CANADA'S ATOMIC ENERGY PROJECT

Canada's atomic energy project, located on the Ottawa River near the village of Chalk River, about 130 miles from the city of Ottawa, is operated by a government-owned Crown company, Atomic Energy of Canada Limited. The company, which has a nine-man board of directors that includes representatives of private industry, public and private power companies, and the universities, was formed in 1952 to take over the operation of the Chalk River project from the National Research Council. It is engaged in four main activities:

1. development of economic atomic power
2. fundamental research
3. operation of nuclear reactors and production of nuclear fuels (plutonium and uranium-233)
4. production of radioactive isotopes and associated equipment such as Cobalt-60 Beam Therapy Units for cancer treatment.

Atomic energy research in Canada had its origin over 50 years ago when Ernest Rutherford came to this country as Macdonald Professor of Physics at McGill University. While working at McGill in collaboration with F. Soddy, he announced in 1902 the results of his investigation of the nature of radioactivity, which had been discovered in 1896 by Henri Becquerel. Rutherford determined the fundamental laws governing spontaneous disintegration of radioactive materials and went on, both in Canada and in England, to make further discoveries of great importance in the development of atomic energy.

As early as 1940 Dr. G.C. Laurence, now Director, Reactors Research and Development Division, Atomic Energy of Canada Limited, assembled at the National Research Council in Ottawa a bin containing 10 tons of petroleum coke, a form of carbon, in which were embeded uniformly spaced packages of uranium oxide. He sought to determine, by measuring the behaviour of neutrons in this material, whether a great quantity of energy could be released.

Concurrently experiments were carried out in France, the United Kingdom, and the United States. It was soon decided that British, French and other European scientists doing nuclear research should move to North America to work on an atomic weapon. Many of them went to the United States and others came to Canada where a joint Canadian United Kingdom project, administered by The National Research Council of Canada, got under way in Montreal in January 1943. The previous month the Americans, under the direction of Enrico Fermi, brought the first atomic pile into operation. (The term "pile" was used because the graphite moderator and the uranium had been piled up layer upon layer until a chain reaction was achieved. Today, however, the term "reactor" has replaced "pile" in this country.)

While the United States project used the more readily available graphite to moderate its reactors, the project in Canada was assigned the task of trying heavy water as a moderator so that all possible routes leading to the production of plutonium for bombs would be tried. About five miles from the village of Chalk River, which was then little known except by the railway men (the village is a divisional point on a main trans-Canada line of the Canadian Pacific Railway), and the hunters and fishermen who came into this region, work was started in 1944 on a new type of plant known mysteriously as the "Petawawa Works". Few people knew that the plant would use mainly two substances secretively named "X-metal" (uranium) and "polymer" (heavy water). The staff in Montreal moved to the site, which is now generally known simply as Chalk River.

On September 5, 1945 the ZEEP (Zero Energy Experimental Pile) reactor went into operation. It operated a mere 10 watts but it made possible a study of the value of a heavy water-natural uranium system, and has continued to be useful for studies of fuel rod arrangements. Two years later, on July 22, 1947, the NRX reactor (National Research X-metal or X-perimental) went into operation. It was then, and so remained for several years, the most powerful research reactor in the world. Even today, after nine years, the NRX reactor is playing a leading role in three main ways: (1) enabling the determination of fundamental properties of matter, (2) producing radioactive isotopes of high specific activity (which means that a given weight of material gives off a large amount of activity), and (3) making possible important experiments relating to the development of atomic power. Both the United States and the United Kingdom are, like Atomic Energy of Canada Limited, using NRX for atomic power studies. Since its reconstruction following the breakdown of December 12, 1952, this reactor has operated at a power output of 40,000 kilowatts (the "power" in the case of such research reactors is a measure of the rate at which heat is produced).

In 1946 the United Kingdom established its own atomic energy programme and the Atomic Energy Control Act was passed in Canada "to make provision for the control and supervision of the development, application and use of atomic energy".

Under this Act was created the Atomic Energy Control Board which had three main functions: (1) it had the power to conduct research and production operations, either directly or through other agencies reporting to it, (2) it had the power to regulate the production and application of materials relating to atomic energy, particularly fission-

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