Nuclear thermal power 13.9.5

Commercial electric power generated from a nuclear reactor in Canada dates back to 1962 when the 20-MW nuclear power demonstration station at Rolphton, Ont., forerunner of a series of large nuclear stations, fed power for the first time into a distribution system in Ontario.

Atomic Energy of Canada Limited (AECL), a federal Crown company incorporated in 1952, has concentrated on development of the CANDU power reactor using heavy water (deuterium oxide) as a moderator for slowing the neutrons released by nuclear fission. The high neutron economy obtained by using this moderator with neutron-transparent core materials (zirconium alloys) means Canada's abundant resources of natural uranium may be used as fuel. The CANDU system is sufficiently flexible that enriched uranium, plutonium recovered from spent fuel, or thorium may be incorporated into its fuel system.

Production of heavy water has been a critical item in the Canadian nuclear power program. The first 726 tonne-a-year production plant at Ontario Hydro's Bruce nuclear power development on Lake Huron went into operation in 1973 and is producing at over 80% of its design capacity. Ontario Hydro started the first of two additional plants at the Bruce site and completion was scheduled for 1978. In Nova Scotia rehabilitation of the Glace Bay plant continued; start-up was scheduled for 1976. Operation of the Port Hawkesbury plant was considerably improved after modifications. Ownership of the plant was transferred to AECL in 1975. There will be a two-year delay in construction of the new 726-tonne-a-year La Prade plant owned by AECL at the Gentilly site in Quebec. The first 363-tonne unit is expected to be operating by 1981.

At Douglas Point, on the shore of Lake Huron, the country's first full-scale nuclear power station went into operation in 1966. The station, built with the co-operation of Ontario Hydro, houses a 220-MW CANDU reactor. Experience gained in the design and operation of the Rolphton and Douglas Point reactors has led to development of larger units. Construction of the 2 160-MW Pickering nuclear station near Toronto is now complete; two of the station's four units came on line in 1971 and the other units in 1972 and 1973. Work on the Bruce nuclear station for Ontario Hydro is proceeding with four 800-MW units planned for installation from 1976 to 1979. In addition, a duplicate of the Pickering station, at the Bruce site, has been committed and Hydro-Québec and New Brunswick Electric Power Commission have started construction of 600-MW CANDU stations at Gentilly and at Point Lepreau.

A further step in development of the CANDU reactor is the use of boiling light water instead of pressurized heavy water as the coolant. The initial Gentilly nuclear power station (Gentilly 1) uses boiling light water; this station came into service in 1971 with 266 MW of nuclear-electric capacity.

Load demand and energy use 13.9.6

Firm power peak load is the measure of the maximum average net kilowatt demand of one-hour duration from all loads, including commercial, residential, farm and industrial consumers as well as the line losses. Such load demand increased at the rate of 7.5% a year from 1963 to 1973 and 7.4% a year from 1969 to 1973; this rate of increase is expected to remain unchanged through 1980. As a result of the rapid increase in generating capability and the somewhat slower but steady increase in peak loads, together with the slight reduction in deliveries of firm power to the US, the indicated reserve on net capability in the 1961-75 period increased each year except 1961, 1963, 1964, 1966 and 1972. The reserve ratio as a percentage of firm power peak load reached a high of 28.2% in 1960, fell to 13.7% in 1968, but is expected to rise to 20.0% in 1980.

As indicated in Table 13.16, total electrical energy consumed in Canada during 1976 showed residential loads up 12.7% from a year earlier. Commercial loads climbed 7.8% in the period while industrial demand crept ahead 1.7%. Industrial accounted for the largest segment of total demand, followed by commercial and residential, which have steadily increased their share of the total since the 1950s.

While availability of electric energy at reasonable cost is an important element in Canada's industrial growth, in only a few industries is the cost of electric power a key