

## FEDERAL EXPENDITURES FOR RESEARCH AND DEVELOPMENT

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### ATOMIC ENERGY COMMISSION PROGRAMS, ECONOMIC GROWTH AND STABILITY

UNITED STATES ATOMIC ENERGY COMMISSION

Statement submitted by K. E. Fields, General Manager

In response to your request of August 2, 1957, we are glad to provide the following information and hope that it will prove helpful to the work of your Subcommittee on Fiscal Policy in exploring the relationship of Federal spending programs to the extent and character of the Nation's economic growth and to the problem of maintaining economic stability.

Under the Atomic Energy Act, the paramount objective of the programs of the Atomic Energy Commission is to make the maximum contribution to the common defense and security. AEC programs are formulated primarily to carry out national security policies, and considerations of national defense are necessarily overriding. Nevertheless, the act further directs that "the development, use, and control of atomic energy shall be directed so as to promote world peace, improve the general welfare, increase the standard of living, and strengthen free competition in private enterprise." The objectives established under these criteria for nonmilitary atomic-energy programs, such as the development of economical civilian electric power from nuclear energy, are of necessity long range in character, but are nevertheless essential for the future growth of the economy. In practice, the substance of atomic-energy programs, including those primarily directed to peaceful purposes as well as those for military purposes, is almost wholly determined by national security policies and technological advances in the field. Thus, there is but limited latitude for selection of implementing measures on the basis of the influence that could be exerted by AEC expenditures on short-term economic trends.

Expenditures of the Atomic Energy Commission were approximately \$1,964 million in fiscal year 1957, or about 2.8 percent of total Federal spending. In the period from the beginning of World War II through fiscal year 1957, Federal expenditures on the atomic-energy program amounted to \$15,811 million, of which \$13,578 million represents payments after the transfer of operating responsibilities from the Manhattan Engineer District to the Atomic Energy Commission on January 1, 1947. The AEC balance sheet shows plant and equipment assets of \$6,908 million on June 30, 1957.

These amounts connote a scale of activity which could not fail to have an important impact on private sectors of the economy. The novelty of many of the major atomic-energy undertakings and the fact that the entire growth of the enterprise has occurred in such a brief period have accentuated this impact. The varied nature of this impact is indicated by the following examples:

#### REGIONAL IMPACT OF AEC ACTIVITIES

The nature of the activities to be performed has required placing a number of atomic-energy installations in areas of low population density, thus magnifying their relative impact on the economies of those regions. Leading examples of such installations are the following:

Installation	Plant investment	Region
Hanford works.....	\$1,053,000,000	Southeastern Washington.
Oak Ridge.....	1,437,000,000	Eastern Tennessee.
Savannah River plant.....	1,235,000,000	Western South Carolina.
National Reactor Testing Station.....	150,000,000	Eastern Idaho.
Albuquerque and Los Alamos.....	317,000,000	Northern New Mexico.

#### URANIUM PRODUCTION

Similarly, the purchase of domestic uranium ores and concentrates and the establishment of guaranteed prices have had a major impact on uranium producing areas, primarily the Colorado Plateau area of Colorado, Utah, New Mexico, and Arizona, and to a lesser degree certain sections of Wyoming, Washington, and other Western States. Uranium mills in operation at the end of fiscal year 1957 represented more than \$50 million of private capital investment, and new mills coming into operation over the next 2 years represent an additional \$60 million investment of private capital. These amounts do not include the cost of mine development. AEC purchases of domestic ores and concentrates were in excess of \$150 million in fiscal year 1957, and are expected to exceed \$200 million in 1958, and \$250 million in 1959.

The procurement of uranium concentrates from foreign sources involved expenditures of more than \$190 million in fiscal year 1957. The projected growth of uranium imports from Canada is expected to bring shipments from that country during the next few years to an annual value of more than \$250 million, and total uranium imports to an annual value of about \$350 million. Exchange payments of this magnitude are a significant factor in creating markets for United States exports.

#### ISOTOPES

A recent survey of the use of radioisotopes in industrial operations indicated that such applications are reducing industrial costs by an estimated \$400 million or more per year. The medical profession uses radioisotopes in the treatment of probably more than 1 million patients a year. The economic significance of such industrial and medical uses is expected to increase several times over during the next few years. In addition, the extension of agricultural applications of

radioisotopes is expected to produce annual savings of several hundred millions of dollars.

#### COAL PRODUCTION

Because the development of atomic energy is sometimes represented as being inimical to the best interests of coal producers, it is pertinent to comment on this relationship. To generate the electric power used in the gaseous diffusion plants at Oak Ridge, Paducah, and Portsmouth, approximately 20 million tons of coal are purchased annually and more than 2 million tons of coal are consumed annually in providing heat and electric power for other atomic energy operations. Payments for this coal amount to about \$100 million dollars per year. Looking ahead to the period when generation of electric power from nuclear energy becomes competitive in cost with generation from the burning of coal, AEC estimates of the growth of nuclear power production are based on the expectation that only a portion of the increase in electric power consumption will be met by nuclear powerplants. In other words, it is expected that annual consumption of coal for electric power generation in the United States will continue to increase for many years.

#### SMALL BUSINESS

The typical pattern by which the Atomic Energy Commission provides for the operation of the Government-owned installations which carry out the major part of AEC-financed activity is by cost-type contracts. The scale of these undertakings largely precludes effective participation of small-business concerns at this level of responsibility. Rather, the opportunities for small-business participation in atomic-energy activities lie primarily in the area of providing materials and services under subcontracts. The long-established policy of the Atomic Energy Commission is that small-business concerns should receive a fair share of available work, and programs undertaken in cooperation with the Small Business Administration are believed to have contributed significantly to the AEC's success in meeting this objective. AEC contract actions with small-business concerns during fiscal year 1957 included prime-contract awards of \$108 million and subcontract awards of \$224 million, or 39 percent of the total value of all subcontract awards by AEC cost-type prime contractors.

#### DEVELOPMENT OF PRIVATE ATOMIC ENERGY INDUSTRY

A growing atomic-energy industry with expanding opportunities for investment could serve as a major stimulant to our economy. A primary purpose of the Atomic Energy Act of 1954 was to remove barriers to the participation of private enterprise in the growth of the atomic-energy industry. Assumption of increased responsibility by private industry offers the long-range prospect of major reduction of Federal expenditures for atomic energy.

Numerous Commission programs serve to encourage such private participation. For example, all technical information necessary to the design, construction, and use of reactors for civilian power and research has been removed from the category of classified information. AEC technical information is being made available to the pub-

lic by various means, a quarter million technical publications on atomic energy having been sold by the Government during fiscal year 1957. The growing list of Government-owned patents held by the AEC and released for royalty-free licensing now totals 1,269. In the general area of materials and services required for its atomic-energy operations, the Commission has urged private industry to take responsibility for supply, and, today, private industry is fabricating reactor-fuel elements and preparing to manufacture uranium feed materials which heretofore have always been provided by Government-operated plants.

Instances of private investment in developmental projects have been particularly notable in the area of power-reactor development. Two large-scale reactors, financed exclusively with private capital, are under construction and are expected to be completed in 1960. A smaller, privately financed, reactor plant, built to furnish technical data for development of one of the large projects, is already operating under license.

A key program in the Commission's efforts to advance reactor technology and to promote private participation is the power demonstration reactor program. By inviting industry to submit proposals for the development, construction, and operation of demonstration reactors, at the same time offering specified types of technical and financial assistance, the Commission is obtaining from industry substantial contributions of talent and funds to the development of promising reactor concepts. Such partnership arrangements substantially reduce the Federal expenditures required to accomplish these program objectives.

Accompanying these major developments is a broad undercurrent of private industrial activity concerned with the development and manufacture of radiation instruments, reactor components, and research reactors, and with provision of the wide range of materials and services associated with the use of radioisotopes and reactors. Growth of such activity is in keeping with the American tradition, in which new processes and products bring about a steady increase in the standard of living.

#### RESEARCH AND TRAINING

The Nation's fund of scientific knowledge and its reservoir of skilled people are among its most precious resources. Their development is no less essential to the long-range objectives of the atomic-energy program than the development of other resources, such as raw materials or technology. In this sense, the Commission's expenditures for research can properly be regarded as investment.

A large part of the funds devoted to support of research also contributes directly to training. In its support of basic research projects performed at universities, the Commission seeks to strengthen the established institutional framework upon which the success of advanced education in the United States depends. This objective is also promoted by the granting of fellowship awards, by special training offered by AEC for faculty members, and by financial grants for the purpose of enabling universities to acquire specialized equipment for teaching purposes. Special courses in reactor technology

are also offered to graduate students at certain AEC installations, but are regarded as interim arrangements which will no longer be required when universities have developed their own capabilities in this field.

Certain types of modern research require capital investment in equipment and facilities which is beyond the capacity of private institutions to provide. A major role of the Commission will continue to be the building of complex research instruments, such as particle accelerators, and the staffing of research projects involving their operation.

The foregoing examples are intended to show some of the more important relationships between Federal atomic-energy expenditures and the processes of economic growth in the private sectors of the economy. You have also requested comment on the usefulness or limitations of atomic-energy programs for purposes of stabilization. For the reasons indicated in the second paragraph, the policy considerations which determine atomic-energy programs afford little latitude for varying either the substance or the timing of implementing measures with a view to exerting compensatory influence on either local or general economic trends. In appropriate situations, such considerations would enter into program decisions, but would seldom be of determining weight. Within the framework of governmentwide policy, the Commission would again take an active part in such ameliorative programs as the effort to make it possible for business concerns in labor-surplus areas to obtain a larger share of AEC procurement awards.

Finally, you have requested comment on the standards employed by the Atomic Energy Commission in determining the kind and size of its requested programs. Approximately 85 percent of the Commission's annual operating costs are directly related to military requirements. The remaining 15 percent is concerned largely with basic research, development of civilian power reactors, regulatory responsibilities involving public health and safety, and other supporting activities of the nature of administrative overhead.

Relative priorities within the military portions of the program determine the main outlines for most of the Commission's appropriation request. The broad nonmilitary objectives of the atomic-energy program are also established as matter of national policy and generally reflect the status of atomic-energy technology. For basic research in the physical and life sciences and the development of civilian power reactor, these objectives serve to define numerous technological problems and areas of ignorance in which the need for increased understanding is critical and urgent. Programs proposed are focused on these needs, subject to such overall limitations as may be established by budgetary ceilings and the availability of qualified technical personnel.