Conventional thermal power. Over 90% of all thermal power generating equipment in Canada is driven by steam turbines. The magnitude of loads carried by steam plants combined with the economies of scale has led to the installation of steam units with capacities as high as 540,000 kw, and units in the 800,000-kw size range have been committed for as early as 1975. Additions of these larger units are, however, only possible where systems are large enough to accommodate them. Additional types of thermal generation are provided by gas turbine and internal combustion equipment. The flexibility of internal combustion engines makes this type of equipment particularly suitable for meeting power loads in smaller centres, especially in the more isolated areas. Gas turbines are frequently used for peak loads where their rapid start-up ability is an advantage.

Table 13.9 shows that thermal generation is predominant in Prince Edward Island and Nova Scotia. By the end of 1971, the Yukon Territory had joined the Northwest Territories, Alberta, Saskatchewan, Ontario and New Brunswick in having greater than one half of their total capacity thermal-electric.It is expected that thermal generation will become increasingly predominant in Ontario. Although coal is still the most important fossil fuel for thermal plants in Nova Scotia, oil is rapidly becoming the preferred choice for thermal power generation in all of the Atlantic Provinces.

Nuclear thermal power. Commercial electric power generated from the heat of nuclear reaction became a reality in Canada in 1962 when the 20,000-kilowatt electrical (kwe) Nuclear Power Demonstration station at Rolphton, Ont., fed power for the first time into a distribution system in Ontario. The NPD station is the forerunner in a series of large nuclear stations that will shoulder more and more of Canada's rapidly growing power loads.

Research into reactor design and the application of nuclear energy in the electric power field are among the more important responsibilities of Atomic Energy of Canada Limited, a Crown company incorporated in 1952 (see also Chapter 9). AECL has concentrated its efforts on the development of the CANDU reactor which uses natural uranium as a fuel and heavy water as the moderator. By using heavy water as the moderator, a high energy yield can be obtained from natural uranium and, since natural uranium is a low-cost nuclear fuel, the cost of fuel is a minor component in the cost of producing power. Natural uranium has the added attraction of being available in commercial quantities in Canada.

The NPD station has been used extensively to demonstrate the ability of the system to operate at a high capacity factor and to determine the nature and predictability of outages. Fuel changes while the system is in operation have become routine and a considerable amount of research into the sources of heavy-water losses has been carried out. As a result of this research, losses have been cut down and the NPD station is demonstrating that a very acceptable heavy-water loss rate is attainable. The station was modified in 1968 to a boiling heavy-water mode of operation to provide additional demonstration capabilities.

At Douglas Point on the shore of Lake Huron, the country's first full-scale nuclear power station went into commercial production in 1967. The station, built with the co-operation of Ontario Hydro, houses a 220,000-kwe CANDU reactor. Experience gained in the design and operation of this reactor has encouraged the development of even larger units. Construction of the four-unit, 2,160,000-kwe Pickering nuclear station is well advanced near Toronto, with two of the station's four units coming on line ahead of schedule during 1971; units 3 and 4 were expected to go into service in 1972 and 1973. Work on the Bruce nuclear station for Ontario Hydro is proceeding with four 800,000-kwe units planned for installation from 1975 to 1978.

A further step in the development of the CANDU reactor is the use of boiling light water instead of pressurized heavy water as the coolant. Quebec's Gentilly nuclear station near Trois-Rivières utilizes boiling light water in its CANDU reactor. This station came into service in 1971 with 250,000 kwe of nuclear-electric capacity.

13.3.6 Electric power transmission

The nature of the loads handled by small, widely scattered generating systems in the early days of the electric power industry in Canada did not warrant the expense of interconnecting power systems. However, as the demand for dependable electric power increased and improved techniques reduced power transmission costs, the benefits of integrating power systems to achieve reliability of service and flexibility of operation were re-appraised. Today, most of Canada's generating stations are components of large, integrated and often interconnected power systems operated by power utilities and companies in the various provinces.