such as lysine; poly-hydroxy alcohols such as glycerol and arabitol; hydroxy fatty acids; and the possibilities of producing specific glyceride types using the enzyme systems of microorganisms. The Laboratory works in co-operation with the Canada Department of Agriculture to help maintain Canada's position as the world's leading exporter of rapeseed, used to produce cooking oils, dressings and oil for use in margarine and shortening. A group working in the field of mycology is concerned with the production of new chemicals, antibiotics, alkaloids and amino acids.

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

**Recent Developments and Prospects.**—The first major fruits of Canadian atomic energy research now appear close at hand. The Hydro-Electric Power Commission of Ontario is constructing a multi-unit nuclear electric generating station at Pickering near Toronto. Each unit will generate 500 megawatts (1 megawatt = 1,000 kilowatts) and, beginning in 1970, it is planned to bring into operation the first four units at yearly intervals. Estimates indicate that the power will be generated for less than four mills (0.4 cents) per kilowatt hour and will be competitive with that from other available types of thermal generating station. The Quebec Hydro-Electric Commission is also entering the nuclear field with a 250-megawatt prototype nuclear generating station of advanced design. Like the earlier CANDU (Canadian Deuterium Uranium) reactors, the design employs natural uranium as the fuel and heavy water as the moderator but the heat will be carried from the fuel by boiling ordinary water instead of by heavy water at a pressure sufficient to prevent boiling. The design is distinguished by the title CANDU-BLW-250 (Canadian Deuterium Uranium-Boiling Light Water-250 megawatts).

The first nuclear power demonstration (NPD) reactor, CANDU-PHW-20 (Pressurized Heavy Water-20 megawatts), at Rolphton, Ont., has shown clearly that capacity factors in excess of 80 p.c. throughout a full year can be achieved with this type of system. Fuel is routinely changed with the reactor at power and losses of heavy water are well within the economic limits. This reactor is now yielding useful information on the long-term behaviour of its components and is providing a training base for those who will staff the larger reactors now being built in Canada and abroad. The next reactor in the series is the 200-megawatt station at Douglas Point, Ont., which was brought into initial operation in 1966.

Canadian heavy-water power reactors are also under construction in India and Pakistan. To meet the large demand for heavy water that these reactors necessarily entail, one plant to produce 200 tons a year is nearing completion at Glace Bay, N.S. (later to be extended to 400 tons a year), and one plant that will produce 500 tons a year is under construction.

Nuclear power is expected to restore the world market for uranium, with the major build-up occurring in the 1970s. The high energy yield from the fission of uranium is the key to economic nuclear 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 is 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 (7 p.c. to 12 p.c.) component is fuel fabrication.

In the past, the major atomic energy activity in Canada was uranium mining and refining for export in support of military uses. Circumstances have changed so greatly that the Government is following a policy of no further exports for nuclear weapons but is encouraging export for peaceful purposes such as nuclear power subject to negotiated safeguards. 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 to interconnect centres of load by high voltage transmission even over long distances.

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