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Joint Committee Vol. 3

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By DM/LA Date 4/22/05

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May 29, 1953

ATOMIC ENERGY COMMISSION

PROGRESS REPORT TO THE JOINT COMMITTEE
DECEMBER 1952 THROUGH MAY 1953

Note by the General Manager

1. Transmitted herewith for consideration by the Commission is a draft of the sixteenth Progress Report to the Joint Committee, covering the period December 1952 through May 1953. Part III, Weapons, and Part IV, Reactor Development, are being circulated separately as AEC 129/50 and AEC 129/51, respectively. Photo-stats of the charts referred to are included in copies 1 through 10 only.

2. Each part of the report has received the concurrence of the responsible division.

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3. As in the past it would be helpful to the staff preparing the report if each Commissioner would convey his changes or comments on the text to Philip Mullenbach during the week of June 1.

4. The report is scheduled to be printed at Oak Ridge during the week of June 8, looking toward delivery to the Joint Committee by June 13.

M. W. BOYER
General Manager

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By authority of U. S. Atomic Energy Commission

For N. F. Brown, R. B. Wolf Date 5/29/53

Document No. LXXXI 196-17

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ATOMIC ENERGY COMMISSION

DRAFT LETTER OF TRANSMITTAL

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 1952 through May 1953. In this sixteenth report are outlined the measures being taken to accomplish the Commission's major objectives, as well as changes in these program goals which have occurred since the preceding report. As in previous reports, Part III, Weapons, is submitted as a separate document.

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U. S. ATOMIC ENERGY COMMISSION

WASHINGTON, D. C.

PROGRESS REPORT TO THE
JOINT COMMITTEE ON ATOMIC ENERGY

DECEMBER 1952 THROUGH MAY 1953

JUNE _____, 1953

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*Transmitted as separate document, AEC 129/50.
 **Transmitted as separate document, AEC 129/51.
 ***Available in Progress Reports and Statistics Branch, Division
 of Finance.

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PART VI

BIOLOGY AND MEDICINE

(UNCLASSIFIED)

1. The Commission's biology and medicine research program is focused primarily upon studies of the nature of radiation sensitivity of various organisms, and particularly on radiation sickness in man. The specific aims of this research are: (1) to adopt and continuously to verify permissible levels of radiation, and (2) to study the effects of overexposure and to develop methods of treatment. These aims complement the over-all objectives of the biology and medicine program: (1) to develop means of protecting people from the harmful effects of radiation; (2) to develop new, beneficial uses for radiation in the treatment of disease; and (3) to investigate possible effects of radiation on crop yields and on development of new varieties of plants.

2. Most of this research is conducted in the Commission's laboratories and at private institutions throughout the nation. Another important source of research data is weapons tests, which verify laboratory results and produce new information which cannot be obtained in the laboratory. The current test series has revealed important facts about the effects of blast on structures and vehicles and is also expected to increase our understanding of the medical and psychological effects of atomic detonations. (End of UNCLASSIFIED section.)

Weapon Test Activities

Fall-Out Data on Operation IVY (SECRET)

3. The world-wide monitoring network described in the preceding report has produced a large amount of data on fall-out from

Operation IVY, conducted at Eniwetok in November 1953. Evaluation of these measurements showed that only very low radioactivity was present in the Pacific Islands. Outside Eniwetok Atoll the highest reading was approximately 1.5 milliroentgens per hour of gamma radiation 60 hours after the first detonation. Air sampling units set up at a number of islands were not activated since fall-out did not reach the minimum measurable value of 0.5 milliroentgens per hour. In the United States, observations disclosed air activity 500 times above normal at Hanford, Washington, but this value declined quickly. Neither this amount nor the much lower values measured elsewhere in the United States constituted a health hazard.

Operation UPSHOT-KNOTHOLE

4. Fall-out data. The first 8 detonations of Operation UPSHOT-KNOTHOLE, the current spring tests at the Nevada Proving Ground, have produced significantly higher fall-out than those of previous series. These relatively heavy fall-outs resulted from tower shots of higher energy yield than those in previous continental tests. (See Part III, Weapons.)

5. The highest gamma doses in populated areas were:

<u>Location</u>	<u>Population</u>	<u>Gamma dose</u>	
		<u>13 weeks</u>	<u>Lifetime</u>
		<u>(roentgens)</u>	
Riverside Cabins, Nevada	14	7.0	11.0
Bunkerville, Nevada	200-300	5.5	8.0
Lincoln Mine, Nevada	200	3.0	3.8
Rockville, Utah	300	2.1	2.85

6. These values may be compared with the Commission's standard of 3.9 roentgens for 13 weeks as a maximum permissible dose.

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7. The measured air and water concentrations were all below maximum permissible limits. The highest air concentration reported was 0.17 microcuries per cubic meter at Mesquite, Nevada, as compared with the maximum permissible value of 1 microcurie per cubic meter, averaged over 24 hours. The highest water concentration, .000087 microcuries per cubic centimeter in the Virginia River Irrigation Canal, was well within safe limits.

8. The only significant fall-out reported in distant parts of the nation occurred three days after the seventh detonation in the Troy Albany, New York, area during heavy precipitation. Concentration of radioactivity was 100-200 curies per square mile, a dose rate of 1 milliroentgen per hour, or .375 roentgens for 13 weeks. (End of SECRET section.)

9. Collection of fall-out data (UNCLASSIFIED). During the current spring tests special attention was given to procedures for assembling, evaluating, and interpreting fall-out data collected by the various test monitoring groups. Special steps were taken to furnish this information promptly to public health officers and state officials so that possible questions arising from erroneous public speculations could be answered without delay. With the cooperation of the U. S. Weather Bureau, trajectory maps were prepared to record the actual movement of the main portion of fall-out from the detonations. The U. S. Public Health Service assisted in the important work of interpreting the health aspects of fall-out to the public. In addition scientists at ten Commission installations throughout the country were designated as authoritative sources to whom local public health officials could refer for fall-out information. (End of UNCLASSIFIED section.)

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10. Radiological telemetering program (RESTRICTED). The detection and measurement of the nature and quantity of fall-out during test operations are costly in terms of manpower and equipment. To reduce the large requirements for highly trained technical personnel in the monitoring system the Commission has developed a type of radio network which permits the automatic transmission of radiological and meteorological data without the need for personnel at remote locations. For the current tests a prototype network of three stations was constructed in an area 10 to 30 miles downwind from the target area. Excellent reception was obtained up to 25 miles from the control point and on occasion at distances up to 70 miles. These results indicate that with relay stations it is possible to cover distances of 200 to 500 miles as effectively with the telemetering system as with the present mobile team method, which involves the hazards of exposing personnel to fall-out. (End of RESTRICTED section.)

11. Civil effects tests (SECRET). Plans for civil effects tests for UPSHOT-KNOTHOLE, as described in the preceding report, provided for 3 months' activity at Nevada Proving Grounds by some 185 physicians, physicists, biologists, geneticists, architects, and other specialists. Basic data from these studies are now being evaluated. Some significant results already determined are:

a. Structures. The typical frame house located 3,500 feet from ground zero was 90 to 95 percent destroyed although the basement area was not greatly damaged. A similar house at 7,500 feet was badly damaged but remained standing.

b. Shelters. Eight FCDA underground "back-yard" shelters appeared capable of withstanding blast over-pressures of at least 20 pounds per square inch and to provide reasonable protection from radiation.

c. Vehicles. General damage to the structure and mechanism of test vehicles was noted. The possible use of vehicles as personnel shelters is being studied.

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d. Blast and displacement. The 15 dogs placed in two communal shelters 1,400 feet from ground zero all survived the detonation and recovered within a few hours. Radiation and thermal effects on the dogs were found to be negligible. Although some degree of local hemorrhage was found in heart valves and lungs, the most severe of these lesions would not have been lethal. Tests with dummies simulating the human body suggested that the tossing about of occupants and objects would have been the greatest hazard in these shelters.

e. Biomedical studies. Results of genetic studies using fly populations, plant materials, and a small number of mice will be determined after a longer period of examination.

Project GABRIEL

12. The Commission has on several occasions examined the general question of how many atomic weapons can be detonated without hazardous long-range and short-range radiation effects upon man, animals, and crops. When the expansion program was considered in 1951 it was tentatively concluded that the proposed stockpile would not contain a number of weapons approaching this danger limit. The Rand Corporation was selected in 1952 to examine this conclusion more thoroughly. To date Rand has calculated a preliminary sample estimate of the range of distribution of radioactive fall-out which would occur from a 1- to 10- kiloton detonation. One important consideration is the relatively large amount of radioactive debris which may be brought down by rain from low-level bomb clouds. In some cases a more serious radiation hazard may be created by weapons of low yield than by those of higher yield, because the radioactive bomb cloud produced by the latter is carried to higher altitudes than are normally reached by weather disturbances.

13. After the basic principles for one detonation have been established, the problem will be to determine possible statistical distributions of rain-out resulting from a number of bombs detonated in patterns which vary in time and space. A

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problem of this magnitude will require additional studies by independent groups like Rand. A consultant group to advise the Commission's staff has recently been established to expedite this work and to ensure that all phases of the problem are properly considered. (End of SECRET section.)

Research Activities

(UNCLASSIFIED)

14. Since July 1952 the Commission has renewed 240 projects and approved 78 new contracts for research in cancer, medicine, biology, and biophysics in universities, hospitals, and private laboratories throughout the nation. The greater part, about two-thirds, of the Commission's research in biology and medicine is conducted at about a dozen AEC installations. Newest of these is the 58-bed Argonne Cancer Research Hospital, dedicated in March 1953.

Effects of Radiation

15. The Commission supports a number of projects designed to study the effects of radiation on animals. Data obtained are useful in determining the probable effects of radiation on humans. (End of UNCLASSIFIED section.)

16. Massive dose studies (~~CONFIDENTIAL~~). The effects of radiation are such that in the absence of other types of injury men and animals can exercise their normal faculties for some period after receiving what constitutes many times a lethal dose. Because of implications for both offensive and defensive tactics, the Air Force is especially interested in determining how long and to what extent men could retain their normal abilities after receiving a massive dose from atomic projectiles at altitudes

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of 40,000 feet or higher. To determine these limits the Los Alamos Scientific Laboratory has irradiated rats, mice, and monkeys with a barium lanthanum source of 10,000 to 30,000 curies. In one experiment monkeys temporarily lost coordination and became nauseated following exposure. Eventually, but after different intervals, all refused to perform completely certain learned tasks. The experiments showed that the incapacitating dose lies between 10,000 and 30,000 roentgens. There is no significant change in the relative biological effectiveness of gamma rays when dose rates are varied from 6,000 to 9,000 roentgens per minute. (End of CONFIDENTIAL section.)

Detection and Treatment of Brain Tumors (UNCLASSIFIED)

17. Massachusetts General Hospital in Boston is developing instruments and techniques to aid in the external localization of brain tumors. Radioactive isotopes administered intravenously to animals in which tumors have been induced concentrate in cancerous and normal tissues in varying ratios. A slightly higher concentration in the tumor mass enables the investigators by coincidence counting with newly developed instruments to locate the tumor mass within the head.

18. The Northwestern University Medical School in Chicago has been developing applications of ionizing radiation in the possible treatment of brain tumors. Small pieces of gelfoam impregnated with radioactive colloidal gold or chromic phosphate were implanted in the brain tissues of 50 healthy adult cats. A small zone of dead tissue soon surrounded the site of implantation. However, later examination disclosed that the dead tissue was replaced by regenerating tissue. The experiments suggest a possible therapeutic application of radioactive gold or chromic

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phosphate to ensure the complete eradication of diseased tissue following surgery.

Somatic Mutation Studies

19. A number of agricultural experiment stations in the eastern states have sent trees and shrubs to Brookhaven National Laboratory for planting in the experimental field surrounding a cobalt 60 source. Trees or shrubs ranging from seedlings to mature flowering plants have been set out in the field at various distances from the gamma source. Mutations induced by radioactivity may be expected to appear in buds of trees or plants of any age. Later, cuttings can be transferred as scions to other nonirradiated plants at the home agricultural stations. Mutations similarly induced in seeds may become evident after a much longer period of growth and testing. It is hoped that the project will result in new and valuable varieties of trees and plants which can be made available to the public.

Argonne Cancer Research Hospital

20. The recently completed Argonne Cancer Research Hospital operated under contract by the University of Chicago was formally dedicated on March 14, 1953. The building, constructed and equipped at a cost of \$4,200,000, was ready for occupancy in December 1952. The 58-bed hospital is the largest facility ever built specifically for the study and application of atomic energy in the study, diagnosis, and treatment of cancer.

21. Complete laboratory facilities, supplemented by a variety of radiation sources available in the Chicago area, will be used for both research and clinical studies in the diagnosis and treatment of experimental cancers and whole-body radiation injury. Facilities of the hospital will be employed by the staffs

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of Argonne National Laboratory and its 32 participating universities and research institutions in the Midwest.

Eniwetok Biological Laboratory

22. The Commission is considering the establishment of a small biological station at Eniwetok which would continue the work heretofore conducted by the University of Washington in measuring the uptake of fission products by plants, fish, and other marine animals in the Pacific. The facilities would be made available to other Government agencies and to a few university biologists. Construction and maintenance costs for a small laboratory accommodating eight biologists would be held to a minimum by using existing facilities. (End of UNCLASSIFIED section.)

Exposure of Uranium Miners to Radiation ~~(RESTRICTED)~~

23. When the U. S. Public Health Service conducted a survey of some 60 uranium mines on the Colorado Plateau in 1950, it was found that concentrations of radon and its radioactive products in the mine atmospheres were far higher than recommended standards. Under an agreement with the Commission, the Public Health Service in the summer of 1952 surveyed 157 mines, representing about 90 percent of those operating on the Plateau. Results showed that in 78 percent of these mines employing 84 percent of the miners atmospheric concentrations of radioactive products of radon were higher than the 100-microcuries-per-liter standard adopted by the Public Health Service. In 1953 investigations will be continued to find effective methods for reducing this concentration. (End of ~~RESTRICTED~~ section.)

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