Ontario and Quebec with the remaining one third shared by all other regions. The share of total consumption by these other regions has, however, been rising (combined total of 26% in 1960 compared to 33% in 1971) while it has been declining in Quebec (40% in 1960 as against 33% in 1971) and has remained constant in Ontario at 34%. In all parts of Canada industrial users have been and still are the prime consumers. The actual portion of total energy consumed by industry in 1971, for instance, ranged from a high of 64% in British Columbia, which includes the energy used in both the Yukon and Northwest Territories, to a low of 47% in the Prairie region. Domestic and farm consumption remains greatest in the Prairie Provinces and Ontario but for somewhat different reasons. In Ontario, where the majority of people are urban dwellers, it is the high demand from the large cities that accounts for the higher level, while in the Prairies it results from a substantial farming load combined with a normal level of domestic usage.

Part of Canada's growing need for electric power reflects a growth in population but in addition the consumption per capita increased in 1971 by 4.2% to 9,800 kwh per capita. Since 1960 consumption per capita in Canada has risen by more than 60%. The Atlantic Provinces experienced the largest increase, 154% to 6,600 kwh per capita, followed closely by the Prairie Provinces with 132% to 7,200 kwh. The lowest increase over the period was in Quebec with only a 36% rise to 11,700 kwh per capita but the level was already very high. British Columbia recorded the highest per capita consumption in 1971, 12,800 kwh. Table 13.12 sets out details of this per capita consumption by region.

Electrical energy generated in Canada during the year was equivalent to 52.7% of the amount which in theory could be generated if the total installed capacity at the end of 1971 were operating continuously. The balance reflects fluctuations in load below peak demand during daily and seasonal cycles together with reserves of generating capacity.

13.3.4 Hydro-electric power generation

As discussed in Section 13.3.2, hydro-electric generation will play a decreasing, yet significant role in Canada's future electrical development. By the beginning of 1972, the hydro portion of the country's total generating capacity had fallen to 66% from over 90% twenty years earlier.

In view of the vast water resources existing throughout Canada, there would appear to be many undeveloped sites that could be potential sources of hydro-electric power. It is not sufficient, however, to assume that all of these possibilities represent economically viable sources of electric power. In fact, only a very minor portion of the sites with a theoretical power potential can actually be developed competitively. Before a site can be termed a source of potential power, a detailed analysis of such factors as costs, geography, geology and ecology must be performed. Until a study is completed on a national scale, estimates of Canada's undeveloped water power resources may tend to be misleading; a recent estimate places them in excess of 60 million kw.

Figures of water power resources already developed are given in Table 13.9 and are based on the manufacturer's rate in kilowatts as shown on the generator name-plate, or derived from the rating where it is indicated in kilovolt-amperes. The maximum economic installation at a power site can be determined only by careful consideration of all the conditions and circumstances pertinent to its individual development. It is normal practice to install units having a combined capacity in excess of the available continuous power at Q50 (flow available 50% of the time), and frequently in excess of the power available at Qm (arithmetical mean flow). There are a number of reasons for this. The excess capacity may be installed for use at peak-load periods, to take advantage of periods of high flow, or to facilitate plant or system maintenance. In some instances, storage dams have been built subsequent to initial development to smooth out fluctuations in river flows. In other cases, deficiencies in power output during periods of low flow have been offset by auxiliary power supplied from thermal plants, or by interconnection with other plants which operate under different load conditions or are located on rivers with different flow characteristics.

The extent to which the installed capacity exceeds the available continuous power at the various rates of flow is dependent upon the factors that govern the system of plant operation, and varies widely in different areas of the country.

The provincial and territorial distribution of installed hydro-electric generating capacity given in Table 13.9 reveals that substantial amounts of water power have been developed in all