Constant research in the field of power transmission has developed techniques that enable power producers to utilize hydro-electric sites previously considered beyond economic transmission distances. Most noticeable, perhaps, is the progressive stepping-up of transmission-line voltages. In Canada, there are a number of transmission lines designed for operation at 500,000 volts and 735,000 volts. A 574-mile, 500,000-volt line is in service to carry power from the Peace River to the lower mainland of British Columbia. In Ontario, a 435-mile, 500,000-volt line carries power from hydro-electric plants in the James Bay watershed to Toronto. In 1965, Hydro-Quebec achieved world leadership when power was carried for the first time at 735,000 volts over the 375-mile transmission line between Quebec's Manicouagan - Outardes hydro complex and the cities of Quebec and Montreal. By the end of 1971, the initial program for 1,228 miles of the 735,000-volt line had been completed. Work also finished on the first of three additional 735,000-volt circuits to connect the Churchill Falls complex with the Hydro-Quebec grid.

Most power is transmitted as alternating current but three applications of high-voltage direct-current (HVDC) are found in Canada. In service in British Columbia is a 260,000-volt HVDC link from the mainland to Vancouver Island. It has a capacity of 312,000 kw and includes 21 miles of undersea cable; it is a monopolar system using the ground as the return path for current. A second HVDC system is expected to be placed in service in 1973 linking the Kettle generation station on the Nelson River to Winnipeg where two 555-mile lines have been completed and converter equipment is now being installed. The initial capacity is 810,000 kw and the planned ultimate rating is 3,200,000 kw. Another application is designed to provide a non-synchronous tie between the systems of New Brunswick and Quebec; this is a 320,000-kw back-to-back HVDC system located at Eel River, NB, which was placed in service in 1972 employing solid state thyristor valves in place of the mercury arc valves used for the earlier HVDC systems.

Interconnections of from 66,000 to 230,000 volts exist between British Columbia and Alberta. Saskatchewan, Manitoba, Ontario and portions of the Quebec system are interconnected and, through the Ontario Hydro system, are linked with the northeastern United States systems. Quebec, New Brunswick and Nova Scotia systems are interconnected. The first international tie connecting regions of the Maritimes in Canada with the United States became a reality during 1970 on completion of a 345,000-volt link between the New Brunswick and Maine systems. British Columbia has an international tie with the Pacific Northwest (500,000 volts) and a 230,000-volt link between Manitoba and the United States was completed during 1970.

The search for economies in transmission systems has led to changes not only in materials used but also in tower erection and cable-stringing methods. Guyed V-shaped and Y-shaped transmission towers are being used increasingly in place of self-supporting towers where the terrain is suitable, and erection costs are being reduced by the use of helicopters to transport tower sections to the site for assembly. The use of helicopters for spraying for brush control on the right-of-way and for line inspection and maintenance is wide-spread.

In addition to considering the economics of transmission development, a concerted effort is under way to provide systems that are acceptable aesthetically. For example, designing more attractive towers led to the development of new tapered aluminum poles which will ultimately replace their unsightly wooden counterparts. Discretion is also being exercised in the selection of routes for proposed lines to ensure only minimal disturbance of the natural landscape.

13.3.7 Developments in 1971

Net additions of 3,862,000 kw to electrical generating capacity in 1971 raised Canada's total installed capacity by 9% to 46,678,000 kw. Reversing the 1970 growth pattern where thermal additions predominated, hydro-electric capacity accounted for 2,308,000 kw or nearly 60% of all 1971 installations. The 1,554,000 kw of thermal capacity added provided only 40% of the 1971 total compared to 1,810,000 kw or 59% of the total in the previous year. With the installation of the first two 540,000-kw units at Ontario Hydro's Pickering station and the commissioning of the 250,000-kw Gentilly station by Hydro-Quebec during the year, the country's nuclear generating capability rose an unprecedented 554% to 1,570,000 kw (from 240,000 in 1970). In fact, nuclear additions provided more than 85% of the over-all thermal-electric installations made in 1971. As at December 31, 1971, total installed capacity was approximately 66% hydro-electric, 31% conventional thermal and 3% thermal nuclear.