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NTD-NRC-95-4485
DCP/NRC0345
Docket No.: STN-52-003

June 14, 1995

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

ATTENTION: T. R. QUAY

SUBJECT: **AP600 THERMAL/HYDRAULIC UNCERTAINTY DELIVERABLES FOR TASKS 1 AND 4**

Dear Mr. Quay:

The AP600 thermal/hydraulic uncertainty evaluation as presented in the AP600 Thermal/Hydraulic Uncertainty Task and Milestone Description report (Westinghouse letter to NRC dated May 8, 1995, NTD-NRC-95-4455), outlined the 10 steps to resolving this issue. The NRC provided comments on the information presented in the milestone description report, and a telecon was held to gain closure on the milestone descriptions. The first of three enclosures to this letter provides the agreed upon wording for the milestone descriptions. The second enclosure is the draft deliverable that Westinghouse is to provide to the NRC by June 15, 1995. Specifically, the enclosures include the following items:

Enclosure 1 — "AP600 Thermal/Hydraulic Uncertainty Task and Milestone Descriptions" A telecon was held between Westinghouse and NRC on June 7, 1995 to discuss the NRC's final set of comments on the milestone descriptions for the T/H uncertainty evaluation. This enclosure provides the agreed upon wording, and it completes the Task 1 deliverable, "develop milestone list."

Enclosure 2 — "Defining a Systematic Process for T/H Parameter Identification" This enclosure pertains to Task 4. It describes the process for the systematic identification of AP600 plant and MAAP4 code T/H parameters in the MAAP4 analyses.

Enclosure 3 — This enclosure is a page change to the Task 2 deliverable that was transmitted to the NRC on May 31, 1995. This revision is based on a change in direction that was arrived at in developing Task 4.

Per the agreed upon schedule outlined in the Westinghouse letter dated May 8, 1995, the NRC is to review and provide all comments to Westinghouse on Enclosure 2 by June 28, 1995.

Please contact Brian A. McIntyre on (412) 374-4334 if you have any questions concerning this transmittal.

Nicholas J. Liparulo, Manager
Nuclear Safety Regulatory and Licensing Activities

/nja

Enclosures

cc: J. Donohew, NRC
M. Franovich, NRC
B. A. McIntyre, Westinghouse

ENCLOSURE 1

AP600 Thermal/Hydraulic Uncertainty Task and Milestone Descriptions

The planned tasks and milestones are depicted in Figure 1. Each item in Figure 1 is assigned an identifier using the following notation. The first digit identifies the item as either a task (T) or a milestone (M). The next digit is the task/milestone number, and the last digit denotes responsibility, either Westinghouse (W) or NRC (N).

The following provides a brief definition of each of the tasks. The corresponding milestones are generally transmittals (which may include telephone discussions and/or meetings) of the results of the tasks, and are not described here.

Task 1: Develop Milestone List

The objective of Task 1 is to develop this task list. The list will be submitted to the NRC for review and comment. Once the list is finalized it will provide the means of tracking the progress of the T/H Uncertainty Assessment.

Task 2: Prepare Program Definition and Binning Criteria with Examples

The objective of Task 2 is to document the approach Westinghouse presented on April 20, 1995 to the NRC for addressing T/H uncertainty and to provide a description and an example of the binning process that will be used to reduce the number of sequences that must be examined. The criteria Westinghouse plans to use for binning of sequences and for justifying the bounding sequence selection will be provided to the NRC for review and comment with an example. This will demonstrate how the Westinghouse approach relates to the NRC Margins Approach to resolving the issue of passive system reliability.

Task 3: Complete PRA Appendix A Revision with Baseline Cases

The objective of Task 3 is to incorporate NRC comments into the AP600 MAAP4 analyses for success criteria (Appendix A of PRA revision 2) . Appendix A will be updated to incorporate the formal process Westinghouse presented to the NRC on March 30, 1995 for selection of baseline success criteria. The revised Appendix A will be provided to the NRC for review and comment.

Task 4: Define a Systematic Process for T/H Parameter Identification

The objective of Task 4 is to define a process for the systematic identification of the AP600 plant and MAAP4 code T/H parameters in the MAAP4 analyses. In order to define this process, the PIRT for WCOBRA/TRAC will be reviewed. The selection of the T/H parameters for the MAAP4 analyses will not be as rigorous as the PIRT for the design basis codes, but the review will provide a starting point for defining the process. A preliminary concept for the process involves feedback between the selection of the parameters and bounding values (Tasks 6 and 7) and the MAAP4

benchmarking process with the design basis NOTRUMP analysis (Task 8) for the cases identified in Task 5. The flowchart in Figure 2 illustrates the preliminary concept. A full description of the process will be provided to the NRC for review and comment.

Task 5: Identify Cases for Benchmarking the T/H Uncertainty Assessment

The objective of Task 5 is to establish the final set of bins to be examined in later tasks, based on the preliminary binning identified in Task 2, and then to define the cases and the hardware configurations for the NOTRUMP (design basis assumptions) benchmarking cases. MAAP4 analyses with bounding T/H values will be compared to the NOTRUMP cases to demonstrate that the MAAP4 analyses bounds the T/H uncertainty (Task 8). It is desirable that the NOTRUMP runs be completed at the beginning of the selection of MAAP4 T/H parameters and their bounding values (Tasks 6 and 7) since the NOTRUMP analyses require a long time to complete, and the results provide a basis for determining the values of the MAAP4 T/H parameters (Task 7). Figure 2 illustrates how Task 5 fits into the process of selecting T/H parameters and bounding values.

- It is anticipated that two cases are required. The first case will examine T/H conditions for sequences in which the RCS pressurizes prior to ADS (small LOCA and transient) and the second case will examine sequences in which the RCS depressurizes prior to ADS (intermediate or medium LOCA). Applicability of the benchmark cases to other bins will be demonstrated. Other NOTRUMP cases may be performed to fully cover the T/H uncertainties in each bin.

- The cases will be selected such that they result in success including limited core uncovery.

- The hardware configuration for the benchmark cases will be determined by running MAAP4 analyses with AP600 plant parameters (line resistances, water levels, temperatures, etc.) and decay heat set to bounding values. These values are already known and available in the design basis analyses. The MAAP4 code T/H parameters will not be set to bounding values at this time since they will not yet be defined.

The case definitions for the T/H uncertainty benchmarking will be provided to the NRC at the conclusion of this task for review and comment. Further MAAP4 benchmarking against best-estimate codes will also be performed, but this is not part of the passive systems reliability effort and is not included in this task.

Task 6: Identify T/H Parameters to be Modeled

The objective of Task 6 is to identify the MAAP4 code parameters that will be set to bounding values for the T/H uncertainty analyses. The parameter identification process defined in Task 4 will be implemented to determine the AP600 plant and MAAP4 code parameters. All of the parameters identified in task 6 are to be set to bounding values.

Task 7: Define Bounding Values for the T/H Uncertainty

The objective of Task 7 is to define the bounding values of the MAAP4 T/H parameters identified in Task 6. Ranges and bounding values of parameters will be determined and justified based on one or more of the following sources:

- the definition and ranges of code modeling parameters in the MAAP4 code documentation,
- review of values of similar parameters in the design basis codes (WCOBRA/TRAC and NOTRUMP),
- from ranges of parameters provided by the core and systems designers and specified in ITAAC,
- benchmarking against the NOTRUMP code (Task 8).

Consideration of interactions between parameters will be included in the selection of bounding values. The benchmarking of the cases identified in Task 5 will provide the final justification of the bounding values selected for the MAAP4 T/H parameters. The plant and code T/H parameters and bounding values will be provided to the NRC for review and comment along with the benchmarking (Task 8).

Task 8: Perform MAAP4 T/H Uncertainty Benchmark

The objective of Task 8 is to demonstrate that the MAAP4 code with bounding T/H parameters bounds the T/H uncertainty. The design basis analyses models bound the thermal-hydraulic uncertainties in the system response and therefore provide a reasonable benchmark. MAAP4 with bounding T/H parameters and NOTRUMP with design basis assumptions will be compared to show reasonable agreement for cases determined in Task 5. Reasonable agreement is defined as producing the same overall conclusions with respect to core uncovery and the success of the sequence (i.e. no core damage). The uncertainty benchmark process will also provide input into the selection of the bounding values of the T/H parameters in Task 7 (see Figure 2). The results of the uncertainty benchmarking will be provided to the NRC for review and comment.

Task 9: Perform and Document Sample T/H Uncertainty Assessment

The objective of Task 9 is to provide a sample assessment to the NRC for review and comment on methodology and documentation. The information developed in the preceding tasks will be used to generate an assessment of the impact of T/H uncertainty for a sample sequence. The methodology will include the following:

- initial sequences will be based on the success criteria baseline cases with conservative hardware assumptions.
- success for the bounding sequences is defined as a peak cladding temperature less than 2200°F; as an objective, extended core uncovery will be avoided for success. The definition of extended core uncovery will be provided along with a database supporting the definition.
- sequences with less conservative hardware assumptions than the baseline sequences will be analyzed to preclude extended core uncovery. The impact of limiting success to less conservative hardware assumptions will be calculated to demonstrate the low probability of failure resulting from the less conservative assumptions.

Task 9 will test the methodology and illustrate its use in the cases chosen in Task 5 for the MAAP4 uncertainty benchmarking effort. The NRC review will provide comments on the methodology prior to the final analyses of the T/H uncertainties. The methodology will be extended, in Task 10, to all bounding sequences identified by the binning of Tasks 2 and 5.

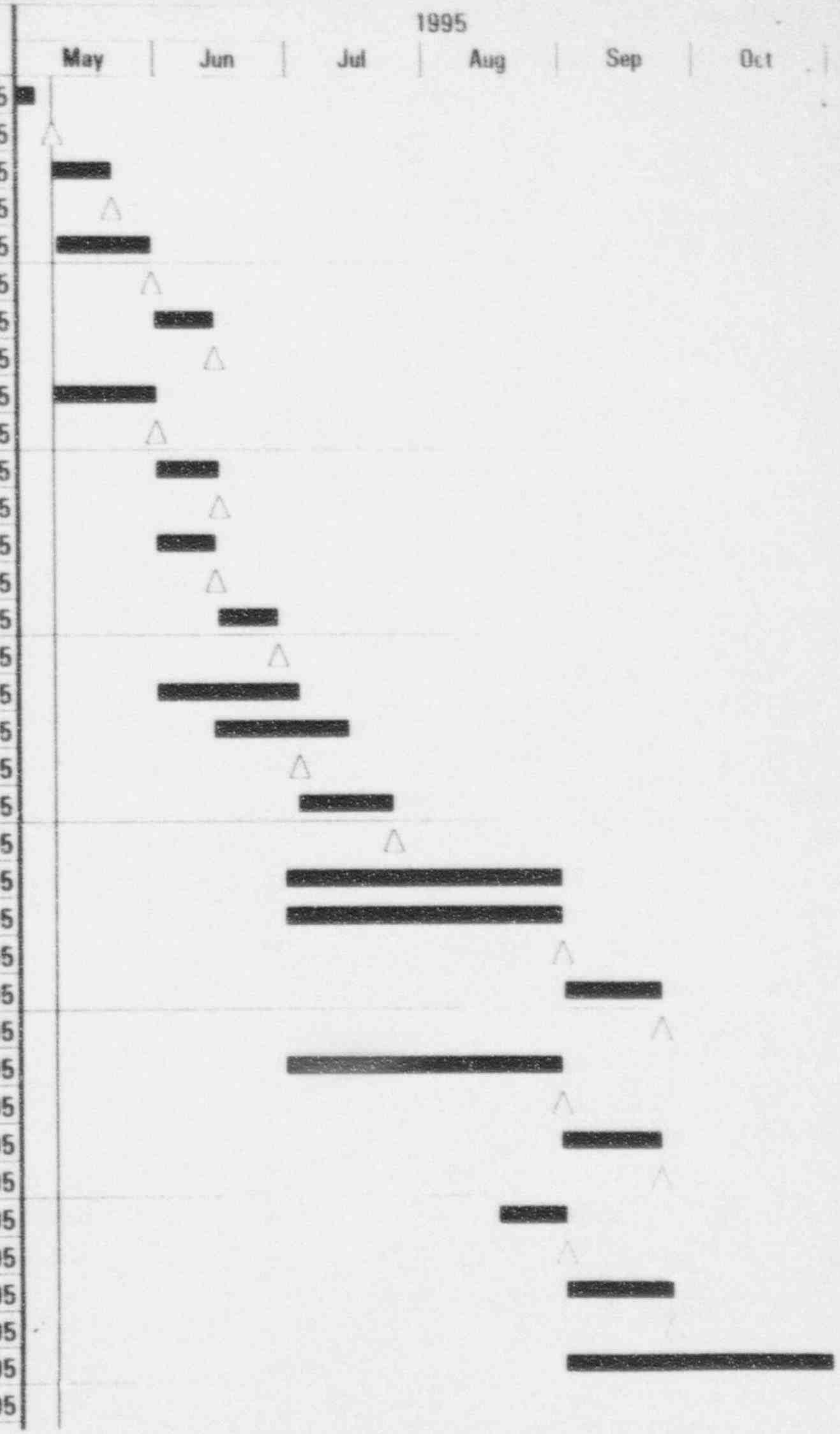
Task 10: Prepare/Document T/H Uncertainty Assessment

The objective of Task 10 is to produce the final T/H Uncertainty Assessment and documentation. Once any major comments are resolved on Task 9, the complete assessment for all bins will be performed and documented in the manner of the sample assessment (Task 9). If the inclusion of T/H uncertainty requires that system success criteria be modified, any impact on the PRA results will be evaluated and addressed in the documentation. Significant impact on the PRA results will result in a revision of the PRA.

Figure 1

AP600 T/H Uncert. Assessment Schedule

Task ID / Description	Start Date	End Date
T1W: Develop Milestones List	May-01-95	May-05-95
M1W: Provide Milestones to NRC for Revw & Comment	May-09-95	May-09-95
T1N: NRC Rev'w & Comment on Milestones	May-09-95	May-22-95
M1N: NRC Comments on Milestones to W	May-22-95	May-22-95
T2W: Prepare Program Definition & Binning Criteria w/Examples	May-10-95	May-31-95
M2W: Provide Criteria to NRC for Revw & Comment	May-31-95	May-31-95
T2N: NRC Revw & Comment on Criteria	Jun-01-95	Jun-14-95
M2N: NRC Comments on Criteria to W	Jun-14-95	Jun-14-95
T3W: Complete PRA App A Revision w/ Baseline Cases	May-09-95	Jun-01-95
M3W: Provide Revised App A to NRC for Review	Jun-01-95	Jun-01-95
T3N: NRC Revw & Comment on Baseline Cases	Jun-01-95	Jun-15-95
M3N: NRC Comments on Baseline Cases to W	Jun-15-95	Jun-15-95
T4W: Define Systematic Process for T/H Parameter Selection	Jun-01-95	Jun-14-95
M4W: Provide Process to NRC for Revw & Comment	Jun-14-95	Jun-14-95
T4N: NRC Revw & Comment on Process	Jun-15-95	Jun-28-95
M4N: NRC Comments on Process to W	Jun-28-95	Jun-28-95
T5W: Identify Set of Cases for MAAP4 T/H Uncert. Benchmark	Jun-01-95	Jul-03-95
T5We: Perform NOTRUMP Analyses for T/H Uncert. Benchmarks	Jun-14-95	Jul-14-95
M5W: Identify Benchmark Cases to NRC for Revw & Comment	Jul-03-95	Jul-03-95
T5N: NRC Revw & Comment on Case Selection	Jul-03-95	Jul-24-95
M5N: NRC Comments on Cases Selection to W	Jul-24-95	Jul-24-95
T6W: Define T/H Parameters to be Modeled	Jun-30-95	Aug-31-95
T7W: Define Bounding Values for T/H Parameters	Jun-30-95	Aug-31-95
M6/7W: Provide Parameters List, Values to NRC for Revw	Aug-31-95	Aug-31-95
T6/7N: NRC Revw of Parameters & Values	Sep-01-95	Sep-22-95
M6/7N: NRC Comments on Parameters, Values to W	Sep-22-95	Sep-22-95
T8W: Perform MAAP4 T/H Uncert. Benchmark Case	Jun-30-95	Aug-31-95
M8W: Provide T/H Uncert. Benchmark Results to NRC	Aug-31-95	Aug-31-95
T8N: NRC Prelim Revw of T/H Benchmark Results	Aug-31-95	Sep-22-95
M8N: NRC Comments on MAAP T/H Benchmark to W	Sep-22-95	Sep-22-95
T9W: Perform & Document Sample T/H Uncert. Assessment	Aug-17-95	Sep-01-95
M9W: Provide Sample T/H Uncert Assess Results to NRC	Sep-01-95	Sep-01-95
T9N: NRC Revw of Sample Assessment	Sep-01-95	Sep-25-95
M9N: NRC Comments on Sample T/H Uncert Assessment	Sep-25-95	Sep-25-95
T10W: Prepare/Document T/H Uncert Assessment	Sep-01-95	Oct-31-95
M10W: Submit T/H Uncertainty Report to NRC	Oct-31-95	Oct-31-95



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Milestone Summary

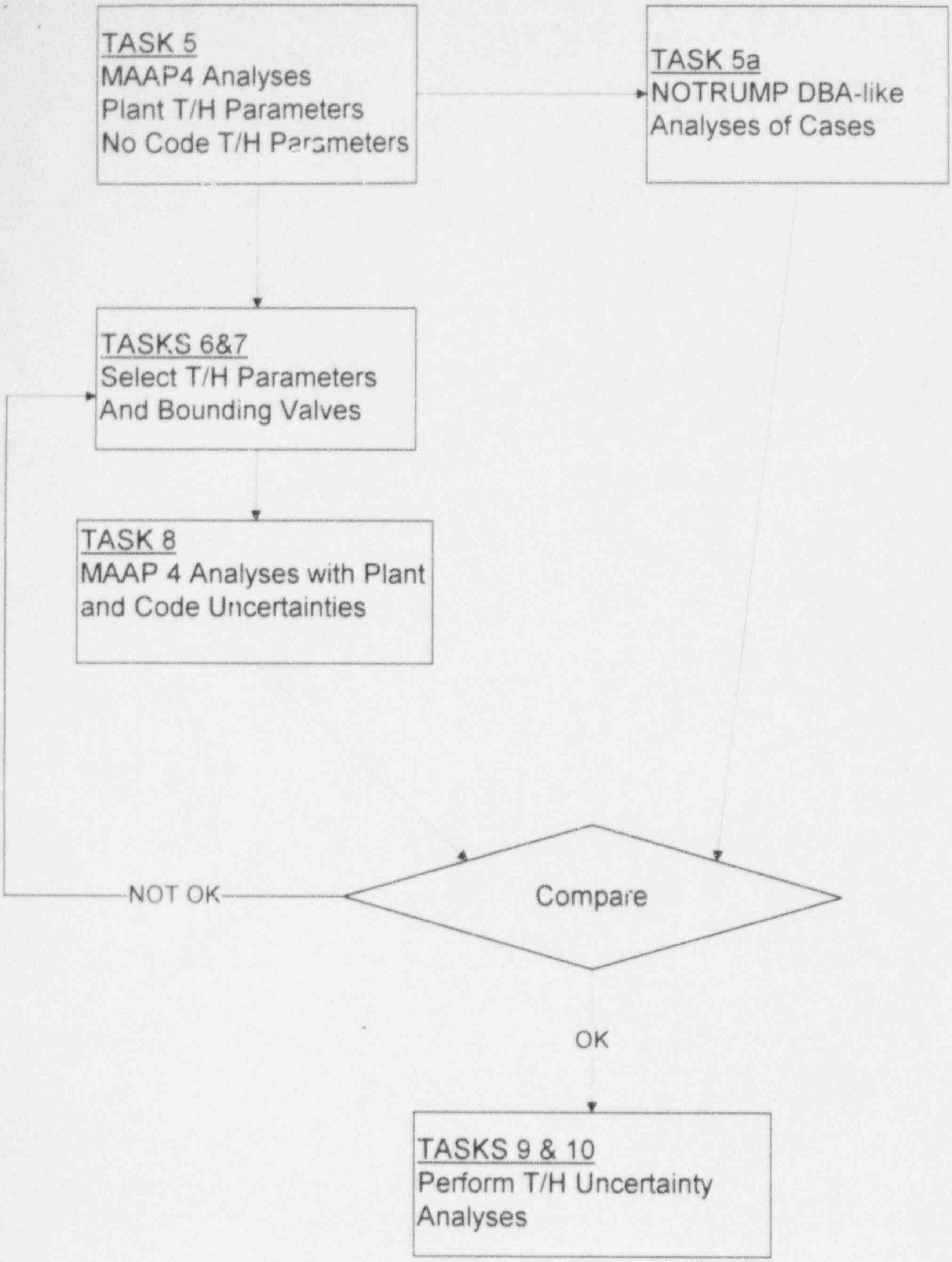

FIGURE 2
Preliminary Concept Of T/H Parameter Selection
and
MAAP4 Code Benchmarking

ENCLOSURE 2

Task 4

Define a Systematic Process for Thermal-Hydraulic Parameter Identification

Background

As part of the AP600 PRA, success criteria that specify the minimum system actuations and operator actions to prevent core damage are defined. The MAAP4 code was used as one of the tools to assist in the success criteria definition for multiple failure sequences beyond the design basis scenarios. Issues have been raised by the NRC and their contractors about whether the AP600 passive systems are more sensitive to thermal-hydraulic uncertainty than to the differences in system hardware availability as modelled in the event trees. More specifically, if MAAP4 input were modified to cover expected, reasonable uncertainty in the behavior of the reactor coolant system (RCS) and the passive systems, would some of the success sequences change to core damage sequences?

Agreement was reached between Westinghouse and the NRC that a set of "thermal-hydraulic uncertainty" tasks would be performed to address the previous issue. This document is the fulfillment of Task 4, which is to define a process for the systematic identification of the AP600 plant and MAAP4 code thermal-hydraulic parameters to be used for further sensitivity studies. Because this evaluation is new and unique in its application to PRA, the process outlined in this document is subject to modification as the thermal-hydraulic uncertainty assessment proceeds.

Review of PIRT and CSAU Method

The NRC and its contractors have developed the Code Scaling, Applicability, and Uncertainty (CSAU) evaluation methodology as a means of quantifying uncertainty in complex phenomena (Reference 1). The CSAU methodology was developed as an auditable, traceable, and systematic method of combining expert opinion with quantitative analyses to arrive at computed values of uncertainty for Final Safety Analysis Report (FSAR) Chapter 15 best-estimate LOCA analyses. The CSAU methodology is a detailed plan for evaluating code applicability, assessing code scale-up capabilities from test data, and quantifying code uncertainties.

Part of the CSAU methodology is the development of a phenomena identification ranking table (PIRT) for each accident scenario to be analyzed. A PIRT is established because plant behavior is not equally influenced by all processes and phenomena that occur during a transient. Each phase of the scenario and system components is separately investigated. By using a PIRT, the important and dominant contributors to uncertainty are stressed, and low-importance contributors are given minimal attention or eliminated. The selection of the dominant contributors to uncertainty is based on experimental evidence, analysis and code calculations, engineering judgment, and appropriate subjective decision-making techniques.

In accordance with previous discussions between Westinghouse and the NRC, the thermal-hydraulic uncertainty tasks for passive system reliability will be systematic in the selection of parameters important to thermal-hydraulic response. However, the systematic process need not be as rigorous as the CSAU methodology, nor is it necessary to define PIRTs. For instance, before the MAAP4 parameters for sensitivity studies are defined, the important phenomena and plant systems must be identified. Although this approach is similar to a PIRT, the phenomena will not be ranked in importance. The focus will be on identifying only the most significant phenomena that dominate plant behavior. Results and insights from the PIRTs defined for Chapter 15 accident analyses will be used to provide useful information in the identification of large impact variables.

Method of Phenomena and System Identification

To define the important phenomena and systems for further sensitivity studies and benchmarking against NOTRUMP, the AP600 PIRTs will be reviewed for their applicability to the scenarios being analyzed with MAAP4. It is anticipated that the small loss-of-coolant accident (LOCA) PIRT will provide the most useful information, since the Chapter 15 small LOCA analyses encompass break sizes defined as small, intermediate, and medium LOCA in the PRA. As an example, the small LOCA PIRT is discussed below in context of how it may be used in the thermal-hydraulic uncertainty tasks for passive system reliability.

The small LOCA PIRT (Reference 2) identifies system components and phenomena that are important during four phases of the transient: blowdown, natural circulation, ADS blowdown, and IRWST injection cooling. For each phenomenon applicable to that phase of the transient, the importance is rated as high, medium, or low. Table 1 contains a list of the phenomena ranked as high importance in each of the four phases of the small LOCA transient. These phenomena will be reviewed for applicability to the PRA LOCA scenarios. Focusing on the highly important phenomena defined in the small LOCA PIRT is a means of addressing the passive system reliability questions without duplicating the rigor of the validation and verification being performed for the Chapter 15 design basis accident codes. However, the most important phenomena for the passive system reliability thermal-hydraulic uncertainty assessment may differ from the high-importance phenomena in the small LOCA PIRT due to any of the following reasons:

1. The PRA sequences include multiple system failures. The resulting scenarios include actuation of fewer systems, and the accident is often extended over a longer time frame than the Chapter 15 accident scenario. The difference in time frame can influence the importance of the phenomena.

2. The identification of the phenomena is a preliminary step to identifying the actual code parameters. The number of code parameters per phenomenon may vary from one or two to several dozen. Because the code parameters to be investigated must be a small enough number to keep future tasks realistically achievable, it may be necessary to limit the phenomena chosen for study. This does not mean that important phenomena will be ignored, rather, it is an acknowledgment of the need to prioritize resources to concentrate on the factors that dominate plant behavior.

3. The thermal-hydraulic uncertainty tasks for passive system reliability are focused on the performance of the passive systems. In considering the passive system behavior, additional phenomena may be identified, or the PIRT phenomena may be highlighted in a new way. For example, the IRWST gravity injection after core uncovery may be strongly impacted by reflooding of the core. IRWST gravity injection is identified as a phenomenon on Table 1, and it may lead to examining thermal-hydraulic parameters associated with reflooding of the core.

4. The binning of accident scenarios and selection of cases for comparison to NOTRUMP are tied very closely to the selection of important phenomena and code parameters. It is important to define the bins, cases, and phenomena/parameters with consideration of the ultimate goals and issues being addressed in the thermal-hydraulic uncertainty tasks for passive system reliability. Therefore, the definition of the phenomena/parameters may be an iterative process with refining the bin classifications and NOTRUMP comparison cases.

The AP600 small LOCA PIRT not only identifies the importance of phenomena, it does so in context of different time frames of the transient. For the passive system reliability thermal-hydraulic uncertainty tasks, it is anticipated that the definition of separate transient phases will not be as important due to the focus of the passive system performance. The passive systems of the greatest interest are the CMT, the ADS, and the IRWST gravity injection. It is evident that these systems will be of interest during the period in which they are actively affecting the course of the transient.

Method of Parameter Identification

For each phenomenon defined through the previous process, the associated models of MAAP4 will be reviewed to identify the parameters that can be controlled by the analyst. A list of the parameters and the input value used in the PRA success criteria analyses will be compiled. From this list of parameters, the ones expected to have the largest impact on thermal-hydraulic response will be identified for potential further sensitivity study. The MAAP4 analyses for the PRA include many input parameters similar to those used in the conservative Chapter 15 analyses. For example, the core axial power shape in MAAP4 is top-skewed because this produces more limiting peak core temperatures during core uncovery events. It is anticipated that the list of MAAP4 thermal-hydraulic input parameters and their values will show that some conservatism is already modelled in the MAAP4 analyses.

The process of identifying parameters for further study will result in two lists of parameters. The first list of parameters will be of "generic" nature and will apply to all MAAP4 analyses. The second list of parameters will be developed for each bin of sequences. The parameter lists are explained below.

1. For each phenomenon defined through the previous process, a list of parameters and input values used in the PRA success criteria analyses will be compiled. The purpose of this list is to provide more concrete information to the NRC on the assumptions that have been incorporated into the MAAP4 success criteria analyses. The thermal-hydraulic parameters expected to be the most significant in predicting plant behavior will be highlighted within the list. The highlighted

thermal-hydraulic parameters will form the basis for the parameters that may be varied in future sensitivity studies.

2. The second list of parameters will identify parameters for which sensitivity studies will be performed. This list will be a subset of the highlighted thermal-hydraulic parameters in the first list and will be defined specifically for each bin of accident sequences. This list will be primarily developed from the need to adjust models to match NOTRUMP results. If a specific NOTRUMP and MAAP4 model was to match reasonably well without the adjustment of MAAP4 input, parameter(s) may still be identified for sensitivity studies to demonstrate the impact on the passive system response. For example, if the CMT model in MAAP4 predicts injection flow rates similar to NOTRUMP, CMT thermal-hydraulic parameters may still be identified to demonstrate the sensitivity in the CMT passive system response.

Summary of Parameter Identification

Defining the process for parameter identification (Task 4) must be viewed in context of the entire scope of the thermal-hydraulic uncertainty assessment for passive system reliability. The parameter identification process is to be implemented in Task 6; ranges and bounding values are to be identified in Task 7; and running MAAP4 sensitivities to match NOTRUMP are to be done in Task 8. The task descriptions (Reference 3) define that Tasks 6, 7, and 8 are performed in an iterative manner. The completion of Task 4 has helped to focus the details of Tasks 6, 7, and 8 on phenomena, rather than individual parameters. Identifying sources of uncertainty will be an achievable effort by concentrating on the modelling of phenomena that dominate plant behavior. The purpose of these tasks is to determine whether the success criteria based on MAAP4 analyses are defined conservatively enough to address thermal-hydraulic reliability concerns in a bounding manner. A secondary goal is to demonstrate the sensitivity of the MAAP4 passive system models to key thermal-hydraulic input parameters.

References

1. NUREG/CR-5249, "Quantifying Reactor Safety Margins: Application of Code Scaling, Applicability, and Uncertainty Evaluation Methodology to a Large-Break Loss-of-Coolant Accident, " INEL.

2. WCAP-14207, "Applicability of the NOTRUMP Computer Code to AP600 SSAR Small-Break LOCA Analyses," November 1994.

3. NTD-NRC-95-4485, letter from N. J. Liparulo to T. R. Quay, "AP600 Thermal/Hydraulic Uncertainty Deliverables for Tasks 1 and 4," June 14, 1995.

Table 1
Components and Phenomena Ranked as
High Importance in AP600 Small LOCA PIRT

Blowdown	Natural Circulation	ADS Blowdown	IRWST Injection Cooling
Critical break flow Decay heat Mixture level mass inventory	Critical break flow Decay heat Mixture level mass inventory CMT balance line - pressure drop - flow composition Hot-leg flow pattern transition Passive residual heat removal natural circulation flow and heat transfer	Critical break flow Decay heat Mixture level mass inventory CMT balance line - pressure drop - flow composition CMT gravity-drain injection Hot-leg flow pattern transition ADS Stage 1, 2, and 3 - critical flow - two-phase pressure drop - valve loss coefficient ADS Stage 4 critical flow Accumulator injection flow rate	Decay Heat Mixture level mass inventory Hot-leg flow pattern transition ADS stage 1 - 4 - critical flow - subsonic flow IRWST gravity-drain injection

ENCLOSURE 3

availability assumptions, an assessment of the significance of the impact on PRA core damage frequency can be made by examining the bounded sequences that changed from success to failure or for which the success frequency changed. For example, suppose that it were shown that changing from ADS criterion ADQ (which is 2 of 4 ADS Stage 4 valves) to 3 of 4 ADS Stage 4 valves resulted in success. Then if there is an effect on core damage frequency, it would be from the difference between the contribution of bounded sequences 93, 94, 97, 100, 102, 105, 108, 109, 112, 115, 116, 117, and 118 (i.e., the failure paths) with the 3 out of 4 ADS Stage 4 criterion and with the 2 out of 4 ADS Stage 4 criterion, for the conditions of most limiting T/H uncertainty. If the difference in the failure probabilities for both of these ADS criteria is sufficiently small, then it can be reasonably stated that the effect of this change on the PRA results is not significant, and the analysis will have demonstrated that, for that particular modeled sequence and for its associated bounded sequences, the effect of T/H uncertainty does not affect the PRA. If the assessment requires moving up through the bounded sequences so far that it cannot be reasonably stated that the effect of the change on the PRA results is not significant, then it may be necessary to revise that PRA success criterion and determine the impact of the change on the PRA.

Correspondence to NRC Margins Approach

The approach to assessing the impact of T/H uncertainty on the PRA results as outlined in the preceding paragraphs generally follows the NRC Margins approach.

A binning process will be used as described in this Task 2 deliverable, based on the existing PRA event sequences. The bounding sequence (i.e., the sequence for which the highest peak core temperature will occur) for each bin will be used; sequence frequency cutoffs will not be used. The binning will be finalized in conjunction with Task 5 and documented in Task 10 of the T/H Uncertainty Assessment.

Identification of sources of uncertainty associated with the T/H performance of passive systems will be done through Tasks 4, 5, 6, and 7 of the T/H Uncertainty Assessment. ~~Identification of "large impact" variables is not anticipated, since all identified sources of T/H uncertainty will be addressed.~~ A systematic process will be used to identify sources of uncertainty.

Analysis of available margin to core damage will be performed for the bounding sequence for each bin, in Tasks 9 and 10 of the T/H Uncertainty Assessment. Bounding values will be used for the identified uncertainty variables.

If, for any bin, the analyses fail to show margin to core damage, a different set of hardware success criteria will be selected for the bin (corresponding to a different bounded sequence) such that margin to core damage can be shown. If this can be shown to result in an insignificant change to the PRA results, then there is no impact of T/H uncertainty on the success criterion for the bin. If there is a significant impact on sequence core damage frequency as a result of selecting a different bounded sequence to represent the bin, this will be addressed for the PRA.