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GENERAL ADVISORY COMMITTEE
to the
U. S. ATOMIC ENERGY COMMISSION
Washington 25, D. C.

November 7, 1953

Mr. Lewis L. Strauss, Chairman
U.S. Atomic Energy Commission
Washington 25, D.C.

Dear Mr. Strauss:

Herewith is the summary report of the Thirty-seventh Meeting of the General Advisory Committee, held in Washington on the 4th, 5th, and 6th of November, 1953.

All members were in attendance.

We wish to thank the Commission and staff for their high degree of cooperation in arranging for this meeting, in supplying complete background information for the subjects to be considered, and in providing for the attendance of staff and consultants, which greatly aided the deliberations of our Committee.

In both our informational and executive sessions we gave particular consideration to: (1) weapon matters, including the study of the recent nuclear explosions in Soviet territory; (2) a review of the reactor program, with particular attention to a possible 5-year plan; (3) research matters, including the proposed large strong-focusing accelerator at Brookhaven, the various heavy particle accelerators proposed for Yale, Berkeley and ORNL, a review of the present status of Project SUNSHINE, and controlled thermonuclear reactions; and, (4) present status of production of fissionable and special materials.

1. The Committee had the benefit of an excellent briefing on the proposal for the CASTLE tests and other weapon matters. We are in agreement with the Division of Military Application on the desirability of including a test of [redacted] in this series, as well as with the remainder of the plans for this test. We did not have time to consider in detail the interesting suggestions for the small weapons program but propose to return to this subject at a future meeting of the Committee. Another subject which we may study is the question of the development of a weapon which will maximize the total explosion yield within the weight-carrying capacity of our largest bombers.

We had an extraordinarily interesting briefing and discussion of JOE-4, 5, 6 and 7 from AFOAT-1 and the staff and consultants of the Commission. We wish to take this opportunity to give our highest

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commendation to AFOAT-1 and their collaborators for their excellent performance of a most difficult mission.

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This worry leads us to a suggestion which we strongly urge on the Commission, namely, to initiate a vigorous program of research in chemical explosives suitable for the implosion of atomic weapons. It has long been felt by some experts in the field of chemical explosives that great improvement in explosion yield per unit volume could be achieved by explosives research and development. The pressure of other programs, however, has caused this field to be largely neglected. We feel that we should no longer leave this largely unexplored. The gains to be achieved from success in this direction are enormous both in the reduction in size of large fission weapons and even more importantly in the possibility of making smaller fission weapons of simple design and great economy of fissionable material. It is well known that both the

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The explosives in present use in the United States were developed for the more usual military purposes. Many of the requirements which are put on such explosives can perhaps be relaxed for nuclear weapons in order to achieve a greater energy release per unit volume. With this in mind and with regard to the great gains to be achieved for the weapons program from such a development, we recommend that the Commission proceed toward the exploration of these possibilities with all speed.

2. Doctor Hafstad's presentation of the budgetary aspects of a five-year plan for power reactors, which is being developed by the Reactor Division, raised a number of technical questions which seem relevant to the soundness of the plan. The Committee would appreciate a paper for its study before the next meeting which would appraise the significant technical features of the several reactor projects involved in the five-year plan. Such a study should compare and contrast the relative merits and economic promise of the projects, including chemical processing, and the probable time factors. Relevant budgetary estimates might well

be appended as a supplement to the technical study.

The Subcommittee on Reactors, Materials and Production which is now chaired by Dr. Walter G. Whitman, succeeding Dr. Eger V. Murphree in this position, has offered to meet in about a month to consider such a study by the Reactor Division should it be available.

3. In the report of our Thirty-sixth Meeting we recommended that the Commission support the design and construction of an ultra-high energy particle accelerator in the 15 - 25 BEV range, at the Brookhaven National Laboratory. We have reviewed with the Director of the Division of Research the proposal submitted by Brookhaven for this project. The proposal provides for the design and construction of a proton synchrotron employing the strong focusing principle, designed to accelerate protons to an energy of 25 BEV, and having a potentiality of ultimately achieving 35 BEV. We find this proposal exactly in accord with the intent of our earlier recommendation and endorse the proposal submitted by the Brookhaven National Laboratory.

During this meeting we considered at some length, with the Director of the Division of Research, proposals which have been submitted for the construction of heavy particle accelerators, a linear accelerator at Yale University and at the University of California at Berkeley, and a cyclotron at the Oak Ridge National Laboratory. The aim is to accelerate relatively heavy nuclei, in the range from beryllium to neon, to an energy of about 10 MEV per nucleon so that they can react with even the heaviest known nuclei. It is believed that an abundance of new nuclear species will be formed as a result of the nuclear reactions of such particles, for example, neutron deficient isotopes throughout the periodic table and isotopes of elements of higher atomic number than californium. The effects of the high energy heavy particles on biological and chemical systems also appear to be of interest. In view of these research possibilities, we believe that there is ample reason to undertake the construction of at least one such accelerator at the present time. Because of the relative abundance of nuclear machines at Oak Ridge and at Berkeley, we believe that the interests of the Commission and of the scientific community will best be served if this accelerator is located at Yale University, and we so recommend. We have not reached a conclusion on whether the simultaneous construction of more than one heavy particle accelerator would be justified.

We have noted with interest the continuing activities in the study of methods for producing controlled thermonuclear reactions. It is not possible at this time to be assured that the goal of the work will, in

fact, be reached; however, there is no doubt but that interesting and valuable results of a scientifid and technological nature will emerge. The program is of interest and worthy of support.

As you know, we were requested by the former General Manager to consider the problem of how most effectively to manage and evaluate the programs of research carried out in the National Laboratories. Our Subcommittee on Research has been active in visiting the Laboratories and studying their researches, and is attempting to develop some principles which may be helpful to the Commission in connection with this problem. The full Committee has discussed the subject at length, but is not yet ready to present final conclusions.

We were interested to hear some preliminary results of the strontium-90 sampling program recommended by Project SUNSHINE. The results were interesting for the very large variations which were found for different samples. We feel that the project is off to an excellent start and await with great interest the results of the analysis of the numerous samples which are now on the way. We continue to attach great importance to this project.

4. The Committee was greatly heartened by the excellent progress which has been achieved in the field of production and special materials and the high promise for the future.

5. The next meeting of the General Advisory Committee will be held in Washington on January 6, 7, and 8, 1954. This meeting will be devoted in the first instance to such problems as the Commission wish to put before the GAC. We will also wish to consider certain matters of which the Commission will be notified well before our next meeting.

As always, members of the GAC will be available to the Commission for any problems which may arise between meetings. The Chairmen of the Subcommittees are also available to call special meetings should the Commission have emergency need of their services.

Sincerely yours,

I. I. Rabi
Chairman