throughout the world. The projected growth of nuclear capacity in electrical output to 1990 is estimated in Table 13.8. Although its share will decrease from 70% to about 50%, the US will probably remain the dominant consumer of uranium, followed by Western Europe and Japan; Canada's share will remain small. By 1990, annual requirements of these countries could reach 220,000 tons of U_3O_8 and cumulative demand to 2 million tons. It seems clear that prospecting and exploration must be accelerated if a shortage of low-cost uranium is not to develop in the 1980s. However, the trend seems to be in the opposite direction. In Canada, exploration has all but ceased, presumably because of the poor short-term market situation with prices of uranium at an all-time low, but should the current low level of exploration persist, there could be a period of uranium under-supply in the 1980s.

13.3 Electric power

13.3.1 Electric power development

While most of the fossil fuels (coal, oil and gas) are extensively employed in a direct form to provide energy, a significant portion is converted into a secondary form of energy, electricity. In the case of coal, more than half of Canada's energy in this form is converted to electricity. Two other primary energy resources, hydraulic energy and uranium, are almost exclusively employed after conversion to electricity. The reasons for employing this energy conversion, and for the sustained growth in electrical energy use in Canada since the beginning of the century, are principally the ease with which energy in the electrical form can be distributed, the flexibility of control and the efficiency of conversion to mechanical power, light, heat and the other end uses. From a modest 133,000 kilowatts of generating capacity installed at the end of 1900, Canada's installed hydro capacity rose to 30,601,000 kw by the end of 1971 and thermal capacity to 16,077,000 kw (Table 13.9).

Thermal-electric power development in Canada was not well documented early in the century but its growth was slow and of relatively minor importance until the late 1940s. The rate of development of hydro facilities, on the other hand, accelerated after the turn of the century when improvements in electric power transmission techniques were introduced and increasing emphasis began to be placed on the construction of large hydro-electric stations.

During the prosperous 1920s demand for electricity became heavier and the rate of installation increased appreciably. Then, in the depressed conditions of the early 1930s, power demand dropped off but this did not show up immediately as a drop in the installation rate because of the time lag inherent in hydro-electric power development. The completion of hydro projects initiated prior to the depression period accounted for the continuation of high rate of capacity installations up until 1935; thereafter, poor economic conditions in the 1935-39 period resulted in a reduced rate.

In the early war years, the tremendous demand for power for Canada's war industries accounted for the sharp rise in installation of new generating facilities between 1940 and 1943, but in the later war years construction dropped off so that, from 1944 to 1947, a second flattening occurred in the growth curve. After the war, industrial expansion and rapidly growing residential and agricultural development placed extremely heavy demands on power generating facilities. To stay abreast of these demands required the installation of new capacity at a rate higher than at any time in Canada's history. This increased demand also led to the start of an extensive program of thermal plant construction in the early 1950s, since hydro sources alone could not possibly satisfy requirements. In 1956, thermal generation represented 15% of installed capacity. Since then, the annual installed capacity has averaged 56% hydro-electric and the remainder in thermal generation. At the beginning of 1972 thermal generation accounted for 34% of Canada's installed capacity.

13.3.2 Current trends

Although water power traditionally has been and still is the main source of electrical energy in Canada, thermal sources will undoubtedly become the main supplier in the future. The choice between development of a hydro-electric power site and construction of a thermal generating station must take into account a number of complex considerations, the most important of which are economic in nature. In the case of a hydro-electric project, the heavy capital costs involved in construction are offset by maintenance and operating costs considerably lower than those for a thermal plant. The long life of a hydro plant and the dependability and flexibility of operation in meeting varying loads are added advantages. Also