

1,820,000 Horsepower Sir Adam Beck No. 2 Generating Project Truly A Big Job

How big is BIG? Then all 16 units are installed at Ontario Hydro's 1,820,000 horsepower Sir Adam Beck — Niagara Generating Station No. 2, near Queenston, this mammoth development will have a powerhouse approximately 1150 feet long. The imposing structure will be 60 feet wide, 50 feet high from the operating floor, with 85 feet of sub-structure below the floor.

If this impressive building were set on Bay Street in Toronto, it would reach for three blocks — from King Street to Queen Street — with four storeys above the ground, and seven storeys below the street level.

Yet the sole purpose of this great structure, nestled at the foot of the 300-foot Niagara Gorge, six miles below the cataracts, is to supply power to the people of Ontario.

And the powerhouse is not the largest part of the Niagara project, by any means. Yes, the Big Job is BIG!

VISITED BY PRESS
More than 70 representatives of press and radio from Eastern Ontario and the Toronto area were shown the initial results of Ontario Hydro's 1,820,000-horsepower Niagara development on Saturday when they saw in operation the first 1000-horsepower unit of the Sir Adam Beck-Niagara Generating Station No. 2.

The development stretches from the intake structures, two miles above the Falls at Chippawa—eight miles across country almost to Queenston—and includes a twin 5½-mile tunnel diving as deep as 330 feet under the City of Niagara Falls, a 2½-mile open-cut canal, a pumped storage scheme, a large forebay, and the powerhouse.

At its peak, it employed a work force of 6800 men and hundreds of machines. It created "Hydro Cities," involved the building of 25 million tons of earth and rock, and pushed back the shoreline of the Niagara River temporarily.

USEFUL MONUMENT
A useful and spectacular monument to Canadian engineering skill and initiative, the big job is now in progress. In December, 1950, the first power shovel took its first mammoth mouthful. Today, the project approaches a record of construction movement and speed. Tomorrow, more and more power will flow into the transmission and distribution lines of the province.

For the Big Job is scheduled to start work this year, when the first five 1000-horsepower units of its 12-unit phase will be placed in service. (Chairman Robert H. Saunders announced recently that the Commission expected to hold the official opening ceremony in August, 1951.)

The 12-unit phase of the project, together with the power developed by the turbine-generators at the pumped storage reservoir, will add a triumphant 1,428,000 horsepower of installed capacity to Ontario's generating pool. With power for four more 100,000-horsepower units to be added as required, the eventual capacity of the new station is 1,823,000 horsepower.

Let's look at the Big Job... the way it is today, and how it got that way.

THE INTAKES
The intakes consist of two gathering tubes, each 500 feet long. Each will supply water to one of the twin tunnels, at the normal rate of 7,500,000 gallons a minute. No. 1 tube is now completed; concrete is being placed in No. 2.

That is the bald "progress report." It tells nothing of the difficulties encountered and overcome during construction.

The intakes had to be built in a location where sufficient water would be available without turbulence, and in such a way that floating ice would not interfere with the flow of water. The location is two miles above the Falls. Anyone who has seen this area, and recalls the sweeping rush of the Niagara River at this point, will realize what problems faced the engineers and construction men.

The first step was to build an 1100-foot timber-crib cofferdam and an earthen dike, 400 feet long, enclosing 14 acres of the Niagara waters. Before excavation for the structures could proceed it was necessary, also, to place a grout curtain around the area to be unwatered. This was accomplished by diamond-drilling some 1200 holes, approximately 25 feet in rock, and pumping in grout (a mixture of cement and water). Following this operation, in which some 109,000 bags of cement were used, it was possible to begin excavation "in the dry," although large pumps had to be kept going constantly to throw back into the turbulent river the forces it still sent to the onslaught.

In placing the structures, it was necessary to excavate 782,000 cubic yards of earth, and 202,000 cubic yards of rock. This put the workers far below the level of the Niagara River. The gathering tubes, which are 50 feet in diameter, will enter under a series of overhead waterways. To bypass ice and to obtain the most efficient flow, the gathering tubes have been located below the water surface, parallel to the main currents of the river.

The open-cut canal is 2 miles long, 200 feet wide, with a depth of eight feet and a rock of 70 feet and it will have a water depth of some 30 feet.

The pride of Canada Steamship Lines is the giant freighter, "T. R. McLaughlin," launched in 1963. The largest cargo-carrier on the Great Lakes, it is 715 feet long, the maximum length allowed to lock through the Welland Canal. The great ship has a beam of 70 feet, and a maximum draft of 25 feet.

The canal could carry a total of 32 such craft, 16 travelling in each direction, with 13 feet of open water between each ship and some 60 feet of passing room. Yet the canal of the Big Job is designed only to convey water to create power for the people of Ontario.

PUMPED STORAGE AREA
One of the unique features of the huge project will be the pumped-storage scheme authorized in July last year. This has necessitated several changes in the plans for the development, including creation of a storage reservoir covering some 700 acres and containing 650,000,000 cubic feet of water; widening of a portion of the open cut canal; enlargement of the forebay, and extension of the headworks for operation of the four additional units to be installed as required.

A pumping plant, equipped with eight pump-turbine units, will be located at the upper end of a 1400-foot "off-take" canal, now being excavated.

The pumped-storage scheme, scheduled for service in 1957, will increase the generating capacity of the project by pumping water into the reservoir at night, and, at peak periods, running the same water back through the units as needed. When these pumps are operated in reverse they will act as turbine-generators and generate some 228,000 horsepower. The reservoir will also enable fuller use to be made of all units of the station, particularly at times of high demand, when quantities of water allowed by the Niagara Diversion Treaty would place temporary restrictions on full capacity operation.

HUGE PENSTOCKS
At the foot of a two-lane service road, carved from the face of the 300-foot cliffs of the Niagara gorge, is the powerhouse of the Big Job. The penstocks, 19 feet in diameter and 492 feet long, for the first five units have been installed with work on the remaining penstocks of the 12-unit phase well advanced.

The powerhouse, looking like the rotunda of a great railroad station and the central building which will eventually operate both the new station and its predecessor just downstream, the Sir Adam Beck, Niagara GS No. 1, have most of the concrete placed. The scroll-cases for Units Nos. 1 and 2 are in place, ready for the installation of the first generating unit, and the scroll-cases for Units 3 and 4 are in and being readied for concreting.

To prepare the powerhouse site, more than a million cubic yards of earth and rock were excavated for the first twelve units. This phase will require 235,000 cubic yards of concrete, and some 19,000 tons of steel.

Designed to blend into the natural grandeur of the Niagara gorge, the powerhouse is already assuming a shape of beauty that is a credit to Hydro's architects and engineers.

BEST POSSIBLE DESIGNS
Nothing was left to chance in preparation for the Big Job. To ensure the best possible designs and the most efficient use of necessary materials, Ontario Hydro constructed five models, one a duplication of five miles of the Niagara River from the tip of Grand Island to the Rainbow Bridge below the Cataracts, set up at the A. W. Mansby Service Centre, Ingleton, Ontario. Four other smaller models of the canal cross-over, the tunnel outlet and canal transition, the canal and forebay, and the intakes were located at the University of Toronto. It is estimated this "design insurance" saved Ontario Hydro more than five million dollars.

Remedial works will be built out in the Niagara River above the Horseshoe Falls, under a joint agreement between Canada and the United States, created to insure uniform flow of the Niagara River over the Cataracts and contributing to the most effective use of water for power production. Thus, not only will the beauty of the Falls be enhanced, but the maximum use of the water available for generation will be made. Ontario Hydro has jurisdiction over the building of the remedial works on the Canadian side of the river.

REMEDIAL WORKS
The remedial works will consist of a 1550-foot long dam at Grass Island Pool, controlling the water level in the Chippawa-Graess Island Pool area. Excavation of rock from the Canadian and Goat Island flanks of the Horseshoe Falls will produce an unbroken cataract crestline, and give the desired distribution of flow over the Falls.

At the same time, earth and rock will be used to fill in the ends of the Horseshoe, eliminating the incidental flow over the extremities of the crest. This will permit an unbroken curtain of water to flow over the precipice. The fills, landscaped to blend with the formation of the gorge, and the remedial works as a whole, will preserve the beauty of the Falls as an unparalleled tourist attraction.

Building of the remedial work is being preceded by unwatering through the erection of cofferdams, upstream and downstream. The unwatering and construction will proceed in four stages. The cofferdam will be composed of steel frames, 39 feet by 10 feet. These will be placed on the bed of the river, supported by piles, and counterweighted with six-ton concrete blocks. Steel sheet piling will be driven along water surfaces as a "water stop."

"BACKSTAGE" OPERATIONS
The Big Job could not have been carried on to its present state had it not been for considerable "backstage" preparation. Some 25 miles of access and service roads were built by Hydro to facilitate activities on the development. Disposal areas 640 acres in extent were set up to handle the millions of tons of earth and rock excavated on land judged of small value for other purposes.

There are three "Hydro Cities" on the job: Chippawa Camp near the intake section; Whirlpool Camp near the centre of the development, and the third close to Queenston,

near the generating station site. These camps are miniature communities in every respect, with accommodation for the workers, recreation hall and cafeteria. Each has its own fire department and sanitary services, and no crack city fire brigade ever polished its equipment to a more gleaming surface than the firemen at the camp fire halls. The recreation halls have facilities for bowling, billiards, movies, refreshments and television. Regular church services are held.

As a major portion of the work on the two tunnels has been completed, Chippawa Camp was closed on March 29, with the smaller labor force being more economically accommodated in the Whirlpool and Queenston Camps. Shells of the four main buildings at the Chippawa site will be sold by tenders.

CAMP CAFETERIAS
Good food is a necessity for hard-working men. A sign in each camp cafeteria states that the men can have more food for the asking, and it means just what it says. Each of the three cafeterias can serve 500 at a sitting. Some 5000 meals are made up for the night shifts.

Behind the scenes at each cafeteria are spotless, well-equipped kitchens. The weekly shopping list for the Niagara project would stagger most housewives. It includes, at peak construction: 6000 loaves of bread; 14,000 pounds of vegetables; 12,000 pounds of meat; 1,000 pounds of poultry; 1800 dozen eggs; 1200 pounds of butter and ingredients for 2500 pies and 5000 pastries.

PROJECT HOSPITAL
Hard by the nerve centre of the Big Job, the Administration Building, is the 30-bed hospital, which Hydro built solely for the workers on the project. A temporary building, it is decorated in attractive pastel colors. The design was by the Commission architect, Kenneth Candy, in consultation with Hydro's medical authorities, from experience gained on other Hydro developments, such as Des Joachims. The spacious corridors lead from the comfortable waiting-room, into a completely-equipped operating room, X-ray room, consulting room, pharmacy and wards that would be the envy of many city hospitals. In charge of the hospital is Dr. Donald Grant, who came from the Hydro hospital at Des Joachims and brought much of the equipment with him. He is assisted by Dr. J. Dales Black, four resident nurses, and first-aid men, as well as other hospital staff. Meals for the patients are prepared at the nearby Hydro cafeteria. Opening July 27, 1951, the hospital had

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FREE OF STRIKES
With a large construction force working on the development, it is entirely conceivable that difficulties might have developed at one time or another. Yet not one hour has been lost through strike action. This has been due in great measure to the establishment in 1950-51 of the Niagara Development Allied Council, A.F. of L., which represented 17 international craft unions. In fact, this Agreement was characterized by a prominent labor leader as the "most worthwhile bargaining agreement in Canada today."

So successful was this agreement, and the one signed with the Ontario Hydro Construction Allied Council, A.F. of L., that in October, 1953, an agreement was signed by

the latter and Ontario Hydro on behalf of approximately 9900 construction workers throughout the province in 98 trade classifications, and representing eighteen unions. This agreement, described as one of the most progressive in Canadian labor history, provided for substantial benefits. Thus the experience gained on this project paved the way for benefits to all Hydro construction men in all parts of Ontario.

This, then, is the Big Job! Its magnitude cannot be contained in three or four, or in a number of stories. It is a volume, with its most interesting chapters yet to be written.

The end of the Big Job will be its beginning.

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The first Congregational church in Scotland was founded by James Haldane at Edinburgh in 1799.

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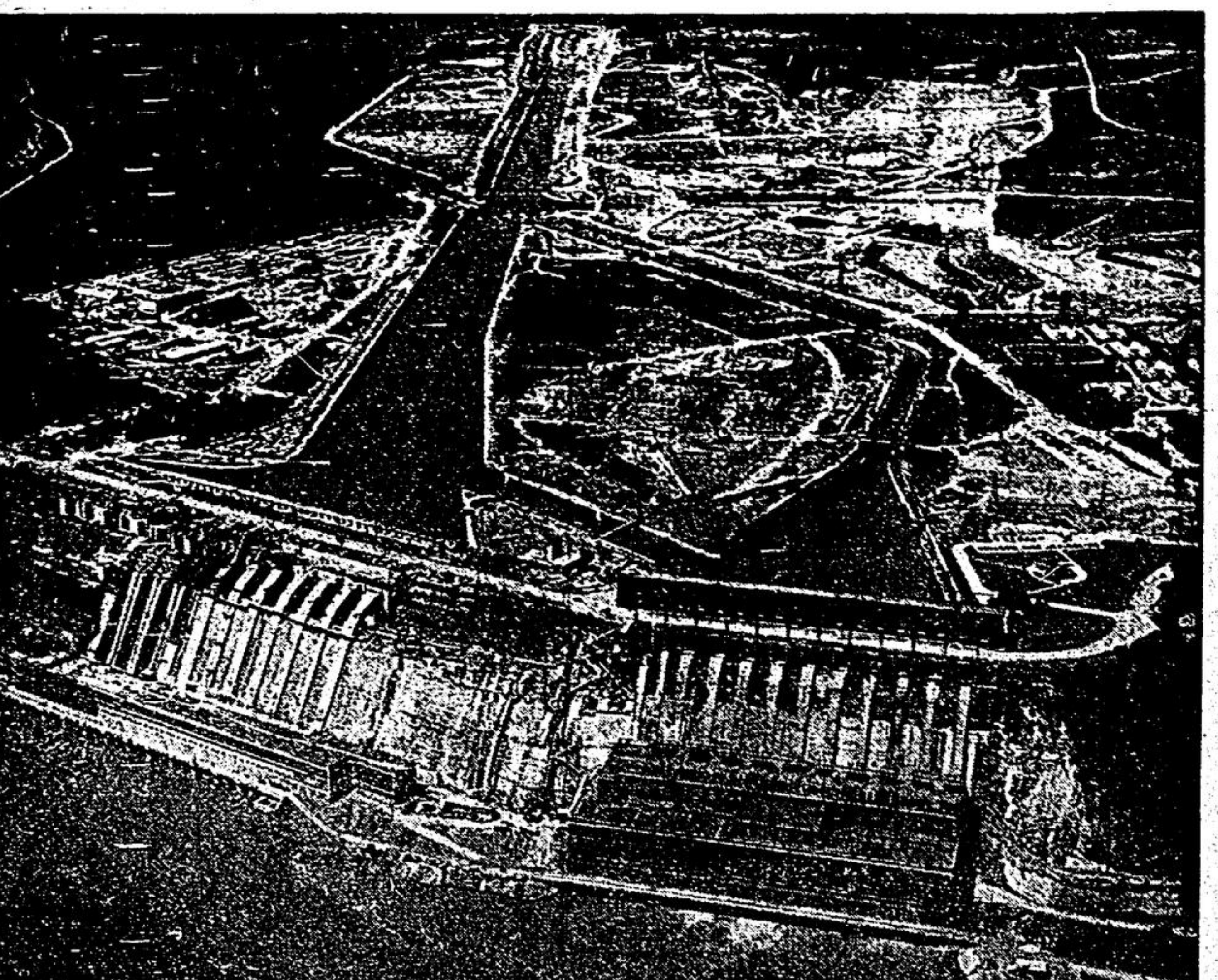
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NEW SIR ADAM BECK GENERATING STATION PRIDE OF HYDRO

HERE, where three-and-a-half years ago there were only the bare and ancient rocks of the 300-foot cliffs of the Lower Niagara Gorge, Ontario Hydro engineers and workmen have created the modern giant of the 1,828,000-horsepower Sir Adam Beck Niagara Generating Station No. 2, adjacent to its

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