

## Section 2.—Research in the Atomic Energy Field\*

The high energy yield from the fission of uranium is the key to the prospect of economic nuclear electric power. The yield is so high that the cost of the raw uranium is a very minor component of the cost of electric power. It will be about 5 p.c. of the total and may be contrasted with 50 p.c. or more paid for coal in some large conventional generating stations. The largest component in the over-all economy of nuclear power systems is reactor plant construction and a minor (10 p.c. to 15 p.c.) component is fuel fabrication.

Hitherto the major atomic energy activity in Canada has been uranium mining and refining for export in support of military uses. A major transition, however, is taking place in which uranium production is giving place to engineering and construction of nuclear-electric generating stations. This phase will last until nuclear plants are established in such numbers and capacity throughout the world that the market for uranium revives and overtakes its former peak. There is some prospect that the economic advantages of the heavy-water reactors designed in Canada will lead to the adoption of this type in many other countries, with the creation of a market for heavy water that is expected to be produced competitively in Canada. The expected export of nuclear generating stations, heavy water and uranium fuel is appearing as a new near-term prospect on a small but significant scale.

In Canada, plans are already taking account of a revolutionary increase in the size of electricity-generating stations. The full-scale 200-megawatt reactor at present under construction has come to seem small (1 megawatt = 1,000 kilowatts). Steam turbines and conventional stations are now appearing in larger capacities and the prospects of long-distance high-voltage transmission to interconnect centres of load, together with the lower unit power costs that result from operating on a larger scale, cause utilities to plan large generating stations of 2,000 megawatts and more. The Canadian design of nuclear power reactor appears capable of expansion to keep pace, and will yield even more benefit than the conventional plant in the resulting reduction of unit power cost.

It is also significant that since lower unit power costs result from larger stations there is a new incentive for large utilities to export power from their systems and Canadian policy is changing to allow such export from Canada. Since the planning and construction of major power plants takes many years, these trends are not expected to be extensively realized before the 1970's. However, the prospect has already had its effect on atomic energy research and development.

Three Federal Government organizations have the basic responsibilities for atomic energy in Canada: (1) the Atomic Energy Control Board, responsible for all regulatory matters concerning work in the nuclear field; (2) Eldorado Mining and Refining Limited, with a double function as a producer of uranium and as the Government's agent for the purchase of uranium from private mining companies; and (3) Atomic Energy of Canada Limited, concerned with nuclear research and development, the design and construction of reactors for nuclear power, and the production of radioactive isotopes and associated equipment, such as cobalt-60 Beam Therapy units for the treatment of cancer, and large installations for the sterilization of medical supplies and other uses.

The Atomic Energy Control Board does not itself conduct research, but it gives substantial grants to universities to further independent studies and to provide the equipment without which the universities would find it difficult to train the nuclear research workers of tomorrow. The National Research Council also has made grants in the atomic energy field. In 1962-63 the total of all these grants was \$1,245,000.

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