Vogel

EPRI
Electric Power
Research Institute

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Dr. Melvin Silberberg
Accident Source Term Program Office
Office Nuclear Regulatory Research
7915 Eastern Avenue
Mail 1130 SS
Silver Springs, MD 20910

Dear Dr. Silberberg:

This letter formalizes EPRI's comments on the draft sections (Vol. IV, V, and VI) of Report BMI-2104, presented at the peer review meeting on January 26 and 27, 1984. These comments pertain to (1) the completed calculations for the Sequoyah ice condenser plant, (2) the recalculated Surry results, and (3) the completed calculations for the Zion plant.

I would like to compliment you for the conduct of the meeting; in general, it was very informative. There was, however, one presentation that was not at all clear due to inadequate time - the QUEST report by Sandia. Since we feel that this work is important, we would very much like some sort of an opportunity to review it so that we might intelligently comment on it.

I would also like to compliment the NRC contractors on attempting to indicate the water location in a reactor accident. While progress has been made in this area, one suspects that more work remains to be done. As you know, the presence of water has a major effect on the behavior of fission products in an accident. Therefore, any study should track the water, perhaps to the kilogram level of mass balance. A case in point is the Surry V-sequence analysis done by EPRI. It now appears that even the most unfavorable location for a break in the RHR line occurs in a place where the pipe will be submerged in three-feet of water. Pool scrubbing should result, appreciably reducing the fission product release to the environment. We would, therefore, encourage you to once again examine the BMI analyses with regard to the disposition of water, and adjust it in those instances where it is inadequate.

3412 Hillview Avenue, Post Office Box 10412, Palo Alto, CA 94303 Telephone (415) 855-2000
Washington Office: 1800 Massachusetts Ave., NW, Suite 700, Washington, DC 20036 (202) 872-9222

The hydrogen burn model employed in BMI-2104 differs considerably from the phenomena observed in large-scale experiments, particularly when the containment safety features are active. The calculational model predicts pressures above the 60 psia assumed failure level while the maximum incremental 'pressure spike', observed in 17 Nevada tests, each lasting 20 minutes, was about 5 psia. We believe that estimates of hydrogen combustion pressures in BMI-2104 are unrealistic. Similarly, experiments have shown that pre-mixed environments of 8 vol % hydrogen and 40 vol % of steam burned vigorously, even in an initially quiescent atmosphere. Thus steam inerting of the lower compartment may not occur specially when combustion sources will be present following vessel failure and fuel dispersal, as in the postulated TMLB' scenario. Presence of steam also substantially reduces the magnitude of the pressure rise.

The magnitude of hydrogen generation in the MARCH analysis is very likely too high due to the assumptions made both for the heat-up phase of the intact core, and the phase in which the core slumps in the lower plenum. The calculated early containment failure in the TMLB' - γ-sequence depends upon the total hydrogen calculated in the MARCH code.

As we all appreciate, the retention of fission products in the primary coolant system (PCS) is a function of the temperatures in the system and the gas flow patterns and rates. The BMI-2104 calculations have assumed once-through flow patterns and estimate a two orders of magnitude increase in the flow rate when the core slumps in the lower plenum, which sweeps the fission products into the cooler regions of the PCS. The gas flow rate is a function of the particle size assumed for the interaction of the molten core with the water in the lower plenum and may not be correct. Also, the flow patterns in the vessel during the core heat-up and slump phases may not be as assumed in the MARCH code calculations. All of the above considerations significantly affect the estimates of the fission product retention in the primary system. We feel that this part of the study may need further consideration. These problems are, unfortunately, difficult.

One technical area of particular concern to all of us is the question of revolatilization/resuspension of aerosols deposited in the primary coolant system. The technical case on this issue is weak. Since it is not clear whether a potential exists for substantial changes in the results, we suggest that a task force

be established to follow the unfolding of this problem as the several groups involved (both experimental and analytical) do their work. Input will be required on the recirculation thermal hydraulics, radiation energy distribution, chemistry, and surface interacions involved.

In summary, we unfortunately believe that another review of some kind is required before EPRI feels comfortable that a firm technical basis for the BMI-2104 report exist. This review should cover the QUEST program and the revolatilization issue.

EPRI appreciates the opportunity to comment on this study. We recognize the large effort to date and encourage you to continue your efforts.

Sincerely yours,

R. C. Vogel

R. C. Vogel
Senior Scientific Advisor

cc: John Taylor
Walt Loewenstein
Frank Rahn
Raj Sehgal