The Extension of Big Chute Generating Station

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THIS extension completes the power development at this site, therefore it might be in order to give a brief history of this development from its commencement.

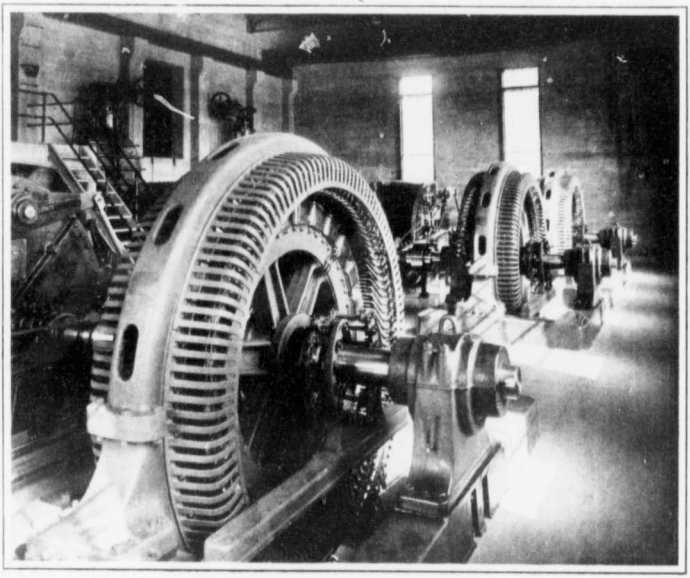
In the fall of 1909 the Simcoe Railway and Power Company commenced a development on the Severn River at Big Chute, which is situated about nine miles up from the point where the Severn River empties into Georgian Bay (see map). By May, 1911, three 900-horsepower units were installed ready for operation. The Simcoe Railway and Power Company transmitted power at 22,000 volts to their substation at Midland. From this station it was distributed at 2,300 volts to the Municipality of Midland. This company also proposed to distribute power to any place in the Simcoe County and Muskoka District.

In 1911 the Hydro-Electric Power Commission of Ontario contracted to take power from the Simcoe Railway and Power Company, and in May, 1911, power was delivered to Midland, and in November to Penetang.

In October, 1911, the load on this Big Chute Generating Station was 350-horsepower; in September, 1912, 550-horsepower. In 1913 the number of municipalities supplied by the Commission increased from two to seven; besides Midland and Penetang, there were Collingwood, Barrie, Coldwater, Elmvale and Stayner. The demand in October, 1913, was 1,233-horsepower.

Up to 1914 the Simcoe Railway and Power Company owned the Big Chute Generating Station, the transmission lines to Midland and the Midland station, also a station and distribution system in Victoria Harbor, whereas the Hydro-Electric Power Commission owned the remaining transmission lines and stations. In 1914 the Hydro-Electric Power Commission purchased the Simcoe Railway and Power Company, and first operated same on July 1st.

In 1915 Waubaushene and Port McNicoll distributing stations were installed and fed from this system. In 1916 Port McNicoll (Canadian Pacific Railway) and Camp Borden Stations were added. In 1918 Allliston, Beeton, Bradford, Cookstown, Thornton and Tottenham were included in the municipalities fed from this system (see Severn System map). In December, 1918, the power demand on this Severn System was 6,350-horsepower, of which 3,700-horsepower was supplied by the Big Chute Station and the remaining



Interior View of Power House, Showing Units Nos. 1-2-3

2,700-horsepower was supplied by the Eugenia and Wasdell's Systems.

In 1912 a 22,000-volt transmission line was installed by the Orillia Light and Power Company between Big Chute Generating Station and their Ragged Rapids Generating Station for interchange of power. This tie-line has since been purchased by the Commission and connected to the Swift Rapids Generating Station, which replaced the Ragged Rapids Station. In 1917 the Severn System 22,000-volt transmission lines were connected to the Eugenia System at Collingwood Station. The Wasdell's Falls System has a 22,000-volt line connected to the Orillia Water and Light Commission's system at Orillia. Thus the Severn System is connected to the Eugenia and Wasdell's Systems and also the Orillia Light and Power Company's system, and allows for an interchange of power, which enables the Commission to meet the increased demand and to provide first-class service with regard to character and continuity.

The original power development as installed under the supervision of the engineering firms of Messrs. C. H. Mitchell and P. H. Mitchell in 1909, 1910 and 1911 was as described in the following. It is also described in detail in the *Electrical News*, February, 1912, page 48, and in the *Canadian Engineer* in June, 1912, page 830.

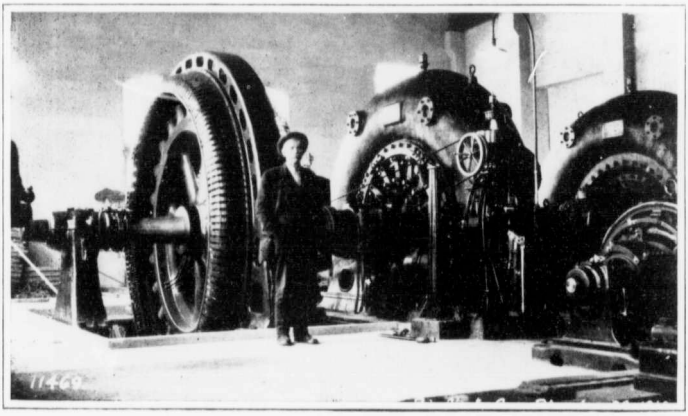
There was the canal entrance, canal about 500 feet long, forebay and one steel penstock nine feet in diameter. The penstock is carried on several concrete piers for about 150 feet down the slope, and turns along the rear of the power house, terminating in a surge tank extending to an elevation four feet above that maintained in the forebay. No. 1 and No. 2 turbines are connected with the penstock by diverging feeders and No. 3 is connected to the Y connection. (See Big Chute Development Plan.)

The general works and power station were constructed by Messrs. Pratt & MacDougal, of Midland.

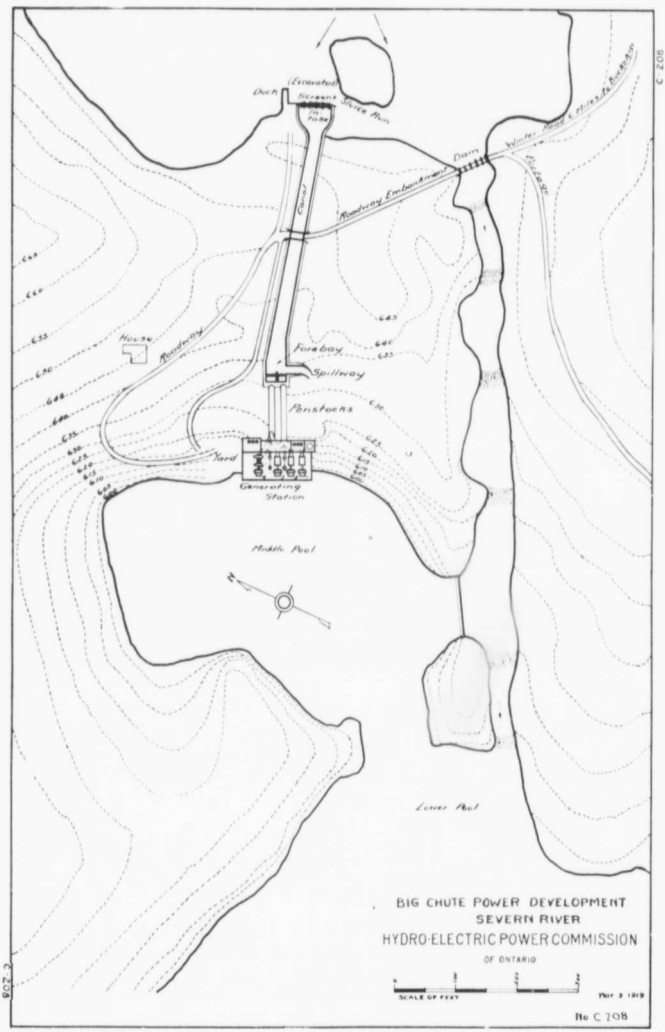
The turbines were built by Wm. Hamilton & Company, of Peterborough, Ontario, and are of the Samson type, and were each designed for 1,300-horsepower capacity at 56 feet head and at 300 revolutions per minute. The exciter turbines have a capacity of 200-horsepower capacity under 56 feet head at 580 revolutions per minute. The hydraulic turbine governors are all of the Lombard oil pressure design.

Practically all the electrical equipment was manufactured and installed by the Canadian Westinghouse Company. There were three 900-kv-a., 2,200-volt, 60-cycle, 3-phase, 300 revolutions per minute revolving field generators (see photograph) There were two turbine driven exciters, each 100-kw., 125-volt, controlled by a Tirrill regulator. There was one bank of three, 600-kv-a., 2,200 25,000-volt, single-phase, 60-cycle, water-cooled transformers. A second bank of similar transformers was installed in 1912 in the same pocket as No. 1 bank: the first bank being rearranged.

The switchboard consisted of 12 black marine finished marble panels. The switchboard gallery extends six



Interior View of Power House Showing Unit No. 4


Dock
(Excavated)
Screens
Penstock
Intake Pier
Dam
Waste Weir
Roadway Embankment
Canal
Roadway
House
Forebay
Spillway
Penstocks
Yard
Generating Station
Middle Pool
Lower Pool
BIG CHUTE POWER DEVELOPMENT
SEVERN RIVER
HYDRO-ELECTRIC POWER COMMISSION
OF ONTARIO
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feet into the generator room, while behind it is the 2,200-volt bus and switch structure and generator rheostats, which are operated by shafts in a straight line between rheostat handle and the face plate on the rheostats. For the 22,000-volt transmission lines between the generating station and Midland, see Severn System map. The Matchedash Bay is about 2,000 feet across, and 2 spans were made, 1,153 feet and 858 feet respectively. The longer span also crosses the ship canal and necessitates

a 175-feet tower; the centre and east shore towers are each 88 feet high.

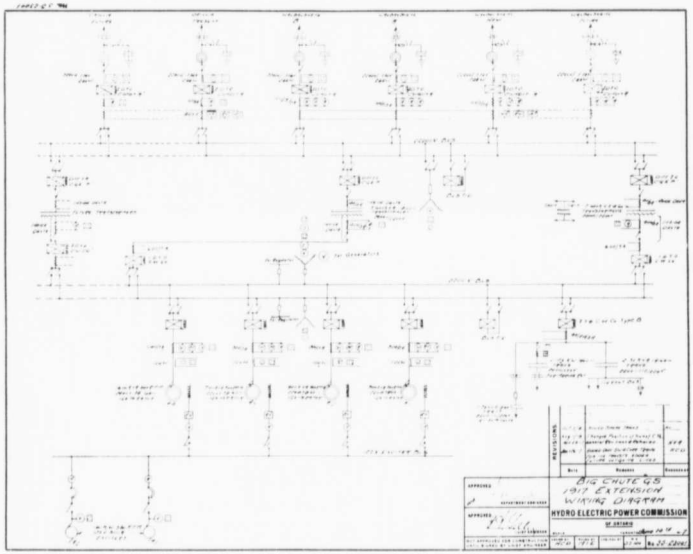
When the Commission took over the Simcoe Railway and Power Company in 1914, a number of minor changes were made in the metering equipment in Big Chute Generating Station to make it conform with the Commission's requirements.

In 1917 some 2,200-volt equipment was installed to supply the Department of Railways and Canada with power and light for the marine railway installed at Big Chute.

In view of the rapid increase in the power demands of the Severn System, it became necessary, early in 1917, to proceed with the extension of the Big Chute Generating Station.

To secure the additional capacity, a new penstock and a fourth turbine were required, together with two new valves, head gates and the necessary power house sub-structure and superstructure. (See plan of Big Chute Development).

The Dominion Bridge Company of Montreal secured the contract for steel penstock, which is nine feet in diameter and about 170 feet long. A contract was placed with the Wellman-Seaver-Morgan Company for a double-runner spiral case turbine of 2,300 brake horsepower under a 56-foot head running at 300 revolutions per minute. The contract for two 66-inch diameter gate-valves, together with two head-gate mechanisms, was awarded to the Boving Hydraulic & Engineering Company, of Lindsay. The extension is 38 by 69 by 30 feet high over the generator room and 40 feet high over the transformer and high tension rooms. The



building will be reinforced concrete throughout, whereas in the original station the roof over the generator room consisted of wooden purlins, 1¼ inch matched pine, and covered with several layers of asbestos felt, laid in asphalt cement, supplied and installed by the Johns-Manville Company. That part of the excavation and concrete work carried out in the fall of 1917 was done by Messrs. Wells and Gray, of Toronto. This work was held up during the severe winter season of 1917 and 1918, and in the spring it was proceeded with by the Commission's Construction Department.

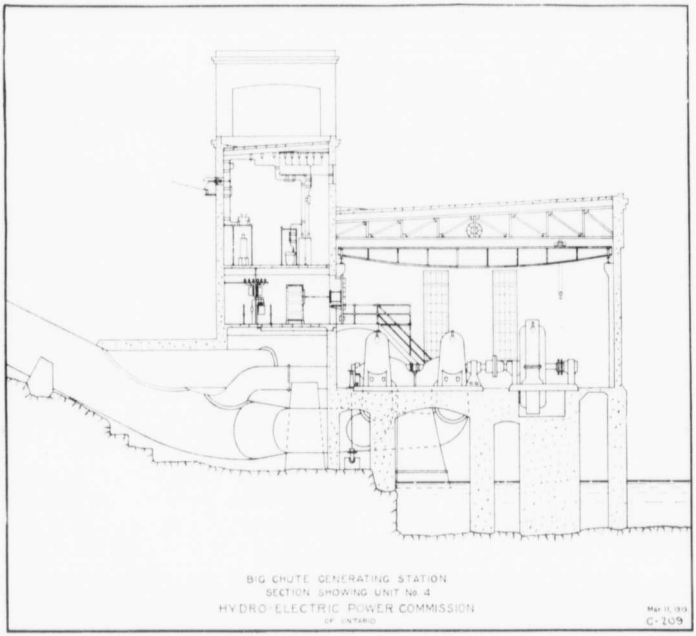
A 1,600-kv-a., 300-revolutions per minute, 2,200-volt, 3-phase, 60-cycle, waterwheel type horizontal generator was purchased from the Canadian General Electric Company, who were also to deliver and erect it. A flywheel effect of 300,000 pounds feet squared was required in the rotor of this generator, and this necessitated a large diameter machine and was the reason for it being set so low in the foundations, as the generator shaft had to line up with the turbine shaft. The specifications for this generator permitted a maximum temperature rise of 40 degrees Centigrade, with a continuous load of 1,600-kv-a., at 80% power factor, normal speed and voltage. This generator was tested in the factory at an overspeed of 185 per cent. normal speed for 15 minutes. An insulation test of 10,000 volts between the armature windings and frame was withstood for one minute. The field windings and the field rheostat resistances withstood 1,500 volts for one minute.

A heat run was made on this generator in the factory, also the necessary measurements were taken to calculate the efficiencies, regulation, etc. No tests were required after installation.

This fourth unit, together with the second penstock as mentioned above, were first placed in service and power fed into the system on January 28, 1919.

When making these extensions to the station, it was decided to remodel the high tension switching room by installing duplicate 22,000-volt busses and making all 22,000-volt oil switches electrically operated. It was also decided to install equipment for one new 22,000-volt outgoing line and to remodel the 22,000-volt arresters, and to provide space for equipment for two future lines, one to Orillia and one to Waubaushene. (See diagram of connections.)

The present switchboard is to be rearranged in order to provide space for the panels to control the new and future 22,000-volt lines. New 2,200-volt electrically operated oil switches will be installed for the low tension sides of the transformers, and the present transformer switches will be used for the new generator and for station service transformers on the low tension side of each bank of transformers. A second set of disconnecting switches will be installed and the oil switch rearranged so that each bank can be connected to either bus, whereas at present each bank can be connected to only one bus. This extension includes a second transformer pocket, and one bank of transformers will be removed from No. 1 pocket to No. 2 pocket and the transformers in No. 1 pocket will be



arranged. Space is provided in No. 2 pocket for a possible future bank of transformers, also space for a machine shop and an oil storage tank. A spare 600-kv-a. transformer has been purchased from the Canadian Westinghouse Company, and will be delivered this spring as soon as navigation opens up in the Severn River between Waubaushene and this Big Chute Generating Station. It will be brought up the river in a scow. This spare transformer will be installed in No. 1 pocket with permanent 22,000-volt connections and 2,200-volt connections carried to each transformer in No. 1 and No. 2 banks, so that with short temporary connections it can be connected in place of any other transformer during an interruption on that bank of only a few minutes.

Practically all the new equipment was purchased from the Canadian Westinghouse Company and was delivered during the summer of 1918. The work of installing this new equipment and remodeling and moving old equipment is now being proceeded with by the Commission's Construction Department, and it is expected that it will be completed early in the coming summer.

An electric hot water heater, together with a water tank and shower bath, are being installed for the use of the station operators and the maintenance men.

In order to provide additional accommodation for the operators a new cottage will be erected shortly.