ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
UNITED STATES ATOMIC ENERGY COMMISSION
WASHINGTON, 25, D. C.

May 11, 1966

Honorable Glenn T. Seaborg
Chairman
U. S. Atomic Energy Commission
Washington, D. C. 20545

Subject: REPORT ON HIGH FLUX ISOTOPE REACTOR (HFIR)

Dear Dr. Seaborg:

At its seventy-third meeting, May 5-7, 1966, the Advisory Committee on Reactor Safeguards reviewed the proposed operation of the High Flux Isotope Reactor (HFIR) by Oak Ridge National Laboratory (ORNL) at power levels up to 100 MWt. This matter had previously been considered at the sixty-fourth and seventieth meetings of the Committee. The Committee had the benefit of discussions with representatives of ORNL and the AEC Regulatory Staff. The Committee also had the benefit of the documents referenced below. Subcommittee meetings were held in Washington, D. C. on February 9, 1966 and May 4, 1966.

In its letter of July 15, 1965, the Committee concluded that the HFIR reactor could be operated at power levels up to 20 MWt without undue hazard to the health and safety of the public, while further information was being developed on some of the features of this plant which influence its safety. The Committee also stated that it wished to review the results of the operations carried on during the period before the power level was increased beyond 20 MWt. The foregoing information has since been submitted to and reviewed by the Committee; the results of the review are summarized below.

ORNL representatives reported that the planned program of zero and low power tests up to 20 MWt has been completed and that no unanticipated results of significance were experienced from any of the tests.

The HFIR reactor has some design features which lead to the possibility of large autocatalytic reactivity effects. ORNL presented the results of analyses of nuclear excursions more severe than those previously postulated, including estimates of energy releases from metal-water reactions which might be initiated by such excursions. They also submitted evaluations of the containment capability of the pressure vessel and of the pool and reactor building. The analyses

performed by ORNL indicated that the reactor vessel can withstand the effects of such excursions without rupture. They also indicated that, even if the rupture of the vessel took place, the containment features of the pool and reactor building would not be violated.

It was reported to the Committee that a back up shutdown system utilizing cadmium nitrate solution had been developed and is being installed in the HFIR facility. This system is to be made operable prior to reactor operation at power levels above 20 MWt. This will include the development of operating procedures to ensure that the system would be effective at all power levels and operating conditions if the control rods were to be immobilized.

The bolts holding the end caps on the beam tubes have been changed to increase their ability to withstand high pressure. Tests on a spare beam tube indicate that the beam tubes in the reactor can contain the internal pressure resulting from rupture of that end of the tube which is inside the reactor vessel. It was reported that, if simultaneous failure of both ends of a beam tube occurred, the rate of coolant loss would be limited by the internal collimator plug which would be restrained by the beam tube shutter assembly. Representatives of ORNL stated that the plant would not be operated without this or a similar flow restriction in the beam tubes without previously discussing the proposed change with the AEC Regulatory Staff. The ORNL representatives also stated that they had developed a program for exposing surveillance specimens in HFIR at neutron fluxes higher than those experienced by the beam tubes; these specimens are to be evaluated periodically to determine if there is any significant change in mechanical properties.

ORNL recognizes that the experiments performed in this reactor could introduce additional hazards if not properly controlled. They have agreed to establish, in conjunction with the AEC Regulatory Staff, operating limitations on the possible energy releases associated with such experiments. The Committee recommends that any experiments involving the possiblity of large chemical energy releases be referred to the AEC Regulatory Staff for review.

The representatives of ORNL also reported that procedures for the testing of the iodine adsorbers in the filter system are being developed and that the adsorbers are to be tested at least twice a year.

The Committee was informed that stack monitors are being installed and that their installation would be completed during the early part of July, 1966, upon receipt of required components. The Committee urges timely completion of the installation.

The Committee concludes that, subject to the foregoing comments, the HFIR reactor can be operated at power levels up to 100 MWt without undue hazard to the health and safety of the public.

Dr. F. A. Gifford and Dr. S. H. Hanauer did not participate in the review of this project.

Sincerely yours,

/s/
David Okrent
Chairman

References.

1. ORNL-TM-1291, The Release and Absorption of Methyl Iodide in the HFIR Maximum Credible Accident, dated October 1, 1965.

2. ORNL-65-11-29, High Flux Isotope Reactor - Safety Review Questions and Answers, dated November 12, 1965.

3. ORNL-65-11-29, Supplement No. 1, Draft - February 1, 1966, The High Flux Isotope Reactor - Safety Review Questions and Answers.

4. ORNL letter to USAEC, Subject: HFIR Safety Review - Request for Approval for Interim Operation at 50 MW, dated April 1, 1966.

5. ORNL-65-11-29, Supplement No. 2, Draft - High Flux Isotope Reactor - Safety Review Questions and Answers, dated April 19, 1966.