52-003

UNITED STATES
NUCLEAR REGULATORY COMMISSION
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May 21, 1996

Mr. Nicholas J. Liparulo, Manager
Nuclear Safety and Regulatory Activities
Nuclear and Advanced Technology Division
Westinghouse Electric Corporation
P.O. Box 355
Pittsburgh, Pennsylvania 15230

SUBJECT: WESTINGHOUSE PLAN FOR MAAP4 BENCHMARKING AND THERMAL-HYDRAULIC UNCERTAINTY

Dear Mr. Liparulo:

Westinghouse letter NSD-NRC-96-4691, dated April 12, 1995, summarizes the current Westinghouse plan to resolve the issues associated with passive safety system thermal-hydraulic (T-H) uncertainty for the AP600. Westinghouse has chosen to separate the T-H uncertainty and MAAP4 benchmarking issue resolution process into distinct efforts. This plan was presented by Westinghouse during a meeting with the staff on February 29, 1996. In that meeting, the staff committed to provide a written response to the Westinghouse plan. Additional information on the plan was provided in a subsequent meeting between the staff and Westinghouse on May 3, 1996. Based on its review of the latest Westinghouse thermal-hydraulic uncertainty issue resolution plan, the staff believes that, since the MAAP4 benchmarking effort has an objective that is fundamentally different from the assessment of the T-H uncertainties related to passive systems, the separation of these two efforts appears to be appropriate. The staff also has the following general observations and comments.

MAAP4 Benchmarking

MAAP4 is used as an evaluation tool for determining success in a given probablistic risk assessment (PRA) sequence. An assessment of the adequacy of MAAP4 for this purpose is therefore needed. Westinghouse intends to use the NOTRUMP small-break loss-of-coolant accident design basis accident analysis code to benchmark MAAP4 as a means to show that MAAP4-related uncertainties are not of sufficient magnitude to change the outcome for those cases considered success in the baseline PRA. This approach assumes that the phenomena important to the PRA success sequences are reasonably well-represented by NOTRUMP. As part of this effort, Westinghouse must therefore demonstrate that the range of cases for benchmarking is broad enough that the results can be extrapolated to all the success sequences analyzed by MAAP4. Westinghouse plans to accomplish this by identifying the key phenomena in these scenarios and assessing the corresponding models in MAAP4 and by choosing a broad enough range of cases so as to exercise all of those models. Westinghouse needs to provide sufficient justification that the cases selected for the MAAP4 benchmarking cover the complete range of conditions pertinent to assessment of the MAAP4 models used in PRA success sequences.

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T-H Uncertainty

Westinghouse's objective in the T-H uncertainty issue resolution plan is to demonstrate that adequately low core damage frequency (CDF) and containment large release frequency (LRF) are attainable using only passive safety systems (focused PRA). To this end, Westinghouse proposes to use a margins approach in lieu of a quantitative uncertainty assessment. The results of this evaluation will also be used to determine if any regulatory treatment of non-safety systems (RTNSS) is necessary. In Westinghouse's proposal, MAAP4 will be used, after it is appropriately benchmarked, as an initial screening tool to help select "risk-significant, low-margin" sequences. Westinghouse has not explicitly defined what constitutes a risk-significant, low-margin sequence although it has been implied that core uncovery sequences might fall into this category. Westinghouse needs to provide additional information on the criteria used to identify risk-significant, low-margin sequences.

If the risk-significant, low-margin sequences cannot be counted as failures in the focused PRA with acceptable values of CDF and LRF, a range of sensitivity studies will be performed using NOTRUMP. Westinghouse intends to demonstrate that by using conservative bounding thermal-hydraulic assumptions (yet to be defined), sufficient margin exists to core damage (defined as a peak clad temperature of 2200°F) for these worst case sequences to provide reasonable assurance that no core damage will be sustained. Based on a more rigorous NOTRUMP analysis of the risk-significant, low-margin sequences, Westinghouse states that it should be possible to adequately justify their inclusion as success sequences in the focused PRA (and, thereby, lowering the resultant CDF and LRF). As noted above, Westinghouse has not yet defined for staff review what "sufficient margin" will be. The staff has also not yet seen the bounding assumptions that are being proposed by Westinghouse. Westinghouse will need to provide additional details on the NOTRUMP analyses of the risk-significant, low-margin sequences before the staff can complete its assessment of this approach.

Westinghouse has not addressed the issue of long-term cooling in the context of either MAAP4 benchmarking or T-H uncertainty. The staff considers this to be an essential part of the T-H uncertainty assessment effort.

The staff believes that the revised Westinghouse plan for resolving T-H uncertainty and MAAP4 benchmarking issues is a workable approach. The staff prepared an initial request for additional information on the April 12, 1996 submittal, and related meeting presentations, which is enclosed with this letter. Additional questions are in preparation. The enclosure also contains two additional comments that do not require a response by Westinghouse at this time, but which should be considered as Westinghouse develops the detail of the T-H uncertainty resolution process. The staff is also prepared to have further discussions and meetings with Westinghouse to resolving these issues in a timely manner.

If you have any questions regarding this matter, please contact the responsible project manager, Mr. William Huffman, at (301) 415-1141.

Sincerely,

original signed by:

Theodore R. Quay, Director
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Office of Nuclear Reactor Regulation

Docket No. 52-003

Enclosure: As stated

cc w/enclosure:
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Docket No. 52-003
AP600

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REQUEST FOR ADDITIONAL INFORMATION

492.15. Besides demonstrating the applicability of MAAP4 for evaluating the PRA sequences, it is not clear what the ultimate result of the MAAP4 benchmarking effort will be. Will a "margins" type of approach also be used, based on the comparisons between NOTRUMP and MAAP4, to help define what peak core temperature as predicted by MAAP4 can be considered "success?" Will these margins then be reflected in the overall evaluation of CDF and LRF in the baseline PRA?

492.16. In discussions pursuant to Westinghouse's December 8, 1995, submittal on this subject, the staff raised several questions with regard to the "key phenomena" in AP600 PRA sequences, as represented by "Table 1" in the attachment to the April 12 letter. While the formal PIRT presented at the May 3, 1996, meeting expanded on the "Table 1" phenomena, Westinghouse has still not completely addressed the staff's previous comments. Please submit a revised PIRT that responds to those comments.

492.17. The MAAP benchmarking cases in the April 12, 1996, Westinghouse letter, and modified by the May 3, 1996, meeting presentation, are weighted heavily toward hot leg break cases. It is not clear that the list of cases chosen will exercise all relevant MAAP models over a "spectrum of cases" as claimed by Westinghouse. Justification for the selection of cases is needed.

COMMENTS

1. Westinghouse states in their documented plan (page 8 of the attachment to the April 12 letter), "The applicability of NOTRUMP to PRA sequences is an outstanding issue to be discussed later." In addition (page 11 of the letter attachment), Westinghouse states, "Further details of the NOTRUMP analyses can only be discussed after it is known which accident scenario will be examined." The staff agrees that an assessment of code applicability can be made only after the scenarios to be examined, and associated important phenomena, are identified. However, the staff emphasizes that code applicability is a key issue that must be addressed satisfactorily by Westinghouse as part of the resolution of the T/H uncertainty issue. The staff recognizes that Westinghouse has begun this process by developing a PIRT as presented in the May 3, 1996, meeting.

2. While Westinghouse has not yet addressed in detail the issue of T-H uncertainty, the staff notes that the approach must demonstrate sufficient margin to account for many different sources of uncertainty related to passive system performance. These include (but are not limited to): age-related changes; lack of experience and data related to system operational characteristics under multiple-failure conditions; the potential for adverse systems interactions; and uncertainties associated with manual operator actions, such as timing and sequence of events.