

PDR 03/08/83
CT-1054

575 W. 1237 N.
West Lafayette, IN 47906
February 1, 1983

Dr. W. Kerr
U.S. NRC
ACRS
Washington, DC 20555

Dear Dr. Kerr:

Thank you for the opportunity of reviewing the progress of the Severe Fuel Damage Program. Many of my previous impressions of this program remain intact, although I do note greater responsiveness to our criticisms and suggestions.

As I have said before, I do feel the overall program on severe fuel damage is desirable to quantify domains of coolability and release of radioactivity during and after a core disruptive accident. The results should impact fuel fabrication, reactor operation and accident management, post-accident cleanup, and source term calculations. It is not clear, however, that sufficient effort is being made by RES to focus and apply the results in a concrete way, and by NRR to define the problems to be addressed. There is some merit in RES's "chicken-and-egg" argument that rulemaking regarding CDA's should precede and focus this program, but that NRR needs or would benefit from the research prior to rulemaking. In the absence of guidance from NRR, the burden is properly on RES and their contractors to use PRA's and deterministic codes and input from NRR to improve the focus of the work.

Having done in-reactor fuel studies myself, I appreciate the difficulties, expense, and especially the inertia of such studies. It is unfortunate that the integral in-pile studies were initiated not only before guidelines were available from licensing, operation, and regulation, but from smaller scale in-reactor and ex-reactor studies as well. It seems clear that the three integral in-pile programs (PBF, NRU, ACRR) are redundant. I would recommend that if sufficient international support is available for the PBF experiments (this should be encouraged!) that they be continued, but with focus on the Phase II experiments that have greater relation to expected risk. However, I feel the overall program would benefit from a delay in the PBF experiments until more experience and information are gained in risk assessment, modelling, out-of-pile, and separate effects experiments. For example, the last two PBF Phase I experiments include very slightly pre-irradiated fuel (1 week), which will not be representative of release from more typical fuel.

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Moreover, I do not feel that the out-of-pile simulations and separate effects experiments have been adequately pursued. There may be ways to simulate severely damaged cores, even after disruption, using other heating methods for the "rubble beds." Alternatively, heat-producing isotopes like $^{238}\text{PuO}_2$ could be used, albeit with glove boxes, but such experiments are still much easier and cheaper than in-pile experiments, and would permit a more thorough study of critical parameters. Thus, I would recommend a shift of funds from in-pile to out-of-pile experiments.

Perhaps I am writing as an academician, but we have almost no direct knowledge or understanding of the detailed mechanisms of gas and fission product release and rubble bed formation in oxide fuels. RES should also fund more basic studies to insure that the phenomena are correctly described in their deterministic codes. Also, it would be very beneficial if a larger community of scientific and engineering cognizance were developed.

I am not convinced that a delay in the PBF Program will deal a "death-blow" to the facility. I think your analogy to "bargain-hunting after Christmas" was very apt. Certainly some inefficiencies and dislocations will result, but the overall program will become more responsive and better focussed, and the scientific and engineering community will develop better judgment in this new area. In addition, we will have gleaned all of the results we can from TMI 2. That "time has run out," should not dictate the termination or continuation of a research program!

Sincerely,

(Signed Solomon)

A. A. Solomon

AAS/mlb