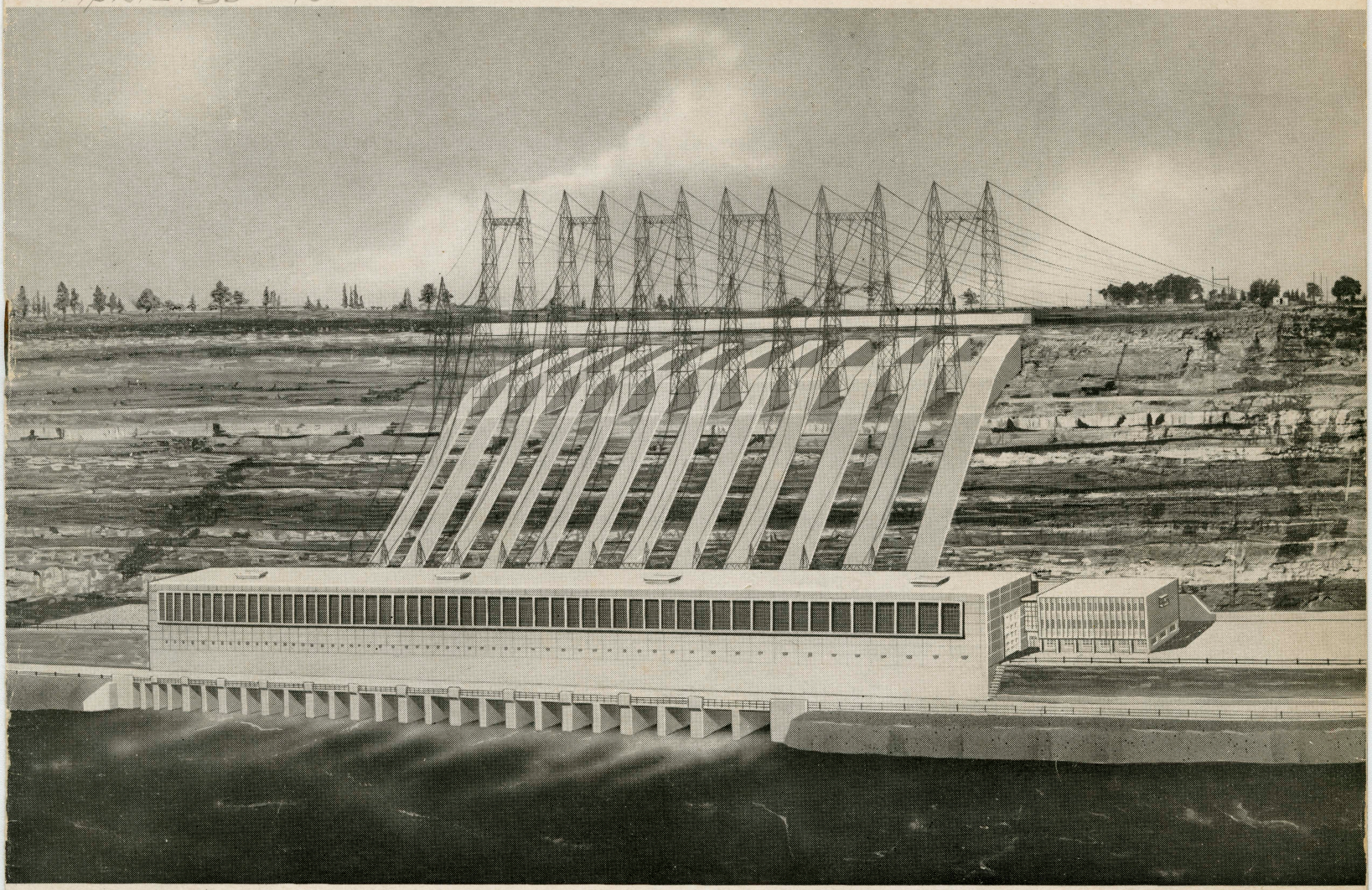
April. 30th 1953.



ONTARIO HYDRO'S

SIR ADAM BECK-NIAGARA GENERATING STATION No. 2

NIAGARA FALLS

ONTARIO HYDRO

THE HYDRO ELECTRIC POWER COMMISSION OF ONTARIO

THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO

620 UNIVERSITY AVENUE, TORONTO 2

This booklet has been given to you in accordance with our sincere desire that the people of Ontario should be constantly informed of the business of their own Hydro. We trust that you will enjoy reading it. If you have suggestions as to how our service might be improved or questions about any branch of Hydro, we shall be delighted to receive them, and you can be assured of a prompt reply.

R. H. Hearn
General Manager

Robert H. Saunders
Chairman

"The Incredible Cataract"

For three hundred years, the wonder, beauty and power of Niagara Falls have cast their spell over all who viewed the roaring cataracts.

One of the earliest descriptions of the Falls was given by Father R. P. Louis Hennepin. He writes of the scene vividly, if with understandable exaggeration, as he saw it on St. Nicholas Day, December 6, 1678:

". . . Four leagues from Lake Frontenac there is an incredible Cataract or Waterfall, which has no equal . . . They (the waters) plunge down a height of more than five hundred feet, and its fall is composed of two sheets of water and a cascade, with an island sloping down. In the middle, these waters foam and boil in a fearful manner.

"They thunder continually, and when the wind blows in a southerly direction, the noise which they make is heard for more than fifteen leagues. Four leagues from this cataract or fall, the Niagara river rushes with extraordinary rapidity especially for two leagues into Lake Frontenac . . ."

To the early settlers, the cataracts were an insurmountable barrier to their dream of trade with the Orient. Traders at the turn of the nineteenth century brought their bales and boxes destined for the Upper Lakes by boat to Queenston. There the goods were transferred to carts for the journey over the Portage Road, "carrying-place of Niagara", to Chippawa. At the latter point, the journey by boat was resumed.

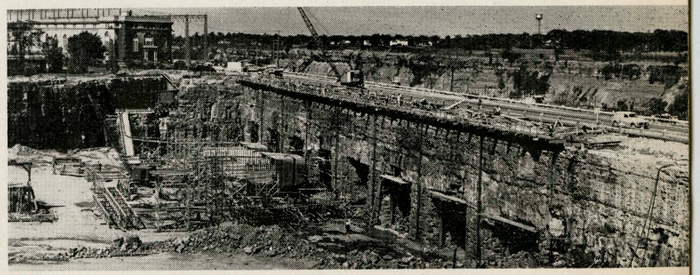
One hundred years later, the same Falls were viewed by a man who considered them not as a barrier but as a source of electrical energy, which would supply power for customers in centres as far away as Kitchener, Windsor, London, and even Toronto. "Rashly", Adam Beck predicted that some day a million horsepower would be generated at Niagara.

Thirty-one years ago, the first stage of this "flight of imagination" became a reality with the official opening of the "Queenston-Chippawa" plant on December 28, 1921, by Sir Adam Beck, Father of Hydro and Chairman of the Commission from 1906 until his death in 1925, Premier E. C. Drury, and Sir Adam's 17-year old daughter, Marion.

The station was for many years the largest hydro-electric development in operation in the world. Its main generating units and two service units are housed in a powerhouse 590 feet in length and rising to a height of about 180 feet, or halfway up the cliff. The installed capacity of the station is 525,000 horsepower.

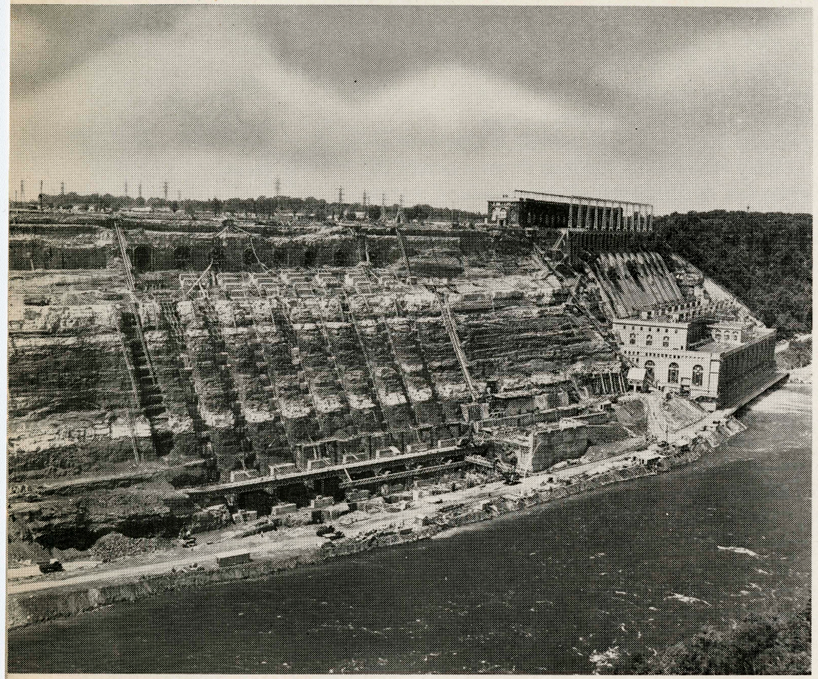
In August 1950, the plant was renamed the Sir Adam Beck-Niagara Generating Station No. 1, in honor of the man whose foresight and determination against continuing opposition triumphed in the realization of his great dream of "power at cost" for the people of Ontario.

History repeats itself today, as Hydro engineers and construction crews team up to build the greatest power development ever constructed by Ontario Hydro and one of the largest in the world—the giant Sir Adam Beck-Niagara Generating Station No. 2. Begun in 1951, this station will start producing electricity in 1954 for the people of Ontario, who, in the past quarter-century, have learned that low-cost power is truly the vital core of living and progress in Ontario.



FOREBAY EXCAVATION

With the screenhouse of Sir Adam Beck-Niagara G.S. No. 1 dwarfed in the left background, the forebay excavation shows construction for the openings through which the water will flow under the roadway and into the penstocks.



HOME OF THE MODERN "CLIFF-DWELLERS"

Looking like a reconstruction of a village of "cliff-dwellers" of New Mexico, the beds for the penstocks of the new development are gouged into the living rock of the 300-foot Niagara cliffs. To the right can be seen the structure of G.S. No. 1. Both these stations are designed to harmonize with and enhance the natural grandeur of the Niagara gorge.

Location: Six miles below the famous cataracts of the Niagara, on the side of the precipitous, 300-foot cliff of the Lower Niagara River Gorge, and just upstream from the Sir Adam Beck-Niagara G.S. No. 1.

Installed Capacity: 12 units, 900,000 kilowatts (1,200,000 horsepower)

Construction Began: ..... January, 1951

Estimated in Service: 4 units in 1954, 6 units in 1955, 2 units in 1956

Estimated Cost: 12 units ..... $300 million

Operation of Station: Water, diverted from the Upper Niagara River, will be conveyed beneath the city of Niagara Falls by two huge, 5½-mile tunnels. Re-emerging to the surface on the other side of the city, the tunnels will empty into a 2¼-mile canal, which will carry water to the forebay of the station.

Intake Structures: Situated two miles above the Falls, the two intakes will each divert 20,000 cubic feet of water a second (7½ million gallons a minute) from the Niagara River.

The intake for each tunnel will consist of a 500-foot long gathering tube, located along the present shoreline to take advantage of the main current in the river.

Extensive investigations on the intake structure were carried out by the Commission in a realistic model of the Upper Niagara. This model, duplicating the river's flow, permitted engineers to test various designs and locations before actual construction.

Tunnels: Two of the largest of their type in the world, the tunnels will have a rough diameter of 51 feet. Completed, they will have circular linings of concrete three feet thick, reducing the diameter to 45 feet.

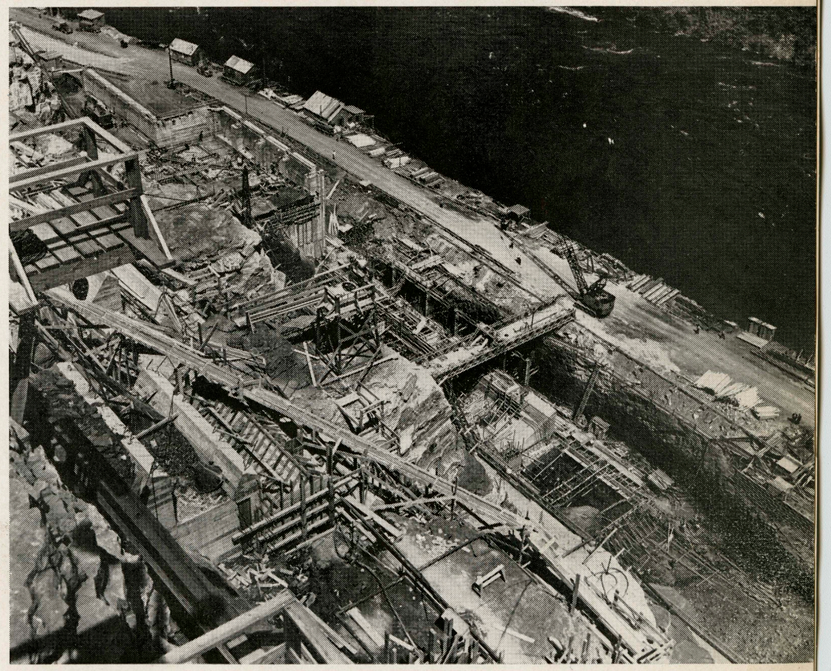
Approximately 954,800 cubic yards of concrete will be required to line the tunnels—sufficient to build a sidewalk 3,400 miles long.

Removal of rock will be from five access shafts, about 6,225 feet apart with depths varying from 200 to 330 feet—depending on the tunnels' horizons. Over 9¾ million tons of rock must be excavated and removed from the tunnels.

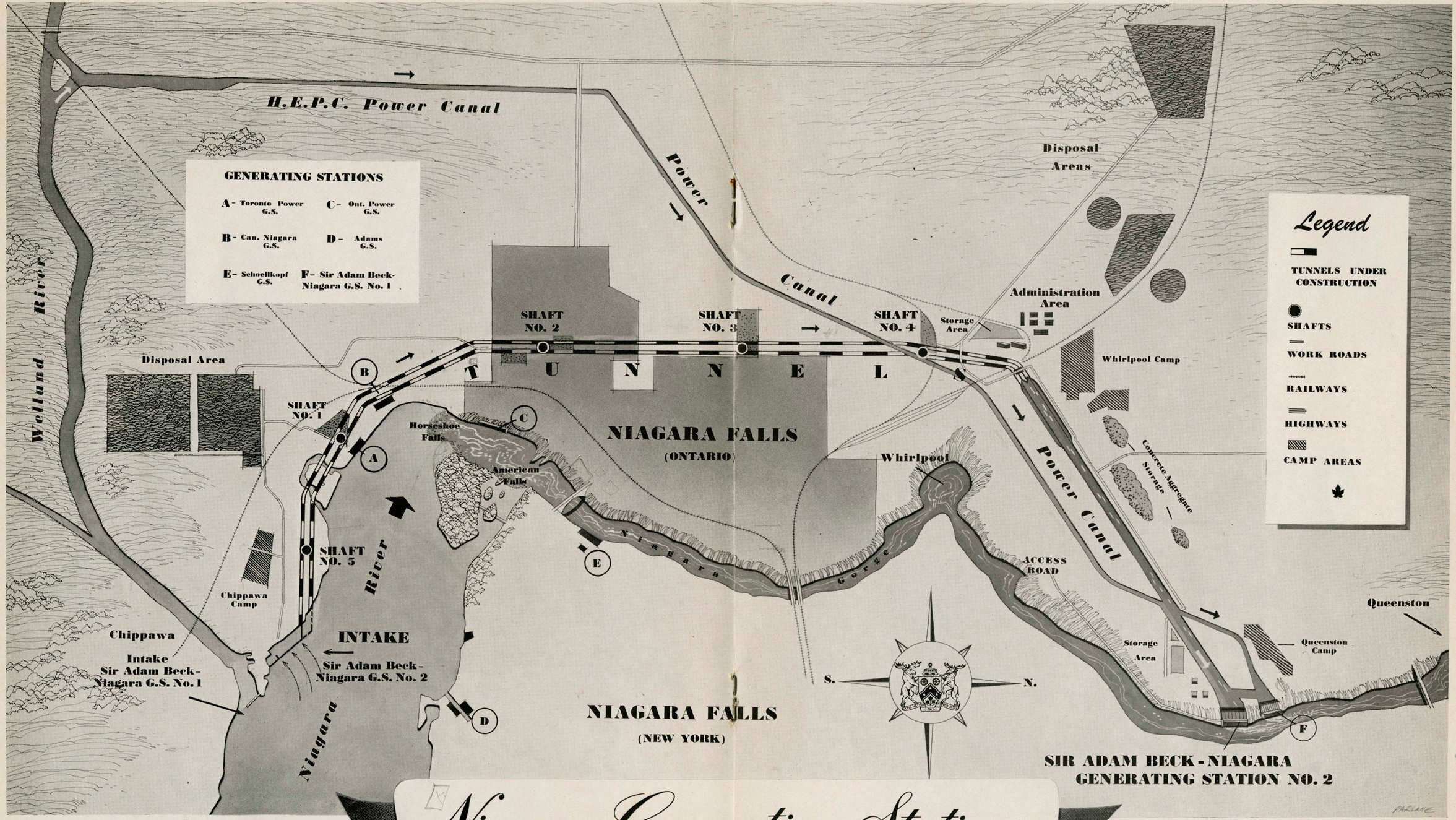
Shafts used on the first tunnel were offset in such a manner that they could also be used for construction of the second tunnel, running parallel at a distance of 250 feet centre to centre. Contracts for sections of the tunnels were awarded to Rayner-Atlas Company, and to Perini-Walsh and Associates.

POWER IS BUILDING

Looking down from the Niagara cliffs some 300 feet above, a sweeping view of the new powerhouse construction is seen. From the 12 generators to be erected in the powerhouse, an estimated 1,200,000 hp. installed capacity will flow to the people of Ontario in 1956. First delivery of power (4 units) will be in 1954, six in 1955, and the remaining 2 units in 1956.



Niagara Generating Stations



Canal: The surface canal will be 2¼ miles in length, with an average width of 200 feet and an average depth through rock and earth of 70 feet.

Over 14 million tons of earth and rock will be excavated and hauled away. This amount will require 470,000 trips of big 30-ton trucks. If lined up, bumper to bumper, these trucks would stretch from Toronto to Vancouver.

The canal will be capable of handling 40,000 cubic feet per second of water.

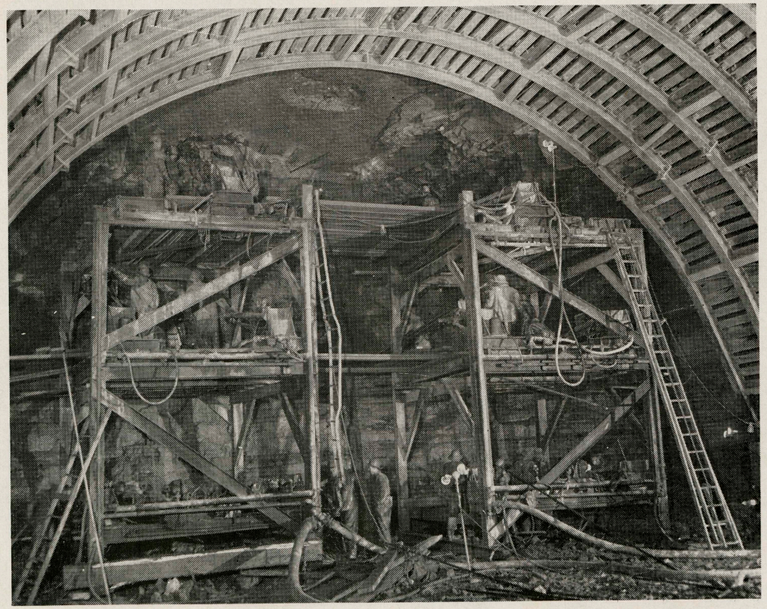
The canal will run unlined through rock, with the exception of a stretch 2,200 feet in length. In this part—the site of an ancient gorge which was filled with glacial debris—a trapezoidal (resembling a spread "V") concrete trough will be built to carry the water.

Near the forebay the canal crosses that of the Sir Adam Beck-Niagara G.S. No. 1 in a unique "X" crossing. The flow in the two canals is redistributed at this intersection. Further redistribution of flow is achieved by an interconnecting canal between the forebays of No. 1 and No. 2 plants.

Generating Station: In order to build the powerhouse on the side of the steep cliff, it is necessary to blast and remove more than 2 million tons of rock.

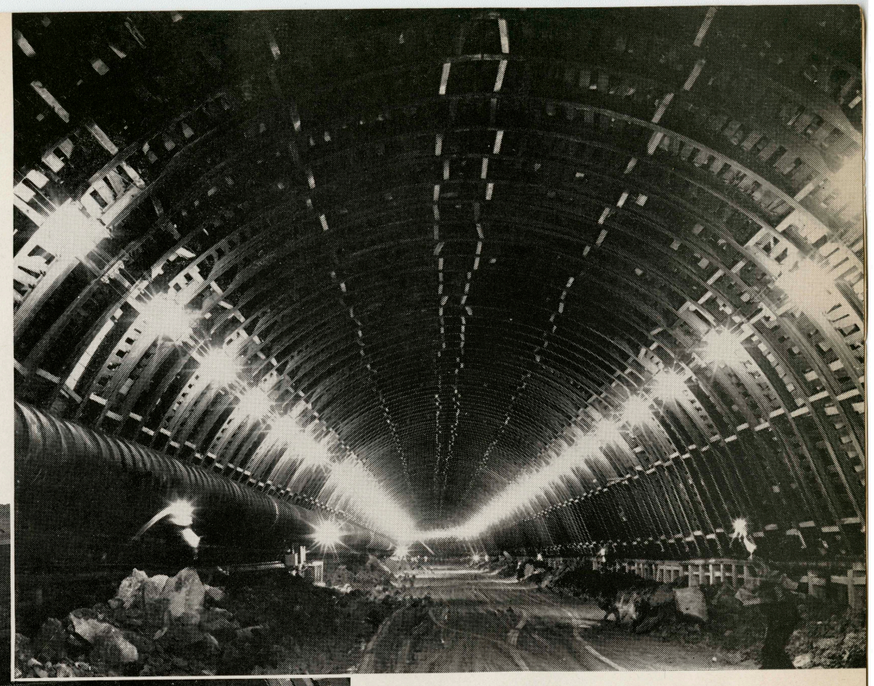
THE BIG PUSH

One of the twin tunnels pushes forward as workmen drill into the end of the tunnel from a "jumbo drilling rig". These rigs are equipped with up to nine drifter drills operated hydraulically. This tunnel is now a semicircle, but will be a complete circle when finished.



THE BIG BORE

Cut as deep as 330 feet underground, twin 5½-mile tunnels, of which a small section is shown here, are being driven under the city of Niagara Falls to carry the water to the $300 million project. These "good neighbours" of the city do not disturb the citizens of Niagara Falls, and yet will help provide them and thousands of others in Ontario with low-cost electricity.



THE BIG BITE

A steam-shovel bites into the end of one of the tunnels to fill a giant 17-ton truck, which will carry the load to the shafts for disposal above ground. These well-lighted, well-ventilated tunnels have their own workshops for underground repairs and maintenance.

With an installation of 12 units, the powerhouse will be 931 feet long, 63 feet wide and 50 feet high.

The site of the generating station enables 295 feet of the 315-foot difference in level between the intake and the powerhouse to be utilized for the production of electric power. This enables 50 per cent more power to be produced than if the generating station were built immediately below the Falls, where a head of only 200 feet could be obtained.

To bring machinery and materials to the bottom of the cliff, Hydro undertook to construct a double-lane road down the side of the steep gorge. Now in use, this road is a spectacular engineering triumph.

Disposal Areas: In order to dispose of the tremendous amounts of rock and earth, four main disposal areas are located on the outskirts of the city, on land which was judged to be of small value. These areas, totalling about 640 acres, will provide enough space for earth and rock from the first and second stages of the project, and upon completion of the development will be graded and landscaped.

"Hydro City": Virtually a city within a city, three main Hydro camps at Chippawa, the Whirlpool and Queenston are equipped to house and feed nearly 3,000 men. Almost self-sufficient, these camps have fire protection, sanitary services, a 30-bed hospital and recreational facilities.

Roads: Over twenty-five miles of specially-built roads have been constructed to carry the trucks which will remove rock and earth from the shafts and canal to the disposal areas. Wherever possible these have been routed to by-pass local and tourist routes.

Niagara Diversion Treaty: Opening the way for the new project was the ratification by the United States and Canada in October 1950 of the Niagara Diversion Treaty, which permits both countries to use more water from the Niagara for power generation most of the time.

Under terms of this agreement at least 100,000 cubic feet per second of water must pass over the cataracts during the daytime hours of late spring, summer and early fall. During the night through the full year —as well as the daytime hours of late fall, winter and early spring— only 50,000 cubic feet per second must pass over the Falls. This will allow Canada and the United States to use greater amounts of the Niagara River water for power generation, particularly during the late fall and winter when power demands are high.

"TO HEAL THE SICK AND HURT"

A modern 30-bed hospital with its highly trained resident staff of a doctor and nurses stands ready for any emergency, part of Ontario Hydro's plan of complete care for its workers.

THE "CHOW LINE"

Famed for the quality as well as quantity of their food, each of the three construction camps has cafeterias such as this, where hungry workers select from well-balanced menus.

Beauty of Falls Unimpaired: The Niagara Diversion Treaty also requires that remedial works be built in the Upper Niagara River Rapids to distribute more evenly the decreased flow in the river over the crest-lines of both cataracts.

Without remedial works 90 per cent of the river flows over the Horseshoe Falls, and 65 per cent of this amount passes over the middle third of the cataract, leaving the flanks bare during periods of low water in the river.

Remedial works will distribute the water more evenly over the 2,600-foot crest-line, lessen erosion at the centre, and preserve the awe-inspiring beauty of the Falls.

Thus while the aesthetic beauty of one of Nature's wonders continues to hold entranced visitors from all lands, the waters of the Niagara will provide more urgently-needed power to advance the material welfare of the people of Ontario.

SUMMARY OF
ONTARIO HYDRO'S DEVELOPMENT PROGRAM, BEGUN IN 1945

DeCEW FALLS (Extension) — Niagara Region — 57,000 kilowatts (76,400 horsepower). Placed in service September, 1947.

EAR FALLS (Extension)—English River—6,000 kilowatts (8,000 horsepower). Placed in service June, 1948.

STEWARTVILLE — Madawaska River — 63,000 kilowatts (84,500 horsepower). Placed in service September, 1948.

AGUASABON—Aguasabon River—40,000 kilowatts (53,600 horsepower). Placed in service October, 1948.

ADDITIONAL POWER PURCHASE CONTRACT—POLYMER CORPORATION—22,500 kilowatts (30,200 horsepower). Power delivered to H.E.P.C. commencing November, 1948.

EMERGENCY FUEL-ELECTRIC UNITS—Hamilton, Scarboro, Chatham, Thorold—63,000 kilowatts (84,000 horsepower). Placed in service January, 1949 to April, 1950.

GEORGE W. RAYNER GENERATING STATION — Mississagi River—47,000 kilowatts (63,000 horsepower). Officially opened June, 1950.

PINE PORTAGE—Nipigon River—93,000 kilowatts (124,700 horsepower). Officially opened June, 1950. Two units in service September, 1950. Third unit scheduled for service 1954.

DES JOACHIMS—Ottawa River—380,000 kilowatts (509,000 horsepower). Officially opened June, 1950.

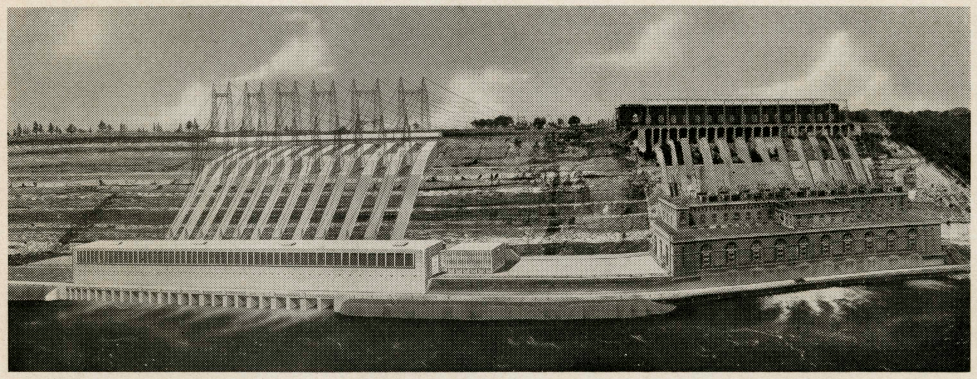
CHENAUX — Ottawa River — 120,000 kilowatts (160,000 horsepower). Placed in service November, 1950.

RICHARD L. HEARN GENERATING STATION—Toronto—400,000 kilowatts (536,000 horsepower) with four units operating at 60 cycles. Officially opened October, 1951.

J. CLARK KEITH GENERATING STATION—Windsor—264,000 kilowatts (354,000 horsepower). Officially opened November, 1951.

OTTO HOLDEN GENERATING STATION—Ottawa River—204,000 kilowatts (273,000 horsepower). Placed in service January, 1952. Officially opened June, 1952.

SIR ADAM BECK—NIAGARA GENERATING STATION NO. 2—Niagara River—900,000 kilowatts (1,200,000 horsepower). Scheduled for initial service in 1954.



A composite architect's conception and photograph shows the Sir Adam Beck-Niagara G.S. No. 2 (left), and the Sir Adam Beck-Niagara G.S. No. 1 (right).

THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO

620 UNIVERSITY AVENUE **TORONTO 2, ONTARIO**

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