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UNITED STATES ATOMIC ENERGY COMMISSION

1951-Jan. 1954
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Tenth Semiannual Report

OF THE

ATOMIC ENERGY COMMISSION

July 1951

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UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C.

LETTER OF SUBMITTAL

WASHINGTON, D. C.,
31 July 1951.

SIRS: We have the honor to submit herewith the Tenth Semiannual Report of the United States Atomic Energy Commission, as required by the Atomic Energy Act of 1946.

Respectfully,

UNITED STATES ATOMIC ENERGY COMMISSION.
T. KEITH GLENNAN.
THOMAS E. MURRAY.
SUMNER T. PIKE.
H. D. SMYTH.
GORDON DEAN, *Chairman.*

The Honorable
The President of the Senate.

The Honorable
The Speaker of the House of Representatives.

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MAJOR ACTIVITIES IN ATOMIC ENERGY PROGRAMS, JANUARY–JUNE 1951

The Atomic Energy Commission increased its supplies of raw materials and its output of fissionable materials during the first 6 months of 1951 while pushing ahead with a very large expansion of production capacity. New foreign sources of uranium ores were being tapped; increases in supplies and processing placed the United States second among the free nations in the production of uranium. Two series of weapons tests were carried out.

Construction and equipment accounted for nearly three-fourths of the more than 2 billion dollars appropriated for fiscal year 1951. Work progressed at the two new major production plants in South Carolina and Kentucky. Construction of a number of other facilities proceeded at an accelerated pace.

In January and February, near Las Vegas, Nev., the AEC conducted the first nuclear weapons tests in the continental United States since the original atomic bomb was fired at Alamogordo, N. Mex., in July 1945. Additional tests were held at Eniwetok Atoll in April and May.

Work on nuclear reactors to power submarines made progress during the last 6 months. Development of reactors to propel military aircraft also advanced. An experimental "breeder" reactor, designed to get basic information which might be used to increase rates of fissionable-material production, was nearing completion at the National Reactor Testing Station in Idaho. Agreements were signed with four industrial groups for studies on the possibility of private investment in building and operating dual-purpose reactors to produce fissionable material and electric power.

A major part of research in the physical and life sciences was directed toward finding solutions of immediate developmental and health and safety problems, but AEC continued commensurate efforts to broaden the base of our knowledge as a foundation for the future progress on which national security ultimately depends.

Expanded atomic energy activities are encountering problems which arise from the simultaneous large increase in other defense work or are directly related to establishing new operations sites and field offices.

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Continued cooperative action with the National Production Authority enabled AEC substantially to meet its scheduled requirements for supplies and materials through use of Defense Order priorities. Operations under the priorities system were assisted by (*a*) expansion of original NPA delegations of authority to AEC to provide assistance to privately financed programs that supply AEC and (*b*) cooperation of NPA in providing special assistance in obtaining deliveries.

Under the Controlled Materials Plan effective on July 1, 1951, AEC was designated as both a claiming and allotting agency. Analyses of requirements for materials and equipment indicate that AEC's needs for such basic materials as steel, copper, and aluminum are not great enough at the present time to have a serious impact on national supply. AEC's needs in specialty items are significant. AEC reviewed these findings with appropriate Federal agencies to assist them in planning for AEC requirements.

Recruitment of manpower became more difficult, particularly in specialized skills. Shortages of housing and of community facilities and services created difficult situations at the new Savannah River, S. C., and Paducah, Ky., sites, where AEC is seeking to avoid constructing and operating Government-owned housing. These problems and the steps being taken to meet them are described in the body of this report.

This report presents only those activities between January and June 1951 that can be described publicly without compromise of national security. In certain instances, because of the urgent requirements for recruiting labor, ordering materials, supplies and equipment or letting contracts, the Commission has found it necessary from time to time to announce major steps in its key programs. Some of these are recapitulated in this report. Also described are developments in such fields as medical and biological research and basic research in the physical sciences on which no restrictions need be placed. Classified projects are not included. The Committees on Appropriations of the House of Representatives and the Senate have been supplied with considerable classified information in executive sessions and the Joint Committee on Atomic Energy of the Congress has been kept fully informed through reports, consultations, and other communications, as required by the Atomic Energy Act of 1946.

During the last 6 months, the term of Commissioner H. D. Smyth expired and he was reappointed by the President for a 5-year term and confirmed by the Senate. Several changes took place in principal staff: Walter J. Williams, formerly Director of Production, became deputy to the new General Manager, M. W. Boyer; Everett L.

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Hollis was appointed General Counsel; Dr. Kenneth S. Pitzer resigned as Director of Research; R. W. Cook became Director of Production. Two new divisions were organized, a Division of Raw Materials under Jesse C. Johnson, formerly manager of the Raw Materials Operations Office, and a Division of Construction and Supply, under E. J. Bloch, formerly Deputy Director of Production.

Weapons Tests

The Atomic Energy Commission conducted limited-scale weapons tests in January and February on the Las Vegas Bombing and Gunnery Range in Nevada with logistic support by the military services. In April and May the Commission and the Department of Defense jointly conducted a full-scale test program at the Eniwetok Proving Grounds in the Pacific's Marshall Islands. The Eniwetok test program included detonations of sufficient energy yield to permit checking or confirmation of the estimates and predictions as to the effects of weapons several times more powerful than the Hiroshima and Nagasaki weapons.

Information obtained on phenomena associated with nuclear detonations, the major purpose of the tests, cannot be reported publicly since such facts are restricted data. Other experiments were carried out to determine the effects of atomic radiation, burns, and blasts on living things, and to obtain additional data as to the effects of atomic weapon explosions on structures, aircraft, and various materials.

Radiation After Explosions

Experience in the 1951 tests of atomic weapons demonstrated definitely that lingering radiation need not delay rescue and recovery work after bombing by high air bursts. Direct radiation from a high air burst disappears almost immediately as the radioactive cloud rises into the stratosphere, and no dangerous residual radiation is left at ground level. A burst close to the ground leaves considerable residual radiation in an area 300 to 400 yards in radius, but destruction within this circle would be practically complete.

After explosions in the 1951 Eniwetok tests, many scientists and technicians returned to the test sites promptly by helicopters and speed boats for periods long enough to recover instruments and specimens. Within 24 hours after one explosion, construction employees, under radiological safety control, were able to begin work on new barracks 1,000 yards from the point of detonation. The barracks were occupied 72 hours later.

Biological Experiments

For the primary purpose of providing data to develop treatments of atomic bomb casualties, the tests at Eniwetok included exposure of many mice and a few dogs and pigs under various conditions and at various distances from the explosions. The experiments sought also to determine whether laboratory data on blast, radiation, and burns could be applied directly to conditions of an actual bombing. The program was designed to verify the reliability of measuring instruments, to give accurate information on radiation exposures and energies at various distances from the bomb burst and a detailed analysis of the relative effectiveness of infrared, visible, and ultraviolet portions of the electromagnetic energy spectrum in causing flash burn injuries.

More than 12,000 mice were used either in the actual exposures or to obtain "control" data. Mice were used because of the wealth of background laboratory data on this species; dogs because their reaction to radiation resembles that of man; and swine because their skin resembles human skin. Many specimens were housed in special structures to protect them from all but one damaging component of the explosion. A number of mice, for example, were placed in chambers designed to admit nuclear radiations but to exclude heat rays and the air blast.

All animals used were bred and reared at Eniwetok so that effective studies with acclimated subjects could be carried out. Because of the tropical climate, battery-driven ventilating systems were installed in exposure chambers to reduce weather damage and get a clear picture of bomb effects. These measures were necessary because several hours elapsed between the time specimens were placed in the chambers and the time they could be recovered after the explosion. All animals were anesthetized before exposure.

Many specimens were autopsied at laboratories set up near the site. Some mice which survived the exposures were flown to the United States for continued observation.

Preliminary analysis indicates the tests will provide definitive answers on radiation distances, dosages, and energies, and the factors involved in the thermal burns. Reports on immediate effects of the tests will be completed this year.

Tests of Structures

Buildings of various materials and types of construction were erected within range of the Eniwetok explosions to develop information for building designs that would minimize blast damage. Some

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900 measurements were made on 27 different structures, including industrial-type buildings, dwellings, and underground and surface bomb shelters for military use. Glass and types of window construction were also given limited tests.

Observations were made of physical damage, and instruments inside and outside the buildings automatically transmitted data on blast waves and nuclear and thermal radiation to recording stations located at safer distances. This large collection of experimental data is now under intensive analysis. It will supplement and bring up to date knowledge that previously was based on the effects of the Hiroshima and Nagasaki bombs.

Automobiles as Shelters

A limited experiment on the effectiveness of automobiles as a means of shelter against blast, heat, and radiation in an atomic explosion was made at the Nevada weapons test. Five automobiles were ranged at half-mile intervals from ground zero at one of the test explosions so that data could be obtained on the distances at which an automobile would afford some protection.

The problem of prescribing various types of shelters for civil defense use is a responsibility of the Federal Civil Defense Administration. In accordance with AEC's general policy of providing the FCDA with technical data resulting from atomic energy experience and research, detailed results of this experiment have been furnished that agency for evaluation.

Joint Operations

"Operation Greenhouse"—code name for the 1951 Eniwetok tests—was carried out by Joint Task Force Three, under the command of Lieutenant General Elwood R. Quesada, United States Air Force. Dr. Alvin C. Graves, head of the weapons test division of AEC's Los Alamos Scientific Laboratory (operated by University of California), served as deputy to General Quesada in charge of the scientific programs. Of almost 9,000 persons required for the tests and the supporting services, more than 6,000 were Army, Navy, and Air Force personnel. The entire project, from first planning stages in 1949 through completion of a program of test detonations, was an outstanding example of effective and fully integrated joint operations involving military and civilian personnel of the three Armed Services and their contractors and personnel of the Atomic Energy Commission and its contractors. In order to maintain the uniformity and efficiency of an integrated operation, the Task Force organization is

carrying through the main work of compilation of data and preparation of reports. Thus both AEC and the Department of Defense look to this jointly sponsored group for factual material on the experiments conducted both for Defense and AEC purposes.

The scientific and technical group, including people drawn from AEC laboratories, the armed forces, and elsewhere, numbered 2,580. In general, agencies of the Department of Defense designed and carried out the experiments dealing with the effects of the weapons, while Los Alamos Scientific Laboratory and its associated contractors carried out the basic program of testing the nuclear devices.

A force of Army personnel numbering 1,400 constructed Army and Air Force base facilities at Eniwetok before the tests, and private contractors designed and built facilities on the test islands. The Army provided military security and logistic support during actual experiments. A Navy force of 2,370 provided offshore patrol, surface and harbor defense, and floating fuel storage facilities, and carried the major burden of transporting personnel and cargo among various islands.

An Air Force group of 2,400 made weather observations, and operated experimental aircraft including radar-directed "drones" to collect observations in and near the radioactive clouds that follow atomic explosions. Other unmanned planes were sent up to test their ability to withstand atomic blasts. Latest developments in radar were used in the split-second problem of placing drones exactly where they were wanted during and after the explosions. This was the first occasion on which jet-propelled drones had been used. Data collected by the unmanned planes were transmitted by electronic devices to ground stations. Three drones were lost during the tests.

The Greenhouse series of tests required moving 250,000 tons of cargo by military and naval transport services from the West Coast to Eniwetok, a distance of 4,500 miles. The Military Air Transport Service carried 3,500 tons of high-priority freight and passengers.

Military Application

Continued progress in military application of atomic energy was achieved in the first half of 1951, and close coordination was maintained with the armed forces.

Development of new facilities for weapons purposes proceeded, and announcements were made of some of the sites.

Weapons tests, such as those which were held in Nevada and Eniwetok this year, constitute an integral part of the weapon-development program and are necessary to advancement in other fields. It

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is anticipated that additional tests will be held from time to time as requirements dictate. Presidential approval is obtained for all such tests.

Arrangements are being made for continued use of the Nevada test site, as well as the Eniwetok Atoll, as a proving ground for atomic weapons. Some construction is planned in Nevada.

Los Alamos Community

Construction at Los Alamos continued in order to meet the technical needs of the Los Alamos Laboratory and to supply necessary housing and community services.

New legislation has recently been obtained from the State of New Mexico which, among other things, grants to the County of Los Alamos ordinance-making powers comparable to those of New Mexico municipalities, grants to the county the power to pay salaries for certain full-time employees, and provides for popular election of school boards.

Net costs to the Government of operating Los Alamos community, the population of which was 12,000 in June 1951, decreased more than two-thirds of a million dollars in the 1951 fiscal year. In the following table, figures for fiscal years 1949 and 1950 are actual costs on an accrual basis, and actual revenues. Figures for 1951 are for 11 months plus an estimate for the twelfth month. Community accounts before fiscal year 1949 were not kept on the accrual basis and are not properly comparable with those reported here.

[Thousand dollars]

	Revenues	Costs	Net costs
1949	2, 591	7, 128	4, 537
1950	3, 163	5, 037	1, 874
1951	4, 201	5, 363	1, 163

Rent revision. In February, rent revisions were announced, effective August 1, 1951, to make them comparable with rents of other towns and cities nearby and to achieve equal rents for equal quarters within Los Alamos.[1] The schedule will also apply to new units of housing as they are completed. The revisions are in line with recommendations made after a survey by real estate experts. They will result in an average rent increase of about 4.8 percent.

[1] In view of the fact that rent control legislation was pending in Congress, AEC in July deferred the effective date until October 1 in order to make sure that rent adjustments would be in accord with national policy on rent control.

Operations Office To Move

Headquarters of the Santa Fe Operations Office, the AEC field office with primary responsibility for atomic weapons work, will be moved soon from Los Alamos to Albuquerque, N. Mex. AEC-owned property is available for office space at Albuquerque.

Raw Materials

Deliveries of uranium concentrates increased during the last 6 months, and AEC made progress toward enlarging future supplies for its expanding production plant.

Deliveries from the Belgian Congo and from Canada continued at scheduled rates.

Domestic production increased during 1950 and 1951 to the point that the United States became second among the free nations in the mining and processing of uranium ores.

With plants under construction to extract uranium from gold ore residues, the Union of South Africa moved nearer to tapping this important potential source of uranium—low in uranium content, but great in volume of ores. Under a three-nation agreement announced last December, South African gold mining companies will process ores and sell the uranium to the United States and the United Kingdom. Canada has moved to stimulate greater production through higher ore prices and premiums for development, and is planning additional processing plants.

In the domestic program, the AEC raised its guaranteed price for uranium ore, offered bonuses for ore from new sources, and expanded exploration and supporting research. Fertilizer producers are actively interested in an AEC-developed process for byproduct extraction of uranium from phosphate rock; one manufacturer has announced plans for a plant in Florida.

Exploration work has shown that the potentially productive part of the Colorado Plateau extends farther west and south than formerly recognized. In this region, some road projects were certified by the Defense Materials Administration of the Department of the Interior for construction by the Bureau of Public Roads—a necessity for successful mine development in an area where hauls of supplies, equipment, and uranium ore averaged 70 miles through a formidable terrain of deserts, canyons, and mesas. Additional road projects are under consideration.

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Incentive Prices and Bonuses

Under AEC's new price scale effective March 1, 1951, producers of acceptable grade carnotite and roscoelite-type ores are guaranteed, for the period ending March 31, 1958: (*a*) A *base price* of from $1.50 a pound of uranium oxide (U_3O_8) content to $3.50 a pound, depending on the grade of ore; (*b*) *premiums* for richer ores; (*c*) a *development allowance* to be "plowed back" into development and exploration of the mining properties; (*d*) a fixed price for the *vanadium content* of the ore; and (*e*) a *haulage allowance* for transportation of the ore from mines to purchase depots (see Appendix 6).

The new prices (together with haulage and development allowances, which remain unchanged) enable Colorado Plateau operators to meet increases in mining costs, serve to maintain continued interest in uranium mining in a period when prices of other nonferrous metals have risen substantially, and provide an incentive to search for and develop new sources of uranium ore.

Both vanadium and uranium are paid for in ores that contain both. Until recent years uranium was a byproduct of vanadium production. Vanadium now is the byproduct. It is a strategic material, and providing a market for it contributes to the incentive to search for and produce uranium. Some of the refined vanadium oxide produced in plants that supply AEC with refined uranium oxide is sold to AEC and turned over to the national stockpile of strategic minerals.

Bonus for Development

In addition to the new basic price scale, the AEC offered for a three-year period ending February 28, 1954, to pay bonuses for initial production of uranium from eligible properties which in the last 3 years produced either no uranium or only limited amounts. The effect of the bonus is to double the base price on uranium oxide content for limited amounts of ore (see Appendix 6).

Bonus for Richer Materials

AEC has a standing offer of a $10,000 bonus for the first 20 short tons of ore or mechanical concentrates assaying 20 percent or more produced from any single mining location not previously worked for uranium. No one has yet qualified for this bonus.[2]

[2] For a full statement of this bonus, see p. 75, "Prospecting for Uranium," Superintendent of Documents, Washington 25, D. C., 30 cents.

Processing Plant Operations

AEC buys ores direct from miners through two purchasing stations and buys uranium precipitates from privately operated processing plants under negotiated unit-price contracts. These plants are required to pay for ores on terms as favorable as the AEC price scale.

A considerable amount of AEC research is conducted to improve the efficiency and reduce the cost of ore processing, particularly on new types of ore which require special treatment. Typical Colorado Plateau ores are crushed and roasted, then subjected to an alkaline or acid leach. This yields a solution containing the uranium and vanadium, which are selectively precipitated. After further treatment to remove impurities, these precipitates yield high-grade concentrates of uranium oxide and vanadium oxide.

In 1951, AEC began buying copper-bearing uranium ore with payment for the uranium and part of the copper content, under contract with producers at the Marysvale and Monticello purchase stations. A new processing plant at Salt Lake City is interested in purchasing copper-bearing uranium ores.

A technically feasible process has been developed for extracting uranium from phosphate rock as a byproduct of fertilizer manufacture. During 1951 one fertilizer producer announced plans to build uranium-recovery facilities in a Florida plant, and most other phosphate producers have shown an active interest.

The Exploration Program

The AEC program to locate and define ore reserves in the United States expanded in the first 6 months of 1951, and 1,200,000 feet of exploratory drilling is scheduled for fiscal year 1952. This is in contrast with 300,000 feet in 1949, and 400,000 feet in 1950. Much of the exploration is directed toward maintaining and increasing production in established uranium-bearing areas, but all regions considered favorable are studied.

Drilling programs are based on aerial mapping followed by detailed surface mapping and studies of available geological data. The drilling is done under contracts awarded by open competitive bidding.

For the most part, diamond core-drilling equipment is used, but non-core drilling also plays an important part in determining ore possibilities. In diamond drilling an annular diamond-tipped bit, rotated by a gasoline-powered drill rig, cuts through the rock formations. The core is recovered in a core barrel to which the bit is attached and is brought to the surface for examination and radio-

metric or chemical assay. Where no core is taken, a specially designed probe is used to measure radioactivity in bore holes.

Diamond drilling has uncovered excellent ore bodies. At one place, where the rimrock of a mesa had produced a few hundred tons of uranium ore from a series of small deposits over 30 years, the deposits did not appear sufficiently attractive for private industry to prospect the mesa. As part of the AEC drilling program, test holes were sunk in the mesa—a thousand holes averaging less than 200 feet deep. They revealed a very considerable body of uranium ore.

The greater part of AEC drilling is on public lands that have been withdrawn from mineral entry under the public land laws. Lands on which further exploration is not anticipated by the AEC will be released from the withdrawal orders and reopened for private entry. In general, withdrawn lands found to contain uranium will not be released but will be available for development and mining by private interests under arrangements with AEC. When it is necessary to drill on private lands in order to obtain more complete information on the ore potentialities of a specific area, permission is obtained and the owner of the mineral rights is provided with the information resulting from the drilling on his property.

Aids to Uranium Prospectors

AEC and two cooperating Federal agencies, the United States Geological Survey and the Bureau of Mines in the Department of the Interior, during early 1951, tested without charge from 650 to 700 ore samples sent in by prospectors each month. About 25,000 to 30,000 such samples have been examined for radioactivity by AEC and cooperating Federal and State laboratories in the last 3 years. Roughly 20 percent have been found to be radioactive and further screened on the basis of their mineralogy and other information. As a direct result of the receipt of samples, approximately 1,200 field examinations of individual properties have been made by AEC or the Geological Survey.

Research to Aid Exploration

AEC finances a program of supporting research to develop more effective methods for locating new uranium deposits. A large part of this research has been conducted by the Geological Survey, involving fundamental laboratory studies on phosphates, carnotites,

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analytical methods, and the development of laboratory instruments, as well as geological and geochemical field studies and the development of drill-hole, air-borne, and car-borne equipment for the detection of radioactivity.

Research contracts are in effect with Columbia University for investigations of primary vein minerals, wall rock alteration studies, and a field study of the uranium deposits at Grants, N. Mex.; with the University of Minnesota for studies of the occurrence of the secondary uranium minerals; with Massachusetts Institute of Techonology for research on radiation characteristics of various uranium ores; with Stanford University for research on thorium mineralogy; with Amherst College for research on the movement of uranium salts in ground waters; with R. F. Beers and Heroy, Inc., for research on the occurence of domestic uranium-bearing black shales. In addition, basic research projects at the universities of Arkansas and Wisconsin and Columbia University related to the raw materials program have been approved.

Distributing Information

Practical information is made available to technical people and the general public. Statements on AEC raw materials policies and technical data on uranium exploration are widely distributed with the cooperation of State and Federal agencies. Papers have been distributed to the public on such subjects as the use of the Geiger counter in prospecting and the occurrence and description of important uranium minerals. Probably the best known publication is "Prospecting for Uranium," [3] a manual which has sold 77,000 copies since its issuance in 1949. It is currently being revised.

Production

AEC pushed ahead with construction of new production facilities during the last 6 months and, while increasing the output of fissionable material in existing facilities, lowered unit costs for both plutonium and uranium 235.

Portions of AEC's construction program cannot be reported publicly. This report is confined to information that can be a matter of public record—covering work at the South Carolina and Kentucky plants, where initial construction is in progress, and at Fernald, Ohio, where construction of a new feed materials plant has begun.

[3] Superintendent of Documents, Washington 25, D. C., 30 cents.

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The feed materials plant in Ohio will be built on a site northwest of Cincinnati as announced March 30. A subsidiary of National Lead Co., of New York, will operate the plant for AEC. Catalytic Construction Co., of Philadelphia, is designing the plant; George A. Fuller Co., of New York, will construct it.

Progress on New Plants

The Paducah Site

Design is well advanced for one of the two gaseous diffusion plants to be built on the site of the Kentucky Ordnance Works, 16 miles west of Paducah, Ky.; design for the second is getting under way. F. H. McGraw Co., of Hartford, Conn., is the principal construction contractor; Union Carbide & Carbon Corp., operator of the similar Oak Ridge plants of AEC, will operate the Paducah plants.

Construction is going ahead on two power plants to supply electricity for the Paducah operations. A formal contract for power was signed May 4 with Electric Energy, Inc., comprised of utility companies which will construct a privately financed plant seven miles downstream from the AEC plant on the Illinois side of the Ohio River. A contract is being negotiated with the Tennessee Valley Authority for power from a second plant which TVA will build with its funds.

Savannah River Plant

Early construction work is under way at the Savannah River Plant, near Augusta, Ga., where E. I. du Pont de Nemours & Co. will construct and operate a new major production center. Some temporary facilities were completed and occupied by du Pont and AEC staffs. As of June 30, construction workers numbered 6,500.

The approximately 200,000 acres needed for the Savannah River plant in Barnwell and Aiken counties of South Carolina include about 1,500 tracts of individually owned land which the Army's Corps of Engineers is acquiring for AEC. The Department of Agriculture and county agents of the Federal-State Extension Services are assisting farmers living within the area to find land elsewhere and keeping them informed about farm labor requirements in other areas.

By the end of June, options on 268 tracts of land totaling 34,056 acres had been accepted, and final payments and closing completed on 115 of these tracts including 15,873 acres. In addition, condemnation proceedings had been started on 36 tracts comprising 7,379 acres. Most of these court actions were required because of title defects

rather than because of inability to agree on a reasonable price. It is AEC policy to negotiate for a price rather than use condemnation proceedings, and court action has not often been necessary.

About 70 percent of the 200,000 acres in the Savannah River site was used for pastures and crops, chiefly corn and peanuts; limited areas were used for raising beef cattle and dairy stock. Some 10 percent of the acreage has timber stands of better-than-average hardwoods, but is located where it is difficult to harvest; the remaining 20 percent of the land has been cut over and was used for pasture. A number of larger tracts were operated on a share-crop or tenant basis, and the Corps of Engineers estimates that the total population, including the 4 small communities in the area, is about 8,000. The largest community is Ellenton, population 760. The other communities are Dunbarton, Meyers Mill, and Leigh. In the communities are 4 cotton gins, 3 schools, 6 churches, 2 sawmills, 1 box factory, 51 commercial establishments, and 287 residences.

Periodic bulletins are sent to all postoffice box holders in the region by the Corps of Engineers to acquaint residents and landowners with the procedures being followed, and so far as possible, with the schedules for acquisition of land in various areas. Where crops are involved, the Department of Agriculture and county agents stand ready to assist farmers in making decisions about them, as well as about relocation or employment opportunities. AEC and its contractors have established a policy of giving preference to residents within the area who wish to work on construction projects.

AEC is assuming costs for removal and reburial from most of the 150 cemeteries, containing about 4,500 graves, that are located within the area. Only a few of the cemeteries within the Savannah River reservation are sufficiently close to its borders so that the public may be admitted for normal use of the cemeteries. A number of desirable new cemetery sites outside the area are being selected, and relatives may choose a plot in one of these sites for reburial or may choose a site at any other location. In the latter event, the Government's liability is limited to the amount it would cost for reburial in one of the selected sites.

Oak Ridge and Richland Community Operations

Government Community Costs

In operating communities in support of its expanding operations, AEC reduced net costs an estimated 1.4 million dollars at Oak Ridge during 1951, but expended about $439,000 more than in the preceding year at Richland, Wash. In the following table, figures for fiscal

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years 1949 and 1950 are actual costs on an accrual basis, and actual revenues. Figures for 1951 are for 11 months plus an estimate for the twelfth month. Community accounts before fiscal year 1949 were not kept on the accrual basis, and consequently are not properly comparable with those reported here.

[Thousand dollars]

	Revenues	Costs	Net costs
Oak Ridge:			
1949	6, 911	14, 283	7, 372
1950	7, 262	10, 251	2, 989
1951	8, 015	9, 554	1, 540
Richland:			
1949	4, 729	7, 299	2, 570
1950	4, 824	5, 839	1, 015
1951	4, 756	6, 209	1, 454

Rent Increases

The Atomic Energy Commission announced in February that shelter rents of Government-owned housing would be increased an average of about 28 percent in Oak Ridge and 41 percent in Richland, effective August 1.[4]

Upon assumption of operating responsibility of Oak Ridge and Richland from the Manhattan Engineer District, AEC initiated a review of the rents charged for federally operated and controlled housing and established the policy of charging rents comparable to those for similar accommodations in the areas surrounding AEC communities.

The Commission's review indicated that the original MED rents had been established at a low level to facilitate recruitment during the war under the extremely difficult conditions prevailing at these locations—rigid security restrictions, unpaved streets, lack of curbs, gutters, drainage facilities and grass, together with inadequate commercial and recreational services. With improvement of these unfavorable and substandard conditions, AEC can find no justification for continuing the unusually low rents, which actually constitute an indirect subsidy to Oak Ridge and Richland residents at the expense of the general public.

In deciding to make rents comparable to those in surrounding areas, AEC was primarily concerned with eliminating this subsidy. It also

[4] In view of the fact that rent control legislation was pending in Congress, AEC in July deferred the effective date until October 1 in order to make sure that rent adjustments would be in accord with national policy on rent control.

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desired to correct inequities in rents within each community. It was further convinced that special privilege should not be granted through offering subsidized rents to workers living on the site, as compared with workers living off-site who pay prevailing rents. Approximately 40 percent of Oak Ridge workers and 18 percent of Hanford workers live outside of AEC communities.

As an initial step, after making rent surveys in the vicinity of the two towns, rent adjustments for both projects were made in the summer of 1949 which corrected internal inequities within each community, and which reduced by one-half the difference between the combined existing utility charges and shelter rents, and comparable rents in the surrounding areas. It was decided that increase to full comparability of both utility rates and shelter rents at one time could have resulted in an undue hardship on tenants. At both Oak Ridge and Richland, utility rates were increased at that time to full comparability.

During the latter part of 1950, independent real estate appraisals were obtained to determine shelter rents which would be comparable to those currently prevailing in the surrounding areas. The appraisals indicated that the shelter rents in the Government communities should be increased an average of $10.74 at Oak Ridge, and $13.17 at Richland.

Community Studies

The Public Administration Service, a nonprofit consulting firm, was employed by the manager of Hanford Operations in April 1950 to develop facts on the feasibility of incorporating Richland as a town and selling to private owners the housing and commercial properties now owned by the Government. Its report was released to citizen groups for study. This report, together with other material related to future operation of AEC communities, is being studied by AEC.

A similar study at Oak Ridge was made by J. L. Jacobs & Co., of Chicago, about 2 years ago, and is being considered by citizen groups there.

A special panel, appointed in the summer of 1950 to study the problems of introducing into the communities private ownership of real property and self-government, visited all three AEC towns. AEC is reviewing preliminary working papers which the panel has developed on Oak Ridge and Richland. The panel includes Richardson G. Scurry, Dallas, Tex., chairman; Frederick M. Babcock, Washington, D. C.; George E. Bean, Grand Rapids, Mich.; George Gove, New York City.

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Housing and Services at New Plants

At the Savannah River and Paducah plants, AEC announced its intention not to build and operate permanent housing for plant personnel, but to rely on private enterprise and existing local communities to supply housing, community facilities, and services. At Paducah, permanent operating personnel will total about 1,600, and construction will employ about 12,000 at its peak, according to preliminary estimates. At Savannah River, operations are estimated ultimately to require 5,400 permanent employees; construction, at peak, about 35,000.

Many people for both permanent and construction forces will be employed from local labor pools, but during the construction period, 24,400 additional persons probably will have to move into the Savannah River area, and 4,900 into the Paducah area. For plant operations, it is estimated that 3,800 new employees will move into the Savannah River area and 850 into the Paducah area.

The Department of Labor is surveying the labor market in the Savannah River and Paducah areas to determine the availability of workers within commuting distance, and the numbers and types of workers required from elsewhere.

Increases in population already are creating difficult problems for local communities. AEC has supplied extensive information to Federal agencies that have responsibilities and authority to assist efforts to provide housing and community facilities.

The Situation on Housing

To alleviate the housing problems at the Savannah River and Paducah plants, the following steps have been taken:

The Housing and Home Finance Agency, after these areas were designated as critical to the national defense, acted with the Board of Governors of the Federal Reserve System to modify credit restrictions under Regulation X for 1,150 housing units at Savannah River and 1,000 at Paducah; sent representatives to these two places to assist in the modified program which will help supply housing for permanent personnel coming into these areas from elsewhere; was considering authorizing 2,600 more housing units at Savannah River as soon as community facilities are available.

AEC authorized McGraw Construction Co. to erect barracks at the Paducah site for 1,000 single nonlocal construction workers, and accommodations for 500 of these already have been built. AEC sold

250 TVA flat-top housing units to a private operator for removal from Oak Ridge and reerection at Paducah. They are to be operated with priority on occupancy guaranteed to AEC for use by key construction contractor supervisors.

The Trailer Manufacturers' Association sent an expert to Savannah River to work with local government officials and private developers on constructing privately operated trailer parks. Thirty-three trailer parks with accommodations for 5,560 trailers are reported as being available during July 1951 at Savannah River. Accommodations for several hundred more trailers are planned, but construction has not started.

With relaxation of credit regulations on certain housing, as described, and with provision of temporary housing for construction workers through private development and erection of some barracks, serious problems in housing have so far been avoided.

The Facilities and Services Situation

The situation on community facilities and services is much less favorable than that on housing. The following steps have been taken:

The Housing and Home Finance Agency advanced interest-free loans for planning additions to Paducah, Ky., and Barnwell, S. C., *hospitals*, and North Augusta, S. C., *schools*, and *water supplies* at Aiken, S. C.

The South Carolina Legislature approved legislation establishing authority for Aiken and Barnwell counties to appoint county *planning* commissions with zoning powers.

Federal assistance for *school* facilities, and for their operation and maintenance, is provided under Public Laws 815 and 874, and under Public Law 45, approved June 2, 1951. AEC is specifically prohibited from using appropriated funds to provide assistance to schools except those located on Federal property under AEC control. Public Law 45 authorizes the Commissioner of Education to set aside funds necessary to provide school facilities in areas declared critical by the President. The earlier laws were passed before emergence of school problems of the presently estimated magnitude near the Savannah River and Paducah sites. Public Law 45 will permit giving additional consideration to these areas which was not possible under limitations attached to appropriations implementing Public Law 815.

The Federal Government provides assistance for *hospital* construction under the Hill-Burton Act. This law was not intended to assist in critical areas, but was designed for general hospital construction

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assistance on the basis of long-range state plans, and requires substantial local contributions, but it may be of some value in providing hospital facilities required near the two new AEC plants.

Little other Federal assistance appears available except for interest-free loans for planning community facilities, which the Housing and Home Finance Agency can make, and in a few instances has made, available.

As AEC reported to the Banking and Currency Committees of the Senate and the House of Representatives in hearings on the Defense Housing Bill, it is clear that the communities near the Savannah River and Paducah plants cannot absorb the substantial influx of additional population without Federal assistance. It is likewise evident that if employees of AEC and its contractors cannot be provided with reasonably adequate accommodations, AEC may be unable to construct these important installations on schedule, or to operate them effectively. The solution of the many complex community problems urgently requires immediate application and effective coordination of full-time specialists in the field of community affairs. Experience has underscored the lesson that problems of this nature cannot be handled by the AEC without involving its top management to a degree which might impair AEC ability to discharge its primary functions.

In the Congressional committee hearings, AEC accordingly indorsed the principles embodied in the Defense Housing Bill, and participated with other Federal agencies in an inspection by the Senate Banking and Currency Committee of the situation at Savannah River.

New Field Offices

Three new field offices were established to carry out construction and operation assignments in production: the Savannah River Operations Office, the Kentucky Area Office under Oak Ridge Operations Office, and the Fernald Area Office under the New York Operations Office.

Reactor Development

Progress in the AEC's reactor program was achieved during the first half of 1951 on (*a*) design and construction of new reactors, (*b*) experiments with new types of reactors, and (*c*) long-range studies to evolve a program of future development. New production reactors are not included in this report.

a) Most advanced at mid-1951 of the four reactors in this group was the Experimental Breeder Reactor, designed to test whether or not atomic fuel can be manufactured more rapidly than it is con-

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sumed in the process, and to generate small amounts of power. A second reactor to test the behavior of materials under heavy radiation was well under way. Some buildings were completed for one experimental nuclear power plant, a prototype for reactors to drive submarines, and facilities were designed for a second type of submarine reactor. All these reactors are of markedly different types from the original reactors built during the war.

b) Construction advanced on a pilot model reactor of the homogeneous type designed to operate on fuel mixed with moderating material in a liquid. The early "water boiler" at Los Alamos is a small reactor of this general type.

c) Although primary emphasis is on reactors to manufacture fissionable material, the production of useful power was also being considered in basic studies of possible reactor designs. Development work continued on atomic propulsion of aircraft. Four industrial groups launched studies with AEC cooperation to determine the technical and economic feasibility of building dual-purpose reactors to produce plutonium and electricity. A temporary committee representing the electric power industry recommended establishment of a permanent committee to explore mutual interests with the atomic energy industry.

Supporting the entire program, new emphasis was given to private production of reactor materials and to possible industrial uses of radioactive byproducts of reactors. Studies were made in the safe management of wastes from reactors, chemical plants, and laboratories. AEC's recently established center to train engineers in the new specialty of reactor engineering graduated its first class, a second is in training, and a third has been selected.

New Full-Scale Reactors

Compared with the earlier production reactors using graphite and natural uranium, new reactors now being built for AEC are of markedly advanced design.

Experimental Breeder Reactor

Of the group of reactors under construction at the Reactor Testing Station in Idaho, the one nearest completion on June 30 was the Experimental Breeder Reactor. Construction of buildings and facilities was finished, and Argonne National Laboratory began installing the reactor core and controls, which it had designed and built.

At first the EBR will undergo a period of testing at low power

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levels to determine the operating characteristics of this first major reactor designed to operate with "fast" neutrons. The step-up to full design power will be gradual, and only at the higher power levels will a small generator be operated to produce experimental amounts of power for heat transfer studies.

It will be some time before specific information on breeding can be obtained. The reactor will use enriched uranium as fuel and a blanket of natural uranium around the core as the "fertile" material in which breeding may take place. The rate of fuel burn-up will be compared with the rate at which new fuel (plutonium) is manufactured.

With some fuels it is possible theoretically to breed new fuel at a rate faster than operating fuel is consumed. In this way it may be possible to increase our supply of fissionable material beyond the 0.7 percent of uranium 235 contained in the natural uranium as mined—now the sole source of fission fuel—and eventually to burn practically all the uranium rather than just a fraction of a percent as at present.

Breeding is theoretically possible because uranium 235, for example, releases an average of 2.5 neutrons per thermal neutron fission, and only one of these neutrons, on an average, must cause fission in another nucleus of uranium 235 to keep the chain reaction going. If no neutrons were wasted, one neutron from each fission would go to sustain the chain reaction, and 1.5 could go to manufacture 1.5 atoms of fuel to replace the one burned.

In practice, such efficiency is not attainable. Construction materials, fission products, and cooling fluids capture some neutrons. The practical problem of reactor designers is to make sure that as large a proportion as possible of the surplus neutrons goes into the manufacture of new fuel.

Other factors of successful breeding include: the efficiency and time requirements of the processes used to recover fissionable materials, the rate at which fuel can be burned, the length of time fuel elements will stand up, and the total amount of fuel and fertile material tied up in the reactor and in various stages of processing. The "neutron economy" of the reactor, however, is basic.

Materials Testing Reactor

Construction went ahead at the Testing Station on the Materials Testing Reactor. The core and controls will be installed under the technical supervision of Oak Ridge National Laboratory. Negotiations were completed and a contract signed with Phillips Petroleum Co., of Bartlesville, Okla., for operating the reactor. Phillips' men are in training at the Testing Station and on the Oak Ridge mock-up of the reactor.

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A test schedule is being set up for the MTR, the prime purpose of which is to try out reactor materials in an intense neutron flux. Operating in the slow neutron range, this reactor will also produce information useful in future reactor design.

Submarine Reactors

Construction of some buildings and facilities, and design of others, for two prototype submarine reactors—the Submarine Thermal Reactor (STR) and the Submarine Intermediate Reactor (SIR)—progressed during the last 6 months.

F. H. McGraw Co., of Hartford, Conn., and M. J. Brock and Sons, of Los Angeles, are major contractors for STR work at the Testing Station. Both are subcontractors to the Westinghouse Electric Corp., and were chosen on a competitive, fixed-price basis.

The contractor designing buildings and facilities for the SIR is Charles T. Main, Inc., of Boston, engaged by General Electric Co., on a lump-sum basis. Knolls Atomic Power Laboratory, Schenectady, N. Y., will prepare a report on this reactor for AEC consideration.

Chemical Processing Plant

Construction continued on a chemical processing plant at the Testing Station for the separation of unused fuel from used fuel units. Employees of the American Cyanamid Co., operating contractor, began training on a pilot plant at Oak Ridge National Laboratory, and Cyanamid opened an office at the Idaho site.

The full-scale plant will provide important new data on fuel processing, an elaborate and costly process essential to the use of reactors. Processing begins with dissolving used fuel elements and separating out the unburned fissionable material. This material is reduced to metallic form, cast, and fabricated into new fuel elements. Fuel elements go through this cycle at frequent intervals because accumulation of fission products and physical breakdown of the material during operation makes them useless. Waste from fuel processing includes highly radioactive fission products.

Reactor Experiments

The reactor program includes exploratory projects or experiments, which serve essentially as pilot-plant operations and point toward later full-scale reactors. One of these now building is the Homogeneous Reactor Experiment.

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Homogeneous Reactor Experiment

A building for the Homogeneous Reactor Experiment was completed at Oak Ridge National Laboratory. Research and development for the long-range homogeneous reactor program were accelerated during the last 6 months. Projects were initiated at the Ames Laboratory in Iowa, the University of California at Los Angeles, the University of Tennessee, and the Markite Co., of New York. The Long Range Planning Group at Oak Ridge National Laboratory continued detailed homogeneous studies.

Long Range Program

The long-range reactor development program is expected to emerge from basic studies now being made. Major studies during 1951 were aimed toward new and more efficient types of production reactors to manufacture fissionable material; other projects looked toward generating useful power as a byproduct.

Selection of designs for the further development of various types of reactors will depend on experience with new reactors, upon fuel supply, and on economic considerations. Much more industrial participation seems likely in the future program. Explorations with industrial groups, which are reported here, reflect AEC's interest in attaining wider industrial participation in the national atomic energy program.

Aircraft Nuclear Propulsion Program

AEC is negotiating a contract with the Aircraft Gas Turbine Division of the General Electric Co., Cincinnati, for development studies on the problems of a nuclear reactor for aircraft. These studies will parallel work on associated airplane propulsion equipment being done by General Electric under contract to the United States Air Force. In addition, basic research and development at Oak Ridge National Laboratory and other projects supported by AEC and the Air Force in the field of nuclear-powered flight are being continued.

With establishment of the theoretical feasibility for nuclear-powered flight, the contract of United States Air Force with the Fairchild Engine and Airplane Corp. was terminated on April 30 for the work of the corporation's Nuclear Energy for Propulsion of Aircraft (NEPA) Division at Oak Ridge.

Industrial Interest in Reactors

Early this year proposals from industry seeking a way for industrial firms to carry a larger share of the task of developing, build-

ing, and operating reactors were studied by AEC. By the end of June agreements had been signed for four joint studies—by Monsanto Chemical Co. and its associate, Union Electric Co., both of St. Louis; by Detroit Edison Co., of Detroit, and Dow Chemical Co., of Midland, Mich.; by Commonwealth Edison Co. and Public Service Co. of Northern Illinois, both of Chicago; and by Bechtel Corp. and Pacific Gas & Electric Co., both of San Francisco.

The four agreements provide for surveys and studies by the companies to (*a*) determine the engineering feasibility of their designing, constructing, and operating dual-purpose reactors to produce fissionable materials and power; (*b*) examine the economic and technical aspects of building such reactors in the next few years; (*c*) determine the possible research and development needed, and (*d*) recommend industry's role in designing, building, and operating such reactors.

The discussions considered the possibility of industries' using their own funds to design, build, and operate large reactors. Twelve months were allowed for completion of the studies, on which reports will be made to AEC. Since only a limited number of studies are being undertaken and since they will be based on information acquired at public expense, yet not generally available to the public, AEC will determine the disposition of patent rights and use of reports made as a result of these studies.

The companies will bear all the costs except those incurred by AEC and its contractors in supplying information and consulting services. The four studies will make considerable demands on the time of technical people in the AEC program; consequently arrangements are not now being made for additional studies of dual-purpose reactors. Another industrial company, however—Bendix Aviation Corporation of Detroit—has entered discussions with AEC over the possibility of a privately financed reactor to produce radioisotopes.

Training for Reactor Engineering

The School of Reactor Technology at Oak Ridge National Laboratory will indirectly assist industrial concerns in reactor development by providing opportunity for training engineers in subject matter not available outside AEC programs. Founded to help increase the number of trained men in this new field, the school graduated in March its first class, an interim group composed of 18 engineers from AEC contractors and the military services. Its members returned to their organizations.

The first regular class, made up 23 experienced people from the Atomic Energy Commission, AEC contractors, and the military serv-

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ices, and 20 recent college graduates employed by AEC, will finish its studies in September. A second class of 75 persons has been selected. As a result of special effort by the AEC to increase the number of experienced engineers receiving reactor training, 31 of these are from industry, some from companies not holding AEC contracts.

A new laboratory to serve the enlarged enrollment is scheduled to be completed during the coming year.

Electric Power Industry Committee Report

The report of the Ad Hoc Advisory Committee on Cooperation between the Electric Power Industry and the Atomic Energy Commission was submitted to AEC on March 28 by Philip Sporn, chairman. In addition to Mr. Sporn, president of the American Gas & Electric Co., the committee membership included E. W. Morehouse, vice president of General Public Utilities Corporation, and Walton Seymour, power adviser, Economic Cooperation Administration.

The report recommends establishing a permanent advisory committee for cooperation between the electric power industry and the Commission which would consist of 10 to 15 representatives of the industry. This committee would make continuing studies in areas of mutual interest—primarily problems of reactor development and of the AEC's supply of power. They would also advise AEC on the availability of special personnel from the power industry to work on AEC problems and to advise the power industry on developments in nuclear energy applications.

AEC is considering the recommendations, and plans to consult members of the current committee on specific questions relating to establishing a permanent committee.

Industrial Zirconium Production

Zirconium production by AEC laboratory contractors reached a point of advancement this year which makes it desirable to place the work on an industrial basis. In March, AEC issued a public request for inquiries from prospective zirconium producers.

About two-score firms replied, of which several are believed able to perform the operations. Negotiations are under way to obtain contract offers on a competitive unit-price basis.

Industrial Use of Fission Products

AEC this year initiated studies to find industrial uses for the radioactive wastes from reactor operation. Under AEC contract, Stanford

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Research Institute, Stanford, Calif., distributed a prospectus for industrial management, "Putting Atoms to Work Through the Use of Fission Products,"[5] and interviewed a 10 percent sampling of the 500 or more who received the prospectus. A report on the interviews and voluntary replies is being prepared.

The prospectus points out five principal capabilities of fission products: they can (*a*) kill organisms, (*b*) induce chemical reactions, (*c*) ionize gases, (*d*) activate phosphors, and (*e*) produce rays which can penetrate solids. It also lists some uses these properties suggest: radiography; sterilizing foods and drugs in containers without heat; producing new or cheaper chemicals, improved static eliminators and fluorescent lights, and new types of luminescent paints and tiles; tracing of pipeline flows. Some of these uses are speculative; others already have been developed with other sources of radiation.

General research projects were established at University of Michigan, Columbia and Yale universities, and Massachusetts Institute of Technology to investigate use of fission products to facilitate chemical reactions, to preserve foodstuffs and sterilize pharmaceuticals, and to study effects on the human body. Brookhaven National Laboratory will prepare radioisotopes for pilot use in these investigations and will coordinate research by other institutions and industry as well as conduct some investigations of its own.

Sanitary Engineering Research

Water treatment to remove radioactivity. Investigations of methods for decontaminating water supplies, which might be poisoned with radioactive material in atomic warfare, began at Oak Ridge National Laboratory and Massachusetts Institute of Technology. Isotopes studied were of the kinds released by an atomic explosion or found in industrial or research wastes.

New filters in commercial manufacture. Four hundred air filters, built according to the new AEC-developed design, have been purchased from Cambridge Corp., of Syracuse, N. Y., for Argonne National Laboratory. The cost, on a unit-capacity basis, is about four-tenths the average price AEC has been paying for other high-efficiency air filters.

Research and development in air cleaning and aerosols continued at Harvard University and the University of Illinois. The Harvard group completed a survey of air-cleaning operations at 11 atomic energy installations and prepared a report which has been distributed to the operating areas. Four other reports—"The Impaction of

[5] Available from Stanford Research Institute, Stanford, Calif.

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Aerosols on Cylindrical and Spherical Collectors," "Calculation of the Size Distribution of Aerosol Particles From Tranquil Settling Data," "Calculation of the Mass Median Diameter of an Aerosol From Stirred Settling Data," "Effect of Temperature and Velocity of Gases on Dispersion from Stacks"—were issued by the Engineering Experiment Station, University of Illinois.

At Brookhaven National Laboratory a procedure was developed for permanently fixing radioactive materials in certain clays by heating, after adsorption. The idea is to return the treated clay to a naturally occurring bed for relatively permanent fixation in nature.

Federal agency cooperation. The work of other Federal agencies with atomic energy waste-disposal problems was strengthened considerably during the past 6 months.

Arrangements were made for the Weather Bureau to carry out coordinated observations at AEC installations. The Geological Survey held a meeting of geologists working at AEC sites and designated a coordinator of research on waste disposal and water supply. The Public Health Service began its survey of the Columbia River and agreed with AEC and E. I. du Pont de Nemours Co., operator of the AEC Savannah River plant, on the desirability of a similar survey of the Savannah.

Physical Research Programs

During the last 6 months, AEC modified the pattern of its unclassified basic research programs carried out under contract, so as to bring these long-term studies in the physical sciences into closer association with program problems of the atomic energy enterprise. AEC approved 39 new research contracts (see Appendix 5), and selected 287 fellows for the 1951–52 academic year, a majority in the physical sciences.

A new research reactor for Argonne National Laboratory was authorized, and building construction got under way by the S. N. Nielsen Co., of Chicago, Ill. At Brookhaven National Laboratory, the west face of the research reactor was partitioned off so that authorized scientists, who have not had AEC clearance for access to restricted atomic energy information, could use that face of the reactor for nonsecret experiments without compromise to security. The west face was formally declassified in May.

Three new particle accelerators, financed partly or entirely by AEC, went into operation during the last 6 months: an 86-inch cyclotron at Oak Ridge National Laboratory, a 60-inch cyclotron at Brookhaven, a synchrocyclotron at University of Chicago.

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Among research accomplishments reported in this section was the success of Argonne National Laboratory in solidifying for the first time the isotope helium 3, a gas under ordinary conditions. In order to achieve this, experimenters had to apply temperatures within 2.7 degrees Fahrenheit of absolute zero and pressures of 600 pounds to the square inch.

Research Program

In reshaping its program of unclassified basic research, mostly carried out in universities and private institutions, AEC is using several devices to bring research workers into closer touch with atomic energy programs. Working through scientists who have been investigated and cleared, AEC informed them of research work in AEC laboratories and is encouraging them to use this knowledge, and their access to secret material, as guidance in selecting areas for their own research and in giving direction to other unclassified work in their institutions. Cleared men were asked to submit proposals for research when they felt their contribution to the program needed financial support. The program got under way in recent months and has been well received.

In applied research, most of which is carried out in AEC laboratories, the groups working in the area of raw materials have been enlarged and are planned for further increase at Oak Ridge and elsewhere.

In addition to research aimed at providing answers to specific problems arising in the present AEC operations, the applied research program is being aimed to give broad general coverage of selected fields. Typical fields, besides basic work in domestic uranium geology and uranium chemistry, are measurements of neutron cross sections of the elements and their isotopes, and a review of isotope separation methods.

Among types of investigations presently planned for the *raw materials* field in which university research will join, and for which research proposals have already been approved, are the following:

a) Genesis and location of uranium-bearing minerals. Projects in this area have been approved for the University of Arkansas, Columbia University, and the University of Wisconsin.

b) Geochemical and geophysical methods of prospecting for uranium ores, including study of more sensitive and stable counters for field use, the thermoluminescence of crystals, and the uranium content of fresh water.

c) Chemical processing of ores, particularly long-range studies of sources considered uneconomic because of low uranium content, or difficulty of mining or processing. These include such sources

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as leached material associated with phosphates, byproduct slimes of the phosphate industry, Chattanooga shales, and North Dakota lignites.

d) Miscellaneous studies, such as the recovery of uranium from fluorite, used in the steel industry, and from sea water, as in the Dow magnesium extraction process.

Strengthening of the effort to measure the *neutron cross sections* of various isotopes has begun. Results of these determinations have immediate application in the design of reactors for production or power, and in the design of the large shields which surround such reactors to prevent the escape of damaging radiation.

In February, a special advisory committee was established to review methods of *isotopes separation.* AEC at present uses gaseous diffusion and electromagnetic devices for this purpose. Evaluating progress and results in these and other methods, the committee will recommend patterns of research looking toward improvements.

New Particle Accelerators

Among the three new particle accelerators put into operation during 1951, the 86-inch cyclotron at Oak Ridge National Laboratory is the largest of its type in the world. It accelerates protons (hydrogen ions) to energies of more than 20 million electron volts (Mev) without cutting back the number of impulses given each second to the speeding particles, and consequently is known as a "fixed frequency" cyclotron.

The new 60-inch cyclotron at Brookhaven has operated for short periods and produced deflected beams of 20 Mev deuterons.

University of Chicago's synchrocyclotron, supported in part by AEC and the Office of Naval Research, has accelerated deuterons to 220 Mev. This accelerator is of a design which permits greater acceleration of particles than does the fixed frequency cyclotron. A problem of fixed frequency cyclotron operation is that the accelerated particles, as they approach the speed of light, have greater mass and tend to slow down and get out of phase. The electrical impulses in a synchrocyclotron are slowed down gradually as the mass of the particles increases so as to synchronize the frequency with the speed of the lagging particles. This, in combination with other mechanisms of the synchronized type of cyclotron, permits particles to be accelerated to high energies.

Drawing on experimental work with accelerators at such places as the Argonne, Brookhaven, and Oak Ridge National Laboratories and at the University of California Radiation Laboratory, scientists and engineers are incorporating new economies, both in design and opera-

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considerable number of reappointments will be made of predoctoral fellows originally appointed for the 1950–51 academic year.

AEC plans to decrease its general fellowship program, and eventually to liquidate it, except in some specialized fields. The AEC recognizes the great need for this type of training, but feels that the type of training it previously sponsored can be administered by such an organization as the National Science Foundation. The National Science Foundation is beginning to develop a fellowship program for the academic year 1952–53.

Results In Unclassified Research

Improving Lead-Uranium "Clock"

Argonne National Laboratory developed a new method of analyzing lead to determine the quantities of various isotopes in the sample. Lead occurs in nature in a mixture of four isotopes whose atomic weights are 204, 206, 207, and 208. The isotope 206 is the stable end-product of a series of steps in radioactive decay which starts with uranium 238, the most abundant isotope of uranium.

This fact—that lead 206 once was uranium—has been used by scientists for some time to estimate the age of uranium-bearing rocks by what is known as the uranium-lead age determination. By measuring the lead 206 content of such rocks, and the relative proportion of uranium and lead, it is possible—since the rate at which uranium decays is known—to calculate the age at which the sample rock was formed. Examination of a number of mineral specimens indicates that such rocks were formed in the neighborhood of 3,000 million years ago.

The new method of isotopic analysis developed at Argonne improves the accuracy of the measurement of lead isotopes. This method requires only 5 millionths of a gram of lead, whereas previous methods required at least 200 times as much. The new method has been used for the uranium-lead age determination in rocks containing as low as one part per million of uranium. Two samples of lead extracted from petrified bones in the Colorado Plateau were analyzed by this technique in an effort to get some clue to how the Colorado uranium deposits originated—data that might assist the exploration of new reserves of ore.

Solidification of Helium 3

Helium 3 was solidified for the first time recently at Argonne. The experiments verified that liquid helium 3, unlike all other liquids except helium 4, cannot be frozen by cooling alone.

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Before helium 3 could be solidified, it had to be cooled to 457 degrees below zero Fahrenheit, and then subjected to a pressure of 600 pounds per square inch. Results indicated that even at absolute zero—459.7 degrees below zero—it would be necessary to apply a pressure of 400 pounds per square inch.

Demonstrating facts of this sort contributes to knowledge about nuclear forces.

Research on helium 3 is handicapped because of its scarcity in nature. It exists as only one part per million of ordinary helium. Argonne's work was made possible because the laboratory has small quantities of helium 3 as a decay product of radioactive hydrogen (tritium) made in atomic piles. The quantity of helium 3 used in these experiments was so small that solidification was carried out in tubing about the thickness of a human hair.

Measuring Mass of Atoms

Brookhaven National Laboratory developed an instrument which measures the masses of heavy nuclei more accurately. Called the "chronotron," this instrument measures the time of flight of a burst of ionized atoms during a certain number of circuits in a uniform magnetic field. From the timing, and other known data, it is possible to calculate the mass of the atomic nuclei. The chronotron is also known as a time-of-flight mass spectrometer. Accurate measurement of mass is important both in practical operations, such as isotope separation, and in the fundamental understanding of nuclear structure.

Meson Research

Studies of the properties of mesons are continuing at the University of California Radiation Laboratory at Berkeley. A study of the process of absorption in matter of negative pi-mesons (heavy mesons) indicated that this meson is absorbed by a single proton of an atomic nucleus and the recoil from the meson's impact is shared among several nuclear particles. These particles in turn eject fast protons from the nucleus by direct collisions rather than by "evaporation" from the highly excited nucleus, as had formerly been believed.

A new value was obtained of the average time required for positive pi-mesons to decay into mu-mesons (light) which is considerably longer than earlier data indicated.

Neutral mesons were successfully produced by bombarding liquid hydrogen with gamma rays from the Berkeley synchrotron. Measurements were made of the yield of neutral mesons from hydrogen,

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deuterium, and oxygen by using ordinary water, heavy water, and liquid oxygen as targets in the 340 Mev proton beam of the 184-inch synchrocyclotron. The yield of mesons was proportional to the number of neutrons in the nucleus.

The study of mesons provides a promising attack on the problems of nuclear forces, and a significant part of the basic nuclear physics program at the Radiation Laboratory is devoted to it.

Research in Universities

The following examples of basic research illustrate the work AEC supports by contracts with universities. The universities mentioned have been chosen at random and are only a few of those engaged in fundamental research looking toward a better understanding of nuclear phenomena.

Johns Hopkins University continued studies on the properties of the excited states of light nuclei, particularly lithium 6, beryllium 9, boron 10, and fluorine 19, which are of current interest in theoretical nuclear physics. Protons or deuterons are accelerated and directed against a target element, and the nature, angular distribution, and energy of resulting particles are determined.

Ohio State University is investigating physical phenomena at extremely low temperatures, very close to absolute zero. Studies are made of the magnetic properties of superconductors which at low temperatures lose every vestige of electrical resistance, of nuclear spin systems, and of nuclear magnetic behavior of various substances. Efforts are directed toward attaining temperatures within one-thousandth of one degree of absolute zero.

Vanderbilt University, using specialized equipment including a magnetic lens spectrometer and a scintillation spectrometer, is making detailed study of the characteristics of the radiation from radioactive isotopes, such as tin 113 and tin 119. Such information is used in the development of nuclear theory and is also useful when the radioactive isotope is used in practical application such as tracer work.

Isotope Program

Manufacture and distribution of radioisotopes, one of AEC's major contributions to the national welfare, continued to expand during the last 6 months. More than 1,000 departments or laboratories in over 500 institutions in the United States are using radioisotopes. They

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are shipped to 46 States, the District of Columbia, and Hawaii, and to 175 institutions in 31 foreign countries.

Oak Ridge National Laboratory has made more than 18,000 shipments of radioisotopes to users in the United States and 1,000 to foreign users since August 1946, when distribution started. In addition, 4,000 shipments have gone to AEC installations.

Radioiodine and radiophosphorus continue to head the list of radioisotopes distributed, but during the last 10 months ORNL made four times as many shipments of radiocobalt (Co 60) as during the preceding 4 years. Industries are using this radioisotope in increasing quantities in much the way that X-ray machines are used—as a source of penetrating gamma rays for radiographic testing of their products and processes.

Between August 1946 and May 1951, ORNL made 6,000 shipments of radioiodine totaling 631 curies, 5,000 shipments of radiophosphorus totaling 220 curies, and 350 shipments of radiocobalt totaling 607 curies.

New Developments and Services

During the last 6 months, AEC simplified procedures for regular users of radioisotopes, started registering available radiocompounds and stockpiling others, increased the number of stable isotopes for distribution, began an irradiation service for experimenters and limited radioisotope production at Brookhaven National Laboratory, started handling requests for British-made radioisotopes, and inaugurated publication of a quarterly bulletin for isotopes users.

Convenience for Large Users

Since January, AEC has issued general authorizations for use of radioisotopes by qualified applicants. Formerly, a separate authorization was required for each shipment. General authorizations are primarily for the convenience of institutions using substantial amounts of radioisotopes and permit the applicant to obtain, from any supplier, any available form and quantity of any radioisotope distributed on authorization or approval of the AEC, with the exception of radiohydrogen.

Use of general authorizations will make it easier for regular users to procure AEC radioisotopes and will increase the responsibility for safety of local groups. They have already been issued to 25 institutions holding AEC contracts and to 19 other institutions.

To qualify for a general authorization, an institution must have (*a*) demonstrated a certain minimum frequency of ordering, now set

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at approximately 20 shipments during the preceding 12-month period, (*b*) established a committee to pass on all proposals for use of radioisotopes in the institution, and (*c*) appointed a radiological safety officer to supervise the health and safety aspects of radioisotope handling and utilization.

Distribution Regulations

On April 13, regulations on radioisotope distribution became effective and were published in the *Federal Register* (10 Code of Federal Regulations, Part 30) (see Appendix 6). The regulations establish instructions and standards governing the procurement, delivery, possession, use, transfer, and disposal of all radioisotopes (with the exception of source and fissionable materials) distributed through AEC facilities. The regulations exempt beta- and gamma-emitting isotopes in quantities up to 10 microcuries for materials with half-lives under 30 days and 1 microcurie of longer-lived materials.

Radiocompound Services

Two new services to isotope users of radiocompounds were introduced in 1951: a registry of isotope-labeled compounds, and a program for stockpiling certain isotope-labeled compounds.

The *registry* will inform isotope users whether a specific compound is available for purchase and who supplies it. It will give users an opportunity to list any compounds, prepared in excess of their needs, which are available to other users. This registry can help increase availability of many important isotope-labeled compounds, the synthesis of which otherwise might consume research time.

The *stockpiling program* was established to supply users with small quantities of isotope-labeled compounds not available from commercial suppliers and difficult to synthesize. Compounds include folic acid, vitamins, DDT, thiouracil, and hormones needed for cancer research.

Through the Oak Ridge National Laboratory, AEC invites bids from private and commercial laboratories to synthesize quantities of wanted compounds. AEC then purchases the material for stockpiling and resale at a proportionate fraction of what it paid. Nothing is added for storage and handling.

Because labeled compound manufacture is complex, it is usually economical to synthesize a much larger quantity than would be required by a single user. By acting as a middleman, AEC serves the interests of both the manufacturing laboratory and the isotope user.

Once the synthesizing procedure for a particular compound has

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been well developed and enough demand has developed to warrant routine preparation by a private supplier, AEC will cease stockpiling that item.

Stable Isotopes

At the present time quantities of the stable isotopes, deuterium, deuterium oxide, boron 10 and 11, helium 3, oxygen 18, plus 227 electromagnetically concentrated stable isotopes, are available for research and industrial uses.

Electromagnetically concentrated isotopes of 38 elements have now been produced, including isotopes of 6 elements not previously available: neodymium, samarium, gallium, lanthanum, hafnium, and vanadium. Not all of these have yet been produced in sufficient quantities for distribution.

Brookhaven Program

In January, Brookhaven National Laboratory began a program of reactor irradiation services and limited radioisotope production. The radioisotope production supplements the Oak Ridge program. Except in unusual cases—requirement for high specific activities, for example, or peculiarities of delivery schedule or exceptional convenience of geographical location—isotopes which appear in the Oak Ridge catalog are still to be ordered from Oak Ridge. Applications for radioisotopes to be procured from Brookhaven are submitted first to the Isotopes Division in the usual manner.

Foreign Distribution Expanded

AEC in July announced that to assist in extending the scope of international cooperation in science it had enlarged its radioisotope export program. It will sell radioactive materials abroad on the same general bases as in this country, and, for the first time, make U. S.-produced radioisotopes available to foreign users for industrial research and applications. This action increased from 26 to 99 the number of AEC isotopes available to buyers in foreign countries.

At the same time, AEC authorized American manufacturers to export radioactive thickness gages, which are finding increasing application in a number of different industrial processes.

The new isotope program also permits Oak Ridge National Laboratory to provide scientists of other nations with special irradiation services, whereby they may send materials to Oak Ridge for exposure to neutron radiation in the nuclear reactor.

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The Commission felt that enlargement of the isotope export program was in keeping with the foreign policy of the United States, which calls for aid to foreign nations in peacetime development, and that, even in the absence of international control of atomic energy, this constituted a field in which international cooperation could be increased. While utilization of radioisotopes in the forms in which they are sold cannot significantly advance the atomic energy programs of nations, it can contribute to advancements in basic science, medicine, agriculture, and industry.

Imports From England

In May, the AEC Isotopes Division at Oak Ridge was authorized to accept applications from United States users for radioisotopes produced at Harwell, England. The procedures for procuring English radioisotopes are similar to those in effect for the import of Canadian isotopes.

Bulletins and Publications

During April AEC sent all isotope users the first issue of "Isotopics—Announcements of the Isotopes Division." This is a quarterly bulletin designed to provide users with information on isotope procurement, allocation procedures, distribution policies, tracer techniques, methods for safe handling and disposal, applications, and sources of information.

Some Uses of Radioisotopes

Scientists using AEC isotopes for research report periodically on their work. The following section gives a few examples of recent findings.

Some Medical Results Since 1940

Over 1,000 cases of *polycythemia vera*, a disease in which red blood cells multiply very rapidly, were treated with radiophosphorus in the decade 1940–50. Over 85 percent of the patients were benefited for periods of 6 months to more than 9 years. In two-thirds of the cases, relief lasted about 2 years.

Over 1,000 cases of *leukemia*, a disease in which white blood cells are overproduced, were treated with radiophosphorus during the decade. Life may not have been prolonged by radioisotope therapy, but the comfort of many patients was greatly improved.

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Over 1,000 cases of overactivity of the thyroid gland were treated with radioiodine in the 10 years. It was reported in the medical literature that 95 percent of *hyperthyroidism* cases can be satisfactorily controlled in this way. It was also reported that radioiodine therapy is now considered the first-choice treatment for patients who are sensitive to antithyroid drugs or whose cases are complicated by heart disease.

Approximately 100 cases of *thyroid cancer* were treated with radioiodine. About 15 percent showed good clinical response.

New Diagnostic Techniques

Human serum albumin containing radioactive iodine was used at Western Reserve University to measure the pumping efficiency of the heart. Developers of the technique point out that this method requires no incubation period as is necessary when red blood cells are tagged with radioactive phosphorus, and that the penetrating radiation from radioiodine permits direct reading of the amount of radioactivity in the blood during the time it is flowing. Accurate timing of the dilution that takes place in the body also can be carried out more easily. Preliminary studies on animals proved successful and similar studies with people are now under way.

Another group at the University of Minnesota recently began using radioiodine blood plasma protein to diagnose and locate certain types of brain tumors. They report that the iodinated plasma protein is as satisfactory for this particular diagnostic test as the dye, diiodofluroescein, labeled with radioactive iodine.

Studies of Metal Wear

Researchers in Massachusetts Institute of Technology are continuing radioisotope experiments to determine the role played by friction transfer of metal between certain piston-ring materials and cylinder walls in formation of surface coatings on piston rings in aircraft engines during their initial run-in.

By making one surface radioactive, and tracing its movement to the other surface, experimenters found that the transfer previously observed in soft metals also takes place in some of the hardest alloys. The amount of metal transfer for a given time was constant at low speeds but began to decrease at higher speeds.

These and other results indicate that, under the conditions of running-in an aircraft engine, a certain amount of nitrided steel from the cylinder barrel will probably be transferred to the surfaces of nitrided-steel, cast-iron, or chromium-plated rings. Experimenters suggested

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that, by running rings in a special cylinder having walls of selected composition and controlled hardness, surface coatings of highly improved characteristics might be obtained in minimum time.

Tests of Rust Preventives

An Army arsenal recently reported using radioisotope tracers to test soft-film rust preventives. Conventional tests were based on visual identification of rust on steel test panels dipped in water and then immersed in the preventive. Surface films, stains, drainage marks, and mottled patterns often masked results of this kind of test.

The new tracer method is based on the assumption that an isotope added to the water used for wetting the test panels will be removed if all traces of the water are removed. If removal is incomplete, the residual radioactivity is proportional to the amount of water remaining. Thus the counting rate obtained by testing the panel with a radiation detector will be highest for the least effective rust preventer.

The tracer tests proved there were appreciable differences among rust-inhibiting compounds, all of which would be rated acceptable under the older visual test.

Radioactivity Gauge for Snowfall

A gauge using a radiation source to measure the water content of snowfall was reported in recent months. The device is used by the Weather Bureau in California where accurate measurement of the water content of the snow-pack on mountain slopes is a key factor in efficient use of this stored water for industrial, agricultural, and other purposes.

Previously, calculations of water stored in snow depended upon measuring the depth of the snow-pack and estimating water content by the density of cores cut through to the earth's surface and then weighed. This laborious method was complicated by the fact that many watersheds were inaccessible during the winter.

In the new gauge, a quantity of gamma-emitting radiocobalt is placed in a lead tube and, before the first snow falls, the tube is sunk in the ground until the upper end is flush with the surface. A radiation detector is mounted above the mouth of the tube so that gamma rays from the radiocobalt strike it after passing through the snow-pack. The snow absorbs and reduces the intensity of radiation in direct proportion to the water content. An automatic radio transmits the signal picked up by the detector.

The gauge has proved 95 percent accurate with snow-packs up to those equivalent to 45 inches of water—a higher degree of accuracy than is attainable by conventional methods.

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Biology and Medicine

AEC placed special emphasis during the first half of 1951 on research in radiation protection and treatment of radiation injuries. Extensive biological experiments were included in the Eniwetok weapons tests reported on page 4. AEC continued work on beneficial applications of atomic energy to medical and agricultural needs.

In addition to work at AEC-owned or financed laboratories, research contracts were held in mid-1951 by 111 universities and other institutions (see Appendix 5). As examples of research, AEC re-

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radiation, they could greatly reduce the number of mice that died. Similar results were obtained by removing embryos from healthy female mice, reducing them to a juice, and injecting this material into mice that had undergone radiation exposures in amounts that ordinarily would cause death.

Spleens and embryos of normal mice apparently contain a protective principle of unknown nature which helps to maintain the production of red and white blood cells but is disrupted by heavy radiation exposure. Work is under way to isolate and identify this active principle.

Spleen shielding before radiation has so far proved practical only under laboratory conditions. The degree of success achieved by injecting splenic or embryonic material after exposure, however, suggests that a method may be found for saving people exposed to heavy radiation during atomic bombings or radiological accidents.

Tests With Siamese-Twin Rats

An AEC-supported project at New England Deaconess Hospital is performing radiation tests on rats artifically made into "Siamese twins"—two animals joined by surgery and grafting in a physiological union.

Upon recovering from the surgery, one rat from each such parabiotic pair was subjected to a normally lethal dose of radiation while the other was protected by a shield. Animals joined in this way exchange about 4 percent of their blood and other body fluids each hour. The tests showed that the exchange was enough to enable the exposed rats to survive twice the amount of radiation that ordinarily would be fatal.

These studies, like the Argonne-Chicago work with spleens and embryos, suggests the existence of an active principle which might be isolated for possible use in treating radiation casualties. They confirm and carry forward the results of various radiation injury studies performed in the last 2 years.

Burns From Atomic Sources

During the last 6 months, Western Reserve University launched an AEC-supported study of physical and biochemical changes in tissue resulting from flash burns—such as those caused by instantaneous radiant heat from atomic bomb explosions. The University of Rochester produced such burns by laboratory methods. Biological experimenters at Los Alamos Scientific Laboratory studied the nature and treatment of burns produced by beta particles. This type of burn can be caused by heavy exposure to various radioactive materials, especially atomic bomb fission products.

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Atomic Bomb Casualty Commission

The Atomic Bomb Casualty Commission, directed by the National Research Council of the National Academy of Sciences and financed by AEC, completed 3 years of medical study of Hiroshima and Nagasaki survivors and possible hereditary effects on their children. Recently completed modern laboratories at the two cities went into full operation. A detailed census of all persons in the cities at the time of the explosions was completed. Facilities are in operation for analyzing the voluminous statistics accumulated in this study.

Full scientific conclusions in this long-range project will require a number of years, but certain trends are already apparent. Among survivors who were within 1,000 meters of the points below the explosions, radiation cataracts have been found in about 10 percent. By contrast, the frequency of this eye disease in normal urban populations in Japan is believed to be less than 1 percent.

Leukemia, a fatal blood disease, apparently appears more frequently among Hiroshima and Nagasaki survivors than among other Japanese. A very real increase of this disease was found among survivors within 2,000 meters of the points below the explosions.

No unusual kind or striking frequency of hereditary abnormalities has been noted to date in children of Hiroshima-Nagasaki survivors. Years more of study will be required, however, before definite conclusions can be drawn as to the genetic effects of atomic bomb radiation.

A new contract for direction of ABCC work was signed with the National Academy of Sciences effective July 1.

Radioactive Waste Problems

In the interests of public health and of convenience to users of isotopes, an AEC-supported project at Mount Sinai Hospital in New York is investigating the possible hazards of releasing radioisotope wastes into public sewers. Evidence indicates that hospitals disposing of radioactive iodine and phosphorus—the isotopes chiefly used in their research—cause no danger to sewage disposal workers because the volume and rate of flow under normal circumstances dilutes the active material to a safe level.

Plumbing fixtures through which isotope wastes had passed were dismantled, tested, and found below any degree of radioactive contamination that might be hazardous to plumbers working on the fixtures.

Agriculture and Animal Husbandry

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Under its responsibility to foster useful applications of atomic energy, AEC gives limited assistance to stimulate use of radioisotopes

in agriculture and animal husbandry studies. Of special interest among such projects during the past 6 months were tracer studies of metabolism in the milk cow and of the role of fertilizers and soil minerals in plant nutrition. In fiscal year 1951, AEC supported these two series of studies, plus certain other basic research in plant nutrition not described here, in the amount of $376,000. Nearly half this amount was for work on the radioactive "labeling" of fertilizers at the United States Department of Agriculture's Experiment Station at Beltsville, Md., for use in agricultural experiment stations throughout the country.

Metabolism in Cows

Compounds containing carbon 14 tracer atoms provide the first effective means of studying the intermediate materials that finally become milk fat and milk sugar in cows. They are being used under AEC contracts that partly support milk metabolism experiments at the universities of California, Maryland, Minnesota, and Missouri. Tagged organic compounds such as acetate, pyruvate, propionate, and butyrate, are injected at the University of California into "fresh" cows, which then produce carbon 14-labeled milk constituents that are studied in laboratories across the country.

Using C 14-tagged acetate, the University of California and the British National Institute for Research in Dairying have shown that acetate is rapidly used in the cow to synthesize milk constituents. It was also demonstrated that propionate and butyrate are important building blocks for milk sugar and that smaller amounts of these compounds go into the fatty acids of milk.

The casein content of milk has been tagged with both C 14 and phosphorus 32. This material is used to study rates of digestion and absorption of milk casein by calves, pigs, and other animals.

Fertilizer and Soil Minerals

With joint support by the Department of Agriculture and AEC, some 25 State agricultural experiment stations are using radioactive-tagged phosphates to determine the ability of growing plants to obtain phosphorus from (*a*) natural phosphates in the soil and (*b*) applications of phosphate fertilizers. Wide differences were found in phosphate utilization among various plant species.

For any given species, the beneficial effects from phosphate fertilizer depend on the time and method of application. Corn and sugar beets, for example, depend largely on fertilizers in early stages of growth, but as they approach maturity a larger part of their phos-

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phate intake comes from natural soil minerals. Where soils are alkaline, plants take up ammonium phosphate and superphosphate fertilizers more effectively than they do calcium phosphates—an important fact in farming arid lands of the West.

The use of radioactive phosphorus has enabled agricultural scientists for the first time to differentiate clearly between the effects of natural and fertilizer phosphates. Research sponsored by USDA and AEC has concentrated on the utilization of phosphorus and calcium, but it is planned to extend the work to other plant food elements for which radioactive isotopes are available, such as potassium.

Other elements needed in "trace" amounts for proper plant nutrition are also under study, including iron, zinc, sulfur, copper, and molybdenum. Radioactive-tagged forms of these elements are in experimental use in the State agricultural colleges of South Dakota, Utah, and Washington, in USDA's experiment station at Beltsville, and elsewhere.

Education and Training

To provide additional radiation safety specialists for the expanding atomic energy program, AEC set up 40 new fellowships in radiological physics for the academic year 1951–52. Nearly all the radiological physics fellows of 1950–51 were offered jobs by AEC operations contractors.

Half the group of 40 will study 9 months at University of Rochester and train 3 months at Brookhaven National Laboratory; the other half will divide the year between Vanderbilt University and Oak Ridge National Laboratory.

Eight new industrial medicine fellowships for men with medical degrees were awarded for 1951–52. This training, also designed to serve needs of the national atomic energy program, will be given at the Universities of Rochester, Pittsburgh, and Cincinnati, and at Howard University.

These 48 special professional fellowships are in addition to 69 predoctoral and 32 postdoctoral awards of AEC general fellowships in biology and medicine, which are reported on page 30.

Survey of Public Attitudes

The University of Michigan Survey Research Center reported on a study the AEC commissioned in 1949 to determine the attitudes of people toward the radiation hazards that exist or are assumed to exist in atomic energy developments.

The report was based on more than 1,200 personal interviews last August and September, half with people living within 25 miles of

seven major atomic energy centers. To determine the extent to which these people's attitudes were affected by living near the plants, the other half of the interviews were in 14 distant areas selected for their social and economic similarity to the plant areas. The interviews were based on a list of questions carefully chosen to yield objective results.

In commenting on the detailed presentation of its findings, the Survey Research Center found that only few and small differences existed between areas near and more distant from atomic energy centers, and that "somewhat fewer people in areas near atomic energy activities are concerned with potential dangers." Residents near AEC centers, the report went on, "are taking atomic energy in their stride . . . Within 25 miles of their homes . . . a great force is held in check and harnessed in the national interest. Yet they do not fear it more than people elsewhere."

For the most part, the persons interviewed did not consider atomic energy work particularly different from other work, and they thought the factors to be considered before taking atomic energy jobs are the same as those in taking jobs in other industries. "A job working with atomic energy is just a job," the report summed up.

No anxiety was found which could be attributed to fear of radiation or plant disaster. The report's analysis stated that "the extraordinary care and precautions exercised by those in charge of the atomic energy development program" have succeeded, in addition to the direct benefits they provide, in reassuring the public.

Civil Defense

At the request of the National Security Resources Board (in charge of civil defense until last December 1), AEC late in 1950 began lending radiation detection instruments to State and local agencies for civil defense training. Up to mid-1951, loans were made to the States of Alabama, Connecticut, Nebraska, New Mexico, North Dakota, Ohio, Oregon, South Dakota, Washington, and Wyoming; to the cities of Berkeley, Calif.; Milwaukee, Wis., and Tacoma, Wash. Instruments also were lent to the Ninth Coast Guard District, and to the Food and Drug Administration of the Federal Security Agency. The instruments were drawn from a stockpile built up for emergency use in AEC plants and laboratories.

Instrument loans were later broadened to include radioactive isotopes for civil defense training. Isotopes for this use have been supplied to Iowa, Maine, Nebraska, North and South Dakota, Ohio, West Virginia, and Wyoming; to Chicago and Milwaukee; and to the Public Health Service's Environmental Health Center at Cincinnati.

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Biological and structural experiments carried out at the 1951 Enewetok weapons tests as reported on pages 4–5 yielded technical data which, when evaluated, may be useful in civil defense. Research on atomic bomb injuries and their treatment reported in preceding pages has certain civil defense implications.

Manpower and Labor Relations

New construction increased AEC contractor employment sharply during the first half of 1951, but labor shortage caused no serious delays.

Labor relations problems did not increase in number or acuteness. Management and labor settled most differences through collective bargaining. Where initial bargaining procedures were not successful, the Federal Mediation and Conciliation Service and the Atomic Energy Labor Relations Panel achieved peaceful settlements of disputes.

In May, AEC codified its policies for harmonizing normal collective bargaining with the paramount requirement for protecting the security of atomic energy installations and information.

Increased Manpower Requirements

Construction employment, for design and actual building work, rose from approximately 26,000 on December 31, 1950, to about 47,000 on June 30, 1951, and further increase is expected. On the Savannah River and Paducah sites, construction forces are expected to total 47,000 at their peaks; at the end of June, totals were 6,500 at the Savannah site, 6,000 at Paducah.

Employment within AEC itself increased about 10 percent—from 5,000 at the beginning of 1951 to 5,500 at mid-1951, of whom 900 are in Washington, the rest at field offices.

Operating contractors who run AEC plants, laboratories, and communities employed 47,500 on June 30, an increase of 13 percent in 6 months. Their employment will increase as new plants go into operation.

Special Recruitment Measures

Some AEC construction jobs create major hiring problems because of their size and fast time schedules, because of special skills required, and often because of their isolation. The Savannah River Plant is one of the three or four largest single construction projects ever undertaken in this country. Like Paducah, it will require assembling a large force with a good many special skills for a comparatively short

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for the most part the 40-hour week is maintained with exceptions only for particular portions of jobs that threaten to become bottlenecks.

Special problems. Shortages in the skilled occupations are felt in plant operations as well as in construction work. Within the group of AEC contractors, there is strong competition for former employees who have full FBI investigation and AEC security clearance and can therefore be reemployed without the delay necessary while new people are being investigated and cleared. Because of this, it has been necessary for AEC to coordinate to some extent the recruitment by various contractors to make sure that the best interests of the program are being served.

Wage Problems

Wage scales adopted for new construction are generally those prevailing in the locality as determined by the Secretary of Labor under the Davis-Bacon Act. Because of special skills on larger AEC jobs, the Department of Labor found it necessary to consider rates in more distant areas where there were substantial numbers of men with needed skills. In some instances, the original scale had to be increased to compete with wages paid in other parts of the country for workmen with rare skills.

Nation-wide wage controls, put in force early this year, created some problems. A few contractors certified to their inability to obtain needed skills within the general 10 percent limit on increases. Some contractors, before the control was established, signed labor contracts committing them to deferred wage increases which, if granted now, would break through the ceiling. Contractors applied to the Wage Stabilization Board and in three such cases the Board found wage increases justified.

Atomic Energy Labor Relations Panel

The Atomic Energy Labor Relations Panel, appointed by the President in 1949, handled six labor-management disputes during the first half of 1951. Panel procedures provide for its jurisdiction in disputes which collective bargaining and normal processes of conciliation have failed to resolve.

The Panel attempts to mediate all disputes in which it enters and retains the right to make formal recommendations when disputes have not been otherwise resolved. During early 1951, the Panel issued three recommendations of this kind to AEC contractors and organizations of their employees. These disputes involved Sandia Corp.,

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Albuquerque, N. Mex., and Atomic Projects and Production Workers Metal Trades Council, American Federation of Labor; the same contractor and Office Employees' International Union, AFL; and General Electric Co., Richland, Wash., and Hanford Atomic Metal Trades Council, AFL. In all cases, the parties accepted the recommendations as a basis for settlement.

A dispute between Atkinson-Jones Construction Co., Richland, Wash., and International Union of Operating Engineers, AFL, was settled by direct negotiation after the Panel requested them to continue bargaining.

Two other disputes were still unresolved at the time this report is made. The Panel's report to the President for the period December 1950 through May 1951, is printed in Appendix 7.

Security and Labor-Management Relations

The Ninth Semiannual Report, in reporting on labor-management problems arising out of AEC's security requirements, described some instances in which security restrictions complicated normal collective bargaining practices. An AEC policy statement, "Security Policies and Practices in the Area of Labor Relations," was issued May 8.

The policies worked out within the framework of AEC's general objectives for labor-management relations in the atomic energy program provide for: (*a*) assurance that all participants in the atomic energy program are loyal to the United States, including those whose participation involves the exercise of negotiating and disciplinary authority over bargaining units; (*b*) assurances that determination of unit, jurisdiction, and similar questions will not breach security; (*c*) minimum interference with the traditional rights and privileges of American labor and management.[6]

The statement codified a number of policies in effect throughout the program. It also established certain other policies and practices arising from recent experience at AEC installations. Policies are given on proceedings of the National Labor Relations Board, loyalty of participants in the collective bargaining relationship and clearance of union and other representatives. The bulletin is summarized below.

National Labor Relations Board Proceedings

1. It is the policy of AEC that NLRB cases falling within the scope of the Labor-Management Relations Act at the various atomic

[6] For a full statement of these policy objectives see Ninth Semiannual Report of the Atomic Energy Commission, p. 77 (Superintendent of Documents, Washington 25, D. C., 40 cents).

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energy installations should be conducted in normal fashion wherever possible, on the basis of open hearings, unclassified records, and published decisions.

2. AEC will encourage every effort by management and labor at atomic energy installations to determine bargaining units and representatives by agreement and consent elections in preference to contested proceedings before NLRB.

3. A panel of NLRB trial examiners having security clearance will be maintained to facilitate resolution of questions as to the materiality of classified information in NLRB hearings, and to facilitate preparation of an unclassified record. To the extent indicated necessary by experience, a similar policy will be followed with respect to arbitrators and to representatives of the Federal Mediation and Conciliation Service.

4. It is recognized that security clearance of counsel for the parties is sometimes desirable for proper preparation of a case even though the record is to be unclassified, in order to make possible their participation in any closed discussions needed preparatory to making an unclassified record. Each party is responsible for requesting clearance of its own counsel. Clearance of temporary special counsel will be withdrawn at the end of a proceeding.

5. In contested proceedings before the NLRB each party to such proceedings will present his own position and the evidence in support thereof with due regard for existing security rules. AEC will be continuously informed of the progress of such proceedings and will act as may appear desirable (*a*) to assure the protection of classified information; (*b*) to assure that material and relevant information is not withheld from the record on grounds of security if such information can be supplied in unclassified form; and (*c*) to assist in determining appropriate action where a decision may turn on data which can be expressed only in classified form.

6. NLRB, at the request of AEC, will insert the following proviso in certifications of representatives for workers at atomic energy installations: "This certification is conditioned upon compliance, by the certified union, with the security requirements of the Atomic Energy Commission, a matter exclusively within the jurisdiction of that Commission."

Loyalty of Participants

7. Loyalty to the United States is a paramount factor applicable to all participants in the atomic energy program, including those whose participation (although not requiring access to restricted data) in-

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volves the exercise of administrative, negotiating, and disciplinary authority over bargaining units composed of employees engaged on classified work.

Clearance of Certain Union Representatives

8. It is recognized that security clearance of certain local union representatives may be necessary to assure opportunity for effective representation of employees in collective bargaining relationships with AEC contractors. Accordingly, AEC managers may authorize investigation for security clearance of union officials whose functions as representatives of employees may reasonably be expected to require access to restricted data (*a*) under NLRB and other procedures according to applicable law (Labor-Management Relations Act, 1947); (*b*) to perform effectively their representation functions in the resolution of grievances and in other collective bargaining relationships with contractors; (*c*) to effectuate the recommendation of the President's Commission on Labor Relations in the Atomic Energy Installations in respect to integration of the union into the plant organization "as a two-way channel of communication and a medium of understanding between management and workers." Security clearance may also be granted to a limited number of national representatives of federations active in the representation of employees on classified atomic energy work in order that such representatives may be available for consultation in the event of a special emergency.

AEC Security Interest in Other Representatives

9. Where derogatory information exists concerning other representatives who are of security interest to AEC because of proximity to classified work or because they exercise negotiating and disciplinary authority over employees, efforts will be made to evaluate the reported information. AEC will afford the individual concerned an opportunity to explore the question and may take such further steps as appear appropriate in the circumstances.

Final Responsibility of AEC

10. The general principle of AEC's final responsibility for program security is laid down in the bulletin as follows:

> On all matters of security at all Government-owned, privately operated atomic energy installations, the Atomic Energy Commission retains absolute and final authority, and neither the security rules nor their administration are matters for collective bargaining between management and labor. Insofar as AEC se-

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curity regulations affect the collective bargaining process, the security policies and regulations will be made known to both parties. To the fullest extent feasible the Commission will consult with representatives of management and labor in formulating security rules and regulations that affect the collective bargaining process.

In the course of its preparation, draft copies of the policy statement were discussed with major AEC contractors and copies were also circulated for comment to members of the Atomic Energy Labor Relations Panel, to NLRB, and to interested labor organizations. Reception by these groups and individuals was generally favorable. While it by no means exhausts all the problems in this complex field, AEC believes the issuance of this bulletin is a major step toward the desired goal of maintaining normal labor relations in the atomic energy industry while continuing to safeguard fully the security of its programs.

Finance and Business Management

In this report, AEC for the first time publicly issues a balance sheet and related statements. Other measures of financial reporting and control were improved in the first half of 1951. Headway was made against several difficulties of long standing, such as the problems of workmen's compensation insurance and pension plans for atomic energy workers. Special measures were taken to achieve economical use of construction equipment, stocks of materials, and other goods and services. AEC began comprehensive commercial-type audits of cost-reimbursement contractors, and the General Accounting Office initiated a similar audit of AEC.

An analysis covering a 9-month period showed that a significant amount of the AEC's total business went to small enterprises.

The 1951 Budget

To finance the rapid expansion of the atomic energy enterprise, the AEC during fiscal year 1951 received four appropriations totaling 2,032 million dollars. Three-fourths of these funds were required for construction and purchase of plant and equipment.

Funds appropriated to AEC for the last three fiscal years were as follows:

	Million dollars
1949	621.9
1950	702.9
1951	2,032.1

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Financial Report

A financial report for fiscal year 1950 was submitted by the staff to the Commission in February. It included a comparative balance sheet showing publicly reportable assets of 1,912.8 million dollars on June 30, 1949, and 2,216.5 million dollars on June 30, 1950; a statement of operations showing net costs of 414.8 million dollars in fiscal year 1950; a summary of the increase in AEC equity during the year; and explanatory remarks.

This document was in the same general form as the financial reports of private businesses—feasible because AEC uses accounting methods such as are followed by modern business enterprises and Government corporations.

In its original form, the new financial statement was a secret document. A second version, which gives less detailed totals that can be revealed without endangering the national security, is printed on pages 56–57 of this report.

Internal and GAO Audits

Comprehensive audits of major contractors whose costs are reimbursed by AEC were begun by all AEC operations offices before mid-1951. They resemble audits of private businesses by public accounting firms but are wider in scope. Comprehensive auditing methods were facilitated by AEC's adopting industrial-type accounting and by its major cost-reimbursement contractors' use of similar methods.

During the last half-year, the General Accounting Office, which audits executive agencies for the Congress, has had a survey force at AEC offices. It will initiate audits of AEC on the comprehensive basis GAO follows with Government corporations.

AEC Business Operations

Demands of the expanding program increased the tempo and complexity of AEC business operations in the past 6 months. Additional real estate and other property were acquired. Transportation and communication arrangements were developed for new locations. Inventory stocks of operating materials were reduced. Lower-cost storage for records was installed at a major atomic energy center.

An Improved Pension Plan

Progress was made during 1951 in bringing more flexibility and greater protection for employees into pension plans of AEC cost-

reimbursement contractors. Many employees automatically forfeit the AEC's contributions toward their pensions if their employer's contract with AEC terminates. This loss to employees is greatly reduced in a revised plan currently being arranged for Oak Ridge plant and laboratory employees.

AEC operations offices at other locations are studying improvements in pension plans for contractor employees.

Control of Insurance Funds

AEC expansion to date has been accomplished without posting additional "frozen" collateral insurance funds with insurance companies or contractors to protect operators of atomic energy facilities against personal and property damage claims.

Collateral funds were set up by the Manhattan Engineer District, wartime agency for the atomic energy enterprise, when the hazards of atomic energy work were unknown and normal casualty insurance could not be purchased. The agreement with each contractor provided that the fund earmarked for his protection would be maintained for 5 to 10 years after his contract was terminated. Altogether, 25.75 million dollars is still on deposit to secure workmen's compensation and general liability risks under contracts inherited by AEC. Another 16.5 million dollars is outstanding to secure special death and disability benefits under MED contracts.

Demands for this type of collateral funds lessened to some extent as it became clear that the safeguards set up against personal injury and property damage were effective. In actual experience, for example, only nine persons have qualified for benefits under the special death and disability plans since the beginning of the atomic energy program. A few additional claims are known to exist.

Some states have recently liberalized their workmen's compensation laws in such a way as to provide more adequate coverage for radiation injuries and other occupational hazards of atomic energy work. AEC reviews all special benefit plans under its contracts to determine whether new state coverage makes it possible to modify or eliminate them without harming employee interests.

Materials and Equipment Economy

Planning for construction equipment. Continuing efforts are made to obtain construction equipment for AEC's expansion program with minimum strain on the defense economy and minimum cost to the Government. The effort is complicated by the fact that several major construction jobs are scheduled at the same time, and this limits the normal practice of moving heavy equipment from job to job. AEC

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finds it necessary to buy considerable equipment, but before making purchases, AEC attempts to meet its needs by methods short of purchase, such as transfers from other sites, economical rentals, and the like.

Stores inventory reduction. Although the increasing rate of operations would normally have required larger stocks of operating materials, stores inventories in the hands of AEC and its operating contractors were reduced 15 percent during fiscal year 1951. Inventory reduction was possible largely because of further progress in AEC's industrial-type accounting system, which includes quarterly inventory reports, established this year, on each warehouse and storeroom.

Lower-cost records storage. Construction of a specially designed records center was completed early in 1951 at Hanford. Accumulated documents will be packaged and stored on steel shelving, thus limiting storage in more costly safes and steel cabinets to documents in active use.

Participation by Small Business

In the 9 months ended March 31, 1951, AEC reports to the small business committees of the Senate and House showed that small businesses received 21 out of 447 million dollars of AEC prime contract awards, and 104 out of 446 million dollars of subcontracts placed by AEC's cost-reimbursement contractors. Independent enterprises with less than 500 employees are classed as small businesses.

In general, only large enterprises have the resources to undertake the very large operations that often are necessary in atomic energy work. On smaller operations, those which amount individually to less than $500,000, small businesses received 29 percent of the prime contracts and 41 percent of the subcontracts.

The following table summarizes details of this 9-month study:

	Under $500,000		*Over $500,000*		*Total*	
	Million Dollars	*Percent of total*	*Million Dollars*	*Percent of total*	*Million Dollars*	*Percent of total*
Prime contracts						
Small business	10. 2	28. 6	10. 7	2. 6	20. 9	4. 7
Larger business	19. 3	53. 9	382. 1	92. 9	401. 5	89. 8
Educational institutions and other	6. 3	17. 5	18. 4	4. 5	24. 6	5. 5
	35. 8	100. 0	411. 2	100. 0	447. 0	100. 0
Subcontracts let by cost-reimbursement contractors						
Small business	86. 8	41. 2	17. 6	7. 5	104. 4	23. 4
Larger business	122. 7	58. 3	217. 8	92. 5	340. 5	76. 4
Educational institutions and other	1. 1	0. 5	-----	-----	1. 1	0. 2
	210. 6	100. 0	235. 4	100. 0	446. 0	100. 0

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BALANCE SHEET AS OF JUNE 30, 1950, AND JUNE 30, 1949

ASSETS

	1950	*1949*	*Increase (decrease)*
Cash and working funds:			
U. S. Treasury	$329,842,953	$155,569,816	$174,273,137
Contractors	34,527,486	28,769,418	5,758,068
Other Federal agencies	28,941,982	43,883,003	(14,941,021)
	393,312,421	228,222,237	165,090,184
Accounts receivable, net	5,783,284	3,826,925	1,956,359
Inventories at cost	68,196,653	57,282,486	10,914,167
Prepaid expenses	10,730,756	4,075,410	6,655,346
	478,023,114	293,407,058	184,616,056
Plant and equipment at cost	2,104,432,727	1,891,197,760	213,234,967
Less—Reserve for depreciation	414,940,563	317,239,733	97,700,830
	1,689,492,164	1,573,958,027	115,534,137
Collateral funds and other deposits	48,972,131	45,437,998	3,534,133
	$2,216,487,409	$1,912,803,083	$303,684,326

LIABILITIES AND EQUITY

Liabilities:			
Accounts payable	$52,433,201	$35,312,405	$17,120,796
Accrued leave	3,527,581	2,270,771	1,256,810
Funds held for others	8,470,781	6,102,693	2,368,088
Deferred credits	497,221	607,600	(110,379)
Total liabilities	64,928,784	44,293,469	20,635,315
AEC equity	2,151,558,625	1,868,509,614	283,049,011
	$2,216,487,409	$1,912,803,083	$303,684,326

The following notes are integral parts of the balance sheet:

This statement excludes from assets inventories of source and fissionable materials and weapons parts and assemblies.

In addition to the liabilities shown in this balance sheet, AEC and its cost-reimbursement contractors had outstanding financial commitments of $804 million at June 30, 1950, and $581 million at June 30, 1949, for goods and services not yet received. Of these amounts $282 million and $145 million, respectively, were fully covered by funds and receivables, and $522 million and $436 million were commitments against unfunded contract authority granted by the Congress.

Unobligated funds available to AEC were $55 million at June 30, 1950, and $45 million at June 30, 1949.

No funds have been obligated to pay accrued annual leave for AEC employees because subsequent appropriations are required for this purpose.

As part of the domestic uranium program, the Commission has guaranteed minimum prices through March 31, 1958, for refined uranium and for uranium-bearing ores and mechanical concentrates. In addition, bonuses are payable under certain circumstances to encourage the discovery of new uranium resources. (See Domestic Uranium Program Circulars No. 1 through No. 6.) The Commission also has long-term commitments for the procurement of foreign ores.

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time. It will have to be done in a period when many other defense industries are building and expanding.

Special measures taken to recruit manpower for AEC jobs include: choosing a site where workers are available, if other considerations permit; Nation-wide recruiting of special skills; utilization of the facilities of the United States Employment Service and State agencies. Sometimes building trades councils or local unions have assisted by combining to form pools. In some instances, longer workweeks are authorized.

Site selection. In selecting the Savannah River site, data on available manpower obtained from the Defense Manpower Administration were compared with estimates of construction and operating forces required—a standard AEC procedure. Analyses showed 15,000 workers available within 40 miles, and 5,000 within 20 miles. Nearly half of the latter group appeared to be available for employment at the time the site was selected.

AEC action, union assistance. Shortages of some types of skilled people, engineers for instance, are Nation-wide. The problem of recruiting them for the atomic energy program is part of a larger national problem.

Other recruitment difficulties arise because unusual materials and higher-than-average quality of workmanship are required in certain AEC work. To obtain men able to weld with uniform high standards the special alloy pipe used in the Oak Ridge gaseous diffusion plant, for example, it was necessary to give tests for welders at various points across the country. The tests were practical demonstrations of skill in handling the special alloys and types of welds, and time was allowed for the men to practice in advance. Many highly skilled welders who took the test could not meet the required standards, but enough were obtained to keep the work moving on schedule.

Labor unions cooperate with AEC contractors and the State employment services in obtaining construction workers. In the face of manpower shortages, some of them have recently assigned national representatives to seek employees from all parts of the country. In other instances, the unions have merged a number of union locals, or combined the building trades councils of neighboring cities, so as to obtain the advantages of a joint effort.

Longer workweek. To a limited degree, manpower shortages have been relieved by authorizing longer working hours. AEC has asked its contractors to adhere to the 40-hour week as a general policy, but sanctions a longer week where schedules can be met by no other means. A few projects have been put completely on extended workweeks, but

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STATEMENT OF OPERATIONS FOR THE YEAR ENDED JUNE 30, 1950

Scientific and technical costs:			
Source and fissionable materials program			$120,416,680
Weapons program			85,832,512
Reactor development program			27,596,200
Physical research (less radioisotope sales of $222,130)			31,128,252
Biology and medicine program			17,687,416
			282,661,060
Auxiliary services and other indirect expenses:			
Community operations:			
Gross costs	$21,356,977		
Less revenue	15,551,590	$5,805,387	
Program administration		22,092,169	
Depreciation		97,019,242	124,916,798
Other expenses:			
Projects abandoned		7,013,312	
Miscellaneous		1,148,097	8,161,409
Total cost and expenses			415,739,267
Less miscellaneous income:			
Interest on collateral funds		621,601	
Other income		351,641	973,242
Net cost of operations for the year			$414,766,025

CHANGES IN AEC EQUITY FOR THE YEAR ENDED JUNE 30, 1950

AEC equity, July 1, 1949		$1,868,509,614
Less adjustments relating to prior years operations (net)		1,484,120
Adjusted beginning balance		1,867,025,494
Additions:		
Congressional appropriation	$702,930,769	
Transfers from other Federal agencies without reimbursement	7,041,582	709,972,351
		2,576,997,845
Deductions:		
Net cost of operations	414,766,025	
Transfers to other Federal agencies without reimbursement	8,642,845	
Funds returned to U. S. Treasury	2,030,350	425,439,220
AEC equity, June 30, 1950 (See Balance Sheet)		$2,151,558,625

NOTE.—AEC equity reported does not include investment in inventories of source and fissionable materials and weapon parts and assemblies.

Financial Statements

AEC presents here for the first time a comprehensive public report on the financial condition and operations of the atomic energy program. This industrial-style financial report, condensed for security reasons, includes figures and explanatory text. It consists of a comparative balance sheet as of June 30, 1950, and June 30, 1949; a statement of operations for fiscal year 1950; and a summary of changes in AEC equity for that fiscal year.

Comparison With Statements of Private Enterprise

These financial statements resemble in form and general content the principal financial statements of industrial concerns. Because of security considerations, costs of source and fissionable materials and weapons parts are not reported. Consequently, the assets in the balance sheet are understated and the statement of operations does not identify the costs of products completed during the year.

Consolidated Character of Statements

The financial statements were prepared by consolidating the annual statements of the AEC with those of its major cost-reimbursement contractors covering their contract work. These financial data are analyzed, organized, combined, and merged into statements covering the operations of each major AEC office. The financial statements of these offices are further combined and become the financial reports of the AEC program as a whole.

Audits of Accounts Underlying Statements

Audit staffs of the AEC field and Washington offices verified cash transactions to the extent necessary. AEC auditors also audited accounts of many cost-reimbursement contractors, using the procedures followed by public accounting firms. All such contractors' accounts are being brought under audit on a continuing basis. The General Accounting Office has performed a continuous voucher audit of the AEC and its cost-reimbursement contractors.

Comments on the Balance Sheet

The major portion of *cash with contractors* represents advances made to cost-reimbursement contractors whose accounts are integrated with the accounts of AEC. Approximately 95 percent of the total

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of *working funds held by other Federal agencies* is with the Department of Defense.

Accounts receivable include current receivables for community services and sale of excess materials. The largest single item at June 30, 1950, is a refund of $3,116,021 overhead advances currently due from a contractor.

Inventories consist chiefly of operating supplies, special materials, laboratory and research supplies, and administrative supplies. For security reasons, source and fissionable materials and weapon parts and assemblies are not reported. Construction materials and supplies held by AEC construction contractors are recorded as construction work in progress and not as inventories.

Costs of fixed assets were determined and allocated to *plant and equipment* units as of June 30, 1949, with the assistance of engineering and accounting firms serving as consultants. The increase in plant and equipment during the year resulted chiefly from new construction. Depreciation was based on the estimated useful life of the various groups of assets.

Collateral funds and other deposits represent deposits held by contractors and insurance companies under various plans covering workmen's compensation, employee benefits, and public liability. (See page 54.)

The *liabilities* consist chiefly of accounts payable covering the unpaid costs of goods and services actually received by AEC and its integrated contractors. Any payments in future years for annual leave due AEC employees at the end of the fiscal year will be made from funds appropriated in future years. Funds held for others include employee withholdings by AEC and its integrated contractors for taxes, savings bonds, and other purposes, and working-fund advances received by AEC to use on projects undertaken for other Federal agencies. The deferred credits are composed to a large extent of rents collected in advance.

Substantial commitments were outstanding at the balance sheet dates for goods and services contracted for but not yet delivered. These obligations consisted chiefly of commitments under cost-type contracts and, in keeping with industrial practice, are not reported as liabilities. Substantial portions of the obligations were made against unfunded contract authority granted by the Congress.

Statement of Operations

The statement of operations presents costs incurred and income earned during the fiscal year 1950 in production, research, development, and other operational activities as distinguished from construction. The statement compares roughly with the income statement of

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private business, but the products are not sold and for reporting purposes are currently written off. Costs and expenses incurred include estimated depreciation of plant and equipment and losses arising from abandonment of uncompleted projects. The Congressional appropriation is not reported as income since it is more appropriately identified as a receipt of capital.

Changes in AEC Equity

The summary of changes in AEC equity presents the major factors that increased or decreased AEC equity (total recorded assets minus liabilities) during the year. It is largely comparable to an analysis-of-surplus statement for a private corporation.

Increases in equity arose from Congressional appropriations and transfers from other Federal agencies without reimbursement. Reductions resulted from the net cost of operations, transfers to other Federal agencies, and the return of funds to the United States Treasury.

During the year, adjustments were made in the accounts as more accurate financial information became available for earlier years. The necessity for such prior-year adjustments should grow progressively less as the accounting procedures and accounting organization mature.

Construction and Supply

In consequence of the growing importance of construction, business services, and supplies of material and equipment in the expanding atomic energy program, AEC on June 1 created a Construction and Supply Division. It was formed by merging under a director who reports to the General Manager the branches of Construction-Engineering, Defense Requirements, and Export Control formerly in the Division of Production, and Business Operations, formerly in the Division of Finance.

The new division supervises construction and related engineering activities for all parts of the AEC program. It administers AEC's relations with the national defense mobilization program, including priorities, allocations, and the Controlled Materials Plan and administers AEC's controls over the licensing of fissionable material production facilities and over the export of atomic energy equipment.

The Division of Construction and Supply exercises staff supervision over AEC arrangements for transportation and communications—also over the procurement, storage, utilization, and disposal of mate-

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rials, equipment, supplies, and real estate and the management of records. It is responsible for the provision of general administrative office services in the AEC Washington Office.

Security Operations

In handling the problems of protecting the secrets and physical security of the expanding atomic energy industry, the Atomic Energy Commission during the last six months:

a) Revised and improved precautions for protecting employees and facilities in event of enemy attack, natural disaster, or the like.

b) Recommended establishment of an additional airspace reservation to eliminate flights of unauthorized planes over certain atomic energy installations.

c) Conducted security surveys at operations offices and assured continued planning to reduce need for numbers of security clearances for construction personnel, and amended its agreement on clearances with the Department of Defense.

d) Issued standards for transportation of documents and materials.

Protecting People and Facilities

Plans have been drawn by each AEC installation for steps to be taken to protect personnel and to insure continuity of operations in event of enemy attack, natural disaster, or any other disrupting occurrence. Anti-sabotage plans, emergency radiation monitoring procedures, and safety and fire protection measures already in existence at each installation provided a basis.

In January 1951, after Presidential proclamation of a national emergency, the General Manager established a Disaster Planning Coordinator on the staff of the Director of Security to guide and consolidate this program. Whenever possible, AEC is following the practices of the Federal Civil Defense Administration.

Atomic Airspace Reservations

At request of AEC, the President issued Executive Order No. 10218, dated February 28, 1951, establishing the airspace above the AEC atomic weapons test site near Las Vegas, Nev., as a reservation through which unauthorized plane flights are prohibited.

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Personnel Clearances

Employment by AEC and its contractors increased from approximately 73,000 on December 31, 1950, to about 100,000 persons as of June 30, 1951; further increases are scheduled.

Under the Atomic Energy Act, the Federal Bureau of Investigation investigates the loyalty, character, and associations of all AEC employees and of those employees of AEC contractors who require access to atomic energy restricted data. AEC grants or withholds security clearance on the basis of FBI reports.

Steps within AEC. To keep pace with the increased personnel requirements of the program and at the same time to maintain essential security, AEC has taken steps to assure itself that it requests only those FBI investigations actually required. A survey of AEC operations offices was made, and instructions were issued to them to assure continued planning for local controls that will make it unnecessary for considerable numbers of construction workers to have access to restricted data. Operations offices are screening all applications for clearance to assure that none is submitted unless clearance is necessary.

Department of Defense agreement. The Department of Defense and the Atomic Energy Commission reviewed the clearance procedures for members of the Armed Forces, and employees, contractors and contractor employees of the Department. The delays incident to the special background investigations of the increasingly large number of personnel of the military establishment and its contractors who require access to restricted data were the subject of discussions between representatives of the military establishment and the Commission. As a result, an agreement was reached between the Commission and the Department of Defense, with the concurrence of the Department of Justice, which permits the Department of Defense to grant access to restricted data within the Department to members of the Armed Services, employees of the Department of Defense and its contractors and the contractors' employees on the basis of clearance procedures prescribed by the Department of Defense for access to top secret, secret, and confidential data, and in accordance with classification criteria jointly established by the Atomic Energy Commission and the Department of Defense.[7] The agreement does not amend the present requirements governing access by Department of Defense personnel, or its contractors and contractors' employees, to restricted data in the possession of AEC's contractors and its contractors' employees, in which case security clearance granted by AEC is required.

[7] Reported in AEC's Fifth Semiannual Report, January 1949, Superintendent of Documents, Washington 25, D. C., 45 cents.

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Transportation of Documents and Materials

A revision of standards covering transportation of classified and other important documents and materials was formulated and distributed throughout AEC operations. These standards include approved methods of shipment, use of receipts, and liaison with law enforcement agencies. A comprehensive discussion of the security features of various methods of transportation furnishes a basis for selecting means for individual shipments.

Atomic Energy Patents

During the last 6 months, 85 patents were issued to AEC on inventions by AEC personnel and contractor employees engaged on AEC work. With these additions, AEC now holds 277 patents that are available to American industries on a royalty-free, nonexclusive basis. The availability of these patents was widely publicized in standard abstracting publications, professional journals, and elsewhere. A complete list of them appears in Appendix 9.

About 125 licenses to use these patents were granted from the first of 1949 to mid-1951, of which 54, or almost one-half, were issued during the last 6 months. The patents embrace wide fields of activity, including general chemistry, uranium chemistry, electronic devices, and radiation detection apparatus. One group of patents covers improved methods and equipment to produce fluorine, new fluorocarbon compounds, fluorination of lubricating oils, new processes for the production of uranium hydride, carbide, trichloride, and hexafluoride, and other halides and alkali metal borohydrides and compounds. Some of the fluorocarbons and fluorolubes are proving of interest to industries that have serious corrosion problems.

Many of the patents cover improvements in Geiger counters, ionization chambers, remote control and handling equipment, mass spectrometers, leak detectors, and radiation detection apparatus. Some may result in commercial devices for use in civil defense.

Patent Compensation Board

The Patent Compensation Board held two hearings in the past 6 months and disposed of three claims with decisions that they presented no valid basis for awards or compensation. This Board was set up under Section 11 of the Atomic Energy Act to fix royalties, just compensation, or awards to owners of patents and inventions in certain areas of atomic energy development.

APPENDIX 1

U. S. Atomic Energy Commission, Principal Staff, and Managers of Operations and Area Offices

Atomic Energy Commission	Gordon Dean, *Chairman.* T. Keith Glennan. Thomas E. Murray. Sumner T. Pike. H. D. Smyth.
General Manager	M. W. Boyer.
Deputy General Manager	Walter J. Williams.
Controller	Lindsley H. Noble.
General Counsel	Everett L. Hollis.
Secretary to Commission	Roy B. Snapp.
Director of Intelligence	Walter F. Colby.
Director of Classification	James G. Beckerley.
Chief, Office of Special Projects	John A. Hall.
Director, Division of Research	Paul W. McDaniel (*Acting*).
Director, Division of Engineering	J. C. Robinson *(Acting).*
Director, Division of Production	R. W. Cook.
Director, Division of Military Application	Brig. Gen. James McCormack, Jr.
Director, Division of Reactor Development	Lawrence R. Hafstad.
Director, Division of Biology and Medicine	Dr. Shields Warren.
Director, Division of Raw Materials	Jesse C. Johnson.
Director, Division of Construction and Supply.	E. J. Bloch.
Director, Division of Security	John A. Waters, Jr.
Director, Division of Organization and Personnel.	Fletcher C. Waller.
Director, Division of Information Services	Morse Salisbury.
Managers of Operations and Area Offices:	
Chicago (Ill.) Operations Office	A. Tammaro.
Ames (Iowa) Area Office	W. W. Lord.
Berkeley (Calif.) Area Office	H. A. Fidler.
Pittsburgh (Pa.) Area Office	Lawton D. Geiger.
Colorado (Grand Junction) Raw Materials Office (reporting to Division of Raw Materials).	Frank H. MacPherson.
Hanford (Wash.) Operations Office	David F. Shaw.
Idaho (Idaho Falls) Operations Office	L. E. Johnston.

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Managers of Operations and Area Offices—Continued	
New York (N. Y.) Operations Office	WILBUR E. KELLEY.
Brookhaven (Long Island, N. Y.) Area Office.	E. L. VAN HORN.
Cleveland (Ohio) Area Office	EDWARD C. SARGENT.
Fernald (Cincinnati, Ohio) Area Office.	JAMES F. CHANDLER.
St. Louis (Mo.) Area Office	C. L. KARL.
Oak Ridge (Tenn.) Operations Office	S. R. SAPIRIE.
Dayton (Miamisburg, Ohio) Area Office.	FRED H. BELCHER.
Kentucky (Paducah) Area Office	KENNETH A. DUNBAR.
Santa Fe (Albuquerque, N. Mex.) Operations Office.	CARROLL L. TYLER.
Los Alamos (N. Mex.) Field Office	ELMO R. MORGAN.
Nevada Test Site Field Office	RALPH P. JOHNSON.
Sandia (N. Mex.) Field Office	DANIEL F. WORTH, JR.
Savannah River (Ga.) Operations Office	CURTIS A. NELSON.
Dana (Terre Haute, Ind.) Area Office	BOURKE SAMPLES.
Schenectady (N. Y.) Operations Office	JON D. ANDERSON.

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APPENDIX 2

MEMBERSHIP OF COMMITTEES

STATUTORY COMMITTEES

Joint Committee on Atomic Energy—Eighty-second Congress

This committee was established by the Atomic Energy Act of 1946 (sec. 15) to make "continuing studies of the activities of the Atomic Energy Commission and of problems relating to the development, use, and control of atomic energy." The committee is kept fully and currently informed with respect to the Commission's activities. Legislation relating primarily to the Commission or to atomic energy matters are referred to the committee. The committee's membership is composed of nine members of the Senate and nine members of the House of Representatives.

Senator BRIEN MCMAHON (Connecticut), chairman.
Representative CARL T. DURHAM (North Carolina), vice chairman.
Senator RICHARD B. RUSSELL (Georgia).
Senator EDWIN C. JOHNSON (Colorado).
Senator TOM CONNALLY (Texas).
Senator CLINTON P. ANDERSON (New Mexico).
Senator BOURKE B. HICKENLOOPER (Iowa).
Senator EUGENE D. MILLIKIN (Colorado).
Senator WILLIAM F. KNOWLAND (California).
Senator JOHN W. BRICKER (Ohio).
Representative CHET HOLIFIELD (California).
Representative MELVIN PRICE (Illinois).
Representative PAUL J. KILDAY (Texas).
Representative HENRY M. JACKSON (Washington).
Representative W. STERLING COLE (New York).
Representative CHARLES H. ELSTON (Ohio).
Representative CARL HINSHAW (California).
Representative JAMES E. VAN ZANDT (Pennsylvania).
WILLIAM L. BORDEN, executive director.
HAROLD BERGMAN, deputy director.

Military Liaison Committee

Under sec. 2 (c) of the Atomic Energy Act of 1946, as amended, "there shall be a Military Liaison Committee consisting of a Chairman, who shall be the head thereof, and of a representative or representatives of the Departments of the Army, Navy, and Air Force, detailed or assigned thereto, without additional compensation, in such number as the Secretary of Defense may determine. Representatives from each of the three Departments shall be designated by the respective Secretaries of the Army, Navy, and Air Force. The Committee Chairman shall be appointed by the President, by and with the advice and consent of the Senate, and shall receive compensation at a rate prescribed by law for the Chairman of the Munitions Board. The Commission shall advise and consult with the Committee on all atomic energy matters which the Committee deems to

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relate to military applications, including the development, manufacture, use and storage of bombs, the allocation of fissionable material for military research, and the control of information relating to the manufacture or utilization of atomic weapons. The Commission shall keep the Committee fully informed of all such matters before it and the Committee shall keep the Commission fully informed of all atomic energy activities of the Department of Defense. The Committee shall have authority to make written recommendations to the Commission on matters relating to military applications from time to time as it may deem appropriate. If the Committee at any time concludes that any action, proposed action, or failure to act of the Commission on such matters is adverse to the responsibilities of the Department of Defense, derived from the Constitution, laws, and treaties, the Committee may refer such action, proposed action, or failure to act to the Secretary of Defense. If the Secretary concurs, he may refer the matter to the President, whose decision shall be final."

Hon. ROBERT LEBARON, chairman.
Brig. Gen. HERBERT B. LOPER, United States Army.
Brig. Gen. STANLEY R. MICKELSEN, United States Army.
Rear Adm. CHARLES F. COE, United States Navy.
Rear Adm. FREDERIC S. WITHINGTON, United States Navy.
Maj. Gen. ROGER M. RAMEY, United States Air Force.
Maj. Gen. ROSCOE C. WILSON, United States Air Force.
Col. HARRY MCK. ROPER, executive secretary, United States Army.

General Advisory Committee

This committee was established by the Atomic Energy Act of 1946 (sec. 2 (b)). The nine civilian members are appointed by the President to advise the Commission on scientific and technical matters relating to materials, production, and research and development. Under the Atomic Energy Act, the committee shall meet at least four times in every calendar year; the committee held its first meeting in January 1947, and to date has averaged six meetings a year.

Dr. J. ROBERT OPPENHEIMER, chairman; director, Institute for Advanced Study, Princeton, N. J.
Dr. OLIVER E. BUCKLEY, chairman, Bell Telephone Laboratories, New York, N. Y.
Dr. JAMES B. CONANT, president, Harvard University, Cambridge, Mass.
Dr. LEE A. DUBRIDGE, president, California Institute of Technology, Pasadena, Calif.
Dr. W. F. LIBBY, professor of chemistry, University of Chicago, Chicago, Ill.
EGER V. MURPHREE, president, Standard Oil Development Co., New York, N. Y.
Dr. I. I. RABI, professor of physics, Columbia University, New York, N. Y.
Dr. CYRIL S. SMITH, director, Institute for the Study of Metals, University of Chicago, Chicago, Ill.
WALTER G. WHITMAN, head, department of chemical engineering, Massachusetts Institute of Technology, Cambridge, Mass.
Dr. RICHARD W. DODSON, secretary; chairman, department of chemistry, Brookhaven National Laboratory, Upton, Long Island, N. Y.

PATENT COMPENSATION BOARD

This board was established in April 1949 pursuant to section 11 of the Atomic Energy Act of 1946, which provides that upon application for just compensation or awards or for the determination of a reasonable royalty fee certain proceedings shall be held before such a board. To date the board has held 8 ses-

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sions; 10 cases have been filed, of which 5 have been finally determined by the board; 1 claim has been withdrawn.

CASPER W. OOMS, chairman; of Dawson & Ooms, Chicago, Ill.
ISAAC HARTER, chairman, Babcock & Wilcox Tube Co., Beaver Falls, Pa.
JOHN V. L. HOGAN, consulting engineer, Hogan Laboratories, Inc., New York, N. Y.

PERMANENT PANEL APPOINTED BY THE PRESIDENT—ATOMIC ENERGY LABOR RELATIONS PANEL

The members of this panel were appointed by the President in 1949 and in 1950 to take jurisdiction and mediate labor management disputes which threaten to interfere with essential operations of the Atomic Energy Commission. The panel operates under procedures designed to safeguard continuity of operations while not inhibiting free collective bargaining between AEC contractors and unions. To date it has acted upon 23 labor management disputes in AEC installations, and has reported semiannually to the President on its activities (see Appendix 7).

WILLIAM H. DAVIS, chairman; of Davis, Hoxie & Faithfull, New York, N. Y.; chairman, Patent Survey Committee, U. S. Department of Commerce.
FRANK P. DOUGLASS; of Douglass & Douglass, Oklahoma City, Okla.
JOHN T. DUNLOP, professor of economics, Harvard University, Cambridge, Mass., public member, Wage Stabilization Board.
AARON HORVITZ, lawyer and arbitrator, New York and New Jersey.
GODFREY P. SCHMIDT, lawyer, New York, N. Y.
EDWIN E. WITTE, chairman, department of economics, University of Wisconsin, Madison, Wis.

SENIOR RESPONSIBLE REVIEWERS

The Manhattan District appointed and the Atomic Energy Commission reaffirmed the need for the Committee of Senior Responsible Reviewers. The committee reviews the major phases of the AEC program and is the principal advisor to the AEC on declassification matters, making recommendations for formulating and modifying the rules and guides for classifying scientific and technical information.

Dr. W. C. JOHNSON, chairman, department of chemistry, University of Chicago, Chicago, Ill.
Dr. J. M. B. KELLOGG, division leader, Los Alamos Scientific Laboratory, Los Alamos, N. Mex.
Dr. W. F. LIBBY, professor of chemistry, University of Chicago, Chicago, Ill.
Dr. R. L. THORNTON, professor of physics, University of California, Berkeley, Calif.
Dr. FREDERIC DE HOFFMANN, secretary; alternate assistant director, Los Alamos Scientific Laboratory, Los Alamos, N. Mex.

ADVISORY BODIES TO THE ATOMIC ENERGY COMMISSION

Advisory Committee on Biology and Medicine

This committee was created in September 1947 on the recommendation of the Commission's Medical Board of Review. The committee reviews the AEC pro-

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gram in medical and biological research and health and recommends to the Commission general policies in these fields. The committee has held 27 meetings and reports to the Commission on each meeting.

Dr. ALAN GREGG, chairman; director for medical sciences, Rockefeller Foundation, New York, N. Y.
Dr. ERNEST W. GOODPASTURE, vice chairman; dean, school of medicine and professor of pathology, Vanderbilt University, Nashville, Tenn.
Dr. EDWARD A. DOISY, director, department of physiology and biochemistry, St. Louis University School of Medicine, St. Louis, Mo.
Dr. GIOACCHINO FAILLA, head, department of radiology, Columbia University Medical School, New York, N. Y.
Dr. E. C. STAKMAN, chief, division of plant pathology and botany, University of Minnesota, Minneapolis, Minn.
Dr. CURT STERN, professor of zoology, University of California, Berkeley, Calif.
Dr. JOSEPH T. WEARN, dean, school of medicine, Western Reserve University, Cleveland, Ohio.

Advisory Committee on Chemistry

This committee was appointed in June 1949 to advise on policy concerning the AEC program of supporting basic unclassified chemistry research in universities, and the relationship of this program to the AEC's own chemistry research program. Most of the work of the committee is accomplished by individual consultation as specific problems arise.

Dr. FARRINGTON DANIELS, professor of chemistry, University of Wisconsin, Madison, Wis.
Dr. G. B. KISTIAKOWSKY, professor of chemistry, Harvard University, Cambridge, Mass.
Dr. JOSEPH E. MAYER, professor of chemistry, University of Chicago, Chicago, Ill.
Dr. GLENN T. SEABORG, professor of chemistry, University of California, Berkeley, Calif.
Dr. DON M. YOST, professor of chemistry, California Institute of Technology, Pasadena, Calif.

Community Operations Panel

This committee was appointed in July 1950 to study the problems of introducing private ownership of real property and self-government in the AEC communities at Los Alamos, N. Mex.; Richland, Wash.; and Oak Ridge, Tenn. The committee visited the three communities and will recommend to the Commission how far and by what means these steps can be taken without jeopardy to AEC operations.

RICHARDSON G. SCURRY, chairman; of Scurry, Scurry & Pace, Dallas, Tex.
FREDERICK M. BABCOCK, private consultant in construction finance and housing, Washington, D. C.
GEORGE E. BEAN, city manager, Grand Rapids, Mich.
GEORGE GOVE, vice president for housing projects, Metropolitan Life Insurance Co., New York, N. Y.

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Advisory Board of Contract Appeals

This board was established in February 1950. One or more of its members hears contract appeals arising under the "disputes articles" of AEC contracts and subcontracts and makes recommendations to the General Manager concerning their disposition.

SHELDEN ELLIOTT, dean of the law school, University of Southern California, Los Angeles, Calif.

[redacted]

H. THOMAS AUSTERN; of Covington & Burling, Washington, D. C.
WILLIAM H. DAVIS; of Davis, Hoxie & Faithfull, New York, N. Y.; chairman, Patent Survey Committee, U. S. Department of Commerce.
JOHN A. DIENNER; of Brown, Jackson, Boettcher & Dienner, Chicago, Ill.
HECTOR M. HOLMES; of Fish, Richardson & Neave, Boston, Mass.
CASPER W. OOMS; of Dawson & Ooms, Chicago, Ill.

Advisory Committee on Personnel Management

This committee of leading authorities from government, industry, and education was named in September 1948 to provide the Atomic Energy Commission with a continuous review of its personnel management practices and to evaluate the best personnel methods of government and industry in determining over-all AEC policies. The committee usually meets once a month.

ARTHUR S. FLEMMING, chairman; president, Ohio Wesleyan University, Delaware, Ohio; assistant to the director of manpower, Office of Defense Mobilization.
LAWRENCE A. APPLEY, president, American Management Association, New York, N. Y.
ALVIN E. DODD, honorary president, American Management Association, New York, N. Y.
L. CLAYTON HILL, professor of industrial relations, University of Michigan, Ann Arbor, Mich.
WALLACE SAYRE, professor of public administration, school of business and civic administration, City College of New York, N. Y.
THOMAS G. SPATES, professor of industrial administration, Yale University, New Haven, Conn.; former vice president, General Foods Corp.

Personnel Security Review Board

This board was appointed in March 1949 primarily to review specific personnel security cases which arise under the Commission's administrative review procedure and make recommendations concerning them to the General Manager. The board, in its monthly meetings, also advises the Commission on the broader considerations regarding personnel security, such as criteria for determining eligibility for security clearance, and personnel security procedures.

GANSON PURCELL, chairman; of Root, Ballantine, Harlan, Bushby & Palmer, Washington, D. C.
ARTHUR S. FLEMMING, president, Ohio Wesleyan University, Delaware, Ohio; assistant to the director of manpower, Office of Defense Mobilization.
BRUCE D. SMITH, director, United Corp., New York, N. Y., and Lehigh Coal & Navigation Co., Philadelphia, Pa.

Committee on Raw Materials

This committee was appointed in October 1947 to review the Atomic Energy Commission's raw materials program and to advise on questions of exploration, development, and procurement. The committee has met nine times since its formation.

DR. DONALD H. MCLAUGHLIN, chairman; president, Homestake Mining Co., San Francisco, Calif.

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EVERETTE L. DEGOLYER, petroleum geologist, DeGolyer & McNaughton, Dallas, Tex.
THOBOLD F. FIELD, consulting mining engineer, Duluth, Minn.
J. K. GUSTAFSON, consulting geologist, M. A. Hanna Co., Cleveland, Ohio.
IRA B. JORALEMON, geologist, San Francisco, Calif.
WILBER JUDSON, vice president and director, Texas Gulf Sulphur Co., New York, N. Y.
WALTER L. MAXSON, vice president, Oliver Iron Mining Co., Duluth, Minn.
ERNEST H. ROSE, chemical engineer, Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
WALTER O. SNELLING, director of research and consulting chemist, Trojan Powder Co., Allentown, Pa.
ORVIL R. WHITAKER, consulting mining engineer, Denver, Colo.
CLYDE E. WILLIAMS, director, Battelle Memorial Institute, Columbus, Ohio.

Reactor Safeguard Committee

This committee was established in the fall of 1947 to advise the Commission on the hazards of the operation of reactors. The committee reviews safety studies made by the contractors on proposed reactors for completeness and accuracy and may make recommendations for modifications or further study. This committee of experts in the fields of physics, chemistry, sanitary engineering, meteorology, and medicine meets whenever problems arise which require its consideration. In the past this has been about four times a year.

Dr. EDWARD TELLER, chairman; assistant director for weapons development, Los Alamos Scientific Laboratory, Los Alamos, N. Mex.
Dr. MANSON BENEDICT, professor of chemical engineering, Massachusetts Institute of Technology, Cambridge, Mass.
Dr. HYMER L. FRIEDELL, director, department of radiology, Lakeside Hospital, Western Reserve University, Cleveland, Ohio.
Col. BENJAMIN HOLZMAN, meteorologist, Office of Director of Research and Development, United States Air Force, Washington, D. C.
Dr. FREDERICK SEITZ, professor of physics, University of Illinois, Urbana, Ill.
Dr. JOHN A. WHEELER, Los Alamos Scientific Laboratory, Los Alamos, N. Mex.
Dr. ABEL WOLMAN, head, department of sanitary engineering, Johns Hopkins University, Baltimore, Md.

Stack Gas Problem Working Group

The appointment of this group was authorized in May 1948 to advise the Commission on the development of methods and equipment for keeping the atmosphere at and near AEC installations free of toxic or radioactive contamination. The group has held five meetings. Individual members also give consulting advice on specific proposals and problems.

Dr. ABEL WOLMAN, chairman; head, department of sanitary engineering, Johns Hopkins University, Baltimore, Md.
Dr. PHILIP DRINKER, professor of industrial hygiene, Harvard University School of Public Health, Boston, Mass.
Dr. LYLE GILBERTSON, research division, Air Reduction Sales Co. Laboratory, New York, N. Y.
Dr. H. FRASER JOHNSTONE, professor of chemical engineering, University of Illinois, Urbana, Ill.

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Dr. MOYER D. THOMAS, department of agricultural research, American Smelting & Refining Co., Salt Lake City, Utah.

Dr. WILLIAM P. YANT, director of research, Mine Safety Appliances Co., Pittsburgh, Pa.

Ad Hoc Committee on Technological Information for Industry

This committee was appointed in July 1949 to advise the Commission on ways to improve the dissemination of its technical information to industry. A working committee examined the Commission's technological files and processes with a view to recommending material which should be submitted for declassification. It reported in January 1951 that "The declassification of information by the AEC has, in our opinion, been found to be satisfactory. In no case have we uncovered any huge amounts of secret information of value to industry, although some specific cases of valuable information are noted in our reports." The working committee is prepared to render further services if and when needed.

SIDNEY D. KIRKPATRICK, chairman; member of working committee; vice president and director of editorial development, McGraw-Hill Book Co., Inc., New York, N. Y.

Dr. HENRY A. BARTON, director, American Institute of Physics, New York, N. Y.

H. E. BLANK, editor, Modern Industry, New York, N. Y.

GENE HARDY, National Association of Manufacturers, Washington, D. C.

KEITH HENNEY, member of working committee; editor, Nucleonics; consulting editor, Electronics, McGraw-Hill Publishing Co., Inc., New York, N. Y.

EDWARD KREUTZBERG, editor, Penton Publishing Co., Washington, D. C.

Dr. WALTER J. MURPHY, editor, Chemical and Engineering News, American Chemical Society, Washington, D. C.

D. O. MYATT, managing editor, Industrial and Engineering Chemistry, Washington, D. C.

CHARLES S. RICH, editor, Electrical Engineering, American Institute of Electrical Engineers, New York, N. Y.

GEORGE STETSON, editor, Mechanical Engineering, American Society of Mechanical Engineers, New York, N. Y.

GEORGE F. SULLIVAN, managing editor, The Iron Age, Chilton Publications, Inc., New York, N. Y.

E. E. THUM, chairman of working committee; editor, Metal Progress, American Society for Metals, Cleveland, Ohio.

S. A. TUCKER, member of working committee; standards manager, The American Society of Mechanical Engineers, New York, N. Y.

F. J. VAN ANTWERPEN, member of working committee; editor, Chemical Engineering Progress, American Institute of Chemical Engineers, New York, N. Y.

Dr. ALBERTO F. THOMPSON, secretary; chief, technical information service, division of information services, AEC, Washington, D. C.

Technical Information Panel

This panel, representing the major AEC research contractors, was appointed in June 1948 to advise the Commission on all aspects of its technical information services. Meetings are held three times a year to consider technical information problems and to make recommendations toward improving the Commission's technical information services.

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Dr. ALBERTO F. THOMPSON, chairman; chief, technical information service, division of information services, AEC, Washington, D. C.

Dr. RUSSELL BALDOCK, research physicist, isotope research and production division, Carbide & Carbon Chemicals Co., div. of Union Carbide & Carbon Corp. (Y–12), Oak Ridge, Tenn.

Dr. HENRY A. BLAIR, director, Atomic Energy Project, University of Rochester, Rochester, N. Y.

BREWER F. BOARDMAN, technical advisor, technical information service, division of information services, AEC, Oak Ridge, Tenn.

W. E. DREEZEN, administrative aide to director, Ames Laboratory, Ames, Iowa.

WILLIAM H. HAMILTON, staff assistant to assistant manager, Westinghouse Atomic Power Division, Pittsburgh, Pa.

Dr. M. M. HARING, director, Mound Laboratory, Miamisburg, Ohio.

SYLVAN HARRIS, manager, documents department, Sandia Corp., Albuquerque, N. Mex.

W. L. HARWELL, head, patents and declassification department, Carbide & Carbon Chemicals Co., div. of Union Carbide & Carbon Corp. (K–25), Oak Ridge, Tenn.

JOHN F. HOGERTON, technical reports director, The Kellex Corp., New York, N. Y.

Dr. E. J. MURPHY, assistant to research director, Carbide & Carbon Chemicals Co., div. of Union Carbide & Carbon Corp. (ORNL), Oak Ridge, Tenn.

Dr. G. M. MURPHY, professor of chemistry, New York University, N. Y.

Dr. DANIEL J. PFLAUM, chief, materials and information branch, division of research, AEC, Washington, D. C.

DENNIS PULESTON, head, information and publications division, Brookhaven National Laboratory, Upton, Long Island, N. Y.

Dr. RICHARD F. RILEY, chief, radiation chemistry section, Atomic Energy Project, University of California, Los Angeles, Calif.

Dr. CHARLES SLESSER, director, division of technical information and declassification, AEC, New York, N. Y.

Dr. RALPH CARLISLE SMITH, assistant director for classification and security, Los Alamos Scientific Laboratory, Los Alamos, N. Mex.

Dr. J. R. STEHN, physicist, theoretical physics division, Knolls Atomic Power Laboratory, Schenectady, N. Y.

C. G. STEVENSON, chief librarian, General Electric Co., Richland, Wash.

Dr. R. K. WAKERLING, chief, information division, Radiation Laboratory, University of California, Berkeley, Calif.

Dr. JOHN C. WOODHOUSE, director, technical division, atomic energy division, E. I. du Pont de Nemours & Co., Wilmington, Del.

Dr. H. D. YOUNG, director, information division, Argonne National Laboratory, Chicago, Ill.

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APPENDIX 3

MAJOR RESEARCH CENTERS OF THE U. S. ATOMIC ENERGY COMMISSION

Ames Laboratory (Iowa State College, contractor)

Director ..... Dr. FRANK H. SPEDDING
Associate Director ..... Dr. H. A. WILHELM
Assistant to Director ..... Dr. E. I. FULMER

Argonne National Laboratory (University of Chicago, contractor) Chicago, Ill.

The participating institutions are:

Battelle Memorial Institute.
Carnegie Institute of Technology.
Case Institute of Technology.
Illinois Institute of Technology.
Indiana University.
Iowa State College.
Kansas State College.
Loyola University (Chicago, Ill.).
Marquette University.
Mayo Foundation.
Michigan College of Mining and Technology.
Michigan State College.
Northwestern University.
Ohio State University.
Oklahoma Agricultural and Mechanical College.
Purdue University.
St. Louis University.
State University of Iowa.
Washington University (St. Louis Mo.).
Western Reserve University.
University of Chicago.
University of Cincinnati.
University of Illinois.
University of Kansas.
University of Michigan.
University of Minnesota.
University of Missouri.
University of Nebraska.
University of Notre Dame.
University of Pittsburgh.
University of Wisconsin.

Director ..... Dr. WATER H. ZINN
Deputy Director ..... Dr. NORMAN HILBERRY
Business Manager ..... JOHN H. MCKINLEY

President, AUI ..... Dr. LLOYD V. BERKNER
Director, Laboratory ..... Dr. LELAND J. HAWORTH
Assistant to Director and Acting Business Manager ..... Dr. GERALD F. TAPE
Assistant Director, University Liaison ..... Dr. ROBERT A. PATTERSON
Assistant Director, Biology and Medicine ..... Dr. DONALD D. VAN SLYKE

Knolls Atomic Power Laboratory (General Electric Co., contractor)
Schenectady, N. Y.

General Manager ..... WILLIAM H. MILTON, JR.
Technical Manager ..... Dr. K. H. KINGDON
Engineering Manager ..... W. W. KUYPER

Los Alamos Scientific Laboratory (University of California, contractor)
Los Alamos, N. Mex.

Director ..... Dr. NORRIS E. BRADBURY
Technical Associate Director ..... Dr. DAROL K. FROMAN

Mound Laboratory (Monsanto Chemical Co., contractor)
Miamisburg, Ohio

Project Director ..... Dr. C. A. HOCHWALT
Executive Director, AEC Projects ..... Dr. JOSEPH J. BURBAGE
Laboratory Director ..... Dr. M. M. HARING

Oak Ridge National Laboratory (Carbide & Carbon Chemicals Co., div. of Union Carbide & Carbon Corp., contractor)
Oak Ridge, Tenn.

Director ..... Dr. C. E. LARSON
Executive Director ..... L. B. EMLET
Research Director ..... Dr. A. M. WEINBERG
Acting Assistant Research Director ..... Dr. E. H. TAYLOR
Assistant Research Director (Y-12) ..... Dr. E. D. SHIPLEY
Acting Project Director (Homogeneous Research Project) ..... Dr. J. A. SWARTOUT

Oak Ridge Institute of Nuclear Studies (contractor)
Oak Ridge, Tenn.

The sponsoring universities of the Institute are:

Agricultural and Mechanical College of Texas.
Alabama Polytechnic Institute.
Catholic University of America.
Duke University.
Emory University.
Florida State University.
Georgia Institute of Technology.
Louisiana State University.
Mississippi State College.
North Carolina State College.
Rice Institute.
Tulane University of Louisiana.
Vanderbilt University.
Virginia Polytechnic Institute.
University of Alabama.
University of Arkansas.
University of Florida.

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University of Georgia.
University of Kentucky.
University of Louisville.
University of Maryland.
University of Mississippi.
University of North Carolina.
University of South Carolina.
University of Oklahoma.
University of Puerto Rico.
University of Tennessee.
University of Texas.
University of Virginia.

Chairman of Council---------- Dr. LOUIS A. PARDUE
Vice Chairman of Council---------- Dr. G. H. BOYD
President of Institute---------- Dr. PAUL M. GROSS
Vice President of Institute---------- Dr. J. W. BEAMS
Scientific and Educational Consultant---------- Dr. GEORGE B. PEGRAM
Executive Director of Institute---------- Dr. WILLIAM G. POLLARD

Radiation Laboratory (University of California, contractor)
Berkeley, Calif.

Director---------- Dr. ERNEST O. LAWRENCE
Associate Director---------- Dr. DONALD COOKSEY
Business Manager and Managing Engineer---------- WALLACE B. REYNOLDS
Assistant Director---------- WILLIAM M. BROBECK
Director, Crocker Laboratory—Medical Physics---------- Dr. JOSEPH G. HAMILTON
Director, Donner Laboratory of Medical Physics---------- Dr. J. H. LAWRENCE
Assistant Director, Donner Laboratory---------- Dr. HARDIN JONES

Rochester Atomic Energy Project (University of Rochester, contractor)
Rochester, N. Y.

Director---------- Dr. HENRY A. BLAIR
Assistant Director for Education---------- Dr. J. NEWELL STANNARD
Business Manager---------- C. M. JARVIS

Sandia Laboratory (Sandia Corp., contractor)
Sandia Base, Albuquerque, N. Mex.

President---------- GEORGE A. LANDRY
Vice President---------- F. SCHMIDT

University of California, Los Angeles, Atomic Energy Project
(University of California, contractor)
Los Angeles, Calif.

Director---------- Dr. STAFFORD WARREN
Business Manager---------- ROBERT J. BUETTNER

Westinghouse Electric Corp., Atomic Power Division (contractor)
Pittsburgh, Pa.

Manager, Westinghouse Atomic Power Division---------- C. H. WEAVER
Assistant Manager---------- Dr. CHARLES M. SLACK
Director of Engineering and Research---------- F. R. BENEDICT

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APPENDIX 4

Distribution of Isotopes, Oak Ridge, Tenn.

DOMESTIC	NUMBER OF SHIPMENTS					
	Aug. 2, 1946, to June 30, 1947	July 1, 1947, to June 30, 1948	July 1, 1948, to June 30, 1949	July 1, 1949, to June 30, 1950	July 1, 1950, to May 31, 1951	Total to May 31, 1951
Shipments classified by broad field of utilization:						
Radioactive isotopes:						
Medical therapy	407	884	1,564	2,594	3,247	8,696
Animal physiology	280	712	890	1,150	1,205	4,237
Physics	82	175	271	376	356	1,260
Chemistry	74	188	254	223	290	1,029
Plant physiology	49	107	195	282	225	858
Industrial research	42	68	135	217	295	757
Bacteriology	11	53	79	64	103	310
Other	----------	4	187	392	662	1,245
Total	945	2,191	3,575	5,298	6,383	18,392
Stable isotopes:						
Physics	27	175	245	298	193	938
Chemistry	12	69	68	92	113	354
Animal physiology	16	35	33	34	43	161
Industrial research	----------	21	4	6	1	32
Plant physiology	----------	5	9	2	1	17
Bacteriology	----------	2	4	----------	2	8
Other	----------	----------	6	2	3	11
Total	55	307	369	434	356	1,521
Shipments classified by kind of isotope:						
Radioactive isotopes:						
Iodine 131	276	741	1,213	1,994	2,526	6,750
Phosphorus 32	260	747	1,221	1,582	1,719	5,529
Carbon 14	88	134	148	216	292	878
Sodium 24	32	113	152	303	202	802
Sulfur 35	31	35	89	115	110	380
Gold 198, 199	63	23	39	79	201	405
Calcium 45	22	40	55	75	92	284
Iron 55, 59	26	34	48	57	69	234
Cobalt 60	24	22	55	82	161	344
Potassium 42	23	24	53	95	132	327
Strontium 89, 90	7	15	17	36	39	114
Other (61)	93	263	485	664	840	2,345
Total	945	2,191	3,575	5,298	6,383	18,392
Stable Isotopes:						
Deuterium oxide (heavy water)	31	115	116	96	114	472
Deuterium (hydrogen 2)	22	97	79	103	95	396
Boron 10 and 11	2	35	32	37	11	117
Helium	----------	----------	----------	7	----------	7
Oxygen 18	----------	23	17	17	23	80
Electromagnetic concentrated	----------	37	125	174	113	449
Total	55	307	369	434	356	1,521

DISTRIBUTION OF ISOTOPES—Continued

DOMESTIC	TOTAL NUMBER OF SHIPMENTS TO MAY 31, 1951	
	Radioactive	Stable
Shipments classified by State and Territory:		
Alabama	44	1
Arizona	3	----------
Arkansas	84	----------
California	1,796	102
Colorado	114	2
Connecticut	308	55
Delaware	37	7
District of Columbia	395	82
Florida	91	4
Georgia	222	----------
Hawaii	18	----------
Idaho	1	----------
Illinois	1,475	211
Indiana	287	48
Iowa	187	6
Kansas	78	6
Kentucky	90	----------
Louisiana	280	10
Maine	3	----------
Maryland	1,215	46
Massachusetts	1,837	174
Michigan	633	44
Minnesota	563	33
Mississippi	11	----------
Missouri	542	23
Montana	4	6
Nebraska	110	----------
New Hampshire	6	----------
New Jersey	279	51
New Mexico	31	----------
New York	2,437	180
North Carolina	339	15
North Dakota	2	----------
Ohio	1,205	141
Oklahoma	70	8
Oregon	177	7
Pennsylvania	1,096	120
Rhode Island	15	1
South Carolina	58	----------
South Dakota	4	----------
Tennessee	525	22
Texas	783	43
Utah	136	3
Virginia	131	7
Washington	175	9
West Virginia	2	1
Wisconsin	481	53
Wyoming	12	----------
Total	18,392	1,521

FOREIGN	TOTAL NUMBER OF SHIPMENTS TO MAY 31, 1951	
	Radioactive	Stable
Shipments classified by country:		
Argentina	54	----------
Australia	98	----------
Belgium	102	----------
Brazil	64	----------
Canada	55	----------
Chile	36	----------
Colombia	4	----------
Cuba	5	----------
Denmark	143	----------
Egypt	1	----------
Finland	5	----------
France	38	----------
Iceland	2	----------
India	1	----------
Italy	13	----------
Japan	38	----------
Lebanon	5	----------
Mexico	2	----------
Netherlands	42	----------
New Zealand	10	----------
Norway	36	----------
Pakistan	3	----------
Peru	8	----------
Spain	4	----------
Sweden	148	----------
Switzerland	41	----------
Trieste	2	----------
Turkey	5	----------
Union of South Africa	27	----------
United Kingdom		----------
Bermuda	15	----------
British West Africa	1	----------
England	96	----------
Uruguay	8	----------
Total	1,112	----------
Shipments classified by kind of isotope:		
Phosphorus 32	496	----------
Iodine 131	240	----------
Carbon 14	127	----------
Sulfur 35	57	----------
Iron 55, 59	52	----------
Cobalt 60	61	----------
Calcium 45	28	----------
Strontium 89, 90	9	----------
Other	42	----------
Total	1,112	----------

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OTAL NUMBER OF SHIPMENTS TO MAY 31, 1951	
Radio-active	Stable
54	
98	
102	
64	
55	
36	
4	
5	
143	
1	
5	
38	
2	
1	
13	
38	
5	
2	
42	
10	
36	
3	
8	
4	
148	
41	
2	
5	
27	
15	
1	
96	
8	
1,112	
496	
240	
127	
57	
52	
61	
28	
9	
42	
1,112	

APPENDIX 5

Current AEC Unclassified Research Contracts in Physical and Biological Sciences and Reactor Development and Guide for Submission of Research Proposals [1]

PHYSICAL RESEARCH CONTRACTS

Chemistry

Arkansas, University of. R. R. Edwards, Chemical Effects of Nuclear Transformation.

California, University of. J. H. Hildebrand, Studies in Intermolecular Forces and Solubility.

Carnegie Institute of Technology. T. P. Kohman, Nuclear Chemistry Research.

Catholic University of America. G. W. Castellan, Electrical Effects at Phase Boundaries.

Catholic University of America. W. J. Moore, Rate Processes in Inorganic Compounds at High Temperatures.

Catholic University of America. F. O. Rice, The Thermal Production and Identification of Free Radicals.

Chicago, University of. S. K. Allison, Radiochemical and Radiobiological Research.

Chicago, University of. H. Taube, Oxygen Atom Transfer Reactions and Purchase of Mass Spectrometer.

Chicago, University of. A. Turkevich and N. Sugarman, Nuclear Chemistry Research.

Chicago, University of. H. C. Urey, Natural Abundance of Deuterium and Other Isotopes.

Colorado, University of. J. R. Lacher and J. D. Parks, Thermochemical Studies of Organic Fluorine Compounds.

Columbia University. V. K. LaMer, Filtration of Aerosols.

Columbia University. J. M. Miller, Basic Chemical Research.

Columbia University. W. A. Selke, Ion Exchange Chromotography.

Columbia University. T. I. Taylor, Separation of Isotopes by Chemical Exchange.

Connecticut, University of. R. Ward, Trace Element Distribution Between a Melt and Solid.

Cornell University. J. L. Hoard, Studies of Fluorocarbons and Elementary Borons.

Fordham University. M. Cefola, Use of Thenoyltrifluoroacetate as an Analytical Reagent.

[1] Contracts listed as of May 31, 1951.

5001473

George Washington University. T. Perros, Studies of the Fluorides of the Rare Earth Elements.

Georgia Institute of Technology. J. Hines, The Occurrence and Rate of Certain Deuterium Exchange Reactions.

Illinois, University of. H. G. Drickamer, The Mechanism of Molecular Motion as Determined From Diffusion and Thermal Diffusion Measurements.

Illinois, University of. P. E. Yankwich, Radiochemistry.

Illinois Institute of Technology. A. F. Clifford, The Acids of the Hydrogen Fluoride System and Basic Chemistry of Polonium.

Illinois Institute of Technology. M. Kilpatrick, The Fundamental Chemistry of Ozone.

Illinois Institute of Technology. M. Kilpatrick and R. C. Vogel, Studies in Chemistry of Ruthenium and Purchase of Recording Spectrophotometer.

Illinois Institute of Technology. M. Kilpatrick and H. E. Gunning, Studies on Decomposition of Organic Molecules by Metal Photosensitization.

Illinois Institute of Technology. S. E. Wood, Study of the Properties of Non-electrolytic Solutions.

Iowa, State University of. L. Eyring, Preparation of Rare Earth Oxides.

Iowa, State University of. K. Kammermeyer, The Separation of Gases by Diffusion Through Permeable Membranes.

Iowa, State University of. S. Wawzonek, The Behavior of Organic Compounds at the Dropping Mercury Electrode in Nonassociated Anhydrous Solvents.

Kansas, University of. P. W. Gilles, High Temperature Research; Hot Laboratory Assistance.

Kansas, University of. J. O. Maloney, Application of Radioactive Tracers to the Design of Distillation Columns.

Louisville, University of. R. H. Wiley, Synthesis and Properties of Ion Exchange Resins.

Massachusetts Institute of Technology. D. N. Hume, C. D. Coryell, and J. D. Roberts, Nuclear Chemistry Research.

Michigan, University of. E. F. Westrum, Jr., Low Temperature Chemical Thermodynamics.

Michigan State College. M. T. Rogers, A Physicochemical Investigation of Interhalogen Compounds.

Missouri, University of. R. A. Cooley, The Kinetics of the Gas Phase Reaction Between Nitrogen Dioxide and Ammonia.

New Hampshire, University of. H. H. Haendler, Inorganic Fluorides.

New York University. C. V. King, Measurement of Metal Dissolution Rates.

North Carolina, University of. S. B. Knight, The Use of the Flame Photometer for the Determination of Small Quantities of Certain Metals.

North Carolina, University of. S. Y. Tyree, Jr., The Systems: $ZrCl_4$ Esters.

Northwestern University. F. Basolo and G. Pearson, Mechanism of Substitution Reactions of Inorganic Complexes.

Northwestern University. D. D. DeFord, Investigation of the Solution Chemistry of Ruthenium in Its Lower Valence States.

Northwestern University. J. N. Pitts, Jr., Photochemistry of Organic Acids, Ethers, and Ketones.

5001474

Utah, University of. A. L. Wahrhaftig, Ionization and Dissociation of Molecules by Electron Bombardment.

Utah, University of. B. J. Zwolinski, Induction of Chemical Reactions by High Frequency Discharges in Gases.

Vanderbilt University. E. A. Jones, Raman Spectra of Some Inorganic Compounds.

Washington, State College of. H. W. Dodgen, The Formulae and Stability of Complex Ions In Solution.

Washington, State College of. M. Lindner, The Experimental Investigation of the Stationary States of Light Nuclei Through a Search for Several Unknown Isotopes.

Washington University. J. Kennedy, Separation of Isotopes.

Western Reserve University. E. L. Pace, Thermodynamic Properties of Gases Absorbed on Solids.

Wisconsin, University of. W. J. Blaedel, High Frequency Titrations.

Wisconsin, University of. F. Daniels, Themoluminescence of Crystals.

Wisconsin, University of. E. L. King, The Rates and Mechanisms of Oxidation Reactions Involving Cerium (IV).

Wisconsin, University of. J. E. Willard, Application of Radioactive Isotopes to Chemical Problems.

Metallurgy

Alabama, University of. T. N. McVay, Research Investigations of Enamels for Metals.

Armour Research Foundation. M. Hansen, Phase Diagram of Zirconium-Base Binary Alloys.

California, University of. E. R. Parker, Creep of Alloys.

California, University of. J. A. Pask, Mechanics of Metal Ceramic Bonding.

Carnegie Institute of Technology. R. F. Mehl and G. Derge, Electrochemical Studies of Nonaqueous Melts.

Carnegie Institute of Technology. R. Smoluchowski, (A) Studies of Grain Boundaries and Lattice Imperfections; (B) Thermodynamic Properties of Binary Alloy Systems; (C) Corrosion of Metals and Alloys.

Chicago, University of. L. Meyer, Research on the Structure and Properties of Graphite.

Columbia University. C. Bonilla, Boiling and Condensing of Liquid Metals; Heat Transfer to Molten Metals.

Columbia University. G. L. Kehl, (A) The Fundamental Mechanism of Metallographic Etching; (B) Electrolytic Cutting of Metals.

Columbia University. T. A. Read, The Study of Diffusionless Phase Changes in Solid Metals and Alloys.

Dow Chemical Company. J. C. McDonald, The Effect of Non-Metallic and Alkali Metal Impurities on the Corrosion Rate and Corrosion Characteristics of Magnesium; The Room and Elevated Temperature Properties of Magnesium-base Alloys Containing One or More of the Elements Aluminum, Beryllium, and Zirconium.

5001476

Graham, Crowley, and Associates. C. A. Crowley, Electrowinning of Zirconium.

Illinois, University of. D. Lazarus and F. Seitz, The Study of the Mechanism of Substitutional Diffusion in Metals.

Iowa, State University of. N. C. Baenzinger, The Structure of Intermetallic Compounds.

Massachusetts Institute of Technology. A. J. Chipman, Thermodynamics of Metal Solutions.

Massachusetts Institute of Technology. M. Cohen, (A) Solid Solutions and Grain Boundaries; (B) Fundamentals of Cold Working and Recrystallization.

Massachusetts Institute of Technology. A. M. Gaudin, Techniques in Mineral Engineering.

Massachusetts Institute of Technology. F. H. Norton, Refractories Research.

Massachusetts Institute of Technology. J. C. Slater, Research on Nature of Distortion on Radiation Damaged Materials.

Pennsylvania, University of. R. M. Brick, Thermodynamic Study of the Iron-Oxygen-Sulfur System.

Pennsylvania State College. H. J. Read, The Corrosion of Zirconium.

Pittsburgh, University of. W. E. Wallace, Thermochemistry of Alloys.

Purdue University. K. Lark-Horovitz, Effect of Cyclotron Radiation on Metal and Alloys.

Rensselaer Polytechnic Institute. H. B. Huntington, Anisotropic Self-diffusion in Metals.

Sylvania Electric Products, Inc. W. E. Kingston, Self-diffusion and High Temperature Phenomena.

Tennessee, University of. R. M. Boarts, Wetting by Liquid Metals.

Tennessee, University of. E. E. Stansbury, Energy Changes from Plastic Deformation.

Wichita, University of. L. Lyon, The Permeability Method of Determining Surface Areas of Finely Divided Materials.

Mathematics and Physics

Alabama Polytechnic Institute. H. Carr, Research with Mass Spectrometer.

Brown University. R. A. Peck, Jr., 500 Kev Cockroft-Walton.

California Institute of Technology. R. F. Bacher, Construction, Operation, and Experimentation—One Billion Volt Electron Synchrotron.

Carnegie Institute of Technology. E. Cruetz, Nuclear Research Using 400 Mev Cyclotron.

Case Institute of Technology. R. S. Shankland and E. F. Shrader, Study of Gamma Ray Spectrums Produced From a 30 Mev Betatron.

Columbia University. W. W. Havens, Jr., Studies and Investigations in Nuclear Physics.

Columbia University. C. H. Townes, Determination of Nuclear Moments and Masses by Microwave Spectroscopy.

Connecticut, University of. S. Friedland, Mass Spectrographic Analysis of Geiger Counter Cases.

Duke University. H. W. Newson, Nuclear Physics Project Using Electrostatic Generator.

Florida, University of. D. O. Swanson, Electrostatic Generator Program.

Iowa, State University of. J. A. Jacobs, Research With Electrostatic Generator.

Johns Hopkins University. H. Dieke, Spectroscopy of Hydrogen Isotopes.

5001477

Johns Hopkins University. R. D. Fowler, Studies of Nuclear Reactions and Energy Levels.

Johns Hopkins University. L. Mandansky, Lifetime Studies of Nuclear States.

Johns Hopkins University. S. S. Hanna, Research in Field of Nuclear Reactions.

Johns Hopkins University. O. D. Swartz, Neutron Angular Distribution Measurements.

Kenyon College. O. M. Nikodym and W. D. Berg, Mathematical Studies in Boolean Theory and Hilbert Space.

Michigan, University of. H. R. Crane, 42-inch Cyclotron Program; 300 Mev Racetrack Synchrotron.

Minnesota, University of. J. H. Williams, Construction and Operation of a 50 Mev Ion Accelerator.

Nebraska, University of. T. Jorgensen, Jr., Study of the Range-energy Relation for Slow Ions.

New York University. M. H. Shamos, Cosmic Ray Research.

North Carolina, University of. E. D. Palmatier, Absolute Intensities of Cosmic Radiation.

North Carolina, University of. A. V. Masket, Nuclear Disintegration in Photographic Emulsions.

Northwestern University. J. H. Roberts, Use of Photographic Emulsions Enriched With Lithium-6.

Ohio State University. J. N. Cooper, Research With Van de Graaff Generator.

Ohio State University. J. G. Daunt, Low Temperature Physics and Nuclear Paramagnetism.

Ohio State University. M. L. Pool, Modification of 42-inch Cyclotron.

Oregon State College. A. C. Yunker, Construction of 32-inch Cyclotron.

Pennsylvania, University of. F. C. Nix, Collins Cryostat.

Princeton University. W. H. Furman and M. G. White, Nuclear Research Using 17 Mev Cyclotron.

Princeton University. L. Spitzer, Transport Phenomena in Ionized Gases.

Puerto Rico, University of. A. Cobas, Low Latitude Cosmic Ray Studies.

Purdue University. E. Blueler and D. J. Tendam, Research in Nuclear Reactions with Fast Alpha Particles, Deuterons, and Neutrons.

Purdue University. R. O. Haxby, Research with Synchrotron.

Purdue University. K. Lark-Horovitz, Modification of the Cyclotron.

Purdue University. F. F. Rieke, Electron Accelerator for Nuclear Physics Investigation.

Reed College. K. E. Davis, Investigation of K and L Capture X-radiation.

Rensselaer Polytechnic Institute. G. N. Glasoe and D. C. Moore, High Speed Coincidence Circuits and Beta Ray Spectroscopy.

Rochester, University of. R. Marshak, Research in High Energy Particle Physics.

St. Louis University. A. H. Weber, Investigation of Beta-Decay at Low Energies.

Syracuse, University of. K. Sitte, Cosmic Rays.

Texas, University of. E. L. Hudspeth, Construction and Operation of 4 Mev Electrostatic Generator.

Vanderbilt University. S. K. Haynes, Mass Spectrograph Research in Beta and Gamma Ray Spectroscopy on Decay Schemes of Radioactive Isotopes.

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California Insti
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[2] Contracts adm

Washington, State College of. R. M. Brown, Nuclear Magnetic Resonance in Liquid Solutions.

Washington, University of. P. M. Higgs, Establishment of Cryogenic Laboratory.

Washington, University of. C. L. Utterback, 60-inch Cyclotron Program.

Wesleyan University. H. E. Duckworth, Improvement of Spectrograph Measurement of Isotopic Ration for Various Substances.

Wisconsin, University of. J. Dillinger, Low Temperature Physics.

Wisconsin, University of. R. G. Herb and H. H. Barshall, Nuclear Research Program.

Wisconsin, University of. R. G. Sachs, Theory of Very Light Nuclei.

Wyoming, University of. C. A. Cinnamon, Measurement of Relaxation Times of Nuclei.

Yale University. W. Watson, Isotope Separation and Related Topics.

BIOLOGY, MEDICINE, AND BIOPHYSICS RESEARCH CONTRACTS

Biology

Agriculture, Department of. F. W. Parker, The Improvement of Soil Management and Crop Production Through Investigations With Isotopes.

Agriculture, Department of. H. R. Bird, Embryonic Metabolism and Internal Radiations.

Amherst College. H. H. Plough, Research in Radiobiology and Biological Genetics.

Arizona, University of. W. H. Fuller and W. T. McGeorge, Utilization of Phosphorus From Biological Material for Soil Fertilizer.

Arkansas, University of. P. L. Day, J. R. Totter, J. S. Dinning and I. Mescham, Biochemical and Nutritional Aspects of X-radiation Injury.

Arkansas, University of. J. M. Singal, Intermediary Metabolism of the Photosynthetic Bacteria.

Arkansas, University of. I. Mescham and E. Kerekes, Utilization of Cobalt 60 as a Radium Substitute.

Battelle Memorial Institue. K. S. Chester, Mode of Action of Fungicides.

Boyce Thompson Institute. G. L. McNew, Use of Tracer Fungicides in Determining the Mechanics of Protecting Plants From Fungus Diseases.

Brooklyn, Polytechnic Institute of. A. D. McLaren, Effect of Ultraviolet Radiation on Enzymes and Viruses.

Brooklyn, Polytechnic Institute of. C. Neuberg, Factors Influencing the Solubility of Heavy Metal Complexes and Their Metabolism.

Brown University. J. W. Wilson, The Role of the Intestinal Flora in Radiation Injury.

California Institute of Technology. H. Borsook, Biological Synthesis of Proteins Labeled With Isotopes.[2]

California Institute of Technology. G. W. Beadle, The Genetic and Cytological Effects of High Energy Radiation.[2]

California, University of. A. S. Crafts, The Translocation of Herbicides in Plants. Radioactive Isotopes and Other Indicators To Study Absorption and Distribution of Herbicidal Chemicals.

[2] Contracts administered through Office of Naval Research, Washington, D. C.

5001479

California, University of. M. Kleiber, Metabolism Study and Biological Synthesis With Farm Animals.

California, University of. H. A. Barker and W. Z. Hassid, Fundamental Biochemical Reactions in Living Organisms.

California, University of. L. Jacobson and R. Overstreet, Ion Absorption in Plants.

California, University of. F. M. Turrell, F. S. Gunther and R. L. Metcalf, Radioactive Tracers in Studies of the Mode of Action of Organic Insecticides.

Chicago, University of. E. M. K. Geiling, Biosynthesis of Radioactive Drug Compounds.

Chicago, University of. R. E. Zirkle, Purchase and Installation of Van de Graaff Generator.

Columbia University. H. B. Burch and C. G. King, The Metabolism of Ascorbic Acid, Glucoronic Acid and Glucose Labeled With C 14 in Known Positions.

Columbia University. T. Dobzhansky, The Population Genetics of Species of Drosophila.

Connecticut Agricultural Experiment Station. J. G. Horsfall and A. E. Dimond, Therapy of Plant Disease by Nuclear Radiations.

Delaware, University of. A. M. Clark, Radiation Effects Upon Haploids and Diploids of Habrobracon (Wasp).

Duke University. P. J. Kramer, Factors Affecting the Absorption of Radioactive Phosphorus by Mycorhizal and Non-Mycorhizal Roots of Pine.

Duke University. K. M. Wilbur, Isolation and Properties of Rat Liver Nuclei; Shell Formation in Mollusks and Barnacles as Studied by Radioisotopes.

Emory W. Thurston Laboratories, Los Angeles, Calif. B. H. Ershoff, Comparative Effects of the Known B Vitamins and an Unidentified Antitoxic Factor in Liver on Radiation Injury in the Rat.

Fordham University. E. V. Brown, Fate of Thiamine and Thiamine Analogs in the Animal Body. Mechanism of Thiamine Inhibition by Thiamine Analogs.

Fordham University. F. F. Nord, Investigation of Enzymatic Degradation of Native and Chemically Modified Proteins.

Georgia, University of. H. Schoenborn, The Production of Mutant Strains of Euglenoid Flagellates and Their Use in the Study of Carbon Dioxide Fixation Processes.

Harris Research Laboratories, Washington, D. C. M. Harris, The Chemistry of Biosynthesized Isotopically Labeled Cellulose and Allied Polysaccarides.

Harvard University. K. Sax, Dosage Curves Under Varying Conditions of Time and Intensity of Radiation.[2]

Howard University. L. H. Hansborough, The Effect of Labeling the Germ Cells on Fertilization and Development.

Idaho, University of. W. K. Ferrell, T. S. Buchanan, and E. E. Hubert, Study of the Absorption and Translocation of Mineral Elements in Diseased and Healthy Western White Pine by Use of Radioactive Materials.

Illinois, University of. I. C. Gunsalus, Metabolic Pathways in Micro-organisms.

Illinois, University of. R. C. Johnson and H. E. Carter, Nutritional Biochemistry for the Metabolism of Amino Acids and Vitamins.

Illinois, University of. H. H. Mitchell and O. F. Kampmeier, Content in Human Tissues of Eleven Trace Elements.

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[2] Contracts administered through Office of Naval Research, Washington, D. C.

5001480

Indiana University. T. M. Sonneborn, Specific Immobilization Substances (Antigens) of Paramecium Aurelia.

Indiana University. F. Haurowitz, The Mechanism of the Combination of Antigen and Antibody.

Interior, Department of. W. A. Chipman, Survey of the Accumulation of Radioactivity in Marine Invertebrate Animals.

Interior, Department of. A. M. Phillips, A Study of the Physiology of Cold-Water Fish.

Iowa State College. S. Aronoff, Metabolism and Physiology of Roots of Plants.

Iowa State College. R. R. Sealock, Combined Biochemical and Physiological Action of Tyrosine and Vitamin B_{12}.

Iowa State College. C. H. Werkman and F. Schlenk, Studies of Metabolism of Purine and Pyrimidine Bases of Nucleic Acids and Nucleotides.

Iowa State College. J. W. Gowen and J. Stadler, Quantitative Study of Lifetime Sickness and Mortality and Progeny Effects Resulting From Exposure of Animals to Penetrating Irradiation.

Johns Hopkins University. C. P. Richter, Part Played by the Adrenals in the Ability of Rats to Withstand Radiation Effects.

Johns Hopkins University. W. D. McElroy and C. P. Swanson, Modification Through the Use of Supplemental Environmental Factors of the Frequency of Gene and Chromosome Changes Induced by X-rays, Radioactive Isotopes, Ultraviolet Light, and Nitrogen Mustard.

Johns Hopkins University. R. Ballentine and W. D. McElroy, Metabolism and Functional Significance of Cobalto-Protein.

Kansas, University of. C. A. Leone and A. B. Leonard, Radium Chloride and Hemapoietic Physiology of Rodents.

Long Island Biological Association Inc. B. Wallace, Adaptive Value of Experimental Populations Exposed to Radiations.

Louisiana State University and Agricultural and Mechanical College. H. E. Wheeler, Investigations of the Physiology, Genetics, and Host-Parasite Relationships of Plant Pathogenic Fungi by the Use of Radioisotopes for Tagging Fungous Mycelium.

Louisiana State University and Agricultural and Mechanical College. J. F. Christman and V. Williams, The Effect of Biotin on Acetate Utilization and Lipide Synthesis by Micro-organisms.

Maryland, University of. J. C. Shaw, The Metabolism of Acetate, B-Hydroxybutric Acid, Glucose, and Other Carbon Compounds in Lactating Ruminants.

Michigan State College. H. B. Tukey, The Absorption and Utilization of Radioisotopes Applied to the Leaves of Plants.

Michigan State College. R. U. Byerrum and C. D. Ball, Pathway of Transmethylation in Plants.

Michigan State College. L. F. Wolterink and E. P. Reineke, Hormonal and Nutritional Factors Which Alter Half Lives and Differential Absorption Ratios.

Michigan, University of. C. L. Market, Mutagenic Effects of Different Types of Radiation.

Michigan, University of. J. V. Neel, The Estimation of the Rate of Mutation of Certain Human Genes.

Minnesota, University of. E. C. Stakman, Effects of Radioactive Substances on Plant Pathogens and Other Micro-organisms.

5001481

Minnesota, University of. W. E. Peterson, et al., Study of Milk Formation by the Use of Radioactive Compounds.

Missouri, University of. S. Brody, Determination of Thyroid Activity in Farm Animals by the Use of Radioactive Tracers.

Missouri, University of. L. J. Stadler, The Genetic Nature of Induced Mutations.

Missouri, University of. J. Levitt, Translocation of Mineral Substances in Plants.

Nebraska, University of. E. F. Frolik and R. Morris, The Genetic Effects of Thermal Neutron Irradiation of Crop Seeds.

North Carolina State College. D. B. Anderson, Investigation of the Rate of Movement of Organic and Inorganic Compounds in the Tissue of Intact Tree Species.

North Carolina State College. N. S. Hall, Study of the Movement of Ions Through Soil Systems.

North Carolina State College. W. C. Gregory, Effects of Nuclear Reactor Radiation Upon Genetics and Physiological Characteristics of Peanuts.

North Carolina, University of. D. P. Costello, Investigation of the Effects of Radiations on Specific Energies (Given off by Various Isotopes) on the Production of Abnormal Mitotic Figures, Abnormal Chromosome Numbers and Mosaic Heteroploid Areas in Larval Salamanders, and on Mitosis of Marine Invertebrate Egg Materials.

North Carolina, University of. M. Whittinghill, The Partial Elimination of Lethal Genes Before Reproduction in Drosophila by the Use of Environmental Agents.

Ohio Agricultural Experiment Station. R. S. Davidson, The Physiology and Genetics of Plant Pathogenic Micro-organisms When Grown in the Presence of Various Radioisotopes.

Oklahoma Agricultural and Mechanical College. A. Eisenstark, Azotobacter Mutants Produced by Beta Irradiation.

Oklahoma Agricultural and Mechanical College. R. M. Chatters, Effects of Radiation on Plant Growth.

Oklahoma Research Institute, University of. R. W. Goff, Effects of Isotopic Irradiation on Embryonic Capillaries.

Oklahoma Research Institute, University of. L. Rohrbaugh and E. L. Rice, Translocation of Tagged 2,4-D and Other Growth Regulators in Plants in Light and Darkness.

Oregon State College. V. H. Cheldelin and B. E. Christensen, Vitamin-Amino Acid and Carbohydrate-Amino Acid Interrelationships, Using Isotopic Tracers.

Oregon State College. J. N. Butts, The Mode of Action of 2,4-Dichlorophenoxyacetic Acid and Isopropyl N-Phenyl Carbamate.

Oregon, University of. P. L. Risley, Localization of Radioactive Isotopes in Germ Cells and Reproductive Tissues During Quiescence and Activation.

Pennsylvania, University of. D. W. Wilson, Synthesis of Isotopic Carbon Compounds Used in Biochemistry.

Pittsburgh, University of. R. Buchsbaum, The Study of Normal and Virus-Infected Living Cells in Tissue Culture in Perfussion Chambers.

Pittsburgh, University of. M. Lauffer, Correlation of Radiation Effects With Physical and Chemical Changes in Viruses.

Purdue University. H. Koffler and P. A. Tetrault, Use of Radioactive Isotopes in Studying Mold Metabolism.

5001482

Purdue University. H. Koffler and D. M. Powelson, The Physiology of Hydrogen Bacteria.

Rice Institute. A. C. Chandler and R. V. Talmage, The Action of Relaxin; Related Studies on Cellular Metabolism.

Rutgers College. H. H. Haskin, Distribution and Accumulation of Radioisotopes of Physiological Importance in Shellfish.

Rutgers College. J. E. Gunckel, Histological and Physiological Effects of Irradiation on *Tradescantia Paludosa.*

Smithsonian Institute. R. W. Withrow, Biochemical Investigation of Photomorphogenesis in Green Plants.

South Dakota State College. A. L. Moxon and E. I. Whitehead, Metabolism of Selenium and Sulfur in Plants.

Southern California, University of. H. J. Deuel and A. L. S. Cheng, Effect of Radiation on Intestinal Absorption and Metabolism of Fats and Carbohydrates.

Southern Illinois University. C. C. Lindegren, The Effect of X-irradiation on a Polyploid Series of Yeast Cultures Containing Determined Amounts of DNA.

Southern Research Institute. H. E. Skipper, Dosages of C 14 Labeled Sodium Formate Required to Produce Radiation Effects.

Stanford Research Institute. R. Pencharz and D. Singman, The Direct and Indirect Effects Produced by X-ray Irradiation of the Spleen.

Syracuse University. J. Lein, Intermediate Carbohydrate Metabolism in Neurospora Using Radioactive Carbon and Biochemical Mutants.

Tennessee Agricultural and Industrial State College. H. B. Crouch, Radiation and Tracer Element Studies on Certain Pathogenic Protozoa and Nematodes of Rodents.

Texas Agricultural and Mechanical College. J. H. Quisenberry, Effects of X-irradiation on Reproduction of the Domestic Fowl.

Texas Agricultural and Mechanical College. R. Reiser, Metabolism of Glycerides in Animals.

Texas, University of. J. Myers, Utilization of Algae for the Disposal of Radioactive Wastes.

Texas, University of. J. W. Foster, Research in Mold Metabolism.

Utah State Agricultural College. C. Biddulph, Use of Radioisotopes in the Study of Reproduction.

Utah State Agricultural College. D. W. Thorne, Radioiron in Studying Lime-Induced Chlorosis.

Utah, University of. L. P. Gebhardt and L. T. Samuels, Labeled Phosphorus in the Study of Nerve Tissue Metabolism During Invasion of Neurotropic Viruses.

Utah, University of. J. D. Spikes and R. W. Lumry, Studies of Photosynthetic Processes in Cell-Free Preparations.

Washington, State College of. O. Biddulph, Absorption, Translocation, and Disposition of Various Elements in Plants.

Washington, State College of. N. Higinbotham, The Rate of Movement of Ions into and Through Plant Parenchyma Tissue as Affected by Rate of Water Uptake.

Washington, State College of. L. Smith, A Study of Factors Influencing the Biological Effects of X-rays.

Washington, State College of. H. B. Milne, The Effect of X-rays Upon the Optical Specificity of Papain.

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Washington, State College of. C. O. Stanberry, The Zinc Nutrition of Plants in Calcareous Soils.

Wisconsin, University of. R. H. Burris, M. J. Johnson, and P. W. Wilson, Metabolism of Organic Acids in Higher Plants and Micro-organisms.

Wisconsin, University of. R. H. Burris and P. W. Wilson, Biological Nitrogen Fixation with Isotope Tracers.

Wisconsin, University of. D. E. Green, The Cyclophorase System of Animal Tissue.

Wisconsin, University of. A. J. Riker and J. E. Kuntz, The Use of Radioactive Isotopes in Determining the Role of Root-Grafting in Forest Trees.

Wisconsin, University of. P. H. Phillips, Long Time Effects of Intermittent Radiation on Dogs.

Wisconsin, University of. J. Lederberg, Cytogenic Effects of Radiations on Bacteria.

Wyoming, University of. I. Rosenfeld and O. A. Beath, Investigations of the Interrelationships of Sulfur, Phosphorus, and Calcium in Selenium Metabolism in Plants and Animals.

Yale University. E. C. Pollard, Irradiation of Viruses and Large Molecules.

Yale University. N. H. Giles, Jr., Mechanism of Radiation-Induced Chromosomal Rearrangements in Tradescantia and Gene Mutations in Neurospora.

Yale University. D. M. Bonner, Relationship of Genes to Biochemical Reactions in Neurospora.

Biophysics

Chicago, University of. R. E. Zirkle, Use of a Microbeam of Light Atomic Nuclei for Biological Investigations.

Columbia University. G. Failla, Research in Radiological Physics and Radiobiology.

Florida, University of. A. A. Bless, Radiation Injury Studies.

Howard University. H. Branson, Studies with Radioactive and Stable Isotopes.

Idaho State College. C. W. McIntosh and A. E. Taylor, Determination of Quantities of Certain Radioactive Materials in Ground Water and Soil of Areas in and Adjacent to the Reactor Testing Station.

Illinois, University of. G. A. Bennett and R. A. Harvey, Distribution and Effect of Radioactive Calcium and Strontium in Bone Development.

Kansas, University of. F. E. Hoecker, Biological Effects of Ionizing Radiation.

Marquette University. W. A. D. Anderson, The Pathological Effects of Radioactive Isotopes of Calcium and Strontium on Bone and Soft Tissue.

Massachusetts Institute of Technology. R. D. Evans, Research in Applied Radioactivity.

Michigan, University of. H. J. Gomberg and F. J. Hodges, High Resolution Detection of Radioactive Isotopes.

Mount Sinai Hospital, New York City. S. Feitelberg, Investigation of Sewage Water Contamination by Radioactive Isotopes.

New York University. V. H. Whitten, Effects of Thorium-X in Selected Vehicles Applied to the Skin of Man, and the Effects of Selected Pure Beta Emitters on the Skin of Man.

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Oregon, University of. F. B. Queen, Evaluation of Body Content of Radium in Individuals With no Known Eposure.

Pittsburgh, University of. A. J. Kammer and F. T. Hatch, Hazard From Inhaled Radioactive Particulate Matter.

Southern Research Institute. L. White, Improvement of Current Models of Photoelectric Smoke Penetrometers.

Washington University, St. Louis, Mo. M. Ter-Pogossian, Measurement of Clinical X-ray Dosages and Intensities by Means of the Use of Scintillation Media.

Washington University, St. Louis, Mo. W. G. Scott, Scanning of *In Vivo* Concentrations of Radioactivity in an Attempt to Locate Metastatic Tumors and Internal Malignancies in the Human Body.

Washington, University of. P. E. Church, Meteorological Studies.

Washington, University of. R. G. Fleagle, Meteorological Studies.

Wisconsin, University of. D. M. Angevine and J. J. Lalich, Development and Application of Historadiography in Relation to the Distribution of Mass and Localization of Elements in Normal and Pathologic Tissues.

Medicine

Beth Israel Hospital Assoc., Boston, Mass. H. Blumgart, The Use of I 131 in Treatment of Heart Diseases and Follow-up Studies on Biological Effects of Radiation.

Botwick, Marvin, New Haven, Conn. Furnishing Kits for Determining Blood Groups and Research in Development of Cross-Matching Method.

Boston University. B. R. Lutz, The Effect of Irradiation on the Functions of Small Blood Vessels.

California, University of. H. Becks, Investigations of Radioactive Strontium, Calcium, and Phosphorus in Dental Structures.

Chicago, University of. C. P. Miller, Bacteriological Aspects of Radiation Sickness.

Chicago, University of. H. S. Anker, Investigation of the Mechanism of Antibody Synthesis by the Tracer Technique.

Chicago, University of. I. Gersch, Histochemical Study of Cement Substance of the Normal and Abnormal Optic Lens.

Chicago, University of. W. L. Palmer, A Study of the Effect on Gastric Tissues of Irradiation Therapy in Peptic Ulcer.

Chicago, University of. P. P. H. De Bruyn, Radiosensitivity of the Lymphocytes.

Chicago, University of. W. H. Taliaferro, The Effect of Localized X-irradiation on Antibody Formation and Antigen Localization. The Site of Antibody Formation.

Cincinnati, University of. R. C. Crafts, The Hypophysis and Iron Metabolism.[2]

Cincinnati, University of. R. A. Kehoe, Research on the Biological Effects of Beryllium and Its Compounds.

Colorado, University of. J. R. Lacher and J. D. Park, Research on the Infrared Absorption Spectra of Nucleic Acids, Amino Acids, and Related Compounds.

Colorado, University of. P. M. Dean and O. J. Sweeting, A Study of the Relationships Between Chemical Structure, Physical Characteristics, and Biological Activity in the Intermediate Metabolism of Nucleic Acid Derivatives.

Colorado, University of. T. T. Puck, Bacteriophage and Radiation Induced Mechanisms.

[2] Contract administered through Office of Naval Research, Washington, D. C.

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Columbia University. A. Gorbman and I. J. Deyrup, Biological Effects of Radiation from Excessive Amounts of Radioiodine.

Columbia University. D. Nachmansohn, Effect of Exposure to Radioactive Material and to X-Ray Irradiation on Nerve Tissue.

Columbia University. H. Grundfest, Study of Changes in Permeability of Normal, Poisoned, and Irradiated Nerve Fibers.

Columbia University. P. B. Hudson and J. M. Reiner, The Turnover of Specific Proteins, Protein Fractions, and Nucleic Acids in Normal and Malignant Human Testis and Kidney.

Creedmore Institute for Psychobiological Studies, New York. Co. Tui, Investigations on the Relationship of Human Skin Types and Blood Types and Studies in the Mechanism of Thermal Injury.

Denver University. F. E. D'Amour, Physiologic and Pathologic Effects of Radioactive Cobalt.

Duke University. P. Handler, Training Program.

Duke University. P. Handler, Turnover of Organic Phosphates in the Kidney.

Duke University. J. S. Harris, Studies of Electrolyte and Fluid Balance in Health and Disease.

Duke University. R. W. Rundles, Study of the Metabolism of the Human Bone Marrow.

Georgetown University. C. F. Geschickter, Study of the Redistribution of Bivalent Metallic Ions in Bone Metabolism and in Bone Disease and Neoplasms through the Use of Radioisotopes and Novel Chelating Compounds.

Georgia, University of. S. A. Singal, The Effects of Nutritional Deficiencies on the Synthesis of Phospholipids and Nucleoproteins.

George Washington University, Washington, D. C. P. K. Smith and E. L. Alpen, Studies of the Effects of Radiation on the Biosynthesis and Degradation of Nucleoproteins and Its Modification by Various Agents.

Hahnemann Medical College and Hospital, Philadelphia, Pa. J. S. Roth and M. J. Boyd, Study of Nutritional and Other Factors Involved in Radiation Injury and Resistance to Radiation Injury.

Harvard University. W. B. Castle, Destruction of Red Blood Cells in Hemolytic Anemia.

Harvard University. R. F. Sognnaes and J. H. Shaw, Metabolism of the Teeth.

Harvard University. L. C. Fogg, Effects of Radiation Upon Developing Rat Embryos.

Harvard University. A. K. Solomon, Use of Isotopes on Medical Problems.

Harvard University. A. B. Hastings, Use of Isotopes in Study of Metabolism of Organic Substances in Mammalian Tissue.

Harvard University. J. C. Aub, Study of Metabolic Activities of Living Organisms by Means of Suitable Isotopes.

Harvard University. D. G. Cogan and R. D. Evans, Production of Cataracts by Neutrons and Other Radiations.

Harvard University. D. G. Cogan, Stereophotography of Anterior Segment of Eye With Special Reference to Crystalline Lens.

Haskins Laboratories Inc., New York City. S. H. Hutner, The Microbiological Assay of Nucleic Acid Constituents Produced by Radiation Injury.

Henry Ford Hospital, Detroit, Mich. F. W. Hartman and G. H. Mangum, Chemical Sterilization of Blood and Plasma with Nitrogen Mustard.

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Illinois, University of. A. C. Ivy, Effects of Radiation of the Gastric Mucosa.

Institute for Cancer Research, Philadelphia, Pa. S. Weinhouse and G. Medes, Origin and Fate of Amino Acid in Plants and Animals.

Iowa, State University of. T. C. Evans, A Quantitative and Morphologic Study of Radiation Induced Cataracts.

Johns Hopkins University. J. E. Howard, Investigation of the Mechanisms of Bone Deposition and Related Physiological Studies.

Johns Hopkins University. T. G. Ward, Metabolism of Phosphorus in Virus-Host Systems.

Johns Hopkins University. J. S. Friedenwald, Enzymatic Histochemistry of the Ocular Lens.

Kansas, University of. R. E. Stowell, Cytochemical, Microchemical, and Biophysical Studies of Tumors and Effects of Radiation Upon Cells.

Kresge Eye Institute, Detroit, Mich. V. E. Kinsey, Effects of Neutrons and Other Radiations on the Ocular Lens.

Maryland, University of. T. E. Woodward, Studies on Monkeys Following Exposure to Large Doses of Total Body Irradiation.

Massachusetts General Hospital. W. H. Sweet, The Use of Thermal and Epithermal Neutrons in the Treatment of Neoplasms.

Massachusetts General Hospital. W. H. Sweet and B. Selverstone, The Use of Phosphorus 32 for the Precise Localization of Brain Tumors.

Massachusetts Memorial Hospital. J. F. Ross, Physiological and Therapeutic Investigations and Fundamental Studies on the Blood Forming Tissues.

Massachusetts Memorial Hospital. F. J. Ingelfinger, Effects of Radiation on the Structure and Function of the Digestive System, Particularly the Gastro-Intestinal Tract in Man.

Mcharry Medical College. P. F. Hahn, Use of Radioactive Gold in Treatment of Tumors.

Michigan, University of. R. L. Kahn and F. T. Hodges, Universal Serologic Action Following Irradiation.

Michigan, University of. F. H. Bethell, Biological Effects of Irradiation.

Minnesota, University of. W. D. Armstrong, Effect of Ionizing Radiation on Electrolyte and Water Metabolism.

Minnesota, University of. C. J. Watson, The Influence of Radiation and Chemically Induced Bone Marrow Injury upon Porphyrin Metabolism.

Minnesota, University of. S. Schwartz, Synthesis of Hemoglobin in Bone Marrow and Maturation and Multiplication of Blood Cells; Studies in Chemical Hematology.

Minnesota, University of G. E. Moore, Localization of Radioactive Materials in the Nervous System.

Montifiore Hospital for Chronic Diseases, New York City. D. Laszlo and K. G. Stern, The Relationship of Stable and Radioactive Lanthanum to Nucleic Acid Synthesis in Normal and Neoplastic Tissue.

Mount Sinai Hospital, New York City. H. Sobotka, The Use of Isotopes in the Study of the Mechanisms of Drug Eruptions.

New England Deaconess Hospital, Boston, Mass. S. P. Hicks, et al., Studies of Acute Radiation Injury.

New York Medical College. A. L. Copley, Study of Vascular Factors in Radiation Hemorrhage and Other Hemorrhagic Diatheses in Patients and Experimental Animals.

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New York University. N. Nelson, Influence of Particle Size on the Retention of Mist Particles in the Human Respiratory System.

New York University. H. W. Smith, Sodium and Potassium Distribution in Man.

New York University. A. Marshak, Investigation of the Physiology and Biochemistry of Nuclei and Nucleic Acid.

New York University. W. S. Tillett, the Influence of Ionizing Radiation on Enzyme Systems.

North Carolina, University of. A. Roe, Effect of C 14 on the Course of Certain Organic Reactions.

North Carolina, University of. C. D. Van Cleave and C. T. Kaylor, Radioautographic Study of Distribution and Retention of Beryllium.

North Carolina, University of. J. C. Andrews and M. K. Berkut, Tracer Studies and Irradiation Effects in Dental Metabolism.

Northwestern University. J. A. D. Cooper and H. L. Alt, Development of Radiobiological Techniques.

Northwestern University. J. G. Bellows, Studies on Radiation Cataract.

Northwestern University. L. Davis, Further Development and Utilization of Radioactive Dyes in the Diagnosis and Localization of Brain Tumors.

Notre Dame, University of. J. A. Reyneirs, Study of the Effect of X-radiation on Germ Free Rats.[2]

Ohio State University. J. L. Morton, Use of Radioisotopes for Cancer Therapy.

Oklahoma Research Institute, University of. S. H. Wender, Isolation and Identification of Flavanoid Pigments.

Oregon, University of, Medical School. E. S. West, Studies of the Metabolism of Cholesterol and Ketone Bodies.

Peter Bent Brigham Hospital, Boston, Mass. F. D. Moore, Intracellular Changes in Trauma, Depletion, and Repair; Biochemical Studies in the Human Being With the Use of Isotopes.

Pittsburgh, University of. F. S. Cheever, The Effect of Radiation on the Virus-Host Cell Relationship.

Pittsburgh, University of. A. J. Allen and C. Moses, Effects of Neutrons From a Cyclotron on Mammalia With Particular Reference to the Development of Cataracts.

Pittsburgh, University of. M. A. Fischer, Mechanism of Protection Against Radiation.

Presbyterian Hospital, Chicago, Ill. R. G. Gould, The Mechanism of CO_2 Fixation.

Reed College. F. P. Hungate, The Application of the Radioactive Tracer Technique in the Field of Cellular Metabolism.

Reed College. A. H. Livermore, The Biochemical Synthesis of Peptide Bonds.

Reed College. A. F. Scott and A. H. Livermore, The Effect of Ionizing Radiation on Biochemical Compounds.

Rochester, University of. G. H. Whipple, Plasma Protein Studies.[2]

St. Louis University. H. Pinkerton, Study of the Relation of Rickettsial and Viral Infections to Radiation Injury.

[2] Contracts administered through Office of Naval Research, Washington, D. C.

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Saranac Laboratory of the Trudeau Foundation, Saranac Lake, N. Y. A. J. Vorwald, Clinical Effect of Cortisone on Chronic Pulmonary Granulomatosis (Beryllium).

Saranac Laboratory of the Trudeau Foundation, Saranac Lake, N. Y. A. J. Vorwald and F. W. Klemperer, (1) Biochemical Aspects of Pulmonary Disease in Beryllium Workers; (2) Clinical and Experimental Investigations Concerning the Biological Hazards of Beryllium.

Sloan Kettering Institute For Cancer Research, New York City. Biological Effect of Radiation, and Related Biochemical and Physical Studies.

Syracuse University. E .L. Lozner, Body Defenses Against Hemorrhage in Health and Disease.[2]

Tennessee, University of. E. J. Williams, Jr., Absorption and Intermediary Metabolism of Calcium.

Tennessee, University of. L. Van Middlesworth, Thyroid Metabolism.

Tennessee, University of. R. R. Overman and D. B. Silversmit, Mechanism of Ionic Imbalance and Pathophysiologic States.

Tennessee, University of. D. H. Sprunt, C. E. Nurnberger, and A. H. Lipscomb, Clinical Cancer Research in Field of Radiology.

Tennessee, University of. D. S. Carroll, J. Cara, and D. H. Sprunt, Study of the Use of Radioactive Ruthenium in the Treatment of Superficial Lesions.

Tufts College. D. Rapport, Study of the Relation of Radiation on Reactions Associated With Growth.

Tulane University of Louisiana. G. E. Burch, Electrolyte Balance Studies in Humans.

Tulane University of Louisiana. W. S. Wilde, The Metabolic Exchange of Tissue Electrolytes.

Tulane University of Louisiana. R. H. Turner, The Influence of Radiation Injury Upon Physiology of Serum Lipids With Particular Reference to the Function of the Liver.

Utah, University of. J. Z. Bowers, Toxicity Studies of Plutonium and Other Radioactive Substances in Animals.

Utah, University of. M. M. Wintrobe and G. E. Cartwright, Metabolism of Trace Elements in Animals and Men with Special Reference to Their Role in Blood Formation.

Vanderbilt University. W. J. Darby, Study of the Absorption and Metabolism of Lipids and the Alterations Which Occur in Acute Radiation Injury.

Virginia, University of. C. L. Gemmill, The Metabolic Exchange of Radioactive Phosphorus and Potassium in Isolated Cell Systems.

Virginia, University of. A Chanutin, Effects of Ionizing Radiation on Mammalian Blood Composition.

Wake Forest College. G. T. Harrell, Jr., Distribution and Turnover of Sodium and Potassium in Acute Infections.

Wake Forest College. C. Artom, Formation of Tissue Phospholipides.

Wake Forest College. G. T. Harrell, Jr., et al., Toxicity of Radiation as Related to Previous Damage and the Functional Capacity of an Organ; The Effect of P 32 and X-rays on Liver and Marrow.

Washington University, St. Louis, Mo. D. Lipkin, Synthesis of Nucleotides and Related Compounds.

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[2] Contract administered through Office of Naval Research, Washington, D. C.

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Washington University, St. Louis, Mo. W. M. Allen, Use of Gamma Ray as a Therapeutic Agent in Cancer.

Washington University, St. Louis, Mo. F. J. Dixon, Investigation of the Effects of Agents Used in the Treatment of Cancer, X-ray and Nitrogen Mustards on the Immunologic Response of Experimental Animals.

Washington, University of. C. A. Finch, Isotope Study in Iron Metabolism.

Washington, University of. H. J. Dauben, Synthesis of Carbon 14 Labeled Diethylstilbesterol and a Study of Its Metabolism in the Body.

Washington, University of. R. H. Williams, Studies on Endocrine and Other Factors Governing the Incorporation of Labeled Amino Acids Into Tissue Proteins *In Vivo*.

Washington, University of. C. A. Finch, Studies Related to Blood Preservation.

Washington, University of. R. D. Ray, Mobilization of Radioactive Elements From Bone.

Western Reserve University. H. L. Friedell, Investigation of the Biological Effects of Internally Deposited Radioisotopes and Related Radiobiologic Studies.

Western Reserve University. A. R. Moritz, Physiological, Biochemical, and Pathological Aspects of Thermal and Flash Burns.

Western Reserve University. L. O. Krampitz, Effect of Incorporated Radioactivity on the Biological Activity of Bacteriophage.

Western Reserve University. H. G. Wood and L. O. Krampitz, Studies in the Intermediary Metabolism of Carbohydrates.

Western Reserve University. C. E. Carter, The Effects of Ionizing Radiation on the Content and Metabolic Functions of Ergothionine in Hematopoietic Tissue.

Worcester Foundation for Experimental Biology, Shrewsbury, Mass. H. Hoagland and G. Pincus, Investigation of the Effects of Radiation on the Biosynthesis and Metabolism of Adrenocortical Steroids.

Yale University. J. H. Heller and E. Pollard, (1) Studies of Factors Influencing Tissue Sensitivity to Radiation; (2) Studies of Oxidative and Reductive Factors in Relation to Radiation Cataract.

REACTOR DEVELOPMENT RESEARCH CONTRACTS

Brookhaven National Laboratory. L. P. Hatch, Waste Disposal. Ultimate disposal of radioactive materials by permanent fixation on natural clays.

California, University of. H. B. Gotaas, Research and Development on the Use of Sewage Treatment Processes on Radioactive Wastes. Investigating use of sanitary engineering methods for disposal of high-volume, low-level radioactive wastes.

California, University of. R. Bromberg and W. L. Martin, Liquid Systems Engineering Research. Studies of bubble and gas formation in liquid systems and transient behavior of high-temperature, high-pressure water systems.

Columbia University. E. L. Gaden and C. G. King, Utilization of Fission Products. To study possibilities of a commercial process of food preservation, uti-

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lizing the bactericidal properties of penetrating X and gamma radiation, including mixed fission products.

Columbia University. W. A. Selke, Utilization of Fission Products. Research and development on the effect of radiations from fission products, particularly the effect of gamma radiation on chemical reactions.

Johns-Manville Co. J. S. Parkinson, Thermal Insulation Matter. To develop insulations with better insulating properties than those now available and with characteristics suitable for reactor use.

Harvard University. H. A. Thomas, Waste Disposal. Determination of distribution and disposition of radioactive material introduced into fresh water reservoirs and streams.

Harvard University. Philip Drinker, Air Cleaning. Research and development of air cleaning, including equipment, sampling methods, compilation of air-cleaning handbook, and training of personnel.

Illinois, University of. H. F. Johnstone, Aerosol Research and Development. Investigation of fundamental properties of aerosols as related to air cleaning.

Johns Hopkins University. Abel Wolman, Disposal of Liquid and Solid Radioactive Wastes. Concentration of radioactivity in plumbing systems; adsorption of radioactive material on natural waterborne silts; circulation of estuarial waters, and distribution of activity in institutional incinerators.

Arthur D. Little Co. E. Stafford and W. J. Smith, Filter Research and Development. Development of high-efficiency filters for removal of particulate matter from gaseous effluents.

Massachusetts Institute of Technology. Rolf Eliassen, Water Decontamination. Removal of radioactivity from water supplies by conventional water-treatment methods.

Massachusetts Institute of Technology. B. E. Proctor, Utilization of Fission Products. An investigation of uses for fission products in the sterilization of foods, pharmaceuticals, and tissues.

Michigan, University of. C. W. Good, Industrial Utilization of Fission Products. Investigate possible use of fission products and identify areas within which (a) industrial uses of such products are technically and economically feasible; and (b) further research and development would be useful.

National Bureau of Standards and Office of Naval Research. L. S. Taylor, Penetration and Diffusion of High-Energy Gamma Rays. Analytical and experimental studies to provide data for design of gamma ray shields.

National Bureau of Standards. U. Fano, Shielding Calculations. Detailed calculations of gamma ray attenuation in various media, covering a wide range of gamma energies.

New York University. Werner Grune, Waste Disposal. Effect of radioactive materials on biochemical oxygen demand and biochemical oxidation rates.

New York University. Gordon Strong, Atmospheric Disposal. Investigation of feasibility of using wind tunnels in evaluating disposal of gaseous effluents.

Powder Weld Process Co. R. A. Wiese, Protective Coatings. To provide for development of methods of applying special metals on odd shapes.

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Rensselaer Polytechnic Institute. J. O. Hougen, Liquid-Liquid Extraction Studies. Research in liquid-liquid extraction; experimentation with pilot-plant size extraction column.

Stanford Research Institute. P. W. Cook, Feasibility Study of Solar Evaporation. To evaluate feasibility of using energy content in sun's rays to evaporate, reduce volume, and decontaminate liquid radioactive wastes.

Stanford Research Institute. J. J. Gordon, Development of a Continuous Ion-exchange System.

Stanford Research Institute. P. J. Lovewell, Industrial Survey. To stimulate industry in investigating uses of fission products and to determine areas of desirable research and development.

U. S. Bureau of Mines. R. C. Corey, Incinerator of Radioactive Wastes. To develop a practical incinerator for disposal of solid combustible radioactive wastes at off-site locations.

U. S. Geological Survey. Geologic and Hydrologic Research. To supply data for waste disposal, water supply development, and plant location and construction.

U. S. Weather Bureau. Meteorological Investigations. Research, development, and field investigations of meteorological aspects of waste disposal, plant location, and operation.

Yale University. R. H. Bretton, Utilization of Fission Products. Research on effect of radiations from fission products, particularly gamma radiation on chemical reactions.

GUIDE FOR THE SUBMISSION OF RESEARCH PROPOSALS [3]

Part I—Guide for the Submission of Proposals for the Support of Research Projects

The Atomic Energy Act of 1946 authorizes the Commission to assist the research programs of universities and other independent research institutions in the United States in certain fields of science related to atomic energy. While projects receiving such assistance must be in areas of scientific research where advancement may be expected to stimulate development of the applications of atomic energy, or to increase the fundamental knowledge in this field, they need not necessarily be directly related to the specific problems which are prosecuted in the various Commission installations.

One type of arrangement which the Commission has adopted for providing such assistance is by direct contract between the Commission and the institution in which the work is to be carried out. Such contracts usually assist in the support of the work of individual scientists whose research projects have been approved by the Commission. Our experience has indicated that the majority of projects fall in unclassified areas, and can therefore be conducted without security restrictions. However, where there is even a very small chance that restricted data may be developed by the work, clearance is required for the senior investigator to act as a security monitor. In cases where there is an appreciable chance that restricted data will be developed, clearance is required for all investigators on the project.

[3] Revised August 1950.

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Proposals for assistance in the support of research projects are usually initiated by the scientist interested in carrying out the work. In most cases the interested scientist discusses such projects informally, either by letter or personal visit if feasible, with an appropriate member of the Division of Research (when the project is in the physical sciences) or the Division of Biology and Medicine (when the project is in the biological, biophysical, or medical sciences). If, on the basis of preliminary discussions, the project appears eligible for consideration by the Commission, a formal proposal is then submitted. Formal proposals should cover the following points insofar as they are applicable.

1. *Title.*
2. *Institution.*
3. *Leader(s).*
4. *Scope and Present Status.*—This should include a statement of the work to be undertaken, its relation to the present state of knowledge in the field and to related work in progress elsewhere. Literature citations pertinent to the project should be included.
5. *Scientific Motivation.* This should include the reasons for undertaking the project and the potential scientific significance of the results.
6. *Material, Equipment, and Facilities.* This should cover all items required to carry out the project with a clear statement as to which are already available and which will have to be procured.
7. *Scientific Personnel.* This should cover the scientific investigators who will work on the project with brief statements of their research experience and publications. If the proposal calls for employing additional scientific personnel, this should be clearly stated. Reprints of articles relating to the project and published by individuals proposing to participate in it, will be welcomed.
8. *Proposed Budget.* This should give a realistic estimate of the total cost of the project and the items for which it is proposed that the Commission will provide funds. The budget should itemize salaries and major items of capital equipment and should include such items as expendable equipment, travel, etc. The proposed duration of the project should be stated but the budget should be prepared on an annual basis. The items which it is proposed the institution will furnish, those that the Commission would furnish, and those to be obtained from other sources, should be designated. Itemization in two columns is helpful.
9. *Other Responsibilities of Investigators.* A statement should be included of other responsibilities of the investigators and support received from other federal agencies. The proposal should have the approval of an administrative officer of the institution and should be forwarded to the Division of Research or to the Division of Biology and Medicine, as appropriate, United States Atomic Energy Commission, Washington 25, D. C. The handling of proposals is facilitated if they are submitted in five copies.

If the proposal is approved by the Division concerned, further negotiation leading to the execution of a contract is the responsibility of one of the AEC field offices, usually the field office located geographically closest to the institution. At the time that the contract is negotiated, a 200-word summary outlining the purpose and scope of the work will be required from the principal investigator.

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Part II—Guide for Submission of Proposals for the Renewal or Extension of AEC Research Contracts

This part of the Guide is intended to assist in applying to the Atomic Energy Commission either:

a) For the allocation of additional funds to a research contract, or

b) Change in scope of work, or

c) For extending the term of such contracts.

Contracts even though in support of continuing projects, are negotiated for specific terms and funds may initially be allocated for periods shorter than the full contract term. This guide is intended to assist the senior investigator in preparing the material necessary for review by the Atomic Energy Commission before the requested modification or extension is authorized. In general, the material submitted should report progress and should also supplement and bring up to date the original proposal and any other material previously submitted. The following comments on the preparation of the proposals refer to the points normally covered in such applications, in the same order as in the basic guide for submitting initial proposals (part 1).

1. *Scope and Present Status.* A report of the progress made on the project and a statement of the work to be undertaken during the period covered by the new application. (The progress report normally required may be included or substituted for this report.) A statement of any changes in the objectives of the work, and the reasons for such changes, should be included.
2. *Scientific Personnel.* Any changes in the scientific personnel working on the project. Junior scientific and technical personnel who have been employed on the project should be listed by name with a brief statement of their qualifications. In the cases of scientists at the doctoral level or higher, the information normally included in a biography in "American Men of Science" and a bibliography of publications should be included, if not given in the initial proposal.
3. *Proposed Budget.* A budget similar in scope to that required for the original proposal must be submitted covering the period of the renewal or extension. The investigator should justify this budget by comparison with the previous year's experience.
4. *Proposed Division of Support.* This should show the division of support among the contractor, the Commission, and any other parties involved, as well as the actual division of support to date.
5. *Other Responsibilities of Investigators.* Any changes from previous statements of the responsibilities of the senior investigators should be indicated. (This should include other projects which involve the investigator, whether supported by the institution or otherwise, and should indicate clearly other Government support.)

Proposals for extension of term or allocation of additional funds are normally initiated by the senior investigator on the project. Such proposals should have appropriate institutional administrative approval and one copy should be forwarded to the appropriate division of the Commission, with two copies to the operations office of the Commission administering the existing contract.

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Proposals for renewals of AEC research contracts should be received by the Division of Research or the Division of Biology and Medicine *at least 3 months* prior to expiration of the contract period in order to allow sufficient time for staff evaluation of the proposal.

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PROCUREMENT POLICY GUIDE [2]

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[1] Regulations of the U. S. AEC announced prior to January 1951 can be found in Appendix 4, Fifth Semiannual Report to Congress; Appendix 10, Sixth Semiannual Report to Congress; Appendix 4, Ninth Semiannual Report to Congress, and in the Federal Register.

[2] Approved by the Commission Dec. 1, 1950, to be effective Feb. 1, 1951. Printed in the Federal Register as Part 5, on February 22, 1951.

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SECTION I

GENERAL PROVISIONS

Part 1—Introduction

1–101 *Purpose and Scope of Procurement Policy Guide.* This procurement policy guide is issued under the Atomic Energy Act of 1946, as amended (McMahon Act), in the interest of the common defense and security, to establish minimum standards for the procurement of supplies and services for the Commission. Section I sets forth introductory information, definitions, and a statement of basic policies. Section II relates to procurement by the Commission by formal advertising. Section III relates to procurement by the Commission where formal advertising is not required. Section IV consists of administrative provisions referring to procurement responsibilities and authority within the Commission and prescribing standards for justifications in support of awards by the Commission. Section V sets forth basic policies for the procurement of supplies and services by cost-type contractors.

1–101.1 *Arrangement.* The numbering of individual paragraphs of this guide is not necessarily consecutive, and is designed to permit subsequent insertions and additions.

1–102 *Matters Not Covered.* This guide is intended to set forth broad policies with respect to procurement and does not prescribe detailed procedures or instructions, except to the extent deemed necessary to establish basic policies. Among the matters not included are detailed contract clauses, cost principles, methods of payment,

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insurance, labor, patents, termination, and administration of contracts as distinguished from methods of procurement. The General Manager, and Division Directors and Managers of Operations within the limits of authority delegated to them, may prescribe procedures and instructions not inconsistent with this guide which implement the provisions of the guide or relate to matters not included herein.

1–103 *Saving Provisions.*

1–103.1 *Relating to Effective Date.* Sections II and III and part 2 of section IV of this guide shall not apply to a contract which: (a) Is awarded pursuant to competitive bidding on an invitation to bid issued prior to the effective date of this guide; or

(b) Is executed as of a date prior to the effective date of this guide; or

(c) Formalizes a preliminary contractual agreement, such as a letter contract or a letter of intent, which itself was made prior to the effective date of this guide; or

(d) Amends, modifies, or supplements a contract executed as of a date prior to the effective date of this guide, unless such amendment, modification, or supplement, provides for substantially additional quantities of supplies or services beyond the scope of the original contract.

1–103.2 *Relating to Subject Matter.* This guide does not apply to the purchase, rental, or other acquisition of real property or rights or interests in real property, nor to the procurement of the services of employees or consultants. Part 3 of this section and sections II, III and IV do not apply to the procurement of supplies or services by contractors or subcontractors but may be used by them as a guide.

1–103.3 *Effect on Authority of Representatives of the Commission, and on Subcontracts and Purchase Orders.* Nothing contained in this guide shall be construed to limit authority otherwise delegated to representatives of the Commission, nor to affect the validity of any subcontract or purchase order entered into by a cost-type contractor.

1–104 *Deviations.* Deviations from the requirements of this guide shall be made only by authority of the General Manager or in accordance with procedures which may be prescribed by him, and then only in cases where special circumstances justify the deviation.

1–105 *Effective Date.* The effective date of this guide is February 1, 1951.

1–303 *Procurement by the Commission by Contract from Outside Sources.* Procurement by the Commission by contract shall generally be effected by formal advertising for bids and award to the lowest responsible bidder, in accordance with section II, but may be effected without formal advertising if the circumstances, and the method adopted, meet the requirements of section III. Where procurement without formal advertising is authorized, steps shall nevertheless be taken to assure such full and free competition as is consistent with the procurement of the supplies and services needed to meet the Commission's requirements, as provided in section III.

1–303.1 *Small Business Concerns.* It is the policy of the Commission to place with small business concerns a fair proportion of the total of supplies and services procured by contract for the Commission. For this purpose a small business concern is any concern which, including its affiliates, employs in the aggregate fewer than 500 persons.

1–303.2 *Inelegible Contractors and Disqualified Bidders.* Each office of the Commission, in accordance with procedures prescribed by the General Manager, shall maintain current lists of ineligible contractors and disqualified bidders, indicating the reasons for such listing and the extent to which procurement from such persons or firms is restricted, as follows: (*a*) Persons and firms listed by the Comptroller General in accordance with the provisions of Section 3 of the Walsh-Healey Public Contracts Act (act of June 30, 1936; 41 U. S. C. 35) which have been found by the Secretary of Labor to have violated any of the agreements or representations required by that act;

(*b*) Persons and firms listed by the Department of Labor which have been held ineligible to be awarded contracts subject to the Walsh-Healy Public Contracts Act for the reason that they do not qualify as "manufacturers" or "regular dealers" within the meaning of section 1 (a) of said act;

(*c*) Persons and firms listed by the Comptroller General in accordance with the provisions of Section 3 of the Davis-Bacon Act (act of March 3, 1931; 40 U. S. C. 276 a), found by the Comptroller General to have violated said act;

(*d*) Persons and firms otherwise disqualified or declared ineligible in accordance with procedures prescribed by the General Manager.

SECTION II

PROCUREMENT BY FORMAL ADVERTISING

Part 1—Use of Formal Advertising

2–101 *General Requirements.* In accordance with the basic policies set forth in part 3 of section I, procurement of supplies and services by contract shall generally be effected by formal advertising. No contract shall be entered into as a result of formal advertising unless the requirements of this section (II) have been satisfied. Minimum requirements relating to justifications in support of action under this section are set forth in part 2 of section IV.

Part 2—Definitions of Terms

1–201 *Definitions.* As used in this guide, the following terms shall have the meaning set forth below:

1–201.1 *Government, etc.* The term "Government" means the United States of America. The term "General Manager" refers to the General Manager of the Commission. "Division Director" refers to any Director of a Division of the Commission who is authorized to enter into contracts. The term "Manager of Operations" refers to any representative of the Commission designated by that title, and "Office of Operations" means any office under the supervision of a Manager of Operations. The term "GM bulletin" means any instructions issued in the GM series and any other instructions of general application issued by the General Manager.

1–201.2 *Contract, etc.* The term "contract" means any prime contract to which the Government, acting through the Commission, is a party, including, by way of description and without limitations, letter contracts and purchase orders, and any amendment or modification thereof or supplement thereto; and, except to the extent otherwise defined in paragraph 5–102 for the purposes of section V, a "contractor" is any person, firm, or corporation entering into such a contract with the Government.

1–201.3 *Contracting Officer.* The term "contracting officer" means the representative of the Commission who executes, or who will execute, a contract, and includes his authorized representative.

1–201.4 *Other Terms.* The term "formal advertising" is defined in paragraph 2–102. The term "procurement without formal advertising" is defined in paragraph 3–102. The term "cost-type contractor" is defined in paragraph 5–102.

Part 3—Basic Policies

1–301 *General Policy.* It is the policy of the Commission that supplies and services be procured by the methods most advantageous to the Government—price, quality, and other factors considered, and that in procurement from outside sources methods be employed which are calculated to assure such full and free competition as is consistent with the Commission's requirements. However, in view of the declaration of a National Emergency by the President [Proclamation 2914, December 16, 1950; 15 F. R. 9029], it is essential that further efforts be made to accelerate defense procurement actions. In doing

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so, it is recognized that there may be a need for considerable use of methods of procurement without formal advertising. In promoting the primary objective of strengthening the common defense and security, rapidly and effectively, there is a great responsibility to protect and preserve competitive enterprise. All practicable steps must be taken to provide for the equitable distribution of contracts among the maximum number of competent suppliers and to avoid the concentration of contracts among a relatively few suppliers. Such broadening of the industrial base of the program is essential to the acceleration of procurement.

1-302 *Procurement from Government Sources.* Procurement of certain supplies and services may be effected by orders against Federal schedule supply or service contracts or stocks of the General Services Administration. Also, certain supplies may be obtained by resort to excess Government stocks, and stocks of Federal prison-made and blind-made products. It is the policy of the Commission that such methods of procurement be utilized to the fullest extent practicable, in accordance with applicable laws and regulations. Procurement by the Commission under the Economy Act of June 30, 1932, as amended (31 U. S. C. 686), from Federal agencies shall conform to the requirements of the act and applicable regulations of the General Accounting Office.

2-102 *Meaning of Formal Advertising.* As used in this guide, formal advertising means the method prescribed by this section of procuring supplies or services by contract as a result of advertising and competitive bidding.

2-103 *Applicability of Section to Amendments.* This section does not apply to an amendment or modification of or supplement to a contract originally entered into pursuant to formal advertising if the amendment, modification, or supplement does not substantially increase, beyond the scope of the original contract, the quantity of supplies or services to be furnished.

Part 2—Solicitation of Bids

2-201 *General Requirements.* Bids shall be solicited by the methods prescribed in this part from all qualified sources of supplies or services deemed necessary by the contracting officer to assure such full and free competition as is consistent with the procurement of the required supplies or services. Current lists of prospective bidders shall be maintained by each office of the Commission concerned with the procurement of supplies or services. These lists shall afford as broad a coverage of sources of supplies and services as is reasonably possible, and every effort shall be made to include small business concerns.

2-202 *Information and Forms to be Supplied to Bidders.* Information as to the Government's requirements and necessary blank forms, including the form of contract to be used, shall be made available to prospective bidders in such form and detail, and with such instructions, that a binding acceptance of the successful bid may be made in advance of the execution of further contractual documents by the successful bidder.

2-203 *Methods of Soliciting Bids.* Bids shall be solicited sufficiently in advance of the opening of bids to allow bidders adequate opportunity to prepare and submit bids. Bids shall be obtained by mailing or delivery to prospective bidders and posting at some appropriate public place the invitation to bid and accompanying forms. To the extent deemed necessary by the contracting officer in order to assure full and free competition, announcements of the essential details of a proposed procurement may also be made available for free publication to newspapers, and to trade journals and magazines circulating in the appropriate trades or industries. Announcements may be inserted as paid advertisements in newspapers only when deemed necessary in order to secure effective competition, and in conformity with the requirements of applicable statutes, regulations of the General Accounting Office

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and GM bulletins. Invitations to bid and announcements shall clearly indicate the source of and means of obtaining additional information and papers essential to the preparation of a bid.

Part 3—Submission of Bids

2–301 *Method of Submission.* In order to receive consideration bids must be submitted by a method authorized in the invitation to bid or instructions furnished to bidders in sufficient time to reach the designated office prior to the time fixed for the opening of bids. Bids received after the time fixed for opening shall be considered if received before award is made and if the failure to arrive on time was due solely to a delay in the mails or other mode of transmission authorized in the invitation for bids for which the bidder was not responsible.

2–302 *Modification or Withdrawal of Bids.* Bids may be modified or withdrawn by written or telegraphic notice received prior to the time fixed for the opening of bids. After the bids have been opened none may be modified (except as provided in paragraphs 2–403 and 2–404) or withdrawn unless such modification or withdrawal is received before award is made, and either (*a*) failure of the modification or withdrawal to arrive prior to the time fixed for opening was due solely to a delay in the mails or other authorized mode of transmission for which the bidder was not responsible, or (*b*) modification is in the interest of the Government and not prejudicial to the other bidders.

Part 4—Opening of Bids and Award of Contract

2–401 *Opening of Bids.* At the time fixed for opening, all bids which have been received shall be publicly opened and read aloud by the official designated to open the bids. Although the correct preparation of a bid is primarily the responsibility of the bidder, it is nevertheless the duty of the contracting officer, after the opening of the bids and prior to award, to examine all bids, for minor informalities or irregularities and for obvious and apparent mistakes.

2–402 *Rejection of Bids.* Any bid which does not conform to the essential requirements of the invitation for bids shall be rejected, except that any such bid may be considered if consideration is in the interest of the Government and is not prejudicial to the other bidders. All bids may be rejected when rejection is in the interest of the Government.

2–402.1 *Unreasonable or Collusive Prices.* Among the grounds for the rejection of all bids is a determination by the contracting officer that bid prices after formal advertising therefor are not reasonable (either as to all or some part of the requirements) or have not been independently arrived at in open competition. If negotiation is to be used after rejection of all bids on either of such grounds the requirements of paragraph 3–203 (h) must be satisfied. Evidence that bids have not been independently arrived at shall be transmitted to the General Counsel, Washington, D. C.

2–403 *Minor Informalities or Irregularities in Bids.* A bidder shall be given an opportunity to cure any deficiency resulting from a minor informality or irregularity in a bid or, in the alternative, when it is not to the disadvantage of the Government, such deficiency may be waived if time does not permit the curing thereof.

2–404 *Mistakes in Bids.*

2–404.1 *Obvious Clerical Errors.* Any clerical mistake obvious or apparent on the face of a bid may be corrected prior to award if the bidder, in response to a request for verification of the bid, furnishes a statement as to such mistake.

2–404.2 *Other Mistakes.* In the case of a suspected or alleged mistake in a bid other than a clerical mistake obvious or apparent on the face of the bid, the bidder shall be requested, prior to

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award, to furnish either a verification of the bid or evidence in support of a mistake. If the bidder fails or refuses to furnish evidence in support of a mistake, the bid shall be considered in the form submitted. If evidence in support of a mistake is furnished, the case shall be referred to the Division of Finance, Washington, D. C., for processing. If limitations of time require that an award be made prior to a decision as to the relief, if any, to be given to the bidder alleging the mistake, and if there is no room for doubt as to the price or other terms intended in the bid in which a mistake occurs, then, pending processing of the case by the Division of Finance: (a) In the case of a mistake in the lowest bid which as clearly intended would not be the lowest bid, such bid may be disregarded;

(b) In the case of a mistake in the lowest bid which as clearly intended would still be the lowest bid, award shall be made on the basis of such low bid as originally submitted but subject to correction if subsequently authorized by the General Accounting Office;

(c) In the case of a mistake in any bid other than the lowest bid, such bid shall be considered on the basis of its price or other terms as clearly intended.

2–405 *Acceptance of Bids.* Award shall be made with reasonable promptness by written notice of acceptance to that responsible bidder whose bid, conforming to the invitation for bids, will be most advantageous to the Government, price and other factors considered.

2–405.1 *Responsible Bidder.* A responsible bidder is a bidder who possesses the financial, technical, and management abilities necessary to perform the contract and is otherwise eligible by law and under this guide.

2–405.2 *Factors in Award Other Than Price.* Among other factors besides price that may be considered in making an award are: (a) Judgment, skill, and integrity of a bidder;

(b) Reputation and experience of a bidder, and prior work of a similar nature done by him;

(c) Foreseeable costs or delays to the Government resulting from differences in inspection, shipping, location of supplies, etc.;

(d) Time of performance, if the solicitation makes time a material factor;

(e) Changes made or requested in any of the provisions of the solicitation, to the extent that any such change does not constitute ground for rejection of the bid under paragraph 2–402;

(f) Restrictions or conditions imposed in the bid;

(g) Advantages or disadvantages to the Government that might result from making multiple awards.

2–405.3 *Equal Low Bids.* (a) When two or more low bids are equal in all respects (taking into consideration cost of transportation, cash discounts, and all other factors properly to be considered), award shall be made by a drawing by lot which shall be witnessed by at least three persons and which may be attended by the bidders or their representatives, provided:

(i) Subject to (ii), (iii), and (iv) below, (1) in the case of equal low bids, one of which is submitted by a small business concern, as defined in paragraph 1–303.1, award shall be made to the small business concern, and (2) in the case of equal low bids, two or more of which are submitted by small business concerns, award shall be made by a drawing by lot limited to the small business concerns.

(ii) Where two or more equal bids are received from small business concerns, one of which is submitted by a bidder who will perform the contract in a distressed employment area, designated as such by or on behalf of the President, award shall be made to the small business concern who will perform the contract in the distressed employment area.

(iii) In the case of equal low bids, two or more of which are submitted by small business concerns who will perform the contract in a distressed employment area, award shall be made by a drawing by lot limited to the small

business concerns in the distressed employment area.

(iv) Where two or more equal low bids are received, one bid being from a business concern (whether small or not) not in a distressed employment area and the other being from a bidder who, although not a small business concern, will perform the contact in a distressed employment area, award shall be made to the latter.

(b) When award is to be made by lot and the information available shows that the product of a particular manufacturer is offered by more than one bidder, a preliminary drawing by lot shall be made to ascertain which of the bidders offering the product of a particular manufacturer will be included in the final drawing to determine the award.

SECTION III

PROCUREMENT WITHOUT FORMAL ADVERTISING

Part 1—Use of Procurement Without Formal Advertising

3-101 *General Requirements.* Procurement without formal advertising shall be in conformity with this section. Minimum requirements relating to justifications in support of action under this section are set forth in part 2 of section IV.

3-102 *Meaning of Procurement Without Formal Advertising.* As used in this guide, procurement without formal advertising means any method of procuring supplies or services by contract for which formal advertising is not required.

3-103 *Methods.* Among the methods of procurement without formal advertising are the inviting of bids from qualified and responsible bidders without formal advertising, and negotiation. Under some circumstances the inviting of bids without formal advertising may nevertheless meet the advertising requirements of section 3709 of the Revised Statutes, as amended.

Part 2—Circumstances Permitting Procurement Without Formal Advertising

3-201 *Atomic Energy Act.* The Atomic Energy Act of 1946 contains various exemptions from section 3709 of the Revised Statutes, as amended, where action without regard to the provisions of section 3709 of the Revised Statutes, as amended, is certified by the Commission to be necessary in the interest of the common defense and security, or upon a showing that advertising is not reasonably practicable. The act also provides, in section 12 (b), that the President may, in advance, exempt any specific action of the Commission in a particular matter from the provisions of law relating to contracts whenever he determines that such action is essential in the interest of the common defense and security.

3-202 *Section 3709 of the Revised Statutes.* Section 3709 of the Revised Statutes, as amended by section 9 (a) of the act of August 2, 1946, 60 Stat. 809, and as further amended by section 502 (e) of the Federal Property and Administrative Services Act of 1949, approved June 30, 1949, Public Law 152, Eighty-first Congress, requires advertising for proposals to furnish supplies or services, but incorporates exceptions to the general rule. Section 3709, as amended, with the material exceptions, reads as follows:

"Unless otherwise provided in the appropriation concerned or other law, purchases and contracts for supplies or services for the Government may be made or entered into only after advertising a sufficient time previously for proposals, except (1) when the amount involved in any one case does not exceed $500, (2) when the public exigencies require the immediate delivery of the articles or performance of the service, (3) when only one source of supply is available and the Government purchasing or contracting officer shall so certify, or (4) when the services are required to be performed by the contractor in person and are (a) of a technical and professional nature or (b) under Gov-

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ernment supervision and paid for on a time basis. . . ."

3-203 *Examples of Circumstances Where Formal Advertising is Not Required.* Without limitation on the generality of the statutes cited or of this guide, the following circumstances shall be deemed to be examples of cases where formal advertising is not required: (a) The information necessary to be furnished bidders includes information classified "Confidential" or higher;

(b) Performance of the work called for under the contract will involve access to information classified "Confidential" or higher, and the contracting officer determines that it would not be practicable to obtain necessary security clearances of personnel of the successful bidder within a reasonable time after submission of the bid;

(c) It is determined by the contracting officer that work must be commenced prior to the development of adequate definitive data upon which bids might be solicited by formal advertising, in order to complete technical or production facilities within the time established by program requirements;

(*d*) It is determined by the contracting officer that it is impossible to draft, for a solicitation of bids, adequate specifications or plans or any other adequately detailed description of the required supplies or services;

(*e*) The services to be procured are architect-engineer services;

(*f*) The services to be procured are research or development services;

(*g*) The conditions prevail which are described in exceptions 1 to 4 in section 3709 of the Revised Statues, as amended;

(*h*) It is determined by the contracting officer that bid prices after formal advertising are not reasonable or have not been independently arrived at in open competition and

(i) notice of intention to negotiate and a reasonable opportunity to negotiate are given by the contracting officer to each responsible bidder whose bid has been rejected;

(ii) the negotiated price is lower than the lowest rejected bid price of a responsible bidder, as determined by the contracting officer;

(iii) the negotiated price is the lowest negotiated price offered by any responsible supplier.

3-204 *Determinations.* Contracting officers shall seek the advice of counsel where there is any doubt as to the application of the foregoing examples or as to whether or not other circumstances in a particular case permit procurement without formal advertising. Records of determinations shall be prepared in conformity with part 2 of section IV.

Part 3—Standards Applicable Where Procurement Without Formal Advertising is Permitted

3-301 *General Requirements.* Where procurement without formal advertising is permitted the method of procurement selected and any negotiations thereunder shall nevertheless conform to the minimum standards set forth in this part and part 4.

3-302 *Assurance of Competition.* The method of procurement selected shall include the solicitation of proposals or bids supported by cost or other information found necessary by the contracting officer, from all such qualified sources of supplies or services as he deems necessary in order to assure such full and free competition as is consistent with the procurement of the required supplies or services, in accordance with the basic policies set forth in part 3 of section I.

3-303 *Factors to be Considered in Contracting.* In negotiating or entering into a contract under this section, due attention shall be given to the following, and to any other appropriate factors: (*a*) Comparison of prices quoted, and consideration of other prices for the same or similar supplies or services, with due regard to cost of transportation, cash discounts, and any other factors relating to price;

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(*b*) Comparison of the business reputations and responsibilities of the respective persons or firms who submit quotations;

(*c*) Consideration of the quality of the supplies or services offered, or of the same or similar supplies or services previously furnished, with due regard to the satisfaction of technical requirements;

(*d*) Consideration of delivery requirements;

(*e*) Discriminating use of price and cost analyses;

(*f*) Investigation of price aspects of any important subcontract;

(*g*) Individual bargaining;

(*h*) Consideration of cost sharing;

(*i*) Effective utilization of the most desirable type of contract.

Part 4—Types of Contracts

3–401 *Authorized Types of Contracts.* Subject to the limitations prescribed by this section, and to any additional limitations prescribed under GM bulletins, contracts under this section may be of any type which will promote the best interests of the Government.

3–401.1 *Examples.* Examples of types of contracts authorized under this section are: (*a*) Fixed-price, lump-sum, or unit-price type;

(*b*) Incentive type;

(*c*) Cost-type, such as cost, cost-plus-a-fixed-fee, and time and material contracts.

3–402 *Prohibition.* The cost-plus-a-percentage-of-cost system of contracting shall not be used.

3–403 *Limitations on Types other than Fixed-Price, Lump-Sum, or Unit-Price.* Prior to negotiating or entering into any contract of a type other than a fixed-price, lump-sum, or unit-price type, which otherwise conforms to this section, the contracting officer shall determine that procurement of the required supplies or services is impracticable without the use of the type of contract selected. A time and material type of contract shall not be used if any other type of contract is equally advantageous to the Government.

3–403.1 *Limitations on Fixed Fees.* Fees negotiated on cost-plus-a-fixed-fee contracts shall be based upon the scope and extent of the services to be performed by the contractor, shall be fair and reasonable, and shall not exceed amounts prescribed by law or directions of the General Manager.

3–404 *Letter Agreements.* A letter agreement, where intended to be incorporated eventually in a formal contract, shall be superseded as promptly as possible by the formal contract.

Section IV

Administrative Provisions

4–000 *Scope.* This section sets forth references to the procurement responsibility and authority of the General Manager, Directors of Divisions, and Managers of Operations, and prescribes minimum standards for justifications in support of awards by the Commission.

Part 1—Procurement Responsibility and Authority within the Commission

4–101 *General Manager.* The General Manager has been authorized and directed by the Commission to discharge the executive and administrative functions of the Commission, and to exercise the statutory authorities of the Commission in the discharge of those functions. The Deputy General Manager acts as alternate to the General Manager, and as General Manager in the absence of the General Manager.

4–102 *Division Directors.* The procurement responsibility and authority of Division Directors is set forth in GM Bulletins issued by the General Manager.

4–103 *Managers of Operations.* The procurement responsibility and authority of each Manager of Operations is set forth in a GM Bulletin issued by the Division Director having responsibility for the coordination and supervision of the Operations Office involved.

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Part 2—Justifications in Support of the Award of Contracts

4–201 *General Requirements.* Contracts to which either section II or section III applies shall be supported by justifications meeting the minimum basic requirements specified in this part. For every such contract United States Standard Form 1036 (Statement and Certificate of Award) shall be duly executed by the contracting officer, for the files of the General Accounting Office and for the files of the AEC (except where special instructions on the reverse of Standard Form No. 1034 apply). The advice of counsel should be sought in connection with the preparation of Form 1036 for a contract exceeding $500 in amount entered into without formal advertising, and in any other case where doubt exists as to the proper certification.

4–202 *Requirements Relating to Contracts Entered into Pursuant to Formal Advertising under Section II.* A record of the date and distribution of all invitations to bid shall be maintained by the office of the Commission concerned. Upon the opening of bids the names of the bidders and the amounts bid shall be entered in an abstract or record, certified by the contracting officer, which shall be available for public inspection; and the hour and date of transmission of bids received after the time fixed for opening, if evident from the papers, shall also be recorded. An award to other than the lowest bidder as to price shall be supported by a complete statement of the reasons therefor. In each case where an award is made pursuant to (i), (ii), (iii), or (iv) of paragraph 2–405.3 (a), United States Standard Form 1036 (or the reverse of United States Standard Form 1034, as the case may be) shall briefly recite the circumstances under which award was made and shall contain a statement that it has been administratively determined that the award will further the Congressional policy with respect to small business or will further the President's policy with respect to distresed employment areas, or both, as the case may be.

4–202.1 *Records Concerning Mistakes in Bids.* Whenever a case of a mistake in a bid is referred to the Division of Finance in Washington, the following papers should accompany a copy of the bid which contains the suspected or alleged mistake: (*a*) A copy of the invitation for bids;

(*b*) An abstract or record of bids received;

(*c*) A statement from the bidder, and any additional supporting evidence such as work sheets or other data used in preparing the bid, setting forth the complete facts on which the allegation of mistake is based and requesting such definite relief as withdrawal of the bid, change in bid, etc.; and

(*d*) A statement from the contracting officer showing the date when notice of the alleged mistake was received, and any additional information he may have as to the alleged mistake, together with his recommendations.

4–203 *Requirements Relating to Contracts Entered into Without Formal Advertising under Section III.* Every contract exceeding $500 in amount entered into without formal advertising shall be supported by justifications in narrative form for the files of the AEC, covering matters such as the following where applicable: (*a*) A reference to the program basis for the contract;

(*b*) The circumstances upon the basis of which it is concluded that procurement without formal advertising is justified;

(*c*) The methods of solicitation employed and the information requested from sources of supplies or services, the distribution of and response to such solicitations or requests, and the basis upon which it is concluded that such solicitations or requests were sufficient to assure such full and free competition as is consistent with the procurement of the required supplies or services;

(*d*) The history of any negotiations,

including the consideration given to appropriate factors, and the basis upon which it is concluded that the results of the negotiations are advantageous to the Government;

(e) If the contract is of a type other than fixed-price, lump-sum, or unit-price, the basis upon which it is concluded that procurement of the required supplies or services is impracticable without the use of the type selected.

SECTION V

PROCUREMENT BY COST-TYPE CONTRACTORS

Part 1—Scope and Application

5–101 *Scope.* This section sets forth basic policies to which cost-type contractors should adhere in procuring supplies and services the cost of which is borne by the Commission, and provides for implementation of those policies.

5–102 *Meaning of "Cost-Type Contractor."* The term "cost-type contractor" as used in this section means a contractor who has a prime contract with the Commission on a cost basis, or a subcontractor who has a subcontract on a cost-basis under such a prime contract provided all the preceding subcontracts, if any, in the contractual chain are also on a cost basis.

5–103 *Limitations on Applicability of this Section.* A cost-type research or development contract which is not to be performed at an installation owned by or leased to the Government shall be exempt from mandatory application of the requirements of parts 2 and 3 of this section if the quantity of procurement contemplated under the contract is not deemed substantial by the contracting officer.

5–104 *Required Approvals not Affected.* Cost-type contracts include provisions requiring approvals by the Commission or its authorized representative of subcontracts and purchase orders. Nothing contained in this guide shall be construed to abrogate or dispense with the requirements of any such contract provision.

Part 2—Basic Policies

5–201 *Objective.* In securing supplies and services cost-type contractors shall effect the procurement in the manner most advantageous to the Government—price, quality, and other factors considered.

5–202 *Government Sources.* Requirements shall be met from Government sources if made available and if procurement from such sources is economically advantageous to the Government. Direct procurement by the Commission, rather than by a cost-type contractor, may be required where deemed necessary by the Commission or its authorized representative in order to carry out special requirements of appropriation acts or other applicable laws relating to particular items.

5–203 *Sources Other than Government Sources.* Procurement from sources other than Government sources shall be effected by methods calculated to assure such full and free competition as is consistent with securing the required supplies or services.

5–203.1 *Contractor-Controlled Sources.* A cost-type contractor shall notify the contracting officer sufficiently in advance of the proposed procurement of supplies or services from sources owned by or otherwise under its control to permit the Commission, at its option or by agreement with the cost-type contractor, to effect the procurement directly by competitive or other authorized methods.

5–203.2 *Lists of Prospective Bidders.* Cost-type contractors shall be given access to or supplied with copies of lists of prospective bidders maintained by offices of the Commission.

5–203.3 *Small Business Concerns.* A fair proportion of required supplies and services shall be procured from small business concerns (as defined in paragraph 1–303.1).

5–203.4 *Ineligible Contractors and Disqualified Bidders.* Cost-type contractors may treat persons and firms as ineligible or disqualified to the extent that such persons or firms are so

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treated by the Commission and listed by offices of the Commission (in accordance with paragraph 1-303.2).

5-203.5 *Types of Subcontracts and Purchase Orders.* Types of subcontracts or purchase orders other than fixed-price, lump-sum or unit-price types shall not be used unless procurement of the required supplies or services is impracticable without the use of the type selected, but the cost-plus-a-percentage-of-cost type shall not be used in any event.

5-203.6 *Justifications.* Each cost-type contractor shall maintain, and make available for review by the Commission, justifications in support of subcontracts and purchase orders adequate to reflect the procurement practices and procedures used and the circumstances supporting particular transactions.

Part 3—Implementation of Basic Policies

5-301 *Review by the Commission of Specific Procurement Practices and Procedures of Cost-Type Contractors.* Written statements of the detailed procurement practices and procedures used or proposed to be used by cost-type contractors, and of the objectives intended to be accomplished by such practice and procedures, shall be submitted to contracting officers for review. Contracting officers are required to satisfy themselves that cost-type contractors follow procurement practices and procedures consistent with the basic policies set forth in part 2 of this section, with due regard to applicable contract provisions, and with reasonable tolerances and exemptions based on the amount or character of a transaction.

PART 1—ORGANIZATION OF THE U. S. ATOMIC ENERGY COMMISSION [3]

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AUTHORITY: Issued under §§ 3.12 of the Administrative Procedure Act, 60 Stat. 238, 244 (1946), 5 U. S. C. §§ 1002, 1011 (1946 ed.) and the Atomic Energy Act of 1946, 60 Stat. 755–775, 42 U. S. C. §§ 1801–1819 (1946 ed.).

GENERAL

§ 1.1 *Creation and Authority.* The Atomic Energy Commission was establish by the Atomic Energy Act of 1946 (60 Stat. 755; 42 U. S. C. 1801 et seq.), approved August 1, 1946. Pursuant to section 9 (a) of the act, certain interests, property, and facilities of the Government, including interests, property, and facilities of the Manhattan Engineer District, were transferred to the Commission as of midnight, December 31, 1946, by Executive Order 9816 of the same date.

§ 1.2 *Purpose.* It is the purpose of the Atomic Energy Act to effectuate the declared policy of the people of the

[3] This statement of Organization and Procedures of the U. S. Atomic Energy Commission was printed in the *Federal Register* March 14, 1951 as Part 1 and Part 2.

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United States that, subject at all times to the paramount objective of assuring the common defense and security, the development and utilization of atomic energy shall, so far as practicable, be directed toward improving the public welfare, increasing the standard of living, strengthening free competition in private enterprise, and promoting world peace.

§ 1.3 *Programs.* The Act provides for the following major programs relating to atomic energy: (a) A program of assisting and fostering private research and development to encourage maximum scientific progress;

(b) A program for the control of scientific and technical information which will permit the dissemination of such information to encourage scientific progress, and for the sharing on a reciprocal basis of information concerning the practical industrial application of atomic energy as soon as effective and enforceable safeguards against its use for destructive purposes can be devised;

(c) A program of federally conducted research and development to assure the Government of adequate scientific and technical accomplishment;

(d) A program for Government control of the production, ownership, and use of fissionable material to assure the common defense and security and to insure the broadest possible exploitation of the fields; and

(e) A program of administration which will be consistent with the foregoing policies and with international arrangements made by the United States, and which will enable the Congress to be currently informed so as to take further legislative action as may hereafter be appropriate.

§ 1.4 *Operations.* The operations of the Commission are carried out largely by industrial concerns and by private and public institutions under contract with the Commission, in accordance with the requirements and policies established by the Commission pursuant to the Atomic Energy Act. Some of the principal production and research and development activities are conducted by contractors in facilities owned by the Commission. Major production facilities owned by the Commission are located at Oak Ridge, Tenn., and Hanford, Wash. Production facilities at sites near Paducah, Ky., Augusta, Ga., are under construction. Major research and development facilities owned by the Commission are the Oak Ridge National Laboratory at Oak Ridge, Tenn.; the Los Alamos Scientific Laboratory at Los Alamos, N. Mex.; the Argonne National Laboratory at Chicago, Ill.; the Brookhaven National Laboratory at Upton, Long Island, N. Y.; and the Knolls Atomic Power Laboratory at Schenectady, N. Y.

§ 1.11 *General Outline of Organization.* This section outlines the principal elements of the Commission's organization, which are described in greater detail in Section 1.21 to 1.49, inclusive.

(*a*) The Commission is composed of five members, one designated as chairman, all appointed by the President by and with the advice and consent of the Senate. The Commissioners confer and act as a body on important matters of policy, programs, and administration.

(*b*) The General Manager, appointed by the Commission, is the principal executive and administrative officer of the Commission. (1) The General Manager is responsible to the Commission for the formulation of policies and programs by the Commission's divisions. Four of the six program divisions—the Divisions of Research, Production, Engineering, and Military Application—were expressly established by the Atomic Energy Act. The Division of Reactor Development and the Division of Biology and Medicine have been established by the Commission.

(2) The General Manager is also assisted in his executive and administrative duties by the Deputy General Manager, by the Office of the General Counsel, by the Director of Intelligence, by the Director of Classification and by the Divisions of Finance, Organization and Personnel, Information Services, and Security.

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(c) Certain executive and administrative functions have been delegated by the General Manager to the division directors, particularly to the Directors of Production, Military Application, and Reactor Development. The Director of Production is responsible for the operations offices at New York, N. Y.; Oak Ridge, Tenn.; Hanford, Wash.; and Augusta, Ga.; and the Raw Materials Operations Office in Washington, D. C. The Director of Military Application is responsible for the operations office at Santa Fe, N. Mex. The Director of Reactor Development is responsible for the operations offices at Chicago, Ill.; Schenectady, N. Y.; and Idaho Falls, Idaho; and for the Division of Engineering in Washington, D. C. These division directors have in turn delegated a large measure of executive and administrative authority to the managers of the operations offices. The managers of operations are authorized, within stated limits, to enter into contracts on behalf of the Commission, to act as representatives of the Commission for the administration of contracts executed under their authority or assigned to their offices, and to perform other special functions.

§ 1.12 *Committees.* The Atomic Energy Act provides for three permanent committees. The General Advisory Committee, composed of nine members appointed from civilian life by the President, advises the Commission on scientific and technical matters relating to materials, production, and research and development. The Military Liaison Committee consists of representatvies of the Department of Defense, and at the present time has seven members. The Commission advises and consults with the Military Liaison Committee on all atomic energy matters which the Committee deems to relate to military applications, including the development, manufacture, use, and storage of bombs, the allocation of fissionable material for military research, and the control of information relating to the manufacture or utilization of atomic weapons. The Commission keeps the Committee fully informed of all such matters before it and the Committee keeps the Commission fully informed of all atomic energy activities of the Armed Forces. The Joint Committee on Atomic Energy, composed of nine members of the Senate and nine members of the House of Representatives, makes continuing studies of the activities of the Atomic Energy Commission and of problems relating to the development, use, and control of atomic energy. The Commission keeps the Joint Committee fully and currently informed on the activities of the Commission.

COMMISSION HEADQUARTERS

§ 1.21 *The Commission.* The five Commissioners are appointed by the President, by and with the advice and consent of the Senate. One member is designated by the President as Chairman. The Commissioners establish policies and programs pursuant to the provisions of the Atomic Energy Act, direct the administrative and executive functions of the Commission to be discharged by the General Manager, appoint the principal officers of the Commission's organization, and take such other action as may be required to effectuate the purposes and policies of the Atomic Energy Act.

§ 1.22 *Office of the General Manager.* The General Manager is appointed by the Commission. The Commission has authorized and directed the General Manager to discharge those executive and administrative functions of the Commission which may be necessary to carry out the provisions of the Atomic Energy Act of 1946. The General Manager is authorized to redelegate such authority in writing, with or without authority to make successive redelegations, and under such terms, conditions, and limitations as he may deem appropriate. He is assisted in discharging his responsibilities by a Deputy General Manager, who is authorized to take action for the General Manager on all matters falling within the authority of the General Manager.

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§ 1.23 *Office of the General Counsel.* The General Counsel advises the Commission directly regarding the interpretation of the Atomic Energy Act of 1946 and other sources of legal powers, and the authority for and legal implications of all activities of the Commission. The Office of the General Counsel advises and assists the General Manager, the division directors, and the Managers of Operations in all matters of law and legal policy. The Office of the General Counsel has supervision of the Patent Branch, which administers matters relating to patents and inventions.

§ 1.24 *Office of the Director of Intelligence.* The Director of Intelligence advises on intelligence matters.

§ 1.25 *Office of Classification.* The Director of Classification administers and effectuates the Commission's programs for the classification and declassification of information.

§ 1.26 *Division of Research.* The Division of Research develops and supervises programs of research in or involving the physical sciences, including the isotopes program, the transfer of peculiar materials and equipment among research installations, the dissemination and use of technical information in the atomic energy program, and research projects requested by other divisions. The Division also administers the program of cooperation with the Office of Naval Research and the contracts with the National Research Council and the Oak Ridge Institute of Nuclear Studies, Inc., for a fellowship program.

§ 1.27 *Division of Reactor Development.* The Division of Reactor Development develops and directs the program for the development of reactors, including the equipment and processes which will make possible their effective and safe use; and integrates into this program the special needs of other divisions. The Director of the Reactor Development Division is authorized to make and administer contracts and to redelegate this authority, except that new or unsual types of transactions are subject to prior consideration of the General Manager.

§ 1.28 *Division of Engineering.* The Division of Engineering handles special engineering and related problems for the Division of Reactor Development.

§ 1.29 *Division of Production.* The Division of Production develops and directs programs of raw materials, production of fissionable materials, and procurement of special materials; supervises construction and related engineering and community activities; maintains accountability records of source and fissionable materials; coordinates mobilization plans; coordinates the use of priorities and allocations powers delegated by control agencies; and administers programs for equipment export control and for source materials and production facilities licensing. The Director of Production is authorized to make and administer contracts, and to redelegate this authority, except that new or unusual types of transactions are subject to prior consideration of the General Manager.

§ 1.30 *Division of Military Application.* The Division of Military Application directs the research, development, production and testing of atomic weapons; manages related AEC installations and communities; and assists in maintaining liaison between the Atomic Energy Commission and the Department of Defense. The Director of Military Application is authorized to make and administer contracts, and to redelegate this authority, except that new or unusual types of transactions are subject to prior consideration of the General Manager.

§ 1.31 *Division of Biology and Medicine.* The Division of Biology and Medicine develops and supervises programs of research in biology, medicine, and biophysics at AEC facilities and through direct contacts with private institutions; supervises measures to guard the health of atomic energy employees and the public; maintains liaison with Federal Civil Defense Administration and other Federal agencies on

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civil defense matters; coordinates the procurement of radiation detection instruments; supervises fellowship and special training programs in the life sciences.

§ 1.32 *Division of Security.* The Division of Security develops and maintains policies, standards, and procedures to assure the safekeeping of restricted data and other classified matter and to assure the protection of installations and materials of AEC; maintains liaison with the Federal Bureau of Investigation, the National Military Establishment, and other agencies as required for the protection of restricted data and for the clearance of personnel; and operates the security program for the Washington Area.

§ 1.33 *Division of Organization and Personnel.* The Division of Organization and Personnel develops and maintains the independent AEC employee personnel policy and related procedures; provides staff assistance in all matters of organization, management methods, contractor personnel administration, and safety and fire protection; and operates personnel services for the Washington Office.

§ 1.34 *Division of Finance.* The Controller has direct responsibility to the Commission to report the financial status of the agency and the results of its operations in conformity with generally accepted accounting principles; to detect fraud and improper diversion of assets and to prevent such occurrences to the extent possible by the maintenance of reasonable accounting and business-management controls; and to advise on financial implications of proposed courses of action. He is responsible to the General Manager for the performance of the functions assigned to the Division of Finance. The Division of Finance plans, develops, and maintains over-all policies and standards for accounting, auditing, budgeting, insurance, business management, records, motor vehicle operation, communications, and the procurement, custody, and disposal of materials, equipment, supplies, and real estate; plans, develops, and maintains procedures for program authorization and progress reporting; performs financial and traffic management services for the Washington Office.

§ 1.35 *Division of Information Services.* The Division of Information Services advises and assists the Commission, General Manager, and Washington principal staff in disseminating scientific, technical, and general information arising from policy determinations and program developments in accordance with provisions of the Atomic Energy Act of 1946 and other statutes. The Division assists managers of operations in complying with the requirements of the Commission, General Manager, and directors of program divisions for coordination of public and technical information programs through advice to their public and technical information staffs.

§ 1.36 *Secretary to the Commission.* The Secretary to the Commission maintains official minutes and records of the Commission; reviews and processes documents to be presented to the Commission; advises the staff, on behalf of the General Manager, of Commission decisions and requests; and provides related services.

OPERATIONS OFFICES

§ 1.41 *Chicago Operations Office.* The Chicago Operations Office, under the direction of a Manager of Operations responsible to the Director of Reactor Development, administers contracts for research and development programs, including those at the Argonne National Laboratory; administers related engineering and construction programs; provides management for the execution of programs at the University of California at Berkeley, Ames Laboratory of Iowa State College at Ames, Iowa, and the Westinghouse Co. at Pittsburgh; and makes or approves purchases, contracts and subcontracts, except that each purchase, contract, subcontract, extension or mod-

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ification in excess of $2 million is subject to the approval of the Director of Reactor Development.

§ 1.42 *Hanford Operations Office.* The Hanford Operations Office, under the direction of a Manager of Operations responsible to the Director of Production, is responsible for the production of fissionable materials and other special materials and fabricated items; manages Richland Village; related engineering and construction programs; and makes or approves purchases, contracts, and subcontracts, except that each purchase, contract, subcontract, extension, or modification in excess of $5 million is subject to the approval of the Director of Production.

§ 1.43 *Idaho Operations Office.* The Idaho Operations Office, under the direction of a Manager of Operations responsible to the Director of Reactor Development, provides for the design, construction, and operation of nuclear reactors and facilities and services as necessary; manages the Reactor Testing Station and performs other special assigned functions; and makes or approves purchases, contracts, and subcontracts, except that each purchase, contract, subcontract, extension, or modification in excess of $2 million is subject to the approval of the Director of Reactor Development.

§ 1.44 *New York Operations Office.* The New York Operations Office, under the direction of a Manager of Operations responsible to the Director of Production, provides for receiving and warehousing source and other raw materials, processing source materials and other raw materials; administers the contract for a research and development program at the Brookhaven National Laboratory; is responsible for source material licensing; supervises the St. Louis and Cleveland Area Offices; administers contracts for research programs in the field of biology and medicine at Rochester, Western Reserve, and Columbia Universities; and makes or approves purchases, contracts, and subcontracts, except that each purchase, contract, subcontract, extension, or modification in excess of $2 million is subject to the approval of the Director of Production.

§ 1.45 *Oak Ridge Operations Office.* The Oak Ridge Operations Office, under the direction of a Manager of Operations responsible to the Director of Production, is responsible for the production of fissionable materials and certain special materials and fabricated items; administers contracts for research programs at Oak Ridge National Laboratory and other AEC installations administered by the Oak Ridge Operations Office; manages the community of Oak Ridge; administers related engineering and construction work; administers the AEC isotope production and distribution program in accordance with policies of the Division of Research; supervises the Dayton Area Office and the Kentucky Area Office; and makes or approves purchases, contracts, and subcontracts, except that each purchase, contract, subcontract, extension, or modification in excess of $5 million is subject to the approval of the Director of Production.

§ 1.46 *Raw Materials Operations Office.* Under the direction of a Manager of Operations responsible to the Director of Production, is responsible for the functions of exploration for, and acquisition and production of, raw materials and the procurement of certain special materials; administers related research, development, engineering, and construction work; supervises the Colorado Raw Materials Office; and makes or approves purchases, contracts, and subcontracts, except that each purchase, contract, subcontract, extension, or modification in excess of $2 million is subject to the approval of the Director of Production.

§ 1.47 *Santa Fe Operations Office.* Under the direction of a Manager of Operations responsible to the Director of Military Application, is responsible for research, development, production, and testing in the field of atomic weapons; supervises facilities at Sandia, N. Mex.; manages the community at Los Alamos, N. Mex.; and

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makes or approves purchases, contracts, and subcontracts, except that each purchase, contract, subcontract, extension, or modification in excess of $3 million is subject to the approval of the Director of Military Application.

§ 1.48 *Savannah River Operations Office.* The Savannah River Operations Office, under the direction of a Manager of Operations responsible to the Director of Production, administers assigned programs for the production of fissionable materials, special materials, and fabricated items; administers related engineering and construction programs; supervises the Dana Area Office; and makes or approves purchases, contracts, and subcontracts, except that each purchase, contract, subcontract, extension, or modification in excess of $5 million is subject to the approval of the Director of Production.

§ 1.49 *Schenectady Operations Office.* The Schenectady Operations Office, under the direction of a Manager of Operations responsible to the Director of Reactor Development, carries out the policies of the Commission for development of nuclear reactors in the Schenectady area, including the Knolls Atomic Power Laboratory; administers related research and development contracts and engineering contracts; supervises work in the Schenectady area performed as assistance to the Hanford Operations Office; and makes or approves contracts and subcontracts, except that each purchase, contract, subcontract, extension, or modification in excess of $1 million is subject to the approval of the Director of Reactor Development.

PART 2—PROCEDURES OF THE U. S. ATOMIC ENERGY COMMISSION

Sec.

2.1 Research assistance.
2.2 Information services.
2.3 Material and equipment control.
2.4 Patents, inventions, and awards.
2.5 Domestic uranium program.

§ 2.1 *Research Assistance.* (a) *Research and Development Contracts.* The Commission has entered into many contracts with public and private institutions for the prosecution of research and development work in various branches of atomic science and technology. These contracts are negotiated and supervised on behalf of the Commission by the General Manager, the Division of Research, the Division of Biology and Medicine, the managers of operations and their authorized representatives. The Division of Research is responsible for the development and supervision of the research program involving the physical sciences in AEC installations and outside organizations, including the isotope program, and inquiries regarding participation in this program may be addressed to the Director of the Division of Research in Washington. The Division of Biology and Medicine is responsible for administration of the program for the support of basic research relating to atomic energy in the fields of biology and medicine, and inquiries regarding participation in this program may be addressed to the Director of the Division of Biology and Medicine in Washington.

(b) *Distribution of Isotopes.* The Commission assists and fosters research and development by a program for the sale and distribution of various radioactive and stable isotopes, including deuterium, and for the irradiation in an operating nuclear reactor of various samples. Because radioisotopes are at present available only in limited amounts, and because they may present a distinct health hazard unless used with proper care, the Commission desires to insure that they are distributed in a manner that will assure effective use and safe handling. Any scientist working in a recognized academic, medical, or industrial research institution in the United States may address his specific request for isotopes or irradiation service to the United States Atomic Energy Commission, Post Office Box E, Oak Ridge, Tenn. The Oak Ridge Operations Office processes applications for necessary approvals. The approved application is returned to the applicant for transmittal to the contractor serving as distributor. The contractor, on receipt

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of the approved application, fills the order and bills the applicant according to a price schedule approved by the Commission.

(c) *Fellowship Program.* The Division of Research is responsible for the administration of contracts with the National Research Council and the Oak Ridge Institute of Nuclear Studies for a fellowship program. The fellowship program for the 1951–52 academic year will be administered for the Commission by the Oak Ridge Institute. Predoctoral fellowships will be given in the physical and biological sciences; postdoctoral fellowships in the physical, biological, and medical sciences. Applications may be submitted to the Oak Ridge Institute of Nuclear Studies, Inc., University Relations Division, Post Office Box 117, Oak Ridge, Tenn.

§ 2.2 *Information Services.* Writers or speakers may submit material to the AEC for security review and for assistance in determining if the material is free of restricted data (as defined in the Atomic Energy Act). Review and assistance will be given insofar as national security permits. Such submission of material, as well as any requests for publicly releasable information concerning the Commission's organization and activities, should be directed to the Division of Information Services, United States Atomic Energy Commission, Washington 25, D. C.

§ 2.3 *Material and Equipment Control.* (a) Pursuant to Section 5 (b) of the Atomic Energy Act of 1946, a regulation for licensing the transfer of source materials (uranium and thorium) has been published as Code of Federal Regulations, Title 10, Part 40 (14 F. R. 1156), which sets forth necessary procedures. Correspondence and other inquiries concerning possession, transfer, and use of source materials should be addressed to the United States Atomic Energy Commission, New York Operations Office, Post Office Box 30, Ansonia Station, New York 23, N. Y.

(b) Pursuant to section 4 (e) of the Atomic Energy Act of 1946, a regulation for licensing the manufacture and transfer of facilities for the production of fissionable material has been published as Code of Federal Regulations, Title 10, Part 50 (14 F. R. 3492 as amended), July 1, 1949, which sets forth necessary procedures. Correspondence and other inquiries in this connection should be addressed to the Division of Production, United States Atomic Energy Commission, Washington 25, D. C.

§ 2.4 *Patents, Inventions, and Awards.* (a) Rules and regulations with respect to applications for awards, just compensation, or the fixing of reasonable royalty fees in connection with patents and inventions under the provisions of Section 11 of the Atomic Energy Act of 1946 have been published as Code of Federal Regulations, Title 10, Part 80 (13 F. R. 3457). Inquiries with respect to such matters should be addressed to the Clerk, Patent Compensation Board, United States Atomic Energy Commission, Washington 25, D. C.

(b) Patents and Patent Applications Owned by the Commission Available for Licensing: The Commission grants nonexclusive, royalty-free licenses on Commission-owned patents and declassified patent applications as part of its program to make nonsecret technological information available for use by industry. Periodic listings of such patents and patent applications are released in press releases and published in various journals including the United States Patent Office, Official Gazette, and the Atomic Energy Commission Nuclear Science Abstracts. Applicants for licenses should apply to the Chief, Patent Branch, Office of the General Counsel, United States Atomic Energy Commission, Washington 25, D. C.

§ 2.5 *Domestic Uranium Program.* The domestic uranium program of the Commission, under the direction of Raw Materials Operations Office, was put into effect in April 1948. The details of this program have been explained in Domestic Uranium Circulars Nos. 1,

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2, 3, and 5 which were published as Code of Federal Regulations, Title 10, Part 60 (13 F. R. 2089; 13 F. R. 2090; 14 F. R. 731). The Raw Materials Operations Office has developed a booklet entitled "Prospecting for Uranium," which provides valuable information and assistance to those interested in prospecting for radioactive materials. This booklet may be obtained from the Superintendent of Documents, United States Government Printing Office, Washington 25, D. C., for 30 cents a copy.

Dated at Washington, D. C., this 7th day of March 1951.

W. J. WILLIAMS,
Deputy General Manager.

PART 30—RADIOISOTOPE DISTRIBUTION

GENERAL PROVISIONS

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Sec.
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AUTHORITY: §§ 30.1 to 30.79 issued under 60 Stat. 755–775 as amended; 42 U. S. C. and Sup., 1801–1819.

GENERAL PROVISIONS

§ 30.1 *Scope.* The regulations in this part establish instructions and standards governing the procurement, delivery, possession, use, transfer (including export), and disposal of radioisotopes (a) originating in or procured from the facilities of the Commission or of a distributor, or (b) originating in domestic facilities not owned by the Commission, but distributed by or through the Commission or a distributor, or (c) originating in any foreign nuclear reactor for shipment into the United States. The regulations in this part do not apply to source and fissionable materials as defined in this part, or to any radioactive material not covered by the immediately preceding sentence.

§ 30.2 *Definitions.* As used in this part:

(a) *Commission.* "Commission" means the United States Atomic Energy Commission created by the Atomic Energy Act of 1946, or its duly authorized representative.

(b) *Distributor.* "Distributor" means any person to the extent that such person is engaged in operating Commission-owned laboratories, plants, or other facilities under a contract with the Commission and is engaged in the distribution of radioisotopes for the Commission.

(c) *Fissionable material.* "Fissionable material" means fissionable material as defined in section 5 (a) (1) of the Atomic Energy Act of 1946 and in the regulations contained in Part 70, Definition of Fissionable Material, of this chapter.

(d) *One millicurie.* "One millicurie" means that amount of radiactive material which disintegrates at the rate of 37 million atoms per second.

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(e) *Person.* "Person" means any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, the United States or any agency thereof, any government other than the United States, any political subdivision of any such government, and any legal successor, representative, agent, or agency of the foregoing, or other entity, but shall not include the Commission or officers or employees of the Commision in the exercise of duly authorized functions.

(f) *Radioisotope.* "Radioisotope" means any radioactive material yielded in or made radioactive by exposure to the radiation incident to the processes of producing or utilizing fissionable material. "Radioisotope" also means any other radioactive material.

(g) *Roentgen (=r).* "Roentgen (=r)" means that quantity of X or gamma radiation such that the associated corpuscular emission per 0.001293 gram of air produces, in air, ions carrying 1 electrostatic unit of electricity of either sign.

(h) *Roentgen - equivalent - man (=rem).* "Roentgen - equivalent - man (=rem)" means that quantity of radiation that when absorbed by mammalian tissue produces an effect equivalent to the absorption by this tissue of one roentgen of X or gamma radiation.

(i) *Roentgen - equivalent - physical (=rep).* "Roentgen - equivalent-physical (=rep)" means that dose of ionizing radiation that is capable of producing energy aborption of 93 ergs per gram of tissue.

(j) *Service irradiation.* "Service irradiation" means the exposure of materials of any kind to radiation in accordance with instructions and at the request of some person.

(k) *Source material.* "Source material" means source material as defined in section 5 (b) (1) of the Atomic Energy Act of 1946 and in the regulations contained in Part 40, Control of Source Material, of this chapter.

§ 30.3 *Amendment.* Nothing in this part shall limit the authority of the Commission to issue or amend its regulations in accordance with law.

§ 30.4 *Communications.* All communications about the regulations in this part or any Authorization issued under them should be addressed to the United States Atomic Energy Commission, Post Office Box E, Oak Ridge, Tenn., Attention: Isotopes Division.

EXEMPTIONS

§ 30.10 *Persons operating Commission-owned facilities.* The regulations in this part do not apply to persons to the extent that such persons operate Commission-owned facilities in carrying out programs on behalf of the Commission. In such cases the acquisition, transfer, use, and disposal of radioisotopes are governed by the contracts between such persons and the Commission, and internal bulletins, instructions and directives issued by the Commission.

§ 30.11 *Transfer to the Commission.* The actions of any person in transferring or delivering radioisotopes to the Commission are not subject to the regulations in this part. The exemption provided in this section does not, however, relieve any person from the obligation to comply with shipping requirements otherwise provided by law. (See § 30.41.)

§ 30.12 *Carriers.* Common and contract carriers transporting radioisotopes in the normal course of business are exempt from the regulations in this part.

§ 30.13 *Items and quantities.* (a) Sections 30.20 through 30.61, inclusive, do not apply to any item listed in § 30.70 *Schedule A*, nor to any quantity listed in § 30.71 *Schedule B: Provided, however*, That no person shall, except as otherwise permitted by the regulations contained in this part, effect an increase in the radioactivity of such scheduled items or quantities by adding other radioactive material thereto, by combining the radioisotopes from two or more such items or quantities, or by altering them in any other manner so

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as to increase thereby the rate of radiation exposure of himself or others above the original rate therefrom.

(b) In addition the Commission may, upon application of any interested party, exempt specific items from the application of all or any portion of the regulations in this part subject to such conditions as the Commission may establish whenever the Commission determines that the possession, use, or transfer, of such items will not endanger health or present a hazard to life or property.

APPLICATIONS

§ 30.20 *Filing.* (a) Any person, except the official representative of a foreign applicant, who desires to possess or use radioisotopes shall file "Application for Radioisotope Procurement," Form AEC–313, with the Isotopes Division of the Commission, or such other place as may be designated by the Commission, specifying the use to be made of the material and giving all other information called for by the form. Copies of the form will be furnished upon request to the United States Atomic Energy Commission, Post Office Box E, Oak Ridge, Tenn., Attention: Isotopes Division.

(b) Applications for radioisotopes to be used in a foreign country shall be submitted through that country's official representative in charge of isotope procurement. Upon request, foreign representatives will be informed by the Commission of the desired form and content of applications and the terms and conditions upon which radioisotopes may be obtained.

§ 30.21 *Conditions.* The Commission will not approve a domestic application:

(a) Unless the radioisotope is requested for one or more of the following purposes: research or development activity, medical therapy, industrial uses, processing or making of compounds, or such other useful application as may be developed; or

(b) If it is determined by the Commission that the applicant is not equipped to observe the health and safety standards established by the Commission; or

(c) If it is determined by the Commission that the applicant is not qualified to use radioisotopes for the requested purpose.

§ 30.22 *Service irradiations.* Upon receipt of an application requesting that radioisotopes be produced through a service irradiation, the Commission may authorize such irradiation and subsequent possession and use of the irradiated materials in accordance with the regulations contained in this part.

AUTHORIZATIONS

§ 30.30 *Issuance.* Upon approval of an application, the Commission will issue an "Authorization for Radioisotope Procurement," Form AEC–374. The authorization shall be the only valid approval for procurement, and its issuance shall be based upon the representations in the application and shall be subject to and in accordance with the regulations in this part and the terms and conditions stated in the application.

§ 30.31 *Nontransferability.* The persons to whom an authorization has been issued shall be deemed the holder thereof, and none of the rights or privileges conferred by the authorization shall be transferable.

§ 30.32 *Expiration.* An authorization shall be valid only for the period stated thereon; it shall expire at the end of such period without the necessity of notice or warning from the Commission. The holder shall not order radioisotopes after the period of validity stated on the authorization has run.

§ 30.33 *Modification.* Upon written request from the holder of an authorization for a modification of its terms, the Commission will usually consider the request without requiring a separate application, and it may modify the authorization by giving written notice to

or by issuing a supplemental
tion.

Revocation. Any authoriza-
ay be annulled, suspended, or re-
at any time in the discretion of the Commission upon a determination by the Commission that the public health or safety requires such action, or that the holder has willfully failed to comply with any term or condition to which his authorization may be subject. In the absence of such determination, no annulment, suspension, or revocation of any authorization will be made except upon request of the holder thereof, or unless conduct or other facts meriting such action shall have been called to the attention of the holder previously in writing, and unless he shall have been accorded opportunity to comply with all lawful requirements but shall have failed to do so.

POSSESSION, TRANSFER, USE

§ 30.40 *Limitations.* No person shall possess, use, or transfer radioisotopes except as permitted by a valid authorization from the Commission or as otherwise permitted by the regulations in this part. When transferring any nonexempt items or quantities of radioisotopes, the transferor shall limit delivery to the locations, materials, and quantities stated in the transferee's authorization.

§ 30.41 *Authorized use.* Each person authorized by the Commission to use radioisotopes shall confine his use to the locations and purposes approved by the Commission on his authorization, and such use is subject to all applicable laws, regulations of the Commission, and terms and conditions stated in the application for such material.

NOTE: Shipment and use of radioisotopes may also be subpect to control by other authority; see, for example, (a) Federal Food, Drug, and Cosmetic Act and the general regulations for its enforcement, (b) Rules and Regulations of the Interstate Commerce Commission, (c) Civil Air Regulations, (d) Postal Laws and Regulations, and (e) Laws and Regulations of State or other local authority.

RECORDS, REPORTS, INSPECTIONS

§ 30.50 *General records.* Each person who possesses or uses radioisotopes shall keep permanent records showing the receipt, use, storage, delivery, and disposal of such radioisotopes, and the safety measures used to protect health. These records shall be accurate and complete and shall be made available to the Commission upon request.

§ 30.51 *Overexposure records.* No report of the overexposure of a person to radioisotopes need be forwarded to the Commission, but where an overexposure is believed to have occurred, the occurrence and its observed effect upon the overexposed person shall be recorded in detail and filed with the general records.

§ 30.52 *Reports of use.* Upon written request from the Commission, any person who uses radioisotopes shall report fully the use made, stating substantially those facts required by §§ 30.50 and 30.51 to be recorded.

§ 30.53 *Reports of transfer.* In the absence of written waiver by the Commission, any person who transfers radioisotopes to another person shall promptly report to the Commission each delivery made, indicating the name and location of the transferee, transferee's authorization number, type and amount of material transferred, and date of delivery.

§ 30.54 *Inspections.* Each person who possesses or uses radioisotopes shall permit the Commission, at all reasonable times, to make such inspections of the facilities wherein materials are stored or used as the Commission deems necessary, and shall make available to the Commission the records required by §§ 30.50 and 30.51.

VIOLATIONS

§ 30.60 *Right to recall.* The Commission may withhold or recall radioisotopes from any person when it is determined by the Commission that such person (a) is not equipped to observe

the health and safety standards established by the Commission, or has failed to do so; or (b) has used the material in a manner other than as disclosed in the application therefor; or (c) has used the material in violation of any law or of any regulation of the Commission.

§ 30.61 *Other action.* Any person who violates any provision of the regulations in this part, or who, in connection with the regulations in this part, willfully conceals a material fact or furnishes false information to the Commission, may be prohibited by the Commission from making or obtaining further deliveries of radioisotopes or using, possessing, or storing them, and may be required to return to the Commission all radioisotopes remaining on hand. Violation of the regulations contained in this part or the furnishing of false information in connection with applications, statements and reports thereunder may also be a crime under the provision of the Atomic Energy Act of 1946 or of 18 U. S. C. 1001, act of June 25, 1948, 62 Stat. 749.

SCHEDULES

§ 30.70 *Schedule A: Exempt items.* (See § 30.13.) None.

§ 30.71 *Schedule B: Exempt quantities.* (See § 30.13.)

(a) *Alpha emitters.* None.

(b) *Beta and gamma emitters.* Not more than a combined total of 0.011 millicurie, made up as follows:

(1) Half-lives no greater than 30 days: Not more than 0.010 millicurie.

(2) Half-lives greater than 30 days: Not more than 0.001 millicurie.

(c) *Neutron emitters.* None.

NOTE: The quantities listed in Schedule B are not to be interpreted or considered as having any bearing on the determination of safe permissible levels of personnel exposure or for waste disposal. It is the Commission's intention to publish at a later date and incorporate in this part appropriate health and safety standards.

Effective date. The regulations in this part shall become effective upon publication of this part in the Federal Register.

Dated this 9th day of April 1951.

M. W. BOYER,
General Manager.

PART 60—DOMESTIC URANIUM PROGRAM

GUARANTEED MINIMUM PRICE FOR URANIUM-BEARING CARNOTITE-TYPE OR ROSCOELITE-TYPE ORES OF COLORADO PLATEAU AREA

[Domestic Uranium Program Circular 5, Revised]

Section 60.5 and § 60.5a of Title 10, Code of Federal Regulations, are amended by increasing the prices and premiums to be paid after March 1, 1951, for uranium ores so that § 60.5 and § 60.5a, as amended, shall read as follows:

§ 60.5 *Guaranteed minimum price for uranium-bearing carnotite-type or roscoelite-type ores of the Colorado Plateau area* — (a) *Guarantee.* To stimulate domestic production of uranium-bearing ores of the Colorado Plateau area, commonly known as carnotite-type or roscoelite-type ores, and in the interest of the common defense and security, the United States Atomic Energy Commission hereby establishes the guaranteed minimum prices specified in § 60.5a effective during the period, March 1, 1951, through March 31, 1958, for the delivery of such ores to the Commission at Monticello, Utah, in accordance with the terms of this section and § 60.5a.

NOTE: In §§ 60.1 and 60.2 (Domestic Uranium Program, Circulars No. 1 and 2), the Commission established guaranteed prices for other domestic uranium-bearing ores, mechanical concentrates, and refined uranium products.

(b) *Effect on §§ 60.3 and 60.3a.* Sections 60.3 and 60.3a, which also apply to carnotite and roscoelite ores, are not revoked by the issuance of this section and § 60.5a and sellers may elect to deliver ore under the provisions of §§ 60.3 and 60.3a rather than under this section and 60.5a, at their option, during the unexpired terms of §§60.3 and 60.3a (through April 11, 1951). It is

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believed, however, that in most cases the provisions of this section and § 60.5a will be more favorable to producers.

(c) *Definitions.* As used in this section and in § 60.5a, the term "buyer" refers to the U. S. Atomic Energy Commission, or its authorized purchasing agent. The term "ore" does not include mill tailings or other mill products. The term "seller" refers to any person offering uranium ores for delivery to the Commission. Weights are avoirdupois dry weights, unless otherwise specifically provided.

(d) *Deliveries of not to exceed 1,000 tons per year.* To aid small producers, any one seller may deliver without a written contract but otherwise in accordance with this circular up to, but not exceeding, 1,000 short tons (2,000 pounds per ton) of ores during any calendar year.

(e) *Deliveries in excess of 1,000 tons per year.* Sellers desiring to deliver in excess of 1,000 short tons (2,000 pounds per ton) of ores during any calendar year will be required to enter into a contract with the Commission providing for, among other things, a rate of delivery and the total quantity of ore to be delivered.

(f) *Delivery.* Seller, at his own expense, shall deliver and unload all ores at the buyer's depot at Monticello, Utah. Deliveries shall be in lots of not less than 10 short tons (2,000 pounds per ton) unless special arrangements have been agreed upon by buyer, but such lots may be delivered in more than one load. Days and hours during which ore may be delivered will be posted at the depot.

(g) *Weighing, sampling, and assaying.* Buyer will bear the cost of weighing, sampling, and assaying. The net weight of each load will be determined by the buyer's weighmaster on scales which will be provided by the buyer at or in the vicinity of the purchase depot and such weight will be accepted as final. A weight ticket will be furnished seller or his representative for each load. Each lot of ores will be sampled promptly by the buyer according to standard practice and such sampling will be accepted as final. Seller or his representative may be present at the sampling at his own expense. The absence of seller or his representative shall be deemed a waiver of this right. Buyer will make moisture determinations according to standard practices in ore sampling. All final samples will be divided into four pulps and distributed as follows: (1) The seller, or his representative, will receive one pulp; (2) the buyer will retain one pulp; (3) the other two pulps will be reserved for possible umpire analysis. The buyer's pulp will be assayed by the buyer. The seller may, if he desires, and at his own expense, have his pulp assayed by an independent assayer. In case of disagreement on assays as to any constituent of the ores, an umpire shall be selected in rotation from a list of umpires approved by the buyer whose assays shall be final if within the limits of the assays of the two parties; if not, the assay which is nearer to that of the umpire shall prevail. The party whose assay is the farther from that of the umpire shall pay the cost of the umpire's assay for the constituent of the ores which is in dispute. In the event that the umpire's assay is equally distant from the assay of each party, costs will be split equally. In case of seller's failure to make or submit assays, buyer's assays shall govern. After sampling, the ores may be placed in process, commingled, or otherwise disposed of by buyer.

(h) *Payment.* Buyer will make payment promptly but payment will not be made until an entire minimum lot of ten short tons (2,000 pounds per ton) has been delivered and accepted, unless special arrangements have been agreed upon by buyer, in which case there may be an extra charge for assaying and sampling. Moisture determinations, analyses and settlement sheets, together with the check in payment, will be mailed to seller.

(i) *Inquiries.* All inquiries concerning the provisions of this section and

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(j) *Licenses.*
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(k) *Limitation*
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§ 60.5a, offers to deliver ores, or questions about the Commission's domestic uranium program in the Colorado Plateau area should be addressed to:

United States Atomic Energy Commission, Post Office Box 270, Grand Junction, Colo.; Telephone: Grand Junction 3000.

(j) *Licenses.* Arrangements will be made by the Commission for the issuance of licenses, pursuant to the Atomic Energy Act of 1946, covering deliveries of source material to the Commission under this section and § 60.5a.

(k) *Limitation of commitment.* Commitments by the Commission to accept delivery of ores are limited to the provisions of this section and § 60.5a as amended from time to time, or to written contracts between the Commission and sellers. Other commitments purporting to be made by the Commission's field personnel or other agents of the Commission will not bind the Commission unless they are in accord with the provisions of this section and § 60.5a or other official circulars.

§ 60.5a *Schedule I; minimum prices, specifications, and conditions*—(a) *Prices.* Payment for delivery of the ores will be computed on the following basis:

(1) *Uranium.* (i) Ores assaying less than 0.10 percent: no payment. Any such ores which are delivered to the purchase depot shall, unless otherwise specifically agreed to by buyer, become the property of the buyer as liquidated damages for buyer's expense of weighing, sampling, and assaying, and after sampling may be placed in process, commingled, or otherwise disposed of by buyer. If seller has any question as to the quality of his ore, it is suggested that before shipment and delivery to the purchase depot a representative sample be submitted to the buyer or to one of the umpires for assay at seller's expense. The buyer at its discretion may assay a limited number of samples without charge.

(ii) Ores assaying 0.10 percent U_3O_8 and more, as follows:

U_3O_8 assay:	*Payment per pound U_3O_8*
0.10 percent	$1.50
0.11 percent	1.70
0.12 percent	1.90
0.13 percent	2.10
0.14 percent	2.30
0.15 percent	2.50
0.16 percent	2.70
0.17 percent	2.90
0.18 percent	3.10
0.19 percent	3.30
0.20 percent and more	3.50

(iii) Premiums on uranium: $0.75 per pound for each pound of U_3O_8 in excess of 4 pounds U_3O_8 per short ton (2,000 pounds per ton) of ore and an additional premium of $0.25 per pound for each pound in excess of ten pounds U_3O_8 per short ton. Fractional parts of a pound will be paid for on a pro rata basis to the nearest cent.

(2) *Vanadium.* V_2O_5 at $0.31 per pound up to, but not exceeding, ten pounds of V_2O_5 for each pound of U_3O_8 contained in ores. No factor will be included for V_2O_5 in excess of ten pounds for each pound of U_3O_8, although buyer may, from time to time, publicly announce that, for limited periods by written agreements with individual producers, V_2O_5 in excess of ten-to-one will be paid for. Any such announcement will be made by posting a notice to this effect at the Monticello depot and through such other channels as are deemed suitable to achieve maximum dissemination among producers. Excess V_2O_5 shall be deemed to be buyer's property.

(3) *Allowances.* (i) A development allowance of $0.50 per pound U_3O_8 contained in ores assaying 0.10 percent U_3O_8 or more in recognition of the expenditures necessary for maintaining and increasing developed reserves of uranium ores. Fractional parts of a pound will be paid for on a pro rata basis to the nearest cent. Sellers accepting this allowance are deemed to agree to spend such funds for the development or exploration of their properties. Sellers delivering less than 1,000 short tons per calendar year will not be

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required to submit an accounting record of expenditures for development or exploration pursuant to this agreement but sellers delivering in excess of 1,000 short tons per calendar year will be required, under the terms of their contracts, to submit proof satisfactory to the Commission that funds equivalent to the amount received as development allowance have been spent for development or exploration either during the contract period or within six months thereafter, unless othewise provided in the contract.

(ii) A haulage allowance of 6¢ per ton mile for transportation of ore paid for under §§ 60.5 and 60.5a from the mine where produced to the purchase depot specified by the Commission, up to a maximum of 100 miles. The haulage distance from the mine to the purchase depot will be determined by the Commission and its decision will be final. Tonnages for purposes of this allowance shall be calculated on the basis of natural weights rather than dry weights.

(4) *Adjustment of assays.* Assays shall be adjusted to the nearest 0.01 percent for purposes of payment.

(b) *Quality and size.* Ores will not be accepted by buyer under §§ 60.5 and 60.5a which, in buyer's judgment:

(1) Contain less than 0.10 percent U_3O_8;

(2) Contain more than three parts of lime ($CaCO_3$) to one part of V_2O_5 or a total of more than 6 percent lime in the ore;

(3) Contain impurities deleterious to buyer's extraction process or for any other reason are not amenable to it;

(4) Contain lumps in excess of twelve inches in size.

NOTE: The Commission will be interested in discussing arrangements for delivery to it of types of uranium-bearing materials other than those for which guaranteed prices have been established, such as tailings, mill products, and ores of types not acceptable under §§ 60.5 and 60.5a.

(60 Stat. 755–775; 42 U. S. C. 1801–1819. Interpret or apply sec. 5, 60 Stat. 761, 42 U. S. C. 1805)

Effective March 1, 1951 through March 31, 1958.

Dated at Washington, D. C., this 26th day of February 1951.

By order of the Commission.

M. W. BOYER,
General Manager.

BONUS FOR INITIAL PRODUCTION OF URANIUM ORES FROM DOMESTIC MINES

[Domestic Uranium Program Circular 6]

§ 60.6 *Bonus for initial production of uranium ores from new domestic mines*—(a) *What this section does.* This section provides for bonus payments for initial and certain other production of uranium-bearing ores. It is intended to encourage and assist the development of new sources of domestic uranium production in the interest of the common defense and security.

(b) *Production bonus established.* The United States Atomic Energy Commission will pay a bonus under the conditions set forth in this section for delivery to a Commission ore-buying station or a qualified uranium mill (hereafter called station or mill) of uranium ores from an eligible mining property up to the maximum quantities specified in this section.

(c) *Term of this section.* This section will apply to deliveries made under its terms between March 1, 1951, and February 28, 1954, inclusive.

(d) *Payment of the bonus.* Bonus payments will be computed on the following basis:

Ores assaying less than 0.10 percent U_3O_8: no payment.

Ores assaying 0.10 percent U_3O_8 and more, as follows:

U_3O_8 assay:	*Payment per pound of U_3O_8*
0.10 percent	$1.50
0.11 percent	1.70
0.12 percent	1.90
0.13 percent	2.10
0.14 percent	2.30
0.15 percent	2.50
0.16 percent	2.70
0.17 percent	2.90
0.18 percent	3.10
0.19 percent	3.30
0.20 percent and more	3.50

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Payment per pound of U_3O_8
$1.50
1.70
1.90
2.10
2.30
2.50
2.70
2.90
3.10
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3.50

ore

Fractional parts of a pound will be paid for on a pro rata basis to the nearest cent. Assays will be adjusted to the nearest 0.01 percent for purposes of payment. Weights are avoirdupois dry weights. Bonus payments made under this section will be in addition to any other payments for delivery of the ore. They will be paid directly by the Commission and not by the station or mill.

(e) *Maximum quantity of uranium ores for which bonus payments will be made.* Subject to the conditions of this section, bonus payments will be made on deliveries of uranium ore from an eligible mining property to a station or mill until bonus payments have been made on 10,000 pounds of contained uranium oxide less the number of pounds, if any, accepted by stations or mills (or any other uranium ore processing plants) from that mining property between April 9, 1948, and February 28, 1951, inclusive.

(f) *Ores for which bonus payments will be made.* Ores for which bonus payments will be made must have been delivered to and paid for by either a station or mill. However, in special cases, bonus payments may be made for ores which have been accepted by the station or mill but for which payment is still pending. Bonus payments will not be made for ores which a station or mill refuses to accept. The weights and final assays made to ascertain the amount of payment due from the station or mill shall be used to determine the amount of bonus payments under this section.

(g) *Which mining properties are eligible.* In order for a mining property to be eligible for bonus payments under this section,

(1) as required by paragraph (e) above, the total quantity of uranium oxide as contained in ore accepted by stations or mills (or any other uranium ore processing plants) from that property between April 9, 1948, and February 28, 1951, inclusive, must have been less than 10,000 pounds; and

(2) the property must be within the United States, its territories, possessions or the Canal Zone; and

(3) the property must be certified by the Commission as eligible using the following criteria as guides:

(i) *Purpose of the bonus.* The purpose of the bonus is to encourage and assist the development of new sources of domestic uranium production.

(ii) *Character of mining property.* The mining property may consist of a placer or lode location, or if not covered by location, a tract which the Commission finds to be comparable or otherwise appropriate. However, an entire holding consisting of contiguous locations or tracts will be regarded as only a single eligible unit of mining property if the locations or tracts are held in common in the manner set forth in the following paragraph.

(iii) *Title or interest of the holder of the property.* The title or interest in the mining property should be one of ownership or lawful possession of mining rights. This type of holding will generally be that of an owner or leaser (lessee). It is recognized that there are various arrangements such as split check leases, piece rate contracts and the like whereby persons either as employees or independent contractors conduct mining operations on designated areas of property held by another who also supplies certain of the mining services or equipment or both and who receives in return a percentage of the proceeds of the ore produced. In the case of such arrangements, the person who grants the right to conduct these mining operations will be considered as the holder of the mining property although others perform mining operations on it.

(iv) *Minimum size of mining property.* The mining property, if it is made up of a location or locations, should contain at least 15 acres. The minimum size of lands on Indian reservations will be established by the Commission after consultation with the Bureau of Indian Affairs of the Department of Interior. The minimum size of other mining prop-

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erties will be established by the Commission in individual cases in the light of the purpose of the bonus.

(v) *Subdivision or consolidation of property.* Since the division of existing mining properties into smaller units might have the effect of increasing bonus payments without advancing the purpose of the bonus program, division of a single unit of mining property on or after March 1, 1951, will not be recognized in determining its eligibility for bonus payments under this section. In addition, consolidation or merger of contiguous mining properties on or after March 1, 1951, will not affect the eligibility of the separate properties for bonus payments.

(vi) *Special cases.* Since the above criteria are merely guides to assist the Commission in its decisions, areas which fail to meet all of the criteria may be certified by the Commission as eligible in special cases where it is determined that the deviations are not substantial or that their disqualification would cause serious inequities. In determining whether or not serious inequities would result, the physical characteristics and location of the deposit may be a factor. Under appropriate circumstances, a segment of a certified property may itself be certified as eligible. On the other hand, technical compliance with all the above criteria will not necessarily make a property eligible. Properties leased to private operators by the Commission will not be eligible for bonus payments except under special circumstances and as provided for in the lease.

(h) *Determination by the Commission.* The Commission expressly reserves the right to decide the amount of any bonus payments to be made, whether the property should be certified as an eligible mining property, the person to whom the bonus should be paid and whether for any reason a bonus is not payable. These decisions shall rest in the sole discretion of the Commission and shall be final and conclusive. The Commission further reserves the right to establish procedures to carry out the bonus program. Any bonus payments made hereunder with respect to particular ores shall be the only such bonus payments made for those ores. The Commission will not consider any other application for bonus payments on those ores.

(i) *Application for certification.* Applications for certification of a property as eligible should be made to:

United States Atomic Energy Commission,
Colorado Raw Materials Office,
Post Office Box 270,
Grand Junction, Colo.

The application should include a description of the mining property indicating its size, location, ownership, interest of the applicant and public recording. There should also be included a statement by the applicant that to the best of his knowledge the total quantity of uranium oxide contained in ore accepted by stations or mills (or any other uranium ore processing plants) from that property between April 9, 1948, and February 28, 1951, inclusive, was less than 10,000 pounds. A form prescribed by the Commission and obtainable at a station or mill should be used for supplying the above information. Certification by the Commission will be a prerequisite to payment of the bonus, but after certification, payments will be made for ores which are delivered before certification and which meet the requirements of this section. Normally certification will not be made before uranium deposits have been discovered on the property, but the Commission may issue certifications prior to discovery in special cases. The Commission reserves the right to revoke a certification if it determines that its issuance was based on fraud, misrepresentation or mistake or if the requirements of this section are not complied with. The Commission may require such information and right to make such inspections of the mining property as it finds necessary for the purpose of

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determining its eligibility for bonus payments and the amounts to be paid.

NOTE: Misrepresentation or falsification of facts in an application for certification or for bonus payments may subject the offender to criminal penalties under pertinent provisions of the United States Code including section 1001 of Title 18. Any such offenses also will disqualify the offender from receiving bonus payments.

(j) *Application for bonus payment.* Application for a bonus payment should be made on a prescribed form (obtainable at a station or mill) at intervals not more frequent than once a month during a period when ore deliveries from the property are believed to meet the requirements of this section. Applications may be addressed as follows:

United States Atomic Energy Commission,
Colorado Raw Materials Office,
Post Office Box 270,
Grand Junction, Colo.

In addition to the application, the Commission may require such other information as it finds necessary.

(k) *Who may apply for bonus payments.* The person (other than a royalty payee or the like) who has lawfully received payment from a station or mill for the delivery of ore from a certified mining property may apply for bonus payments under this section. However, in special cases, the applications of persons whose ores have been accepted by the station or mill but for which payment is still pending will be considered.

(l) *Mill processing ores from its own mines.* In the event that an operator of a mill processes in the mill ores which it obtains from mining properties operated by it, the Commission will pay the bonus under the conditions set forth in this section to the same extent as if the mining properties were operated by another person who delivered ore to the mill and received payment for it from the mill. In such case, however, the weights and assays used to fix the amount of payment due as a bonus under this section shall be determined in accordance with practices satisfactory to the Commission.

(m) *Definitions.* As used in this section,

(1) "Commission" means the Atomic Energy Commission created by the Atomic Energy Act of 1946, or its duly authorized representative.

(2) "Person" means any individual, corporation, or partnership, firm, association, trust, estate, public or private institution, group, or combination thereof. The term "person" shall not include the United States or any agency thereof or any officer or employee of the Commission.

(n) *Commission ore-buying stations and qualified uranium mills.*

(1) *Stations.* The following are Commission ore-buying stations (that is, ore-buying stations operated on behalf of the Commission):

American Smelting & Refining Co., Monticello, Utah.
American Smelting & Refining Co., Marysvale, Utah.

(2) *Mills.* The following are qualified uranium mills:

United States Vanadium Co., Uravan, Colo.
United States Vanadium Co., Rifle, Colo.
Climax Uranium Co., Grand Junction, Colo.
Vanadium Corp. of America, Durango, Colo.
Vanadium Corp. of America, Naturita, Colo.
Vanadium Corp. of America, Hite, Utah.
Vitro Chemical Co., 600 West Thirty-third St., South Salt Lake City, Utah.

(3) *Modificatoins.* These lists may be modified from time to time by public announcement of the Commission.

(o) *Inquiries and communications.* Inquiries about this section and all other communications should be addressed as follows:

United States Atomic Energy Commission,

Colorado Raw Materials Office,
Post Office Box 270,
Grand Junction, Colo.

(p) *Records, rules and regulations.* The Commission may require applicants for bonus payments under this section to keep for Commission inspection such records concerning production and deliveries of uranium ores for which application is made as it finds proper and may issue such additional rules and regulations relating to bonus payments as it finds necessary or desirable.

Dated at Washington, D. C., this 27th day of June 1951.

By order of the Commission.

M. W. BOYER,
General Manager.

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APPENDIX 7

Report to the President by the Atomic Energy Labor Relations Panel

December 1, 1950 to June 1, 1951

During the period December 1, 1950, to May 31, 1951, the Atomic Energy Labor Relations Panel closed its files on five cases. As of June 1, 1951, two cases are still open. Three of the closed cases, numbers 16, 19, and 20, and one of those remaining open, number 17, were first referred to in our previous report.

Of the five completed cases, two were settled following recommendations by the Panel; one settlement based upon Panel recommendations, is awaiting Wage Stabilization Board approval; in one case the parties were referred to the National Labor Relations Board since the matter involved a question of union recognition; and one case was settled by the parties after Panel mediation.

For the full year June 1, 1950, to May 31, 1951, the record now stands: six cases settled by recommendation, four settled as the result of mediation, one case referred to the National Labor Relations Board, and two cases still open.

For proper perspective, these figures should be related to the total labor relations picture of the atomic energy program. As of May 15, 1950, there were 22 contractors operating production or laboratory facilities. This figure does not include construction contractors nor contractors at plants not yet in actual production, nor does it reflect multiple plant operations, e. g., Union Carbide and Carbon which operates two plants and a laboratory, the General Electric Co. which operates two plants, and the Monsanto Chemical Co. and the University of California, each of which operates two laboratories.

During the period from May 15, 1950, to May 15, 1951, 48 agreements were negotiated or amended by the 22 contractors and the unions representing their employees. During this same period the Panel was called into 13 disputes and has issued recommendations in 6.

This means that 73 percent of the negotiations were completed without reference to the Panel. The Panel was invoked in the remaining 27 percent of the negotiations and issued recommendations in 12 percent. While this record reflects far more outside interference with the collective bargaining process than the Panel believes to be either healthy or necessary, it nevertheless falls far short of the prediction that the existence of the Panel would destroy collective bargaining.

In the period ahead, questions of wage increase will, of course, be subject to the general regulations or the explicit approval of the Wage Stabilization Board.

A summary of the cases handled during the period covered by this report follows:

CASE NO. 16. AEC INSTALLATION: Sandia Laboratory, Albuquerque, N. Mex.; PARTIES: Sandia Corp., subsidiary of Western Electric Co.; Atomic Projects and Production Workers, Metal Trades Council (AFL).

The early history of this case is contained in our previous report. On November 9, 1950, the Panel issued recommendations covering eight of the items which the Panel considered to be the major stumbling block to an agreement. Within the framework of these recommendations, the parties continued negotiations, settling most of the remaining items. On December 4, 1950,

however, the Panel was informed that a deadlock had been reached and further progress could not be made.

Accordingly, Panel members Horvitz and Witte, accompanied by Panel secretary Straus, met with the parties at the Sandia Base. In the course of these meetings progress was made in ironing out several of the remaining issues. On January 12, 1951, it appeared that another set of recommendations would be required before an agreement could be reached. Before departing from Albuquerque, the Panel members issued their recommendations.

On January 16, 1951, the Panel received a telegram from the parties indicating that the complete set of recommendations had been accepted and that an agreement had been signed.

CASE NO. 17. AEC INSTALLATION: Knolls Laboratory, Schenectady, N. Y.; PARTIES: General Electric Co.; International Union of Electrical, Radio & Machine Workers, Local 301 (CIO).

This dispute was first drawn to the Panel's attention on August 22, 1950, when it received a letter from Local 301 enclosing a resolution requesting Panel intervention. As previously reported, as of December 1, formal jurisdiction of this dispute had not yet been taken.

A national agreement between the General Electric Co. and the IUE (CIO) became effective as of September 15, 1950.

On November 30, 1950, the Panel received a letter from Jack Suarez, President of Local 301, informing the Panel that negotiations for a local agreement under the provisions of the national contract had broken down, and requested that the Panel intervene "in order to avert any possible discontinuing of work necessary for the prosecution of the National Defense Program."

The Panel replied to Mr. Suarez, stating that Panel procedures required that requests for intervention which originate with a local union must be channeled through the international office.

On January 25, 1951, the Panel received the following telegram from Mr. Suarez:

> "Local 301, Atomic Workers, IUE (CIO) voted last night to strike at the General Electric Co. atomic installation at time set by the Executive Board."

After telephone calls to top officials of the Company and to International IUE President James Carey, the Panel arranged a meeting of the parties for February 6 and at the same time obtained an indefinite postponement of strike action.

On March 14 the Panel received a telegram from President Carey indicating that negotiations had been exhausted. Carey referred to the strike vote of the membership in January, and again urged the Panel to take jurisdiction. The contents of this telegram were transmitted to the Company for its comment.

On March 22 the Company replied that most of the items in dispute as of January 16 had been settled and those still remaining open were either "quite insignificant in character" or "contrary to the terms in the national contracts."

On March 31, a letter was received from Benjamin C. Sigal, general counsel for the IUE, setting forth the background of the dispute in some detail, and listing four issues which remained in disagreement. These issues were:

1) A request for a change in day shift working hours;
2) A request for automatic progression schedules for skilled workers;
3) An adjustment of the rates for classifications covering 95 employees out of 425 in the bargaining unit, based upon the burden and discomfort of wearing very cumbersome devices as protection against the danger of serious injury or disease;
4) Pay for Labor Day holiday, September 4, 1950, for "95 people who were improperly denied holiday pay."

In this letter Mr. Sigal stated that "neither State nor Federal mediation

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services were invoked to settle this dispute prior to its submission to the Atomic Energy Labor Relations Panel. This course was followed because we were convinced, after months of negotiations, that such action would be useless, and we were constrained to avoid any further delays."

The Panel replied to Mr. Sigal on April 5, saying, in part:

"You give two reasons for wishing the Panel to waive this normal procedure (entrance of the Federal Mediation and Conciliation Service before Panel intervention); the urgency of the matter and the belief that mediation by the Service would be futile.

"In respect to the first reason, the Panel believes that a further short delay compared to the span of time that has already elapsed since November 13, cannot outweigh the benefits of mediation by the Federal Mediation and Conciliation Service.

"In respect to the second, the Panel cannot accept your conclusion that such an effort would be futile. Therefore the Panel requests that you meet again with the Company, this time under the auspices of the Federal Mediation and Conciliation Service."

On April 13 the members of Local 301 received notification from Mr. Suarez that strike action would commence at 7 a. m., on April 16. This message, which described the background of the dispute in some detail, concluded with the following sentence:

"Your Executive and Negotiating Committee is exercising the right that the membership granted it on January 24 to force 'Davis Panel' intervention in support of our local demands."

That was on a Friday. Over the weekend, through the efforts of the Federal Mediation and Conciliation Service, strike action was again indefinitely postponed.

On April 26 the Panel received the following telegram from Mr. Suarez:

"Very urgent that I receive information concerning date Davis Panel intends to act upon our case . . . Unrest very high in the plant. Strike of April 16 postponed temporarily pending Davis action."

On April 27 the Panel received a telegram from the Federal Mediation and Conciliation Service saying that the negotiations had failed to result in an agreement and that the Service had "no objection to Panel proceeding in disposing of this dispute."

On May 10 the Panel informed the parties that it had arranged a meeting for June 7 in Schenectady.

As of June 1 this matter is still pending.

CASE NO. 19. AEC INSTALLATION: Hanford Works, Richland, Wash.; PARTIES: General Electric Co.; Hanford Atomic Metal Trades Council (AFL.).

The events leading up to the assumption of jurisdiction by the Panel were set forth in our previous report.

The Panel met with the parties at the Hanford Works, Richland, Wash., during the week of December 18, 1950. The dispute was over the amount of a wage increase to be negotiated under a wage reopening clause. The Union requested 20 cents per hour, the Company's offer was 3 percent, or 5.6 cents, which, on top of a 3 percent increase paid in May of 1950, would have brought the total increase for 1950 up to 6 percent.

The Company supported its offer with the following major arguments:

1) The proposed increase was slightly above the Company-wide pattern of increases negotiated with other unions in its private operations;
2) Based on the BLS Consumers' Price Index for the Richland area, the 3 percent more than compensated for the post-Korean war increase, which, as of November 1 amounted to 2.7 percent;

3) According to a Company survey, wage rates at the Hanford Works were already 10 percent above the area, and the Company offer would boost the Hanford rates to 13 percent above the area.

The Union based its demands on the following major points:

1) The 3 percent negotiated in the spring was meant specifically to compensate for a rent increase which had occurred in August of 1949, and therefore should not be considered part of the 1950 package;
2) Although the BLS survey indicated a rise of only 2.7 percent, a privately conducted Union survey revealed an increase closer to 11 percent;
3) While the wage level at Hanford was admittedly above the level of wages in the surrounding area for similar jobs, the differential since 1947 had been considerably narrowed. The Union contended that the original differential should be maintained.

In the course of its mediation efforts, the differences between the parties was considerably narrowed. Nevertheless, on December 20, 1950, the Panel concluded that no agreement could be obtained and informed the parties that it would issue a recommendation.

Accordingly, on January 22, 1951, the Panel recommended that:

> "The Company's offer be accepted, i. e., a wage increase of 3 percent of the rates in effect on July 2, 1950, with a minimum of 4 cents an hour, to be effective September 18, 1950."

In issuing this recommendation, the Panel stated, in part, as follows:

> "The first responsibility of the Panel has been to decide how the change in living costs for families in Richland is to be measured. There can be no reasonable doubt in our judgment that the best available measure is the BLS study published early in November 1950, reporting an increase in the Richland index of 2.7 percent between May 15 and November 1, 1950.
>
> "We have given full consideration to the partial study reported in Item IX of the Council's brief. It falls very far short of giving a basis for rejecting or modifying the BLS study. The measurement or estimate of changes from one date to another in retail prices of the goods and services that make up the 'market basket' or 'cost of living' of an average family of moderate income is just about as difficult and specialized a statistical undertaking as anything that can be imagined and the results can never be better than an approximation; but the BLS index has become, in recent years, more and more widely recognized by organized labor and by employers as a reasonably satisfactory, and the best available, measure of such changes. It has in effect become a conventional yardstick in wage negotiations. The Panel has no choice but to adopt it here."

The Panel also found that the Company's offer was "reasonably in accord on its face with the 1950 pattern of increases, unless, as the Council contends, the mid-year increase of 3 percent was made as compensation for the rent increase of 1949."

The Panel concluded that this was a matter which led into a field quite different from that of an interim wage adjustment, which was, in theory, to protect employees from losses due to current and unpredictable economic changes. In this connection, the Panel stated that it had no views to express concerning this problem of rent, other than to make the suggestion that if this question should arise at the end of the contract period, the parties "should try first to reach some reasonable core of common understanding and agreement about the facts."

On February 23, 1951, the Panel received word that the parties had executed a formal agreement providing for the wage adjustments recommended.

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CASE NO. 20. AEC INSTALLATION: Los Alamos, N. Mex.; PARTIES: International Brotherhood of Electrical Workers, Local 611 (AFL); International Union of Operating Engineers, Local 9 (AFL).

On October 13, 1950, the Panel received a letter from the International Union of Operating Engineers, AFL, requesting that the Panel help settle a dispute between that Union and the International Brotherhood of Electrical Workers, AFL. The dispute was over the manning of a new steam generating and power plant at Los Alamos, N. Mex.

Investigation by the Panel revealed that this matter involved a question of the proper bargaining unit, and a letter, containing the following paragraph, was sent to the parties on December 12:

> "The National Labor Relations Board furnishes the established procedures for settling this type of dispute. The Panel will not, at this stage, enter the case. Meanwhile, the Panel expects that the parties will maintain production and will do nothing to disturb the essential work of this atomic energy facility."

The Panel has heard nothing further concerning this matter and considers the case closed.

CASE NO. 21. AEC INSTALLATION: Hanford Project, Richland, Wash.; PARTIES: Atkinson-Jones Construction Co. International Union of Operating Engineers, AFL, Local 370.

This matter was first brought to the Panel's attention by a telegram received on November 24, 1950, from William E. Maloney, General President of the International Union of Operating Engineers. His message indicated that there had been a breakdown in negotiations between the Operating Engineers and the Atkinson-Jones Construction Co. at the Hanford Project over the terms of a renewed agreement. Wages were not in dispute, since they had already been established, although not yet put into effect, in accordance with an area agreement between this Union and the Associated General Contractors.

Although the Federal Mediation and Conciliation Service had mediated in several sessions, a preliminary investigation indicated some hope that the FMCS could make further progress. Accordingly, the Panel sought and received from both sides a willingness to participate in further discussions under the auspices of the Service.

On January 19, 1951, the Panel received a telegram from Richard Gray, President of the Building and Construction Trades Department, AFL, submitting a dispute involving all of the craft unions signatory to the Hanford Works construction collective bargaining agreement. As later developments revealed, this telegram referred to two completely separate matters: (1) a dispute between the Operating Engineers and the Atkinson-Jones Co., which is the subject of this case; and (2) a dispute over isolation pay which is the subject of Case No. 23.

After untangling the separate ingredients of these two cases, the Panel found that the Operating Engineers' controversy contained nine issues. Several telephone conversations with the parties, however, made it clear that the nonpayment of the agreed upon wage schedule had created an atmosphere in which constructive negotiation was virtually impossible. As already stated, the wage increase was the product of an area agreement. The unresolved issues pertained to a contract of working rules covering only the employees on the Hanford job. The Company's position was that the wage rates, which were to become effective on January 1, should not be paid until the whole contract had been completed. The Union's position was that the area agreement covering wages had been completed and that the wages should therefore be paid.

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The Panel learned that the Company would be willing to pay the wages if, in return, the Union would agree to a stipulation limiting the other issues still in dispute. Further telephone conversations with the union officials in both Washington and at the Hanford project, and with the company officials, finally resulted in a stipulation satisfactory to both parties. The Union reduced the issues to two, and the Company promised to put the new wages into effect as soon as AEC reimbursement approval could be obtained. A Panel meeting for the purpose of handling the two open issues was scheduled for February 12 in New York City.

The open items were the Union's request for contract language which would (1) assure a qualified operator and oiler on duty to operate and assist mechanics in making field repairs or in changing attachments on shovels and draglines and other heavy equipment, and (2) forbid the assignment of work under the jurisdiction of the Operating Engineers to foremen belonging to any other union.

At the meeting in New York, Panel mediation resulted in a Company proposal for meeting the union demands on all essential points, with the proviso that the contents be put in a letter of understanding rather than in the body of the contract. The Union representatives reacted favorably to the proposal, but said that they would have to take it back to the membership for approval. On February 16, the Panel received a letter from President Maloney indicating that an agreement had been reached, and this case was thereupon closed.

CASE NO. 22. AEC INSTALLATION: Sandia Laboratory, Albuquerque, N. Mex.; PARTIES: Sandia Corporation, subsidiary of Western Electric Co.; Local 251, Office Employees International Union, AFL.

Panel assistance in a controversy between the Sandia Corp. and Local 251 of the Office Employees International Union was requested by telegram from Paul Hutchings, International President of the Union, on January 25, 1951. A Panel meeting was scheduled for February 14 in New York City. This dispute was over the terms of an initial agreement. The Office Workers unit was certified by the NLRB on September 8, 1950.

Because of a dispute over the definition of the unit, which was not resolved until January 5, 1951, bargaining on the substantive terms of the contract did not begin in earnest until after this date. The Federal Mediation and Conciliation Service assisted in the negotiations between January 11 and January 23.

There was a close relationship between the negotiations involving the office workers and those which included the production and maintenance workers, as reported in Case No. 16. Throughout the production and maintenance discussions, an international representative of the Office Workers Union actively participated, and it was clearly stated by this representative that he considered that the basic terms of the production and maintenance contract should apply to the Office Workers unit. However, when this dispute came to the Panel, the most difficult issues arose over requests made by both parties for deviations from the production and maintenance contract.

When the hearings began on February 14 there were 26 unresolved items. In the course of mediation all but seven of these were settled. The hearings were adjourned on February 16 with the seven unresolved issues defined, and a deadline of March 2 set for the submission of post-hearing briefs. On March 21 the Panel issued its recommendations for the settlement of this matter.

After several bargaining sessions there still remained some disagreement over interpretation of the intent of the Panel recommendations. In addition, the parties were unable at first to agree upon a procedure for submitting the cost items to the Wage Stabilization Board for approval. By April 14, with

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the aid of the Panel, the matters of interpretation were clarified and the necessary steps for Wage Stabilization Board approval were initiated. As of June 1, Wage Stabilization Board action is still pending.

CASE NO. 23. AEC INSTALLATION: Hanford Project, Richland, Wash.; PARTIES: Guy F. Atkinson Co. and J. A. Jones Construction Co.; Pasco-Kennewick Building & Construction Trades Council Negotiating Committee.

On January 19, 1951, the Panel received a telegram from Richard Gray, President of the Building and Construction Trades Department, AFL, asking aid in resolving a dispute between the Atkinson-Jones Co. and the various construction craft unions signatory to the Hanford Works Agreement, over an adjustment in isolation pay. Background briefs on the issue were requested from the parties and a meeting was scheduled for February 12. Upon the advice of representatives of both union and management, there appeared to be distinct advantages in holding the discussions in the east, and, accordingly, New York City was chosen.

The Hanford Works Construction Agreement covers all of the unions and the contractors engaged in cost-plus-fixed-fee construction at Hanford. The first agreement was executed in August of 1947 and was revised in August of 1948. It was automatically renewed in 1949 since neither party chose to exercise its right to reopen it for revision. In May of 1950 the unions reopened the contract. All matters, except for isolation pay, have been concluded by agreement between the parties.

The origin of isolation pay can be traced back to the following wording in the collective bargaining agreement of August 16, 1947:

> "Travel: It is recognized by Employer and Union that further consideration should be given to the problems of transportation and travel on the project because of the large area covered by it; it is agreed, therefore, that the amount and the mode of handling same for work within the barricaded area shall be left open for negotiation with the signatory unions prior to commencing construction in the barricaded area."

Subsequent negotiations amended the 1947 contract to include the subject of isolation pay which stated that: "in lieu of any travel and/or subsistence allowances, workers shall be granted isolation pay of $1.50 per day to employees living within North Richland and the Village of Richland, and $2 per day for employees living outside North Richland or the Village of Richland."

The amount of isolation pay has remained unchanged since 1947. It should be noted that the practice on major construction projects outside of the Hanford Works in respect to travel pay varies among the separate craft unions. Some agreements contain no provision whatsoever for travel pay, and for those unions the Hanford isolation pay represents an increased benefit. For those unions which have travel pay in their outside agreements, the Hanford arrangement is less than they would otherwise receive.

The contract itself is silent in respect to both the criteria upon which isolation pay was originally computed and the duration of the amounts specified. The Company contends that the original allowances were negotiated to remain in effect unchanged until the completion of all work under the present Atkinson-Jones contract, or for at least a 5-year period, which was originally forecast for the completion of the job.

In the fall of 1949 there was a sharp reduction in the operations, attended by the wholesale layoff of workers. The Union contends that this event was in effect the expiration of the original job and that for all practical purposes a wholly new job was begun in the spring of 1950. Under this interpretation the isolation pay allowances are properly the subject for renegotiation.

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In respect to criteria for computing isolation pay, a wide variety of theories was advanced by both sides, none of which could be supported by anything but the memory of the individuals who participated in the original negotiations.

At the hearings on February 12 and 13, the positions of the parties were thoroughly explored. Although no settlement could be reached in mediation, the representatives of both sides agreed to make another attempt to resolve the issue through direct negotiations. In the event that no final agreement could be reached, the parties further agreed that Panel determination would, in part, have to hinge upon the movement of average wage rates between August of 1947 and April of 1951. With this in mind, the representatives were asked to submit to the Panel jointly computed figures for average wages on these two dates.

On May 10 the Panel received a report indicating that the parties had been unable to reach an agreement on any adjustment of isolation pay and that they had also been unable to agree on the correct method for computing the average wage figures for the two reference dates. On May 17 the Panel wrote the parties that it took cognizance that the issue was still in dispute and that it would, therefore, proceed to issue recommendations. As of June 1 this case was still pending.

WILLIAM H. DAVIS, *Chairman.*
JOHN T. DUNLOP, *Member.*
AARON HORVITZ, *Member.*
GODFREY P. SCHMIDT, *Member.*
EDWIN E. WITTE, *Member.*

DONALD B. STRAUS, *Secretary.*
June 11, 1951.

PUBLICATIONS

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APPENDIX 8

PUBLICATIONS OF THE UNITED STATES ATOMIC ENERGY COMMISSION [1]

In addition to the Semiannual Reports to Congress, of which this is the Tenth, the Commission has also published or sponsored publication of the following documents available to the public.

GENERAL REPORTS ON ATOMIC ENERGY PROGRAMS

Handling Radioactive Wastes in the Atomic Energy Program, October 1949 (being revised), reports on the sources and types of radioactive wastes in atomic energy operations, methods developed for their safe handling and disposal, and methods specified for the safe handling of radioisotopes by private users, 30 pages, 15 cents.[2]

Isotopes—A 3-Year Summary of Distribution—With Bibliography of Uses, August 1949, summarizes the Oak Ridge isotopes production, distribution, and training program, with statistics on the distribution and use of isotopes by state and institution, by field of use, by foreign country, and contains an extensive bibliography of published literature on isotopes, 201 pages, 45 cents.[2]

Prospecting for Uranium, 1949, is a nontechnical booklet prepared by the United States Geological Survey and AEC describing the uranium-bearing minerals, where to look for them, and instruments to use in prospecting and in laboratory testing and analysis of ores. Laws, regulations, and price schedules for uranium-bearing ores are included, 123 pages, 30 cents.[2]

Contracting and Purchasing Offices and Types of Commodities Purchased, revised March 1951, lists the types of items the AEC must procure, procurement officers, and location of the purchasing offices. Included are responsibilities of the AEC operations offices and major research centers for whom the materials are procured, and security requirements that must be met by firms supplying certain materials to AEC, 20 pages, 15 cents.[2]

A Guide for Contracting of Construction and Related Engineering Services, revised January 1951, gives AEC policy on awarding contracts for construction and architect-engineering services, procedures followed when requests for bids are formally advertised and when prices are fixed, and when contracts are negotiated. Operations offices and officials responsible for letting such contracts are listed, 16 pages, 15 cents.[2]

Index to the Semiannual Reports to Congress, April 1951, is a cumulative index by name and subject to the first nine semiannual reports to Congress, 40 pages, 20 cents.[2]

TECHNICAL PUBLICATIONS ON DEVELOPMENTS IN ATOMIC ENERGY

Sourcebook on Atomic Energy, Samuel Glasstone, D. Van Nostrand Co., N. Y., 1950, presents a comprehensive, technical description of the theory, history, development, and uses of atomic energy. Chapters are included on the struc-

[1] Listed as of July 1, 1951.

[2] Available from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

ture of the atom, radioactivity, isotopes, neutron research, acceleration of charged particles, and other phases of nuclear science, 546 pages, $2.90.

The Effects of Atomic Weapons, 1950, prepared for the Department of Defense and the AEC by a board of editors under the direction of the Los Alamos Scientific Laboratory, presents a technical summary of the results to be expected from the detonation of atomic weapons, with chapters describing an atomic explosion, the shock from air, underwater, and underground bursts; blast, radiation, and fire effects; methods of protecting personnel; and decontamination methods, 456 pages, $1.25.[2]

Handbook on Aerosols, 1950, contains chapters from the National Defense Research Committee Summary Technical Report, Division 10, declassified by the Army at the request of AEC, on the properties and behavior of aerosols, principles and instruments used in meteorology studies, and information useful in studies of the disposal of gaseous radioactive wastes, the dispersal of insecticides, the disposal of industrial gases, etc., 147 pages, 60 cents.[3]

Manual of Analytical Methods for the Determination of Uranium and Thorium in Their Ores, C. J. Rodden and J. J. Tregoning, 1950, presents a number of tested methods for analyzing ore samples for their uranium and thorium content. It is intended to be an aid to assayers, commercial laboratories, and others interested in raw material assay work, 55 pages, 20 cents.[3]

Liquid-Metals Handbook, R. N. Lyon, et al., 1950, compiled by the Department of the Navy and AEC, summaries current information on the physical and chemical properties of liquid metals, their present industrial uses, and their use and potentialities as heat-transfer media, 188 pages, $1.25.[2]

Trilinear Chart of Nuclear Species, W. H. Sullivan, John Wiley & Sons, Inc., N. Y., 1949, shows physical data for all the nuclear species known as of June 1949, $2.50.

Periodicals and Catalogues

Nuclear Science Abstracts, issued twice a month by the AEC Technical Information Service, contains abstracts of all current AEC declassified and unclassified reports, of non-AEC reports related to atomic energy, and of articles appearing in both the foreign and domestic periodical literature, $6 per year.[3]

Guide to Russian Periodical Literature, a monthly title list prepared by the Brookhaven National Laboratory of available current scientific papers and with complete translations of significant articles, 20 cents.[3]

Radiation Instrument Catalogue, No. 2, 1950, compiled by the Radiation Instruments Branch, AEC, lists most of the commercially available radiation instruments, accessories, and components, $2.[3]

Isotopes—Catalogue and Price List, Isotopes Division, United States Atomic Energy Commission, Oak Ridge, Tenn., March 1951, lists and describes radioactive and stable isotopes available from Oak Ridge, and includes prices and instructions for ordering the isotopes.

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[2] Available from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

[3] Available from Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C.

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THE NATIONAL NUCLEAR ENERGY SERIES

These volumes were written by the scientists who performed the research and development on the atomic energy enterprise under the Manhattan Engineer District and later under the Atomic Energy Commission. The following volumes have been published for the AEC by the McGraw-Hill Book Co., New York, N. Y.

Division I: The Electromagnetic Separation Process

Vacuum Equipment and Techniques, vol. 1, edited by A. Guthrie and R. K. Wakerling, 1949, describes the development and study of high vacuum equipment and high vacuum systems for the large-scale separation of isotopes by the electromagnetic process, 264 pages, $2.50.

The Characteristics of Electrical Discharges in Magnetic Fields, vol. 5, edited by A. Guthrie and R. K. Wakerling, 1949, covers most of the significant studies by the University of California Radiation Laboratory on electrical discharges, with emphasis on studies of electrical discharges in vapors of uranium compounds, 376 pages, $3.50.

Division II: Gaseous Diffusion Project

Engineering Developments in the Gaseous Diffusion Process, vol. 16, edited by M. Benedict and C. Williams, 1949, describes a number of mechanical, electrical, and chemical engineering developments related to the operation and handling of materials used in the gaseous diffusion process—principally special plant instruments, vacuum engineering, development of heat-transfer equipment, and absorption of uranium hexafluoride and fluorine, 129 pages, $1.25.

Division III: Special Separations Project

Spectroscopic Properties of Uranium Compounds, vol. 2, edited by G. H. Dieke and A. B. F. Duncan, 1949, presents data compiled from a comprehensive study of the absorption and fluorescence spectra of uranium compounds and describes the experimental techniques used in the studies, 290 pages, $2.75.

Bibliography of Research on Heavy Hydrogen Compounds, vol. 4C, compiled by A. H. Kimball, edited by H. C. Urey and I. Kirschenbaum, 1949, contains about 2,000 references to published literature on research with heavy hydrogen. References are arranged by subject with an index of the hydrogen compounds and authors, 350 pages, $3.25.

Division IV: Plutonium Project

Radiochemical Studies: The Fission Products, vol. 9, edited by C. D. Coryell and N. Sugarman, 1951, presents 336 original research papers on the techniques and results of radiochemical studies of uranium and plutonium fission products, 2,086 pages (in 3 parts), $18.50.

The Transuranium Elements. Research Papers, vol. 14B, edited by G. T. Seaborg, J. J. Katz, and W. M. Manning, 1949, includes 163 research papers on neptunium, plutonium, americium, curium, and several of the heavy elements related to them, and historical summaries of transuranium element research, 1,733 pages (in 2 parts), $15.

The Chemistry and Metallurgy of Miscellaneous Materials; Thermodynamics, vol. 19B, edited by L. L. Quill, 1949, contains 10 research papers on thermodynamic properties of the elements and several of their compounds, 329 pages, $3.

Industrial Medicine on the Plutonium Project, vol. 20, edited by R. S. Stone, 1951, describes the medical program established for the care and protection of workers on the plutonium project, 511 pages, $6.25.

Histopathology of Irradiation from External and Internal Sources, vol. 22I, edited by W. Bloom, 1948, is an advanced treatise on the histopathological and cytological effects of total-body irradiation, 808 pages, $8.

Toxicology of Uranium, vol. 23, edited by A. Tannenbaum, 1950, describes the studies made on the distribution, accumulation, excretion, and chemical and physiological effects of uranium and uranium compounds in the animal body, 323 pages, $3.00.

Division V: Los Alamos Project

Electronics: Experimental Techniques, vol. 1, edited by W. C. Elmore and M. L. Sands, 1948, describes a number of complete circuits and circuit elements developed at Los Alamos for making nuclear and other physical measurements, 417 pages, $3.75.

Ionization Chambers and Counters: Experimental Techniques, vol. 2, edited by B. Rossi and H. Staub, 1949, describes the physical principles of ionization chambers and counters, and includes previously unpublished project developments by scientists at the Los Alamos Laboratory, 243 pages, $2.25.

Division VI: University of Rochester Project

Pharmacology and Toxicology of Uranium Compounds, parts I and II, vol. 1, edited by C. Voegtlin and H. C. Hodge, 1949, summarizes the results of 3 years' research on the toxicity of uranium compounds and the mechanism of uranium poisoning, and includes a section on the toxicology of fluorine and hydrogen fluoride, 1,084 pages (in 2 parts), $10.

Biological Studies with Polonium, Radium, and Plutonium, vol. 3, edited by K. Fink, 1949, describes the studies made of the biological effects of these alpha-emitting elements in the animal body, air monitoring precautions, and equipment used in atomic energy laboratories where work with these elements is carried on, 411 pages, $3.75.

Division VIII: Manhattan Project Chemistry

Analytical Chemistry of the Manhattan Project, vol. 1, edited by C. J. Rodden, 1950, describes methods of analyzing the many different materials used in the atomic energy project—with emphasis on analytical methods for the determination of uranium and thorium, 748 pages, $6.75.

Chemistry of Uranium. Part I. The Element, Its Binary and Related Compounds, vol. 5, by E. Rabinowitch and J. J. Katz, 1951, is a detailed discussion of the physical and chemical properties of uranium, its occurrence in nature and extraction from ores, and preparation and physical properties of its binary compounds, 609 pages, $7.25.

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APPENDIX 9

Patents Issued to the Commission Which are Available for Licensing [1]

The following 277 United States Letters Patents owned by the United States Government as represented by the United States Atomic Energy Commission have been made available for licensing since December 29, 1949. Licenses are granted on a nonexclusive, royalty-free basis. Abstracts of patents available for licensing are published in the *United States Patent Office Official Gazette.*

PAT. NO.	TITLE	PATENTEE
2,410,384	Furnace control system	H. W. Lindsay, Oakland, Calif.
2,417,392	Torsion balance	R. Craig and R. Q. Boyer, Berkeley, Calif.
2,418,523	Method and apparatus for producing radiographs.	S. H. Neddermeyer, Pasadena, Calif. and D. W. Kerst, Urbana, Ill.
2,419,915	Apparatus for the storage of fluorine	H. F. Priest, New York, N. Y., and A. V. Grosse, Bronxville, N. Y.
2,421,649	Method of welding or cutting metal by hydrogen-fluorine flame.	H. F. Priest, New York, N. Y., and A. V. Grosse, Bronxville, N. Y.
2,422,590	Production of fluorine	W. C. Schumb, Milton, Mass. and A. J. Stevens, Holliston, Mass.
2,422,907	Purification of acid potassium fluorides	P. R. Johnson, Claymont, Del.
2,422,921	Adjustable capillary leak	A. O. C. Nier, New York, N. Y., E. P. Ney, Charlottesville, Va., and M. G. Inghram, New York, N. Y.
2,423,173	Safety pipette	E. L. Brady and L. E. Glendenin, Oak Ridge, Tenn.
2,431,732	Locating and welding fixture	E. Colbert, Chicago, Ill.
2,431,905	Quick locking furnace base plate	R. J. Anicetti, Beverly, Mass.
	Fluorination of perchloro-hexatriene	W. S. Struve, Carneys Point, N. J.

PAT. NO.	TITLE	PATENTEE
2,462,935	High stability voltage regulator	W. R. Baker, Berkeley, Calif.
2,462,997	Attachment for milling machines	J. L. Roush, Oak Ridge, Tenn.
2,465,018	Valve	W. C. Hein and L. W. Winchester, Chicago, Ill.
2,465,886	Electrical measuring apparatus	O. G. Landsverk, Chicago, Ill., and E. O. Wollan, Oak Ridge, Tenn.
2,465,938	Radiation measuring device	F. R. Shonka, Chicago, Ill.
2,466,118	Precipitation of ammonium diuranate	A. J. Miller, Oak Ridge, Tenn., and G. M. Armstrong, Providence, R. I.
2,468,678	Regulator	K. R. MacKenzie, Richmond, Calif.
2,468,681	Purification of hydrogen fluoride	R. H. McBride, Gary, Ind.
2,469,916	Process of producing uranium tetrabromide	J. M. Carter, Pasadena, Calif.
2,470,895	Impulse type power supply	E. W. Marlowe, Chicago, Ill., and H. A. Wilcox Los Alamos, N. Mex.
2,472,365	Alpha particle counting	C. J. Borkowski, Oak Ridge, Tenn.
2,472,456	Crucible and method of making crucibles	R. J. Anicetti, Beverly, Mass.
2,474,042	Vibration eliminating apparatus	E. J. Egle, Jr., Woodside, N. Y.
2,474,773	Radiation detector	W. R. Baker, Berkeley, Calif.
2,475,138	Device for measuring thermal conductivity	C. B. Hood, Jr., W. Jones, and H. L. Johnston, Columbus, Ohio.
2,476,249	Remote-control manipulator	J. H. Payne, Jr., Ballston Spa, N. Y.
2 477,924	Method of preparing uranium trioxide	S. M. Fried, Chicago, Ill., and N. R. Davidson, Sierra Madre, Calif.
2,479,271	Ionization chamber circuit	F. R. Shonka, Chicago, Ill.
2,479,600	Ionization chamber	C. J. Borkowski, Oak Ridge, Tenn.
2,479,699	Apparatus for magnetic measurements	W. M. Powell, Berkeley, Calif.
2,481,320	Magnetic pump	S. L. Madorsky, Washington, D. C.
2,481,506	Fast neutron meter	C. C. Gamertsfelder, Jr., Oak Ridge, Tenn.
2,481,964	Fast neutron meter	E. O. Wollan, Chicago, Ill.
2,483,981	Dynamic condenser	H. Palevsky, Urbana, and R. K. Swank, Chicago, Ill.
2,483,991	Radiation exposure meter	E. O. Wollan and L. A. Pardue, Oak Ridge, Tenn., and N. Goldstein, Chicago, Ill.
2,485,469	Method and means for detecting ionization	J. S. Allen and B. B. Rossi, Chicago, Ill.
2,485,470	Method and apparatus for control of beam energy.	C. P. Baker, Ithaca, N. Y.
2,485,507	Chlorinated hydrocarbon	M. A. Perkins, Wilmington, Del.
2,485,516	Shallow plane proportional counter	R. W. Thompson, Minneapolis, Minn.
2,486,207	Liquid level measuring apparatus	M. K. Richards, Wilmington, Del.
2,486,955	Producing thin film of metal oxide	K. E. Langwill, New York, N. Y.
2,486,976	Pressure measuring device	W. R. Perret, Vicksburg, Miss.
2,487,360	Nitrogen purification process	A. S. Newton, Ames, Iowa.
2,487,510	Current integrating network	W. R. Baker, Berkeley, Calif.
2,489,028	Positive shut-off dispensing nozzle	C. B. Graham and V. D. Carver, Oak Ridge, Tenn.
2,490,298	Radiation detecting apparatus	A. Ghiorso, Berkeley, Calif. and C. M. Gordon, San Pablo, Calif.
2,491,220	Neutron detector	E. G. Segre, Santa Fe, N. Mex., and C. E. Wiegand, Berkeley, Calif.
2,491,320	Neutron detector and method of making same.	P. G. Koontz, Fort Collins, Colo.
2,492,365	Dispensing nozzle	O. E. Miller, Oak Ridge, Tenn.
2,493,137	Voltage doubling circuits	W. W. Hansen, Palo Alto, Calif.
2,493,935	High-energy neutron counter	C. E. Wiegand, Oakland, and E. G. Segre, Berkeley, Calif.
2,494,267	Surface hardening of ferrous metals	H. I. Schlesinger and G. W. Schaeffer, Chicago, Ill.
2,494,641	Radiation counter	H. L. Anderson, Hartford, Conn., and P. G. Koontz, Fort Collins, Colo.
2,494,834	Mounted specimen	R. S. Ringheim, San Gabriel, Calif.
2,494,968	Alkoxy borohydrides and their method of preparation.	H. I. Schlesinger, Chicago, Ill., and H. C. Brown, Detroit, Mich.
2,495,081	Packless valve	J. B. Thomas, Jackson Heights, N. Y.
2,495,497	Method of liquid stabilization of nickel catalysts.	J. E. Ahlberg and C. F. Hiskey, New York, N. Y.
2,495,650	Coincidence proportional counter	J. M. Blair, Stillwater, Okla., and J. M. Hush, Lincoln, Nebr.
2,496,115	Stabilization of perfluoro oils	W. B. Burford, III, Baltimore, Md., and C. E. Weber, Schenectady, N. Y.
2,496,123	Ionization chamber	J. K. East and S. G. English, Oak Ridge, Tenn.
2,496,819	Pulse generator	A. R. Simpson, Knoxville, Tenn.
2,496,886	Radiation alarm and measurement device	E. W. Molloy, Pasadena, Calif., and W. H. Hinch, Denver, Colo.
2,497,823	Radiation measuring device for air filters	E. W. Molloy, Pasadena, Calif.
2,498,841	Ion source	L. D. P. King, Santa Fe, N. Mex.
2,499,288	Vacuum analyzer	J. G. Backus, Los Angeles, Calif.
2,499,289	Ion generator	J. G. Backus, Los Angeles, Calif.
2,499,320	Ion generator	R. Loevinger, Berkeley, Calif.
2,499,830	Air proportional counter	E. W. Molloy, Pasadena, Calif.
2,499,833	Method of making fluorinated organic compounds.	M. A. Perkins, Wilmington, Del.
2,499,836	Preparation of higher chlorides of uranium	H. G. Reiber, Davis, Calif.
2,499,839	High speed mercury diffusion pump	G. R. Stoltenberg, Baltimore, Md.
2,500,492	Apparatus for handling materials	F. C. Henriques, Jr., Winchester, Mass.
2,500,756	Rectangular pulse amplifier	Q. A. Kerns, Berkeley, Calif.
2,501,461	Valve	H. E. Wirth, Worthington, Ohio.

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PAT. NO.	
2,503,077	P
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2,505,877	V
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2,506,419	M
2,506,428	C
2,506,431	P
2,506,433	M
2,506,435	R
2,506,944	N
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2,507,301	A
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2,508,234	D
2,508,989	A
2,509,009	L
2,509,394	V
2,509,669	M
2,509,700	R
2,510,850	M
2,510,864	C
2,510,872	M
2,510,930	S
2,511,667	C
2,512,538	E
2,513,805	I
2,514,115	M
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PAT. NO.	TITLE	PATENTEE
2,503,077	Perhalogenated ethylcyclopentane	F. B. Stilmar, Woodstown, N. J., W. S. Struve, Carneys Point, N. J., R. N. Lulek, Silverside Heights, Del.
2,503,078	Cyclic compounds and method of making	Do.
2,504,530	Vacuum leak detector method	R. B. Jacobs, Rochester, N. Y.
2,504,585	Cyclotron target	A. F. Reid, New York, N. Y.
2,505,877	Vapor phase fluorination process	A. F. Benning, Woodstown, N. J.
2,505,919	Proportional counter	J. A. Simpson, Jr., Chicago, Ill.
2,506,419	Method and apparatus for detecting ionizing particles.	E. R. Graves, Santa Fe, N. Mex.
2,506,426	Condensation product and process	E. T. McBee and J. S. Newcomer, West Lafayette, Ind.
2,506,431	Pressure measuring device	W. R. Perret and T. Davis, Oak Ridge, Tenn.
2,506,433	Magnetic flux measuring apparatus	E. H. Plesset, Los Angeles, Calif.
2,506,435	Radiation measurement	B. B. Rossi, Winchester, Mass. and J. S. Allen, Champaign, Ill.
2,506,944	Neutron meter	L. S. Stauffer, Rotterdam Junction, N. Y. and T. M. Snyder, Schenectady, N. Y.
2,506,945	Treatment of pitchblende ores	H. C. Thomas and A. S. Tomcufcik, New Haven, Conn.
2,507,301	Apparatus for controlling magnetic fields	H. W. Fulbright, Princeton, N. J.
2,507,321	Leak testing device	D. W. Sherwood, Seattle, Wash.
2,508,234	Distillation apparatus	D. Duffey. LaFontaine, Ind.
2,508,989	Apparatus for purifying gases	M. M. Brandegee, Lewiston, N. Y.
2,509,009	Insulating column structure	J. L. McKibben, Los Alamos, N. Mex.
2,509,394	Vacuum tube flux meters	R. Kinslow, Cookeville, Tenn.
2,509,669	Mechanical couplings	L. B. Borst, Oak Ridge, Tenn.
2,509,700	Radioactivity measuring device	J. A. Simpson, Chicago, Ill.
2,510,850	Methods of producing uranium fluorides and a compound produced thereby.	P. A. Agron, Kew Gardens, N. Y., and S. W. Weller, Pittsburgh, Pa.
2,510,864	Catalysts for fluorination	G. H. Cady, Leonia, N. J.
2,510,872	Methods for regenerating antimony pentafluoride from spent antimony halides resulting from the fluorination of organic chlorides.	F. B. Downing, Carneys Point, N. J.
2,510,930	Systems for measuring limited current changes.	K. G. MacLeish, Oak Ridge, Tenn.
2,511,667	Chemical method for concentrating isotopes of carbon.	M. Calvin and P. E. Yankwich, Berkeley, Calif.
2,512,538	Electric discharge device	W. R. Baker, Berkeley, Calif.
2,513,805	Detecting device	W. R. Kanne, Chicago, Ill.
2,514,115	Method of dissolving difficultly soluble metal sulfates.	A. H. Angerman, Oak Ridge, Tenn.
2,514,116	Induction reamer	W. R. Baker, Berkeley, Calif.
2,514,135	Radiation detector	H. G. Neil, Knoxville, Tenn.
2,514,142	Hydraulically driven oscillatory brush	J. D. Reid, Oak Ridge, Tenn.
2,515,112	Method for disposing of corrosive gases	W. B. Burford, III, and H. C. Anderson, Baltimore, Md.
2,515,159	Quick operating valve	E. Zurcher, Knoxville, Tenn.
2,516,050	Adjustable centrifugal switch	Q. J. Evans, New York, N. Y., and A. Kushner, Oak Ridge, Tenn.
2,517,469	Method and apparatus for measuring alpha particle radiation.	R. W. Dodson, Pasadena, Calif., and W. H. Beamer, Youngstown, Ohio.
2,517,676	Pulse-forming preamplifier	Q. A. Kerns, Berkeley, Calif.
2,517,863	Voltage supply circuit for vacuum tubes	D. K. Froman, Denver, Colo.
2,518,217	Apparatus for testing tensile characteristics of a material.	C. K. Beck and D. Kirkpatrick, Oak Ridge, Tenn.
2,519,007	Radiation counters	V. C. Wilson, Schenectady, N. Y.
2,519,319	Method of preparing chloranil	E. T. McBee and J. S. Newcomer, West Lafayette, Ind.
2,519,323	Method of measuring corrosion and erosion	W. B. Shank, D. H. Gurinsky and E. C. Creutz, Chicago, Ill.
2,519,792	The electrolytic production of metallic uranium.	R. Rosen, Elizabeth, N. J.
2,521,112	Method and apparatus for separating fluids by thermal diffusion.	J. W. Beams, Charlottesville, Va.
2,521,121	Dispersion separation	M. Kilpatrick, Philadelphia, Pa.
2,521,133	Secondary electron multipliers	A. H. Snell, Oak Ridge, Tenn., and L. C. Miller, deceased, late of Oak Ridge, Tenn.
2,521,495	Carbonaceous articles and production thereof.	H. A. Wilhelm, Ames, Iowa and P. S. Gerald, Omaha, Nebr.
2,521,626	Process for fluorinating hydrocarbons	A. F. Benning, Woodstown, N. J.
2,521,634	Accoustic chamber for analysis of gaseous mixture.	W. H. Janssen and W. Mikelson, Schenectady, N. Y.
2,521,656	Ionization chamber	E. G. Segre, Santa Fe, N. Mex. and O. Chamberlain, Philadelphia, Pa.
2,521,891	Valve	J. W. Beams, Charlottesville, Va.
2,521,894	Low inductance resistor	R. J. S. Brown, St. Paul, Minn.
2,521,937	Method of purifying inert gases	A. S. Newton, Ames, Iowa.
2,523,856	Resistance capacitance network	W. R. Baker, Berkeley, Calif.
2,523,892	Extraction process for cerium	J. C. Warf, Los Angeles, Calif.
2,524,379	Neutron velocity selector	E. Fermi, Santa Fe, N. Mex.
2,524,384	Production of uranium triiodide	J. A. Holmes, Stillwater, Okla.
2,524,388	Saturable core triggered gap	Q. A. Kerns, Berkeley, Calif.
2,524,692	Scaling circuit	W. H. Bradley, Chicago, Ill.
2,525,197	Thermal flowmeters	J. W. Beams, L. B. Snoddy and L. G. Hoxton, Charlottesville, Va.

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PAT. NO.	TITLE	PATENTEE
2,526,213	Processes for production of mesitylene	W. M. Ewalt, Niagara Falls, N. Y.
2,526,805	Method of forming uranium carbon alloys	J. H. Carter, Harrisonburg, Va., and A. H. Daane, Ames, Iowa.
2,526,825	Fluid selecting apparatus	A. O. C. Nier and G. H. Goertzel, Riverdale, Minn., and R. B. Thorness, Minneapolis, Minn.
2,527,320	Dehydration of alkali-metal acid fluorides	R. C. McHarness and A. F. Benning, Woodstown, N. J.
2,528,415	Pump	H. A. Boorse, Leonia, N. J., and G. F. Boeker, New York, N. Y.
2,528,436	Stuffing box and expansion joint	M. E. Johnson, Prospect Park, Pa.
2,528,454	Coating process	H. I. Schlesinger and G. W. Schaeffer, Chicago, Ill.
2,529,666	Pulse height analyzer	M. L. Sands, Everett, Mass.
2,530,169	Electronic regulator	E. O. Lawrence and V. B. Waithman, Berkeley, Calif., and F. H. Schmidt, Seattle, Wash.
2,530,176	Apparatus for measuring local variations in flux density in a magnetic field.	W. M. Powell, Berkeley, Calif.
2,530,178	Fluxmeter	W. R. Rathkamp, Oak Ridge, Tenn.
2,531,065	Apparatus for changing the ion source of a cyclotron.	J. J. Livingood, J. V. Peters, and R. A. Streeter, Cedar Rapids, Iowa.
2,531,106	Pocket radiation alarms	R. J. S. Brown, Lawndale, Calif., and H. G. Weiss, Waltham, Mass.
2,531,143	Methods of purifying beryllium oxide	J. G. Malm and C. A. Hutchison, Jr., Chicago, Ill.
2,531,144	Coincidence proportional counters	J. H. Manley, Urbana, Ill.
2,531,802	Filter and valve mechanism	R. Q. Boyer, Berkeley, Calif.
2,531,807	Magnetic measuring apparatus and methods.	J. DePangher, Berkeley, Calif.
2,531,811	Coulombmeter	J. E. Hammel, Oak Ridge, Tenn.
2,531,830	Voltage pulse generators	A. R. Simpson, Knoxville, Tenn.
2,531,833	Tachometer	H. A. Straus, Baltimore, Md.
2,531,953	Apparatus for handling radioactive solutions.	W. Q. Smith and G. W. Struthers, Oak Ridge, Tenn.
2,532,257	Corrosion testing apparatus	I. Kirshenbaum, New York, N. Y., and D. A. McCaulay, Chicago, Ill.
2,532,490	Processes for recovery of C 14 activities	B. A. Fries, El Cerrito, Calif.
2,532,503	Electronic counting circuits	J. W. Kennedy, Santa Fe, N. Mex., W. R. Baker, Berkeley, Calif., and C. E. Wiegand, Santa Fe, N. Mex.
2,532,707	Methods of preparation of neptunium trifluoride.	S. Fried, Chicago, Ill., and N. R. Davidson, Sierra Madre, Calif.
2,532,874	Detection apparatus	H. L. Anderson, Hartford, Conn.
2,532,891	Flanged joint sealing gasket	W. W. Chupp, Berkeley, Calif.
2,532,956	Air proportional counter	J. A. Simpson, Jr., Chicago, Ill.
2,533,102	Container for radioactive samples	J. F. Gifford, Richmond, Calif.
2,533,138	The purification of hydrogen	A. S. Newton, Ames, Iowa.
2,533,149	Precipitation processes and apparatus therefor.	L. G. Stang, Jr., Chicago, Ill.
2,533,491	Valve control mechanism	J. B. McMahon, Wilmette, Ill., and T. A. Abbott, La Grange, Ill.
2,533,696	Diborane purification process	G. W. Schaeffer, St. Louis, Mo., and G. D. Barbaras, Cleveland, Ohio.
2,533,701	Collimating shield	R. D. Watt and W. N. Watson, El Cerrito, Calif.
2,534,676	Preparation of compounds of uranium and nonmetals.	A. S. Newton and O. Johnson, Ames, Iowa.
2,534,677	Production of uranium halides	A. S. Newton and O. Johnson, Ames, Iowa.
2,535,355	Voltage regulator and supply	D. K. Froman, Denver, Colo.
2,535,572	The preparation of UF_6	R. M. Hainer, Revere, Mass.
2,535,886	Electronic switches	W. R. Baker, Berkeley, Calif., and Q. A. Kerns, Oakland, Calif.
2,536,602	Automatic flange system	J. J. Goett, Chicago, Ill.
2,536,610	Hydrogen purification system	L. D. P. King, Santa Fe, N. Mex., C. P. Baker, Ithaca, N. Y., and R. E. Schreiber, McMinnville, Oreg.
2,536,616	Preparation of uranium hydride	J. C. Warf, Ames, Iowa.
2,536,617	Direct current negative feedback amplifier	B. L. Weller, Richland, Wash.
2,536,808	Fast impulse circuits	W. A. Higinbotham, Upton, N. Y.
2,536,991	Radiation detector	E. O. Wollan and L. A. Pardue, Oak Ridge Tenn.
2,537,775	Ion vacuum gauge	S. M. MacNeille, Oak Ridge, Tenn.
2,537,777	Chlorofluoroheptanes	E. T. McBee, West Lafayette, Ind.
2,538,632	Combination beta and gamma chamber	E. R. Tompkins, Oak Ridge, Tenn.
2,539,273	Alternating current generator	W. L. Ringland, West Allis, Wis.
2,539,282	Rare earth separation by adsorption and desorption.	F. H. Spedding and A. F. Voigt, Ames, Iowa.
2,539,578	Bearing test apparatus	L. M. Headley, New York, N. Y.
2,540,248	Manufacture of fluorine by electrolysis	R. C. Downing, Wilmington, Del.
2,540,941	Latch mechanism	C. B. Graham and V. D. Carver, Oak Ridge, Tenn.
2,540,944	Sampling apparatus	S. L. Handforth, Wilmington, Del.
2,540,960	Electrolytic cell	S. G. Osborne, Niagara Falls, N. Y.
2,541,190	Fluorination of lubricating oil	A. F. Benning, Woodstown, N. J.
2,541,198	Amplifier	I. R. Brenholdt, Chicago, Ill.

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PAT. NO.	
2,541,599	R
2,541,940	E
2,542,905	A
2,543,491	P
2,543,511	T
2,543,902	R
2,544,277	T
2,544,285	E
2,544,472	T
2,545,595	Li
2,545,606	M
2,545,612	Su
2,545,623	Fr
2,545,633	Th
2,545,920	Tr
2,545,924	Fa
2,546,106	Ap
2,546,706	M
2,546,933	Me
2,546,953	Zir
2,547,409	Gu
2,547,874	Hy
2,548,283	Ion
2,548,449	Ser
2,548,452	Co
2,549,565	Mo
2,549,596	Be
2,549,609	Sep
2,549,899	Pro
2,549,988	Ma
2,550,445	Ele
2,550,460	Mo
2,550,488	Rac
2,550,878	Pul
2,551,529	Pul
2,551,531	Rac
2,551,541	Imp
2,551,542	Flu
2,551,543	Pro
2,551,544	Ma
2,553,217	Cyc
2,554,316	Pro
2,554,476	Rac
2,554,649	Sep
2,554,792	Pre
2,554,933	Pho
2,555,512	The
2,555,996	Val
2,556,457	Pul
2,556,768	Net
2,556,921	Gol
2,557,761	Flu
2,558,377	Pre
2,558,485	Cab
2,558,698	Ele

PAT. NO.	TITLE	PATENTEE
2,541,599	Radiography	P. Morrison, Chicago, Ill.
2,541,940	Electronic circuit	B. B. Rossi, Cambridge, Mass. and H. H. Staub, Palo Alto, Calif.
2,542,905	Apparatus for measuring pressure	S. Cromer, Oak Ridge, Tenn., E. T. Booth, Jr., and F. L. Alexander, New York, N. Y.
2,543,491	Pulse integrating circuits	D. K. Froman, Denver, Colo.
2,543,511	The preparation of diborane	H. I. Schlesinger, Chicago, Ill. and H. C. Brown, Detroit, Mich.
2,543,902	Radio frequency voltage supply	R. C. Dye, Los Angeles, Calif.
2,544,277	The preparation of uranium nitride	A. S. Newton and O. Johnson, Ames, Iowa.
2,544,285	Electrolytic cells	K. E. Stuart and S. G. Osborne, Niagara Falls, N. Y.
2,544,472	The preparation of diborane	H. I. Schlesinger, Chicago, Ill. and H. C. Brown, Detroit, Mich.
2,545,595	Linear accelerator	L. W. Alvarez, Berkeley, Calif.
2,545,606	Methods of coating with plutonium acetylacetonate and coated product.	B. B. Cunningham, Chicago, Ill., C. Smith, Oakland, Calif., and J. S. Dixon, Santa Fe N. Mex.
2,545,612	Sulfur-containing compounds of neptunium and a process for their preparation.	S. Fried, Chicago, Ill. and N. R. Davidson, Sierra Madre, Calif.
2,545,623	Frequency modulation systems	K. R. MacKenzie, Pacific Palisades, Calif.
2,545,633	The preparation of lithium borohydride	H. I. Schlesinger, Chicago, Ill. and H. C. Brown, Detroit, Mich.
2,545,920	Transuranic metal halides and a process for the production thereof.	S. Fried, Chicago, Ill.
2,545,924	Fast impulse circuits	C. W. Johnstone, Los Alamos, N. Mex.
2,546,106	Apparatus for regulating high voltage	K. G. Morrison, Oakland, Calif.
2,546,706	Multiple chisel structure for disintegrating and removing incrustations from interior walls of receptacles.	C. H. Prescott, Jr., Berkeley, Calif.
2,546,933	Methods of dissolving thorium values	F. L. Steahly and R. W. Stoughton, Oak Ridge, Tenn., and F. W. Schuler, Madison, Wis.
2,546,953	Zirconium-hafnium separation process	K. Street, Jr., Berkeley, Calif.
2,547,409	Guiding means for movement of solid materials.	C. H. Prescott, Jr., Berkley, Calif.
2,547,874	Hydrogen purification method	E. D. Klema, Saline, Kans.
2,548,283	Ion gauge	S. Bashkin, Madison, Wis.
2,548,449	Sensitivity modulator	H. H. Staub, Palo Alto, Calif.
2,548,452	Corona triode voltage regulator	G. M. Turner, Stony Brook, N. Y.
2,549,565	Method of fluorinating organic compounds with molten silver fluorides.	R. G. Benner, Carneys Point, N. J.
2,549,596	Beryllium target and method of manufacture	J. G. Hamilton, San Francisco, Calif., T. M. Putnam, Oakland, Calif., and J. H. Wiens, Redwood City, Calif.
2,549,609	Separation of fluorinated hydrocarbons by distillation with hydrogen fluoride.	K. C. Johnson, Claymont, Del.
2,549,899	Process for the preparation of neptunium tetrafluoride.	S. Fried and N. R. Davidson, Sierra Madre, Calif
2,549,988	Manufacture of organic fluorine compounds.	M. A. Perkins, Wilmington, Del.
2,550,445	Electrolytic cell with welded anode assembly.	A. F. Benning, R. C. McHarness, Woodstown, N. J., and G. W. Feldman, M. K. Richards, Wilmington, Del.
2,550,460	Monitoring circuit	G. M. Farly, D. A. Mack, Berkeley, Calif.
2,550,488	Radiation counter	C. R. Marsh, State College, Pa.
2,550,878	Pulsing circuit	H. H. Staub, Palo Alto, Calif.
2,551,529	Pulse amplitude discriminator	F. J. Davis, Washington, D. C., and L. F. Curtiss, Garrett Park, Md.
2,551,531	Radiation counters	M. S. Freedman, Chicago, Ill.
2,551,541	Improved vacuum pumping method with mechanical oil sealed pumps.	F. A. Knox, Oak Ridge, Tenn.
2,551,542	Fluorophotometer	C. R. Marsh, State College, Pa., and C. B. Pickle, Baltimore, Md.
2,551,543	Production of uranium peroxide	P. Mohr, Urbana, Ill.
2,551,544	Mass spectrometer	A. C. Nier and M. G. Inghram, New York, N. Y.
2,553,217	Cyclic organic fluorine compound and method of making.	F. B. Stilmar, Woodstown, N. J.
2,554,316	Production of radioactive halogens	A. F. Reid, New York, N. Y.
2,554,476	Radioactive product and method of producing the same.	L. B. Werner, Berkeley, Calif.
2,554,649	Separation of radium from barium	E. R. Tompkins, Berkeley, Calif.
2,554,702	Pressure measuring device	W. R. Peret, Vicksburg, Miss.
2,554,933	Photo-multiplier circuit	L. F. Wouters, Oakland, Calif.
2,555,512	The preparation of diborane	H. I. Schlesinger, Chicago, Ill., and H. C. Brown, Detroit, Mich.
2,555,996	Valve	A. B. Pontius, New York, N. Y.
2,556,457	Pulse width modulation	R. J. Watts, Los Alamos, N. Mex.
2,556,768	Neutron detector	J. L. McKibben, Madison, Wis.
2,556,921	Gold beryllium alloy and method of making same.	H. Hirsch, Chicago, Ill., and M. Kowalchik, Rahway, N. J.
2,557,761	Flux phase indicator	W. M. Powell, Berkeley, Calif.
2,558,377	Preparation of compacts of high density uranium hydride.	M. L. Perlman, New Orleans, La., and S. I. Weissman, Chicago, Ill.
2,558,485	Cable testing system and method	J. D. Gow, San Francisco, Calif.
2,558,608	Electromagnetic pump	E. J. Wade, Scotia, N. Y.

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