

The extensions cover enlargement of the building to accommodate two additional generating units, one of which is now being installed, and for double high-tension and low-tension busses, and for six 25,000-volt feeders. The new unit consists of a 2,810-kv-a., three-phase, 60-cycle, 720-rev. per min. horizontal maximum-rated generator direct-connected to a 4,000-h.p. turbine. Each generator has a direct-connected 125-volt exciter of sufficient capacity to excite two generators.

The success of the development depended upon the storage of the water of the Beaver River and for this purpose two large storage dams were constructed as shown on accompanying plan. From the head works, a wood stave pipe 46 in. in diameter conducts the water 3,400 ft. to the Johnson differential surge tank which is 105 ft. high. From this tank a 52-in. diameter steel pipe is carried 1,550 ft. to the power house, which is a brick building 69 ft. wide, 112 ft. long and 34 ft. high above the generator room floor. Actual tests made at this station after the first installation was completed in 1915 gave an overall full load efficiency of 80 per cent. which shows how carefully the design was worked out.

Additional power for the Eugenia System will be obtained, when required, by the construction of further water storage systems and of a second pipe line at the Eugenia Falls development and the installation of a fourth unit, also by the construction of a station on the Saugeen River near Lake Huron which operating in parallel with the Eugenia Station will make available a total output for the system of 15,000 h.p.

The Eugenia system comprises 245 miles of 22,000-volt circuit (176 miles of lines) supplying sub-stations at the points shown on the accompanying diagram, and 50 miles of 4,000-volt circuits. This system is connected to the Severn System by means of a single-circuit, three-phase tie line from the Eugenia generating station to Collingwood, a distance of 24 miles.

By means of this tie line and the tie line from Wasdell's Falls to Big Chute mentioned above, the Eugenia, Severn, and Wasdell's systems are paralleled. The generating station of the town of Orillia on the Severn River at Swift Rapids near Big Chute is also connected into the Severn system.

Central Ontario System

Five main generating stations, one on the Otonabee River and four on the Trent River, all operating in parallel supply this system. These are now fully loaded and plans are being prepared for new stations near Campbellford to provide additional power. The five exciting stations were built by the subsidiary companies of the Electric Power Company. Immediately after the operation of this system was placed under the Commission by the Ontario Government, arrangements were made to install a new unit in the Healy Falls generating station and work on the same is now nearing completion.

The following table gives the data relative to the existing developments, all generators being three phase, 60 cycles, with 25 per cent. overload guarantees:—

In addition to the above stations, a 1,000-kv-a., three-phase, 60-cycle, 120-rev. per min. horizontal generator, owned by the town of Campbellford in its generating station, a short distance north of the Campbellford station, delivers its output to the 2,400-volt bus in this station. Also at Fenelon Falls, a small generating station is operated, containing two 400-kw., 600-volt, three-phase, 60-cycle, 200 rev. per min. generators connected to two 700-h.p. turbines. These feed into the 44,000-volt net work of the Central Ontario system at Lindsay, the voltage being stepped up in the generating station through two banks of transformers to 11,000 volts for transmission to Lindsay.

All these stations are on the route of the Trent Valley Canal, the dams having been constructed by the Government of the Dominion of Canada.

The Trenton station, known as Sidney Dam 2 development, being at Dam 2, section 1 of Trent Valley Canal, about one mile north of the town of Trenton, was placed in operation by the Sidney Electric Power Co. in August, 1911. The four generators feed into a single sectionalized bus, and two 6,600-volt feeders conduct the current to a transforming station across the road, which station also receives the output of the Frankford generating station at 6,600 volts. Two 75-kw. 125-volt exciter units are installed, one being a vertical turbine-driven unit and the other a motor-driven unit. Each of these exciters is capable of exciting all generators at 25 per cent. overload with 65 per cent. power factor current lagging.

The Frankford station, known as Sidney Dam 5 development, is located at Dam 5 on Section 1 of Trent Canal, about four miles north of Dam 2. This station was constructed by the Sidney Electric Power Company and placed in operation a short time after the Trenton station. It has a single unsectionalized 6,600-volt bus and its entire output is fed over two 6,600-volt circuits to the transforming station at Dam 2.

The Trenton transforming station contains three 3,000-kv-a., 6,600/44,000-volt, three-phase, 60-cycle, shell-type transformers connected delta-star with ungrounded neutral, double high-tension and low-tension busses, switching equipment for three 44,000-volt lines and for six 6,600-volt lines.

The Campbellford station, known as the Stephen's Dam Station, was first placed in operation in 1909, and is near Dam 1, Section 5 of Trent Valley Canal. This station contains four 1,125-kv-a., three-phase, core-type, 2,400/44,000-volt transformers and two outgoing 44,000 volt line equipments. Excitation for the generators is obtained from two 60-kw., 125-volt exciters, one turbine-driven and one motor-driven, with two 17½-kw. belted exciters for emergency use. The station is situated some distance below the dam, the water being conducted to it through an open head race.

The station at Healy Falls is situated about seven miles above Campbellford. Water is conducted through steel penstocks from the head gates to the turbines. A long tail race excavation through rock was necessary and

Location.	River.	Gross head		Number.	Units.			Rated capacity.		Generator	Type.	Generator voltage.
		feet.	Present.		Future.	kv-a.	Turbine	Speed, rev.	h.p.			
Trenton	Trent	20	4	..	..	937.5	1,400	120			Vertical	6,600
Frankford	Trent	18	4	..	..	812.5	1,200	112.5			Vertical	6,600
Campbellford	Trent	23	5	..	..	750	1,100	150			Vertical	2,400
Healy Falls	Trent	76	3*	1	1	3,750	5,600	240			Horizontal	6,600
Auburn	Otonabee	18	3	1	1	625	950	150			Horizontal	{ 2-6,600 1-2,400

*One unit now being installed.