

PDR 7-16-82

CT-1453

MEMORANDUM

5 May 1982

TO: R. Gasser, BNL *thermal margin beyond design basis*

FROM: Ivan Catton

SUBJ: CRBR Meeting to Review TMBDB, 16 April 1982, Bethesda, Maryland

bcc: P. BOEHNERT

My reaction to the meeting was one of having been in a time warp. As you know (you helped), TLTM was reviewed by UCLA in 1976. I found very little new in the TMBDB report and submitted to you a number of questions and comments. I don't believe the 16 April meeting was very fruitful in answering the questions.

My specific comments on each element of the meeting follow. Separately, I would like to comment on comparing CRBR to the WASH 1400 PWR or BWR. The CRBR PRA was done some time ago for a non-existent plant of a yet to be built type. The calculated consequences of a LWR, as questionable as they might be, are based on the working experience of a number of people. The CRBR PRA is based on optimistic speculation. As beneficial as the exercise might be, I do not believe it can be used for safety evaluation even on a relative basis.

Sodium-Limestone Concrete Reaction - L.D.Nuhlstein

Disagreements between HEDL and SANDIA about the basic physical mechanisms governing sodium concrete interactions existed when the CRBR licensing process stopped in 1977. It seems as if they still exist. SANDIA should be requested to state in writing what their concerns are and what they think a resolution of their concern might be. They should give their judgment as to the impact on safety of their concerns to put them into perspective. If they are unwilling or unable to do so, we should proceed without their input.

Questions about scale (size) still exist. Discussion of scale needs to be divided into two parts. Horizontal surfaces looking up don't have to be more than a foot or so across to be wide enough. Vertical surfaces on the other hand will require several tests of differing length scales to eliminate questions. A vertical surface would erode faster because the slurry would drain away. The horizontal surface slurry layer would not be effected much by greater horizontal scale. The gasses evolving would stir the pool with a vigor that is related to the sodium pool depth. How deep the pool should be may need some consideration.

It was interesting (but not surprising) to note that dehydrated concrete was attached more vigorously. This leads one to ask whether long term (years) dehydration is analyzed.

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AB/AA Comparison Tests - J.M. Siegel

An experiment to compare results of high temperature sodium-concrete reactions from HEDL and SANDIA does not seem to be a worthwhile effort. Either we understand the physical processes or we don't. I would be terribly surprised if the two laboratories could not reproduce each others work. The small cylinders to be used in the tests will not yield information that will answer questions of scale for example. If comparison tests are to be conducted, more meaningful tests should be sought.

Possible Effects of Core Debris on the Sodium Concrete Reaction - L.L.Baker

Baker's scoping experiments showed that there was no effects of core debris on the sodium-concrete interaction. His experiment, however, did not simulate decay heat. The core debris will be buried in the reaction layer. At high penetration rates the heat of reaction will be larger than the decay heat. The slurry is rather viscous and will thermally isolate the debris. It could heat up and enhance the decomposition rate. Thermally decomposed concrete may behave differently than solid concrete. The area deserves some more attention.

Status of Assessment of Extreme Sodium-Concrete Penetrations - L.Strawbridge

Aerosol plate out at high temperature may be different than that postulated by Strawbridge. Under some circumstances cleaning up the SANDIA apparatus has been very difficult because the aerosols form a rough film. This should be given some attention.

From 14 hours to 16 hours, there seems to be sufficient cavity to containment ΔP to drive the sodium up through the floor vents and onto the RCB floor. Timing of RC and RCB pressures are crucial if pumping sodium into the RCB is to be adequately assessed. It could be very helpful to see a curve of sodium head (based on RC to RCB ΔP) versus time and a reactor building elevation schematic.

It is not clear to me what one should do with a PRA comparison to WASH 1400. Our knowledge of LMFBRs brings in a great deal more uncertainty. Further, a half-hearted PRA is worthless.

Evaluation of Structures for Extreme Penetration Case

A number of questions arise from the CRBR structural analysis. First, the thermal analysis is inadequate for a structural analysis. Proper analysis of the liner studs in the concrete were not shown. Non-uniform temperature distributions in the RCB liner were not looked at. Failure of the isolation ring at the one-foot level (the fin like ring extending from the liner into the concrete) was not considered. Its failure would allow sodium to react with the insulating concrete.

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CACECO Code Question Responses - T. W. Ball

The CACECO code is basically a bookkeeping code used to keep track of energy and mass in a four volume system. How good it is, is a function of the assumptions one makes. To give an opinion requires a detailed study. It is, however, my view that this type of code always must be viewed with a great deal of suspicion.

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