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Progress Report to the Joint Committee on Atomic Energy

DECEMBER 1951 THROUGH MAY 1952

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By authority of the U. S. Atomic Energy Commission

Per Francis J. McCarthy Jr. Date June 23, 1952

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July

UNITED STATES ATOMIC ENERGY COMMISSION

WASHINGTON, D. C.

JUNE 16, 1952

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PROGRESS REPORT OF THE
DOE ARCHIVES

United States Atomic Energy Commission

DECEMBER 1951 THROUGH MAY 1952

PREPARED FOR THE

JOINT COMMITTEE ON ATOMIC ENERGY

OF THE UNITED STATES CONGRESS

JUNE 16, 1952

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

June 16, 1952

Honorable Brien McMahon
Chairman, Joint Committee on
Atomic Energy
Senate Office Building
Washington 25, D. C.

Dear Senator McMahon:

Transmitted herewith, in accordance with the Joint Committee's request of July 23, 1947, is the Progress Report of the United States Atomic Energy Commission covering the period December, 1951, through May, 1952. As in other recent reports, Part III, Weapons, and Appendix D, Raw Materials Supplement, are submitted as separate documents.

In this fourteenth progress report are outlined the measures being taken to accomplish the Commission's major objectives, as well as changes in these program objectives which have occurred since the preceding report.

Sincerely yours,

UNITED STATES ATOMIC ENERGY COMMISSION

Gordon Dean
Chairman

FOREWORD BY THE COMMISSION

[redacted]

In recent months we have once more been engaged concurrently in planning a further major expansion of production capacity while pressing toward conclusion previously authorized programs to increase plant capacity. In this fourteenth Progress Report, covering the six-month period December, 1951, through May, 1952, we direct primary attention to currently authorized operating and construction programs.

Postwar Expansion

Successive additions to capacity have been a dominant feature of the postwar atomic energy program. The major increments to capacity completed at Hanford were two graphite reactors, built originally to offset the threatened failure of the three original reactors. At Oak Ridge the K-29 and later the K-31 plants were built to add to the capacity of the K-25-27 cascade. These new facilities have made possible rates of output for both plutonium and U 235 that are now nearly five times those in 1947. Major additions now under construction are a sixth graphite reactor at Hanford, the five heavy water reactors at Savannah River, and the new gaseous diffusion plants at Paducah. When these facilities are completed and operating at design capacity the annual output of plutonium and U 235 will be more than 12 and 9 times greater, respectively, than in 1947.

Further Expansion Proposed

During much of 1951 joint studies under the auspices of the National Security Council were, as in the summer of 1950, again directed to the relation between projected fissionable material capacity and military requirements. This study was impelled by the continued state of near conflict with the USSR, the variety of atomic weapons becoming available for tactical as well as strategic use, and by the greatly improved prospect for additional raw materials.

On the basis of more than a score of cases analyzed by the joint study group, the Department of Defense in the latter part of 1951 recommended an expansion of facilities that would increase plutonium output 50 per cent and U 235 output 150 per cent above that planned with presently authorized facilities. We concurred in this proposal and the National Security Council recommended such an expansion to the President. A special report on this and an alternative plant expansion was furnished the Joint Committee in January, 1952, upon the President's endorsement of the recommended expansion. He later approved a more detailed formulation of the program in February, 1952. A request for additional funds needed in fiscal year 1953 to finance the $3.9 billion 4-year plant and equipment program was submitted to the Congress on May 28, 1952.

Under the proposed expansion program, the annual rate of weapon production would by 1958 be [redacted] DELETED planned with presently authorized facilities, referred to in the report as the "Base Program." Moreover, the total weapon stockpile by the end of 1961

would be [DELETED] greater. The additional output of plutonium required to assure this weapons goal would be provided by building two large graphite reactors at Hanford and a sixth heavy water reactor of improved design at the Savannah River Plant. The additional output of U 235 would be accomplished by building further gaseous diffusion facilities at Oak Ridge and Paducah and by building a new plant at a third site, tentatively planned for the Ohio River Valley. These additional facilities, when fully operating, would increase the annual U 235 output to 24 times and plutonium output to 18 times that in 1947.

Status of Current Expansion

Some slippage in major construction schedules has continued to occur. Construction at Paducah, however, has proceeded more satisfactorily since the beginning of the year because of decreased work stoppages. At the end of May the overall project was 29 per cent complete against a scheduled 32 per cent. The first C-31 building is now expected to be brought into initial operation in August rather than in the second quarter of 1952. At Savannah River, construction of the heavy water reactors has been delayed chiefly by the technical problems of novel design, by recruitment difficulties, and by delays in materials and equipment deliveries. Recruitment has improved as a result of lengthening the workweek to 54 hours. At the end of May over-all construction of the Savannah project was 22 per cent complete, and initial operation of the first reactor is now scheduled for March, 1953, instead of January, 1953. The new graphite reactor at Hanford was 72 per cent complete at the end of May against a scheduled 79 per cent and completion is scheduled for October, 1952. Construction of an enlarged plant to produce lithium 6 for use in thermonuclear weapons was begun at Oak Ridge in March 1952 and is scheduled for completion in February, 1953, to permit weapon tests later that year.

Summary of Operating Programs

The highlights of the six-month period are as follows:

Raw Materials. By 1958 the annual receipts of uranium are expected to be nearly three times those in 1951. Major increments are expected to come from South Africa, Canada, the Colorado Plateau, and the Florida leached zone. Research and development now indicate that recovering uranium from the leached zone may eventually be less costly than previously expected.

Fissionable Materials. Output of both plutonium and U 235 continued at record levels, notwithstanding continued slug failures and tube corrosion at Hanford and barrier tube breakage at Oak Ridge.

Weapons. Stockpiling of a number of new models, including tactical weapons, began. Preparations for testing a very large yield thermonuclear device at Eniwetok in the fall of 1952 progressed on schedule. Plans were started for testing in the fall of 1953 a second device of a design which may be of immediate utility in a weapon. Although considerable uncertainty is involved, supporting effort to provide an emergency capability for fabrication of such devices and their delivery is going forward on the assumption of success in the 1953 test.

Research and Development. The Materials Testing Reactor was brought to full power, construction of the Submarine Intermediate Reactor was begun, and initial operation of the Experimental Breeder Reactor has shown that a sodium-potassium-cooled fast reactor will operate. Some indication of breeding will be available in the next year. In the physical resear program, scientists have continued to provide basic data, explore new concepts, and investigat immediate problems such as chemical separations and long-range detection of foreign atomic energy activities. In the life sciences, important conclusions have been drawn from the biomedical experiments conducted in 1951 at Operation GREENHOUSE and Operation BUSTER-JANGLE.

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

June 11, 1952

Mr. Gordon Dean
Chairman, United States
Atomic Energy Commission
Washington 25, D. C.

My dear Mr. Dean:

I submit herewith, in response to the Commission's request, a report of progress in the activities of the U. S. Atomic Energy Commission during the period December, 1951, through May, 1952.

Respectfully submitted,

M. W. Boyer

M. W. Boyer
General Manager

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*Transmitted as a separate document.

PART VI

BIOLOGY AND MEDICINE

(UNCLASSIFIED)

The principal objective of the biology and medicine program in recent months has been the further evaluation of data obtained in connection with atomic weapons tests. The report of the biomedical studies conducted at Operation GREENHOUSE has been completed. Significant data have been obtained from the nation-wide monitoring program for measuring radioactive fall-out from atomic detonations in Nevada. Research and civil defense activities have continued at a somewhat accelerated pace. (End of UNCLASSIFIED section.)

Weapon Test Activities (SECRET)

GREENHOUSE report. Analysis of the results of the biomedical experiments conducted at Operation GREENHOUSE in the spring of 1951 has led to several important conclusions:

1. Completely analogous injuries are produced in animals when they are exposed to single doses of whole body radiation from a nuclear weapon and from high voltage X rays in the laboratory. These injuries are in turn similar to those sustained by victims of the Hiroshima and Nagasaki detonations.

2. The contribution of neutrons to the total dose was measured by using animals and plants as biological dosimeters. At distances at which gamma radiation was still a significant biomedical hazard, the effect of neutrons was found to be not significant. The neutron flux is variable and will depend on the assembly of the weapon.

3. Intense thermal sources have been used recently in the laboratory to reproduce in animals the anatomical and histological features of flash burns observed at Hiroshima and Nagasaki. To determine how accurately the burns from an atomic weapon can be reproduced in this manner, animals at GREENHOUSE were placed at distances up to about 5,600 yards from ground zero. Burning commenced about 20 to 30 milliseconds after detonation, approximately the same interval which was believed to have elapsed in the Japanese detonations. All thermal injury occurred in less than one second. It was also shown that ultra-violet light from the bomb did not contribute significantly to the thermal injury. The experiment confirmed the validity of the laboratory methods, with all their advantages of convenience, economy, and control.

4. Foxholes afford reasonable emergency shelter against blast and radiation, depending upon yield and distance from ground zero.

5. For occupants of aircraft passing through the stem of an atomic cloud, gamma radiation from external sources is a greater hazard than radiation from inhaled bomb debris.

6. The use of plants, such as Tradescantia, as biological dosimeters may be feasible. The number of breaks in the chromosomes of Tradescantia exposed to bomb radiation correlated very highly with dosages for X and gamma rays, and for neutron dosage when gamma radiation was screened out. Plants may thus provide another means of measuring radiation, comparable to film badges or instruments.

Analysis of radioactive soil. At the Nevada Proving Ground underground explosion in November, 1951, large amounts of radioactive soil fell in the immediate area down wind from ground zero. At a distance of four miles, this fall-out amounted to about 63 tons per square mile. External radiation produced in this way may be an effective method of radiological warfare when coupled with bombing activities.

The relative biological danger from fall-out radioactivity is under investigation. Plants growing in the soil taken from the test site were found to rapidly take up radioactive strontium, one of the fission products. The radioactive strontium would be deposited in the skeletons of animals eating these plants.

Nation-wide monitoring program. The nation-wide monitoring program described in the preceding report was continued during the spring tests at the Nevada Proving Ground. During these tests a network of about 100 stations was utilized in cooperation with the United States Weather Bureau. Of these stations, six were operated in foreign countries by weather detachments from the United States Air Force. Seventy-five stations of the total fixed network collected samples of settled dust, 29 collected filtered dust, and 22 collected both. In the western half of the country the monitoring was accomplished by two aircraft furnished by the Air Force and by eight mobile teams of two men each.

Fall-out studies. Dust and fall-out were measured within the 10- to 50-mile radius of ground zero for three of the tower detonations in the spring tests at the Nevada Proving Grounds. The objectives of the program are:

1. To measure the radioactivity per cubic meter in air for 24 hours following a detonation;

2. To determine approximate size distribution of particles in the air;

3. To chart the pattern of fall-out within this area by the use of gummed paper at approximately 100 collecting points; and

4. To obtain an outline and measurement of radioactivity of particularly hot areas by means of survey teams.

Project GABRIEL. The General Advisory Committe has recommended additional studies of the long- and short-range hazards associated with the detonation of a large number of atomic air bursts. A study by the Rand Corporation has already begun, and another independent investigation is planned. The findings will supplement a preliminary study made in 1949 and more recently brought up to date in relation to the expansion program. (End of [redacted] section.)

Biomedical Test Planning and Screening Committee (UNCLASSIFIED)

A Biomedical Test Planning and Screening Committee, and a companion Committee on Structures, have been formed for the purpose of coordinating requirements of civilian agencies in biomedical and structures experiments at atomic bomb tests. The committees presently are composed of representatives from the Department of Agriculture, Public Health Service, Federal Civil Defense Administration, General Services Administration, Department of Defense, Division of Biological Sciences of the University of Chicago, Los Alamos Scientific Laboratory, New York Operations Office, and the Washington AEC Divisions of Military Application, Construction and Supply, Reactor Development, and Biology and Medicine.

The committees' activities have had three significant results:

1. Certain field experiments have been avoided by the investigation of the feasibility of scale-model HE tests, shock tube tests, and other laboratory testing procedures, resulting in lower costs and more efficient use of personnel.

2. Experiments have been deferred, when possible, for coordination with the testing program schedule to permit more economical and orderly planning.

3. Duplication and overlapping requirements have been avoided and consolidated plans developed.

Research Activities

Radiological use of high energy deuterons. The physical properties and isodose curves of 190 Mev deuterons have been studied by the Radiation Laboratory at the University of California. The study showed that the deuteron beam has unique radiological properties: straight and deep penetration in tissue; small scattering; and maximum dose near the end of the range of the beam. The deuteron beam appears to be suitable for intense irradiation of small volumes deep within the human or animal body. Measurements have been made of the range of the ion beam, the ionization in tissue, and stopping power of tissue. The significance of these studies lies in their possible application to radiotherapy.

Radiation cataract studies. As has been previously reported, radiation cataracts were found in some of the Japanese survivors of the atomic bomb detonations at Hiroshima and Nagasaki. The first re-examination of these Japanese, completed 16 months subsequent to the original study, has revealed interesting information. Fifty per cent of the cataracts had progressed from 1 to 2 grades in a scale of 4 grades; 20 per cent showed regression of about the same degree as those which had progressed; and 30 per cent showed no change. The results suggest that a radiation cataract does not necessarily progress to an advanced state requiring surgery.

Low-level portable cobalt irradiator. A pilot-model, semiportable cobalt irradiator has been developed by the Brookhaven National Laboratory. The Worcester Foundation for Experimental Biology plans to use the instrument for investigating the effects of radiation on the production of adrenal cortical hormones.

The cobalt irradiator, designed to accommodate a source of moderate intensity up to 250 curies of cobalt 60, will fill the need for relatively inexpensive flexible sources of highly penetrating gamma radiation in the experimental radiobiology program. (End of UNCLASSIFIED section.)

Civil Defense Activities

Washington area dispersal plan [redacted] At the request of the National Security Resources Board, the Commission has provided data for the formulation of assumptions to be used by the executive agencies as a basis for testimony on dispersal legislation embodying the President's recommendations for security of the nation's capital. (End of [redacted] section.)

Loan of radiation instruments and sources (UNCLASSIFIED). The Commission has continued to provide, on a loan basis, radiation detection instruments and radioisotopes to qualified state, territorial, and local civil defense organizations. Since December, 1951, the following loans have been made:

Type	States	Cities & Counties	Territory	Total
Radiation instruments	6	9	1	16
Radioisotopes	5	7	0	12

Trinity Site, Alamogordo, New Mexico

Governor Mechem of New Mexico recently protested the Commission's plan for disposal of trinitite at the Trinity Site, scene of the first atomic bomb detonation. The potential health hazard arising from the decay of trinitite and the medical-legal problem were discussed with the Governor. Commission representatives expressed no objection to preserving all historical features of the site, provided the potential health hazard is removed. Until a final agreement is reached with the State of New Mexico, plans to surface the area have been postponed. (End of UNCLASSIFIED section.)

2/21/85

PARTIAL DOCUMENT RECORD SHEET

Parts of this document were judged irrelevant to the CIC collection effort and were not copied:

Pages Part I (pgs. 11-21), Part II (pgs. 22-32), Part III (pgs. 33)

~~Enclosures~~ Part IV (pgs. 34-39), Part V (pgs. 40-44)

~~Attachments~~ Appendices (pgs. 49-61)

Other _____

DOE ARCHIVES

Title page and table of contents have been copied for reference.

W. Tench
signature

10/2/85
date