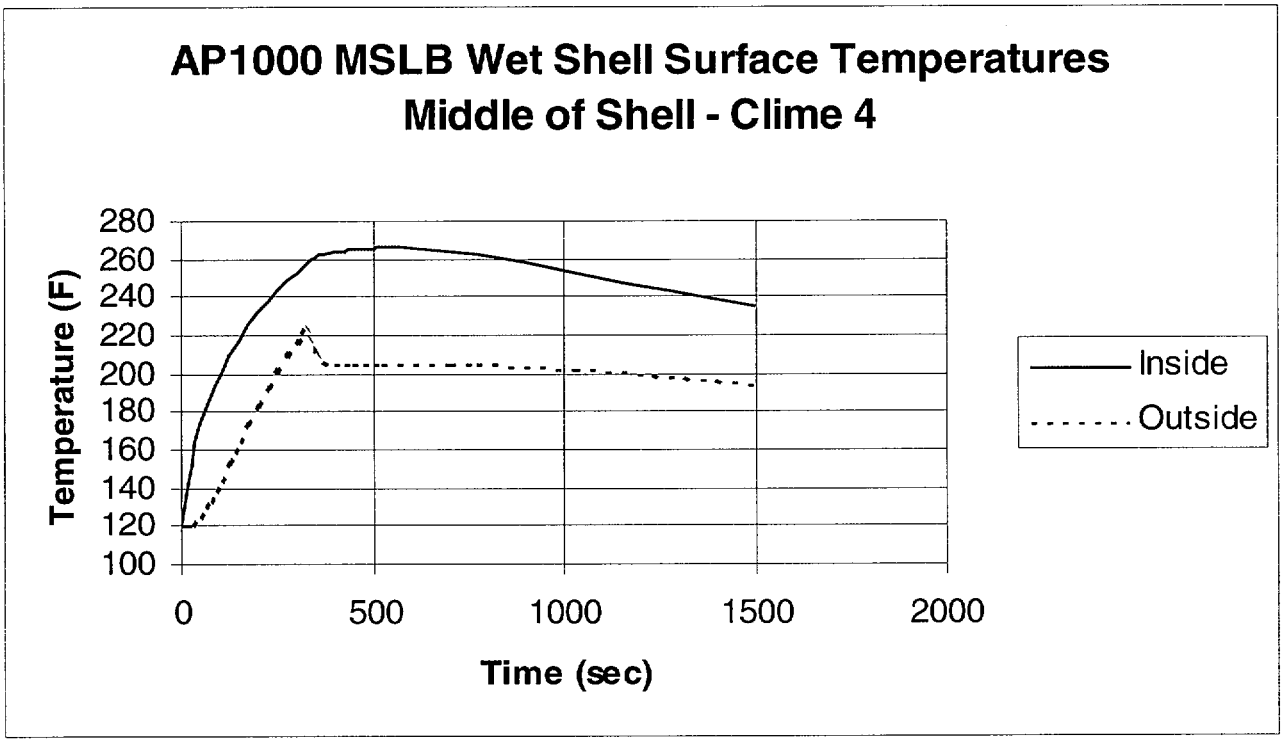
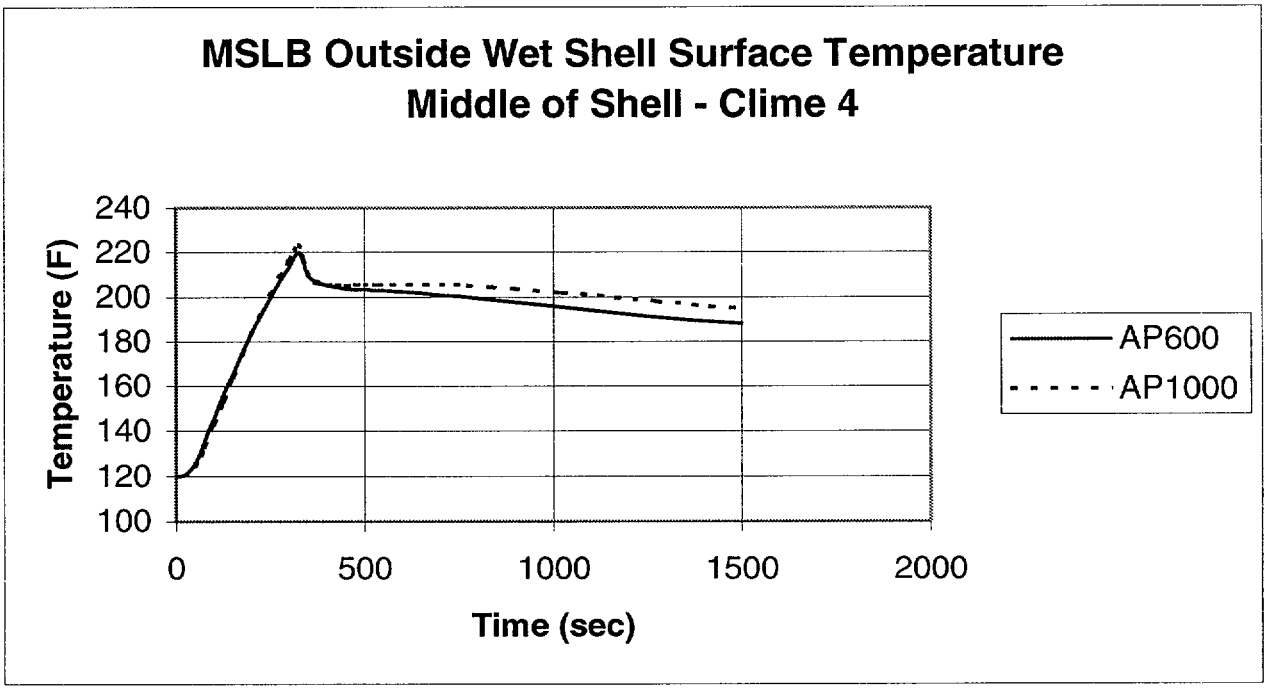


Figure 004-2



AP1000 PRE-CERTIFICATION REVIEW

REQUEST FOR ADDITIONAL INFORMATION

RAI: P005

Question:

(p 5.7) It is stated that the examination of the Phenomena Identification and Ranking Table (PIRT) did not identify new phenomena. Was boiling on the outside of the shell considered? If not, why not, since it will occur for the AP1000, but not for the AP600.

Westinghouse Response:

Boiling heat transfer from the external shell surface was not considered in either the AP600 or AP1000 PIRT. Continuous boiling of the PCS liquid film is not expected to occur for any potential passive containment DBA due to the relatively low heat flux.

The wetted area on the outside surface of the containment shell increases with time after PCS actuation as the dams fill and water spills over the weirs. Westinghouse does not model the water coverage transient and conservatively assumes no PCS flow during the estimated time period required to establish steady state PCS flow over the weirs and water coverage on the shell surface.

The temperature of the dry area of the containment shell will increase with time after the LOCA or MSLB event. Westinghouse has committed to provide the staff with a description of the proposed AP1000 containment evaluation model (which would be similar to the approved AP600 containment evaluation model) and preliminary analysis results from this model. In that model, a new delay time will be determined based on the methodology and approach used to determine the AP600 delay time. The revised AP1000 delay time will be provided to the staff.

AP1000 PRE-CERTIFICATION REVIEW

REQUEST FOR ADDITIONAL INFORMATION

RAI: P006

Question:

(p 5-7) The statement is made that "The Large Scale Test (LST) was well scaled for steady-state." This an overstatement. Where a similar statement was made on page 4-76 of WCAP-15613, *AP1000 PIRT and Scaling Assessment*, this is qualified by:- "component level distortions in the LST were addressed by using local measurements of temperature, concentration and velocity from the LST in the quasi-steady-state phase. Therefore, the steady-state LST data was determined to be acceptable for use as a source of separate effects data for water coverage and internal condensation". However our previous evaluation, set out in the SER (NUREG-1512, Vol. 2, section 21.6.5.5.4.3) is that the LST data was considered to be of little use in directly validating WGOTHIC from a system perspective, though use of the LST data was considered acceptable to validate the conservative multipliers for local conditions correlations. The SER did not state that the LST was well scaled for steady-state. Will you therefore please provide justification for your claim.

Westinghouse Response:

The text in WCAP-15644 regarding the quality of the LST scaling will be changed to be consistent with the statement made in WCAP-15613.

AP1000 PRE-CERTIFICATION REVIEW

REQUEST FOR ADDITIONAL INFORMATION

RAI: P007

Question:

(p 5-7) It is stated that the test data for the riser region of the annulus covered the Grashof (Gr) and Reynolds (Re) numbers for the upper range for the AP1000. Table 4.2-2 of WCAP-15613 confirms that it does for the riser, but not for the chimney. The chimney Gr is 2 orders of magnitude greater than the data, while the Re is an order of magnitude greater. Also, did the riser Re and Gr consider added steam/droplets from boiling and evaporation, or only the air flow?

Westinghouse Response:

The test data does not cover the range of the Gr and Re numbers in the chimney region for either the AP600 or AP1000. Westinghouse conservatively does not use the clime heat and mass transfer correlations in the chimney region.

The riser Re and Gr numbers consider the affect of steam being added to the air flow due to evaporation from the shell. Vapor mass addition due to boiling, and liquid mass addition due to drop entrainment in the riser were not considered when estimating the operating ranges for either AP600 or AP1000.

AP1000 PRE-CERTIFICATION REVIEW

REQUEST FOR ADDITIONAL INFORMATION

RAI: P008

Question:

(p 5-8) It is stated that the maximum heat flux range is covered by the data. In the boiling mode the heat flux will be very high. Please explain why you consider that the data covers this range? Only limited and qualitative water film formation testing was performed at surface boiling conditions (using the six foot long Flat Plate Test facility). No quantitative data at the high surface temperatures typical of boiling conditions was used to derive the conservatism factors for the WGOTHIC heat and mass transfer correlations.

Westinghouse Response:

Evaporation is the primary mode of heat rejection for both the AP600 and AP1000 containment shells. Local edge-effect boiling may occur as the film advances into a dry portion of the shell while trying to establish steady state coverage, however, Westinghouse does not model or credit this mode of heat and mass transfer.

AP1000 PRE-CERTIFICATION REVIEW

REQUEST FOR ADDITIONAL INFORMATION

RAI: P009

Question:

The staff requests that Westinghouse provide the results of calculations of the limiting LOCA and the limiting main steam line break accident done with the approved model. In particular, provide plots vs. time of the pressure, containment atmosphere temperature, mass and energy release and heat transfer coefficients on the inside and outside the containment.

Westinghouse Response:

Westinghouse is in the process of creating an AP1000 containment model that is similar to the approved AP600 containment evaluation model with multiple above deck volumes and 8 active climes. The requested mass and energy release input data and containment transient response output data will be provided after this model has been completed.

AP1000 PRE-CERTIFICATION REVIEW

REQUEST FOR ADDITIONAL INFORMATION

RAI: P010

Question:

The assessment analyses do not conform with the restrictions and requirements placed on the use of WGOTHIC for passive containment cooling system (PCCS) evaluations, nor are some of the mass and energy releases consistent with the current approved licensing approach. The nodal model is not consistent with the prescribed modeling practices developed by Westinghouse for the use of the WGOTHIC computer program for passive containment cooling system licensing evaluation. The boundary conditions (driving mass and energy, PCCS water flow rates and evaporation surface areas) are non-conservative with respect to the above prescribed modeling practices. The AP600 application of WGOTHIC took essentially no credit for evaporation on the surface of the dome, therefore if credit for dome evaporation is sought for the AP1000 Design Basis Accident analysis then justification for this will need to be provided. The staff cannot conclude from the results of the analyses presented that containment shell temperatures and PCCS film temperatures will not exceed 212 °F. The mass and heat transfer correlations do not account for film boiling, a potential new phenomena for the AP1000, onset of which would cause a discontinuity in the PCS performance. The NRC staff believes that a WGOTHIC model and results for the AP1000 design based on the approved AP600 evaluation model must be provided before a meaningful evaluation can be carried out.

Westinghouse Response:

Westinghouse agrees that the assessment analyses did not conform with some of the restrictions and requirements placed on the use of WGOTHIC for passive containment cooling system (PCCS) evaluations. As part of the assessment analyses, Westinghouse provided sensitivity cases to the SG heat release assumption in the LOCA mass and energy releases; some of these cases were not consistent with the currently approved licensing approach.

This RAI incorrectly states that the WGOTHIC AP600 application takes "essentially no credit for evaporation on the surface of the dome". As described in our response to RAI-P3, the WGOTHIC AP600 model assumes evaporation from 5200 ft^2 of the first clime (top of the dome down to just below the second weir). Since the dome of the AP1000 is identical to the AP600, this same water coverage input value is being proposed for the WGOTHIC AP1000 containment evaluation model.

In our teleconference with the staff on 6/29/01, Westinghouse committed to provide the staff with a description of the proposed AP1000 containment evaluation model (which would be similar to the approved AP600 containment evaluation model) and preliminary analysis results from this model. Westinghouse proposed modifying the PCS water coverage delay time input value to address the NRC concern that the calculated AP1000 dry shell temperature could exceed the boiling point before steady state water coverage would occur. It was agreed that the preliminary analysis results (using the revised AP1000 evaluation model) should be sufficient to allow the staff to determine the applicability of the WGOTHIC model for use on AP1000.

AP1000 PRE-CERTIFICATION REVIEW

REQUEST FOR ADDITIONAL INFORMATION

RAI: P011

Question:

In support of the Westinghouse determination that there is no need to account for new phenomena for the AP1000, the containment assessment analyses provided in WCAP-15612 are used as supporting information in WCAP-15613. In WCAP-15613 it is stated that the "PCCS film temperature increases to over 200 °F, but it was not predicted to reach the boiling point." For the AP600, Westinghouse provided supporting information to confirm that the shell temperatures would not exceed 188 °F. Westinghouse needs to provide the results from an acceptable passive containment cooling system licensing evaluation to the staff to support the conclusion that shell temperatures in excess of the boiling temperature will not occur, or provide supporting evidence that the water coverage assumed is applicable to boiling conditions, and that the effects of boiling on PCCS film flow stability have been calculated with a validated model.

Westinghouse Response:

In our teleconference with the staff on 6/29/01, Westinghouse committed to provide the staff with a description of the proposed AP1000 containment evaluation model (which would be similar to the approved AP600 containment evaluation model) and preliminary analysis results from this model. Westinghouse proposed modifying the PCS water coverage delay time input value to address the NRC concern that the calculated AP1000 dry shell temperature could exceed the boiling point before steady state water coverage would occur. It was agreed that the preliminary analysis results should be sufficient to allow the staff to determine the applicability of the WGOTHIC model for use on AP1000.

AP1000 PRE-CERTIFICATION REVIEW

REQUEST FOR ADDITIONAL INFORMATION

RAI: P012

Question:

The NRC staff reviewed the NAI GOTHIC 4.0 manuals during the AP600 review and found errors. Westinghouse provided markups as to their interpretation of what the errors were and said they forwarded the information to NAI for consideration. Westinghouse needs to provide the NAI response, as the staff does not know how or if they were resolved. At this time, the base-GOTHIC documentation contains known errors.

Westinghouse Response:

As documented in the Westinghouse responses to AP600 RAIs 480.463, 480.468, 480.472, 480.473, and 480.476, errors in, and / or clarification to the GOTHIC manual was investigated, and their impact (if any) on the AP600 evaluation model was described to the NRC in these responses. In the letter from T. L. George, NAI to J. Woodcock, Westinghouse, March 19, 1997, NAI provided clarifications of the discrepencies in the GOTHIC Technical Manual. Pertinent portions of this letter were provided to the NRC in the responses to the RAIs as necessary to resolve the individual RAIs. Westinghouse plans on using the same WGOTHIC evaluation model as approved for AP600, with those changes as necessary to accommodate the physical changes of the AP1000, as described in WCAP-15644.

AP1000 PRE-CERTIFICATION REVIEW

REQUEST FOR ADDITIONAL INFORMATION

RAI: P013

Question:

The WGOTHIC 4.2 code approved for the evaluation of the AP600 is based on the GOTHIC 4.0 code. Considerable GOTHIC development and assessment efforts have occurred since GOTHIC 4.0 (the current version is GOTHIC 7.0). These efforts have led to the discovery and correction of a number of errors and deficiencies in the GOTHIC program, some of which may significantly affect the AP1000 (and AP600 as well) containment analysis results. For example, drop behavior models have been significantly changed and improved in GOTHIC 6.0 and 7.0 to correct overestimates in droplet entrainment and deposition. Westinghouse needs to provide a list of the significant GOTHIC changes and error corrections since GOTHIC 4.0 and identify whether these changes have (or will be) been factored into the WGOTHIC code and model, and what potential impact these changes could have on the AP1000 containment analysis results.

Westinghouse Response:

Westinghouse has performed internal evaluations of these known errors in GOTHIC and has made a determination of their impact on containment analysis results performed for the AP600. A summary of these assessments and their potential impact on the AP1000 containment analysis results will b provided in a revision to WCAP-15644. Westinghouse internal procedures require that Westinghouse evaluate identified errors that could impact safety analysis results performed by Westinghouse.

As discussed in section 5.8 and Appendix 9A of WCAP-14407 Rev. 3, Westinghouse justified the use of a conservative approach to modeling droplets with the AP600 WGOTHIC evaluation model. Westinghouse intends to use the same conservative approach for AP1000.

AP1000 PRE-CERTIFICATION REVIEW

REQUEST FOR ADDITIONAL INFORMATION

RAI: P014

Question:

Westinghouse uses the AP600 scaling study to support the AP1000. However, the staff and Westinghouse agreed during the AP600 review that the Large Scale Test (LST) was not properly scaled for transient situations. The LST is only valid for steady-state, as acknowledged by Westinghouse in WCAP-15612. In WCAP-15613, Table 2.6-1, Westinghouse refers to the "Transient Phase Scaling Parameter Comparison." Westinghouse needs to clarify the purpose of the table as there is apparently no value-added to the report with this information.

Westinghouse Response:

Table 2.6-1 documents the AP1000 PIRT for containment performance following design basis accidents. It is provided for completeness, to document that the AP600 PIRT and AP1000 PIRT for containment performance is the same.

Table 4.2-1, "Transient Phase Scaling Parameter Comparison" provides the basis for the use of the LST to provide test data to support steady-state separate effects phenomena for both the AP600 and AP1000. It also provides documentation that the LST is not well-scaled for blowdown, transient, condensation, and convective energy transfer for either the AP600 or the AP1000.

AP1000 PRE-CERTIFICATION REVIEW

REQUEST FOR ADDITIONAL INFORMATION

RAI: P015

Question:

The expert's review process is not described. Please provide a summary of the expert's reasoning behind there being no changes at the 'Component or Volume' level as used in Table 2.6-1 of WCAP-15613.

Westinghouse Response:

The expert review process for AP1000 consisted of a review of the AP600 PIRTs for application to AP1000. To accomplish this review, the experts were furnished with AP600 PIRT tables, drawings depicting the geometric scale and physical arrangement of the AP1000, and important AP1000 plant parameters (i.e. core power, etc.). Given this information, the experts performed their review and provided written comments. Where needed, follow-up phone conversations were held. A summary of the comments received from the expert's review is provided in the response to RAI P026.

The experts provided reasoning only where potential changes were recommended for AP1000; explicit reasoning was not provided to justify "no change" from an AP600 PIRT ranking. Based upon discussions with reviewers such as Dr. P. Peterson, the main reason for no changes in the containment PIRTs is that AP1000 is essentially an AP600 at a larger geometric scale. As such, the important phenomena are still expected to be important and no new phenomena are expected relative to AP600. The only real difference is the geometric scale and hence the difference between AP600 and AP1000 is expected to be a matter of scaling which is appropriately addressed in WCAP-15613.