ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
UNITED STATES ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

November 12, 1969

Mr. Robert E. Hollingsworth
General Manager
U. S. Atomic Energy Commission
Washington, D. C. 20545

Subject: ACRS COMMENTS ON THE POWER BURST FACILITY (PBF)

Dear Mr. Hollingsworth:

In response to the letter from Mr. Shaw of June 4, 1969, requesting comments on the preliminary draft of the "PBF Test Program Outline", the Advisory Committee on Reactor Safeguards held a Safety Research Subcommittee meeting at Chicago, Illinois on September 26, 1969, at which time the document was reviewed with the Regulatory Staff and with the Division of Reactor Development and Technology and its contractors. Our comments with regard to the PBF and to the proposed program are herein provided.

1) The Committee believes that PBF is potentially a very valuable facility for reactor safety research; every effort should be made to make it available for experiments as soon as possible.

2) Although the PBF program discussed in the draft document is quite broad, the Committee believes that the effort currently proposed for the first two years is too heavily oriented toward study of the detailed behavior of unirradiated water-cooled, oxide-fuel elements during severe reactivity transients. It is recommended that this portion of the proposed program be reduced considerably and reoriented to emphasize experiments under transient conditions not already studied in other facilities. A considerably greater proportion of the transient experiments should be conducted with pre-irradiated fuel specimens, including a substantial fraction having had high burnup. Less emphasis than now planned should be placed on cases involving transients of very short period. The experiments should be aimed primarily at previously unexplored or poorly explored effects, including fuel-coolant interactions.

3) The water-cooled reactor safety research program in PBF should concurrently investigate, with high priority, the mechanisms and phenomena associated with the initiation, growth, and propagation of fuel pin failure, including the circumstances under which melting of fuel could progress beyond one fuel element. Such a situation could develop in a large power reactor because of a local reduction in heat removal rate (as by flow blockage),

a locally abnormal power density (as by incorrect enrichment of fuel), or a more widespread perturbation in power or flow. These experiments are required in order to ascertain the probability of a local incident progressing into a serious accident and, if possible, the course and consequence of such a sequence of events.

4) The possible early use of PBF for LMFBR research on fuel failure propagation, fuel-failure modes during transients, fuel melting during power to flow mismatches, fuel-coolant interactions, and molten fuel containment should be pursued urgently. While PBF was originally designed primarily for water reactor safety research, some LMFBR safety experiments appear to be practical with the current core configuration. Furthermore, a more realistic simulation of the LMFBR environment may be possible with an altered core configuration (and experimental cavity). This possibility should be pursued expeditiously while preparations proceed for concurrent vigorous programs of water reactor and LMFBR safety research using the first PBF core configuration.

In view of the long lead time required to prepare for experiments in PBF, especially those involving irradiated fuel or a sodium environment, the ACRS recommends prompt implementation of a program revised in accordance with the above comments.

Sincerely yours,

/s/
Joseph M. Hendrie
Acting Chairman