

Canada's Superpower Zone

What Ontario Has Done in Hydroelectric Development

By Robert G. Skerrett

CANADA has set the pace for the United States in the creation of what may properly be termed a superpower zone. Physical and economic circumstances forced this upon a section of the Dominion; and we have every reason to be interested in what our neighbors to the north have achieved in overcoming natural handicaps. The subject is all the more deserving of consideration on our part because of conditions that are gradually changing within our own borders, and especially in view of the proposed institution of a superpower zone in our northeastern Atlantic States.

The Provinces of Quebec and Ontario hold more than half of the population of the entire Dominion, and within their gates five-sixths of the country's manufactures are produced. And yet, strange as it may seem, this chosen center of Canadian industry is woefully devoid of native fuel suited to the generation of abundant power and the heating of the habitations of the millions of people making their homes in that region. In Quebec there is neither coal nor mineral oil for power purposes; and Ontario can boast only small and diminishing quantities of natural gas and petroleum. True, in the northern part of the province, traces of low-grade lignite have been found, but so far nothing has been disclosed that warrants the belief that there

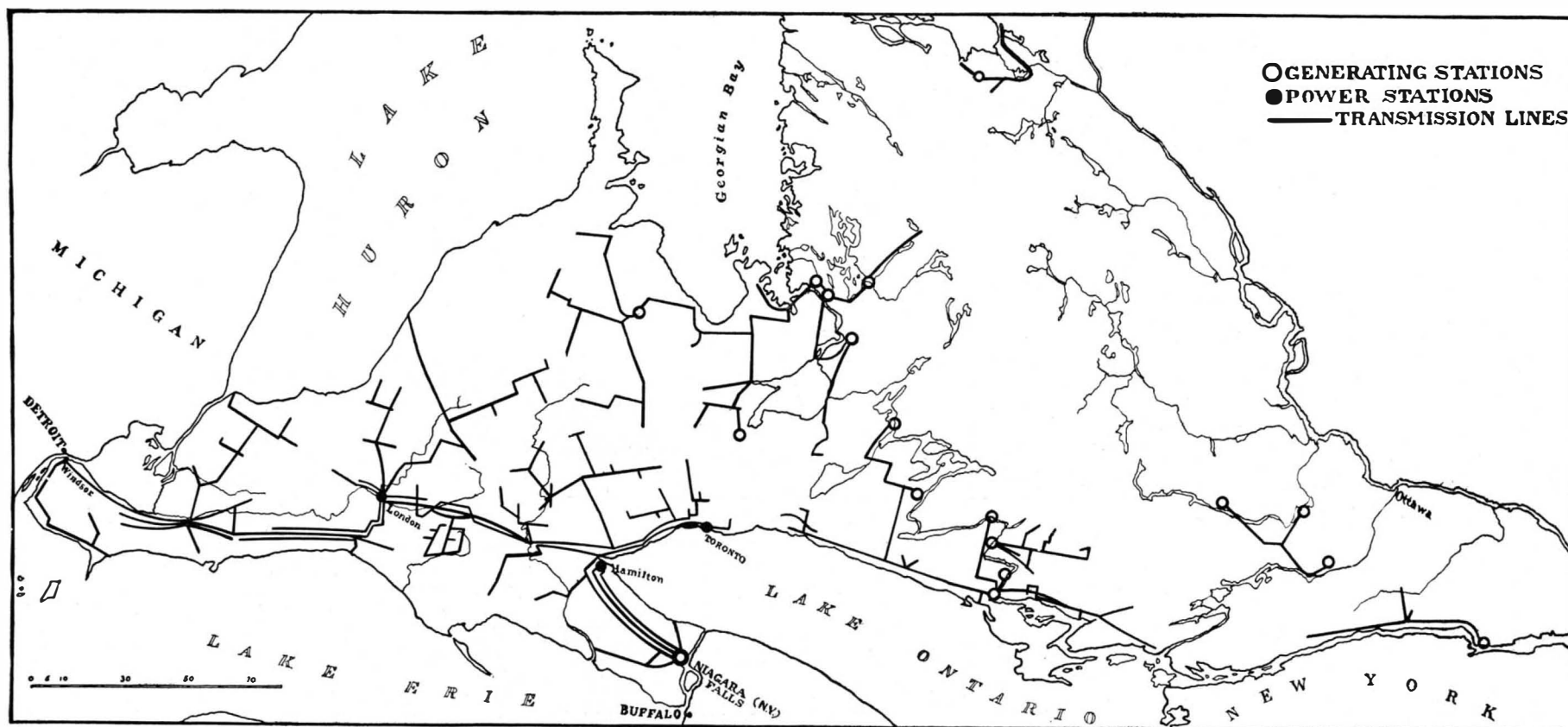
intense suffering was mitigated only by importing coal from Wales. That experience directed general attention to the fuel and power problem of Ontario and Quebec, and the taxpayers of Ontario were aroused to a better understanding of what water-power meant to them and how intimately they were concerned in the potential benefits of long-distance transmission of electric current.

Out of the agitation that followed, the Ontario Hydroelectric Power Commission was born in May, 1906, and modified for the better by the act of the succeeding year and by various subsequent amendments, the last of which was passed by the Canadian Parliament in 1920. The Commission is, in effect, a body corporate, consisting of three commissioners, two of whom may be members, and one of whom shall be a member, of the Provincial Cabinet. Broadly, the organization is a governmental one which is authorized to cooperate with municipalities and districts desiring electrical energy, and is empowered to build and to operate distributing systems, power plants, and even railways.

At the beginning, the Niagara Division of the Commission's project constituted the biggest hydroelectric distributing system then extant. Since then eleven other districts have been covered; and it is claimed

municipal ownership under Government control, with certain variations that give the Commission the right of initiative, the power of eminent domain, and authority to go ahead when the public welfare warrants. In general, when a city, town, village, or rural district wishes to participate in the benefits of the hydroelectric system, the community asks the Commission for information as to cost of local distributing lines and the needful connection with the nearest of the Government wires. The Commission's engineers examine the territory and report, and, if the terms suit the applicant, the taxpayers of the locality vote to provide the required funds. With this done, the Commission enters into a contract with the municipality. As a matter of security, the Commission then stands back of the community's obligation, and, in its turn, the province becomes the financial sponsor for the Commission. However, there is no revenue to the province other than the rentals it derives from leases of water-powers, such as those of the Niagara River, etc.

Even so, the province faces no liability in the working out of the undertaking, for the power and light users are charged sufficient not only to cover the expense of the service but to create a sinking fund which, in thirty or forty years, according to the arrangement, will leave



Map showing generating and distributing stations together with the transmission lines of the Ontario Hydroelectric Power Commission

are any deposits of coal of actual commercial value.

While nature has been seemingly stingy on one hand she has been generous on the other in furnishing a substitute source of motive energy. Canada, in its entirety, has a total endowment of approximately 20,000,000 horsepower in her falling waters, and fortunately three-fifths of this aggregate of inexhaustible impulse flows through the Provinces of Ontario and Quebec—for the most part within easy reach of the present settled area. For a while, and that only a few years back, water-power developments were sporadic and wholly in the hands of private enterprises; and those that partook of a public-service character were, more often than otherwise, inclined to exploit the people—charging for current out of all proportion to the cost of generation and distribution.

During this period, the main reliance of the populace was upon coal for domestic heating, and the majority of industries also depended upon this fuel, most of which reached them from the United States. Then came the coal strike in Pennsylvania during the fall of 1902, and a Canadian Railway, tapping that source, showed no disposition to transport the coal already mined when the rigors of winter set in. Citizens in Toronto had to pay a hundred per cent more for their fuel; and their

that the present network of wires and the associated power plants form the greatest combination of its kind. It is certain that the undertaking has forged ahead in an impressive manner. In 1910, the Commission initiated its transmission business with the delivery of only 750 horsepower, and none of that energy was produced by it. Last year the transmitting wires distributed more than 315,000 horsepower, and by the close of 1921, when stations now building are ready, the total output for public use will amount to 750,000 horsepower—a thousandfold amplification of service in eleven years. By 1923 the aggregate production is expected to reach 1,400,000 horsepower.

The twelve active systems of distribution take care of 180 communities, ranging from cities down to villages and townships. In addition to these there are numerous municipalities that have made contracts with the Commission, and service will begin as soon as the necessary equipment can be obtained. And then there is a considerable group on the waiting list, which cannot be accommodated until the supply of current is equal to the demand. In brief, according to the reports, the actual and prospective centers of population interested in the Commission's work total more than 250.

Broadly speaking, the whole scheme is in a measure

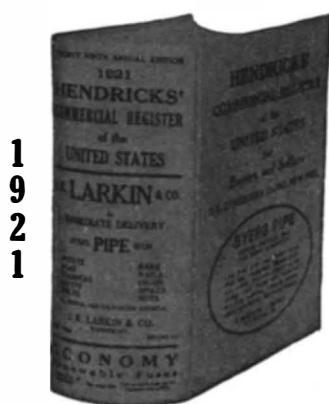
each constituent community the owner of its plant. At the end of that time, the rates will be just high enough to take care of upkeep, repairs, and the actual cost of the electrical energy delivered. That is to say, the principle on which the Commission executes its trust is that the charges to the public shall be reduced whenever the income exceeds the surplusses required to meet the provisions of the sinking fund.

Generally stated, a steam-raised horsepower entails an outlay in Canada today from \$40 to \$60 annually within the territory where the Commission is able to give on an average a hydroelectric horsepower for only \$18 a twelvemonth. This, so it seems, is less than half that charged in any section of the United States east of the Pacific slope. No wonder, then, that the Province of Ontario generates nearly 96 per cent of its power through the impulse of falling waters; and the Dominion at present has 276 developed horsepower for each thousand of its inhabitants—a ratio that is surpassed by only one other country, Norway. The Commission, through its widened use of electricity, has cut down the consumption of bituminous coal yearly in the Province of Ontario by something like 6,000,000 tons.

Electric power has been made available to well-nigh

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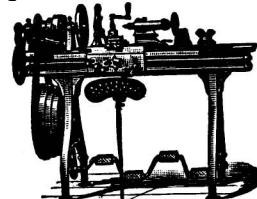
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four instruments: steam pressure in generator coils; temperature of outgoing water; temperature of outgoing brine; pressure of ammonia in the generator.

There is room on the board for about a dozen more instruments. Among other additions contemplated are an instrument for measuring the velocity of the wind, which will be valuable in preventing damage to flags, etc.

Keeping Check on Gas Burner Performance

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in pressure caused by this meter air is permitted to flow through the 40-cubic-foot gas holder. The joint use of these various devices constituting the laboratory-test unit is so effective that the air and gas enter the burner at such uniform pressure that fluctuations thereof in the burner are less than one-thousandth of an inch of water pressure.

The top of the box, shown at the right in the foreground of the illustration, is left open and the burners operate in a normal fashion. The pressure in the burner is indicated by a very sensitive slope U-gage, xylene being used in this pressure-recording instrument. Minimizing the hazards that otherwise might be caused by explosions in the box attributable to the harnessing of a combustible mixture, a piece of oil paper is pasted on one side of this box. This answers the demands for an adequate explosive head.

Ultimately, this Government bureau should be enabled to indicate to industrial as well as domestic appliance manufacturers scientific methods of procedure in designing gas-appliance apparatus. To minimize gas consumption by one-half may appear as a fantastic dream, but a scientist of the Bureau of Standards thinks that such an ambition is not a remote accomplishment.

Phosphates by a New Process

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costly losses are entailed in divorcing the impurities from the phosphate material, finely divided particles going to waste. It is computed that the wastage is twice as great as the volume marketed, with mechanical and chemical skill yet failing in its efforts to draw a dividing line between the phosphate and these impurities.

Although the commercial practicability of producing phosphoric acid from mine-run phosphates by this new process has not been established, the Government authorities are inclined to be prophetic as to the maturity of plans. Material in the hard-rock regions of Florida as it occurs in the mines has a composition which is said to be admirably adapted to this furnace treatment. Furthermore, instead of necessitating enrichment by supplementing of higher grade phosphate much of it must be brought to the desired composition by the addition of silica or sand, of which there is an abundance throughout the phosphate-mining area.

If the new process can eliminate the costly operation of washing and screening plants, coupled with the possibility of prolonging the life of the phosphate deposits, the additional expense involved in the preparation of briquets and the use of fuel oil instead of sulfuric acid as a reagent will be more than offset by other advantages. According to claims, the concentration of the product gives an advantage of standing the expense of longer shipments than the ordinary phosphoric acid, which contains only from 16 to 18 per cent of the soluble phosphoric acid. Combine this concentrated phosphoric acid with ammonia and potash and the highest grade of fertilizers is the result, so say the Government experts.

Canada's Superpower Zone

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every community, large or small, conditional only upon its being prepared to

make a contract with the Commission and to assume the liability that accrues on account of such an undertaking. There is no discrimination. The small user buys electricity at the same price charged the large consumer; and there is a standard rate in each locality agreeable to the circumstances that control there. The dominating purpose of the Commission is that there shall be an equality of right to power in all areas within range of the current generated in any of its plants. The longest transmission distance now spanned by the Ontario Hydroelectric system is 250 miles from Niagara to Windsor, just across the boundary river from Detroit. The people of Windsor pay 40 per cent less for their energizing current than the citizens of the far larger Michigan municipality.

The territory over which power is now transmitted by the Commission extends from the Ottawa Valley on the east to the Detroit River on the west, and from the shores of Lake Erie and Lake Ontario on the south to the regions north of Lake Superior. The latter district, however, is disassociated from the principal field of service. The desire of the Commission has been to extend the convenience and the stimulating productive effect of electricity wherever possible, and to this end the farm dwellers are being brought more and more within reach of hydroelectric power sources.

As is well known, when the general load increases the cost of delivery of current diminishes; and on this account the heavier charges for wages and materials since the war have been more than counterbalanced. In some cases the credit sheets of the communities show sinking funds nearly equal to the original expenditures for the local plants, and by reason of this it will be possible to extinguish in fifteen years or less debts that were only expected to be wiped out in thirty years. Again, where circumstances call for it, the surpluses are being reinvested in bettering or enlarging existing equipment. The City of London, in 1917, after paying all charges and keeping its powerhouse, etc., in first-class condition, had a surplus of \$76,000 on an initial investment of \$750,000. Because of extensions and improvements this bustling Ontario municipality has a plant today valued at \$1,200,000. Over a third of this installation is now free of sinking fund and interest charges and is subject only to maintenance and operating expenses.

In the earlier days of hydroelectric development in Ontario, the Commission bought all its supplies from dealers and manufacturers, but as its operations expanded the organization found it expedient and more economical to obtain its lamps and other equipment in large quantities and then to provide the municipalities from this stock, thus enabling the consumers to get these things more cheaply.

Perhaps a financial summary will give a more complete idea of what has been achieved in Ontario through this pooling of the public interests for the promotion of a wider employment of hydroelectric energy. The installations owned by the Commission, and by which it serves a multiplicity of communities with power and light, represent a cash value of \$56,923,000. This includes the erstwhile privately held Ontario Power Company's works. The equipment belonging to the various constituent municipalities under the direction of the Commission is worth \$24,298,870, making a total of \$81,221,870. The administration offices and the buildings for other purposes could not be replaced for less than \$1,500,000. The total cost of the Niagara power development is \$15,000,000. If, to these fixed assets, be added the value of materials and supplies on hand, securities, interest-bearing investments, sinking fund deposits, etc., the combined monetary strength of the Commission can be put at \$106,000,000.

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