Ontario

During the second half of the 1800s, when commercial electricity was a novelty, electrical applications were limited. At first this new energy form greatly enhanced communications through the telegraph and telephone. Then the magical medium was extended to give improved lighting on streets and in the homes of urban centres. During the 100 years since, electrical applications have expanded dramatically and constantly until today we see electricity applied in every conceivable manner for the most complex and instant response communications systems, lighting, heating, cooking and housekeeping chores, industrial and commercial power, mass transportation, calculating, recording, science, surgery, entertainment and space travel.

The story behind this expansion, and the establishment of the public utility to make this new form of energy available to all the people in all the areas of Ontario is a story of small beginnings, enterprise and great foresight. It started when local electric power plants were installed in some towns and cities. For example, commercial generation and distribution of electricity in Toronto began during the 1880s. Likewise, through local steam or small water power stations, electricity became available in many towns and cities until it was recognized as a necessity across the province.

Before the turn of the century transmission voltages were leaping from 1100 volts to 2500 to 5000 to 11,000 volts-each step being taken to economically provide for distribution of electrical energy from points of generation to more distant and far flung points of consumption. Alternating current had cracked the distance barrier but many claims were made by early entrepreneurs for the advantage of one frequency system over another. Some favored 135 cycles per second (135 hertz). Others claimed 662/3, 60, 40 or 25 cycles. What was claimed to be
good for lighting was not necessarily accepted as best for factory motors. Early developments of public utilities to produce, distribute and sell this energy were hampered by these arguments and by the consequent variety of systems which sprang up.

As in some of the other provinces of Canada, there remains in Ontario to this day a mixture of privately-owned, municipally-owned and provincially-owned (Ontario Hydro) generating plants. An outstanding example of privately owned generation capacity is to be found in heavy industry locations such as the Great Lakes Power Co. at Sault Ste Marie.

The Hydro-Electric Power Commission of Ontario was formed in 1906. A capricious Mother Nature had left Ontario without adequate fossil fuels. As the electrical age dawned, there was a growing realization that falling water could become the fuel source to transform the Province’s economy. There were able spokesmen in industry and in municipal politics. E. W. B. Snider of St. Jacobs, D. B. Detweiler of Berlin (now Kitchener) and A. Beck of London were among these early advocates. Of course, there were many others as well. But, in his book “The People’s Power”, Merrill Denison said: “Sometimes singly and sometimes in combination, Snider and Detweiler have been hailed as the true fathers of Hydro: Snider as the architect who designed the imaginative system of municipal co-operation, Detweiler was the fervent prophet to whom the cultural and industrial gains to be won through public ownership became an obsession.” It was, however, Alderman F. S. Spence of Toronto who detailed the proposal which led to the formation of the Power Commission by the provincial government. Then Adam Beck, who had
been Mayor of London, was newly elected to the provincial legislature. He provided the focus and driving force to get the act through the legislature itself. Beck, appointed as the first chairman of the HEPC of Ontario, guided the Commission from its creation in 1906 until his death in 1925.

Initially Ontario Hydro purchased power from privately-owned generating companies and transported it over a growing transmission line grid, which originated at Niagara Falls, and delivered it to municipally-owned utilities for final distribution and use in streets, homes, factories, commercial buildings and public institutions.

The principal private utilities generating power in the vicinity of Niagara Falls at the time were the Electrical Development Company, Ontario Power Company, The Canadian Niagara Power Company and the Hamilton Cataract Power Light and Traction Company whose generating station was located at DeCew Falls. In the eastern part of the province contracts for power to supply the City of Ottawa were concluded with the Ottawa and Hull Power Manufacturing Company while in Northern Ontario, Port Arthur was supplied with power purchased from the Kaministiquia Light Heat and Power Company.

The earliest city to receive power from Ontario Hydro was Berlin (now Kitchener) in October, 1910. Before the end of the same year Guelph, Waterloo, Preston, Woodstock, London, Hamilton and Stratford were added to the Hydro system. During the following year others were connected to the system: Dundas, Hespeler, New Hamburg, St. Thomas, Galt, Toronto, Ingersoll and St. Mary’s.

In 1913, Ontario Hydro began construction of its first hydraulic development at Wasdell Falls on the Severn River and in 1914 bought the Big Chute generating station from the Simcoe Light and Power Company. A pattern was thus formed where Hydro constructed some facilities and either Hydro or the government purchased the assets of privately-owned power companies.

The Commission began its second hydraulic development at Eugenia Falls on the Beaver River completing it in 1915. In 1916 the Ontario Government purchased the assets of the Electric Power Company and in 1918 Ontario Hydro began construction of the Cameron Falls generating station on the Nipigon River. In 1917 the Commission had bought the Ontario Power Company generating station at Niagara Falls and had also embarked upon the construction of the Queenston-Chippawa generating station. As plans matured it was said that the “work presented problems comparable in scope and difficulty with those encountered in building the Panama Canal, until then the world’s most impressive engineering accomplishment. The material to be excavated totalled 17,000,000 cubic yards, or 5 times the volume of the Pyramid of Cheops, and the concrete to be poured would amount to 450,000 cubic yards”. At the end of 1921 the Premier switched on an illuminated sign proclaiming the station as “The Largest Hydro-Electric Plant in the World”. The Gregory Commission, looking into cost over-runs, declared it to be “a magnificent piece of engineering”. The last unit was placed in service in 1925.

As in other provinces, the government provided a system of subsidies in 1921 to permit the extension of the benefits of electricity to rural areas. This resulted in a rapid expansion of the rural network. The farmers and rural communities had, since 1912, been regaled with the wonders of the electrical age for it was in the summer of that year that Beck had put his famous Hydro Circus on the road. Household and farm appliances were standard features of the exhibitions.

The burgeoning demand for electricity in Ontario during the 1920s coincided with a surplus of power in Québec. This led to the negotiation of contracts for supplies of energy from the
Gatineau Power Company, the Maclaren-Québec Power Company and the Beauharnois Light, Heat and Power-Company. At the same time Ontario Hydro and the Ottawa Valley Power Company undertook the joint development of Chats Falls on the Ottawa River. The contracts necessitated a 220,000 volt transmission line from Paugail Falls in Québec 230 miles to the Leaside Transformer Station on the outskirts of Toronto. The line was the longest, and operated at the highest voltage, yet constructed in Canada.

Despite a setback in the early 1930s, upward growth in the demand for electricity continued. Mining in Northern Ontario led to new generating stations and transmission lines. Then there was the Long Lac Diversion. Rivers and lesser lakes whose flow was normally towards Hudson Bay were diverted into the Agasabon River and thence to Lake Superior to increase water volume for generating stations at Niagara Falls. Under the impetus of wartime demand a further diversion from the Ogoki augmented water availability for generation on the Nipigon River, at Niagara and at DeCew Falls. New hydraulic stations were developed at Big Eddy on the Muskoka River and Barrett Chute on the Madawaska. In spite of all these measures it became necessary to place restrictions on the non-essential consumption of electricity and to increase purchases from Québec.

The end of World War II brought no diminution in the increasing demand. So rapid was the rate of increase that by the fall of 1946 Hydro had to cut interruptible loads and appeal to all customers to curtail unnecessary consumption. In succeeding years low rainfall added to the problems of shortage of generating capacity. Hydro was given mandatory powers by the Ontario Legislature “to prohibit the use of electrical energy for specific purposes”. Rotating blackouts were experienced at times of peak loads during, 1947-48-49.

Construction of coal-fired steam-electric generating units was begun at Toronto (Hearn Station) and at Windsor (Keith Station) to close the longer lead time of hydraulic developments.

Ontario Hydro developed plans for additional hydraulic generating stations and new units were to be added to existing stations all over the Province. Des Joachims (360,000 hp), Chenaux (120,000 kW) and La Cave (later renamed Otto Holden G.S.-220,000 kW) were planned for the Ottawa River. A 70,000 hp second unit for installation at DeCew Falls and a new plant at Stewartville on the Madawaska River to deliver 54,000 hp were also in the works. In northern Ontario, Agasabon G.S. on the Agasabon River would add 40,000 kW. A fourth unit would be added to Alexander G.S. on the Nipigon River while, on the Mississaga River, Tunnel G.S. (later renamed G. W. Rayner G.S.) would be built to deliver 47,000 kW. A fourth unit of 7,500 hp would also be added at Ear Falls and, nearby, Hydro’s first generating station to be controlled by radio link would be built at Manitou Falls to deliver 42,000 kW. At the same time a new development was planned for Niagara Falls to take advantage of the additional water available through the diversions from Northern Ontario into Lake Superior and from the agreement with the United States regarding use of Niagara River waters.

All of these foregoing projects to expand Hydro’s generating capacity were completed by the early 1950s.

Ontario Hydro’s generation from the earliest days of Niagara was mostly at 25 hertz frequency. This turned out to be unfortunate mostly because neighboring systems within Ontario, the Québec system and the bordering U.S. system were already operating at 60 hertz. Ontario Hydro decided, in the late 1940s, to standardize at 60 hertz. This was a bold decision leading to improvement in performance for lighting and greater flexibility of transmission interconnections to surrounding systems. The changeover was a huge task involving motor replacements or
rewinds in 6,213,000 frequency sensitive items of equipment. From 1949 it took about a decade to complete this frequency conversion project.

Additional thermal units were installed in the early 1950s at Hearn and Keith generating stations as delays continued with respect to undertaking the development of the St. Lawrence. The new hydraulic generating station at Queenston was begun at about the same time. It involved the building of two 45-foot diameter, 51/2 mile long, concrete-lined tunnels under the City of Niagara Falls and would add 1,370,000 kilowatts of generating capacity. An ancillary was the construction of a pumped storage station that would draw electrical power from the system during the night-time low-demand period in order to pump water into a 750-acre storage reservoir. During daytime peak-demand periods, the water would flow back through the pumps, now acting as turbines, and would be added to the water flowing through the turbines of the main generating station.

In 1950, the Canadian Government, restive with the continuing impasse over the development of the St. Lawrence Seaway and the associated hydraulic generating facilities, indicated that it was prepared to proceed alone and could and would make construction of the seaway its undivided responsibility. By December 1951 the Canadian Parliament, with unanimous consent of all parties, passed both the St. Lawrence Seaway Authority Act and the International Rapids Power Development Act. The latter empowered Ontario Hydro to undertake the construction of a hydroelectric power development, together with a designated U.S. power authority, in the international rapids section of the river.

With the opening of the Sir Adam Beck Generating Station #2 at Queenston in 1954 (completed in 1958 to its full capacity of 1,370,000 kilowatts including the pumped storage facility) there remained but one large hydraulic site for development. Ground breaking ceremonies for the St. Lawrence generating station (later to be called the Robert H. Saunders Station) took place in August 1954 with dignitaries from the Canadian Government as well as the Ontario Government and the State of New York. In the same year Ontario Hydro, in concert with Atomic Energy of Canada Limited, began the exploration of the power of the atom to generate electrical power. The latter was timely for Ontario had come to the end of its economical hydroelectric sites and was once again having to turn to coal-fired generation to meet the demand for electrical energy. The limits of “white coal” were in sight. A new raw source of energy was needed.

On Dominion Day 1959 the St. Lawrence generating station was placed in service adding some 940,000 kW of power to Ontario Hydro’s system in a 3,300-foot-long generating station built in two halves, part by Americans, part by Canadians, with a total capability of 1,880,000 kW. A dream spanning decades was finally a reality.

“White coal”, the indigenous low-cost source of energy, had contributed magnificently to Ontario’s well-being. What was to replace it in coming years? The joint studies by Ontario Hydro and AECL led to the design and construction of a demonstration prototype NPD (Nuclear Power Demonstration) at Rolphton on the Ottawa River. The plant was undertaken as a joint venture by AECL, Canadian General Electric Company and Ontario Hydro. With a capability of 20 MW, it produced the first electrical power in Canada generated from the fissioning of uranium in June of 1962. Concurrently with the design and construction of this station, another team of designers began the design and construction of a full-scale demonstration plant to deliver 220 megawatts of electricity at Douglas Point. The nuclear age of electricity was under way in Ontario, and, as was the case with “white coal” earlier, would be able to draw upon an indigenous raw material source of energy.
Pioneers of Ontario Hydro

Daniel B. Detweiler, Berlin (now Kitchener), Ontario.

E.W.B. Snider, St. Jacobs, Ontario.


Alderman F.S. Spence, Toronto, Ontario.
During the 1950s Ontario Hydro began tests on EHV (extra high voltage) transmission at 500 kV. Once this method of transmitting electricity over long distances was demonstrated to be economical, studies were carried out for a series of hydraulic generating stations on the Moose River system in northeastern Ontario. About 60 miles north of Kapuskasing three new generating stations were built to join the Smoky Falls generating station (55,000 hp owned by the Spruce Falls Power & Paper Company—built in 1928) on the Mattagami River (a tributary of the Moose River). These stations were Little Long G.S. (about 130,000 kW), Harmon G.S. (about 145,000 kW) and Kipling G.S. (about 145,000 kW) and were completed in 1963, 1965 and 1966 respectively. Nearby on the Abitibi River (also a tributary of the Moose River) Otter Rapids G.S. (about 180,000 kW) had its first two units placed in service in 1961 and a further two units in 1963. Power from these generating stations was collected at Pinard T.S., located between Harmon G.S. and Abitibi G.S., by means of 230 kV lines and thence transmitted to Sudbury and Essa at 500 kV. In more recent years, the flow of electrical power has been from Southern Ontario to the north.

During these past twenty years Ontario’s increasing requirements for electrical energy have been met by additional thermal plants. Some of these have been oil-fired, some coal-fired and some nuclear-fired. The Lennox G.S. oil-fired station has since been mothballed as an aftermath of the oil cartel formed by OPEC nations. Coal-fired stations have been installed on Lake Ontario near Toronto, on Lake Erie at Nanticoke, on the St. Clair River (Lambton G.S.) and in the northwest near Thunder Bay. Nuclear plants have been added at Pickering and at the Bruce location on Douglas Point.

The construction of Nanticoke G.S. (4,000 megawatts) and Lennox G.S. (2,000 megawatts) led to the building of 500 kV lines linking these two plants to the Toronto area. Completion of the CANDU nuclear generating stations at Pickering (2,000 megawatts in 1973) and on the Bruce peninsula (3,200 megawatts in 1979) led to extensions to the 500 kV transmission system. Currently additional units coming into service will double the size of both the Bruce and Pickering generating stations.
Under construction at the present time is one of the largest nuclear generating stations, Darlington Station, located near Bowmanville, which is slated to come into service in the early 1990s. By that time nuclear power will be supplying over 50 percent of a still growing demand for electrical energy in Ontario. Today this demand stands at 18,896 megawatts during peak periods.

What started out as a series of small water wheels and steam engines in the 1880s has expanded to an enormous network of generating stations and transmission line grids. These are the backbone of Ontario’s industry, commerce, and modern way of life. Without these electrical developments the province could not have reached its present state of well-being. Its cities, as we know them, could not exist. Continuing progress to support the ongoing growth of population at a high level most certainly calls for improvement, expansion and extension of the electricity system regardless of whether it be fed by waterpower, gas, oil, coal, or nuclear fuel. Electricity is the magic medium that permits the movement of energy from remote generating sites to millions of points where it is called into service. and controlled by millions of people “at the touch of a finger”.

**World Wide Web Resources as of March 2000:**
- Ontario Power Generation - www.ontariopowergeneration.com
- Ontario Hydro Services Commission - www.ohsc.com
Sir Adam Beck Generating Stations 1 and 2 with reservoir in background. Photo courtesy of Ontario Hydro.

Duncan Street Substation, 1914. Photo courtesy of Toronto Hydro Electric System.

Constructing an extension to Duncan Street Substation, 1916. Photo courtesy of Toronto Hydro Electric System.

Duncan Street Substation with extension, 1918. Photo courtesy of Toronto Hydro Electric System.
Duncan Street Substation, today, still serving in downtown area. Photo courtesy of Toronto Hydro Electric System.

Modern power entrance station for downtown office building complex. Photo courtesy of Canadian Imperial Bank of Commerce and Toronto Hydro Electric System.
Power Distribution Station for downtown office building complex. Photo courtesy of Canadian Imperial Bank of Commerce and Toronto Hydro Electric System.

Monitoring and Control Room for downtown office complex. Photo courtesy of Canadian Imperial Bank of Commerce and Toronto Hydro Electric System.
1937-Yonge Street North of Alexander. Photo courtesy of Toronto Hydro Electric System.

1985-Yonge Street north of Alexander. Photo courtesy of Toronto Hydro Electric System.