space. Isotope techniques have brought about revisions in the basic theory of chemical reactions induced by radiation. This basic research may find a useful application in the technology of using an organic liquid as coolant in nuclear power reactors.

The research facilities of the NRX and NRU reactors have continued to attract individual scientists as well as teams from universities and from other countries. The international study on the scattering and slowing of neutrons by moderators and other materials of interest at high and low temperatures is drawing successfully to a close. More facilities for studying radiation damage under closely-controlled conditions are coming into use. These include devices for measuring creep of metals under stress and fast neutron bombardment at controlled temperatures.

The first major installation at the Whiteshell Nuclear Research Establishment (WNRE) is the organic liquid-cooled, heavy-water-moderated experimental reactor WR-1, commissioned in 1965. The facilities are specially suited for development work roward large reactors of a similar type. The facilities of WR-1 are quite extensive and can be applied to development work also with other coolants such as boiling water and super-heated steam. Laboratory facilities at WNRE are specially suited to studies of the effects of radiation and a wide programme from molecular biology to radiation chemistry and reactor engineering is under way.

Nuclear Power Development

Much of the success of CANDU series of reactors is attributable to the engineered design of the fuel tested in many experimental irradiations under conditions that are more exacting than normal service. The fuel is uranium dioxide specially prepared from natural uranium entirely in Canada. Strings of pellets of sintered oxide are charged into thin-walled zirconium alloy tubes. The tubes deform slightly in service in a determined manner that has proved satisfactory. The migration of the fission product atoms, especially the gases, has been extensively studied and satisfactory operating conditions established for the full energy yield of 9,000 megawatt-days per ton of uranium and more. This energy yield is so great that there is no need to make provision for processing the spent fuel and the prospective fuelling cost is less than one mill (0.1 cent) per kilowatt hour of electricity. This cost may be compared to about three mills from coal at $8 a ton. The low fuelling cost is most important because Canada has access to such an abundance of coal, oil and natural gas that the competitive cost level for electric power is lower than in many countries.

The low fuelling cost derives as much from the details of the design proposed as from the general type of reactor chosen. Some of the important features seem worthy of mention. At Douglas Point, the first full-scale plant generates 220 megawatts with a steam-cycle efficiency of 33.3 per cent, so that the reactor has to supply 660 thermal megawatts to the steam-raising plant. The reactor is essentially a tank of heavy water, 20 feet in diameter and 16.5 feet long, lying horizontally. It is penetrated by 306 fuel channels parallel to the axis on a lattice nine inches square. Each channel is a zirconium-alloy pressure tube of 3.25 inches inside diameter and about 0.16 inch thick. The fuel consists of bundles of 19 rods,