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No. 51/9 HYDRO-ELECTRIC POWER IN THE CANADIAN ECONOMY.

An address by Mr. Lionel Chevrier, Minister of Transport, delivered to the Joint Annual Meeting of the Association of Municipal Electrical Utilities and the Ontario Municipal Electric Association, in Toronto, on February 27, 1951.

...We in Canada have been singularly fortunate in the variety and abundance of our natural resources. Not only has nature given us great wealth of minerals, forests, and other resources, but most thoughtfully, she so fashioned the contours of our country as to produce one of the world's greatest hydro-electric potentialities. The fast-flowing rivers of the Canadian Shield and Cordilleran regions, together with the Great Lakes - St. Lawrence System, offer an estimated maximum capacity of fifty-five million horsepower.

Our forefathers, as early as 1607, sought to harness this gift of nature. The many water-wheels used in the operation of grist mills and saw-mills were testimony to their efforts. True, by our present day standards they represent an elementary application of water power - the theory of direct application was the rule, that of "roundaboutness" (which is the basis of our modern technology) was yet to be realized. In such humble beginnings there was little intimation of the role hydro-electric power would some day play on the Canadian scene. Nearly three hundred years were to pass before the invention of the incandescent lamp, the subsequent development of the water-driven turbine dynamo, and successful transmission of electric power were to make our potentiality realizeable. Man's inventiveness and nature's gift constituted the cornerstone of a great new industry. On this industry, in large measure, has been built many of the industries on which the prosperity and progress of our country is so dependent.

It is readily apparent that in the course of a relatively short time great strides have been made in the production of hydro-electric power. It is not so readily apparent however, just how great these strides have been. At the turn of the century the total turbine installation in Canada was somewhat less than 200,000 horsepower. Fifteen years later it had increased twelve-fold; thirty years later, thirty-five fold. In spite of the depression conditions of the thirties, and in spite of the necessary restrictions imposed by the War, hydro-electric development continued apace. Canada emerged from the War with an installed hydro-electric capacity in excess of 10,000,000 horsepower: total generated electricity exceeded 42 billion kilowatt hours, of which some 40 billion originated at water-power establishments. On a per capita basis Canada's daily kilowatt hour output is exceeded only by Norway - it is 175 per cent of the United States output.

Impressive though our water power development was during these years, the unprecedented demand for electric power during the past five years - resulting from the greatest period of prosperity and industrial growth our country has known - has initiated further hydro developments on a scale never before contemplated. From 1945 to 1950 installed capacity increased by two and one-third million horsepower; or nearly 23 per cent. Today our hydro-electric installations total some 12,576,000 horsepower.

But the production of electricity is not an end in itself - rather it supplies a service and facilitates production. The true significance of electric power's role lies in its relationship with the general economy of Canada. Nearly two-thirds of the total national production of electricity is absorbed by our manufacturing industries - on the basis of consumption figures, our manufacturing industries absorb almost three-quarters. The direct dependency of Canadian manufacturing upon the hydro industry is apparent. Within the manufacturing group, five major industries used over half of the total power generated for consumption. When it is realized that these industries namely, pulp and paper, primary iron and steel, abrasives, electro-chemicals, and the smelting and refining of non-ferrous metals - are directly and indirectly responsible for approximately one-third of the gross value of our manufactured goods, then the importance of low cost power to an industrial machine which in turn is largely dependent for its prosperity upon its ability to compete in world markets, is clearly evident.

From the standpoint of electric power consumption these five industries are dominated by two of their members - the pulp and paper industry, and the smelting and refining of non-ferrous metals. These two industries consume nearly one-half of the total power made available for national use. Electric power has been a common factor in raising them to the top of Canadian industry. In return for such a huge consumption of power it is desirable to evaluate the contributions of these two industries to our general economy. The pulp and paper industry has a gross value of production approximating \$960,000,000; it directly employs some 50,000 people; it pays out in salaries and wages about \$170,000,000 per year. Of singular importance to our economy is the export value of newsprint - which exceeds \$486,000,000 and is our most important export. As a "dollar earner" the pulp and paper products are most important. Over 90 per cent of these products are purchased by the United States and are valued at approximately \$650,000,000. A somewhat similar situation exists in the non-ferrous smelting and refining industry. Its gross value of production is around \$700,000,000; as a "dollar earner" it contributes substantially, its products being valued at approximately \$267,000,000. Even on the basis of these two industries alone, there can be no doubt but that Canada is obtaining a handsome return from its electric power production.

These two large power-using industries are principally located in the central provinces of Ontario and Quebec. Of the gross value of the pulp and paper industry's production over three-quarters originates within these two provinces. The diversity of the smelting and refining industry makes a similar comparison difficult, but 9 of the 11 firms listed in the industry are similarly located. It is natural then that we should expect to find the greatest hydro-electric developments within these two provinces. Indeed these two provinces hold, and for many years have held, the predominant position in this field - in 1930 they

developed 78 per cent of the Canadian total, during the War years 82 per cent, and today 78 per cent. Ontario and Quebec presently have at their disposal almost 10,000,000 horsepower of developed hydro facilities.

Both public and private enterprise have undertaken to develop this great power capacity through the years. In the field of public development "Niagara Falls", initiated by the Ontario Hydro-Electric Commission, has for years been synonymous with electric power. On the other hand, private enterprise has been responsible for such great projects as Shawinigan Falls and, more recently, Shipshaw - which has made possible the production of aluminum on a scale of world importance.

The post-war industrial expansion in Ontario and Quebec coupled with the rising standard of living has placed a tremendous strain upon the power capacity of existing systems. As a result various interests embarked on power developments which in total may well surpass the developments of earlier eras.

The post-war period has seen an increase of 524,000 horsepower - nearly 10 per cent - in the hydro-electric capacity available in the Province of Quebec. This growth is largely attributable to four major projects of the Quebec Hydro-Electric Commission and the Shawinigan Water and Power Company. In 1948 the public authority installed the last 53,000 horsepower turbine in its Beauharnois plant No. 1 bringing that development to its ultimate capacity of 742,000 horsepower; work was begun on plant No. 2 and the first units totalling 110,000 horsepower were installed last year. The current year programme calls for an additional 220,000 horsepower. Ultimately 660,000 horsepower will be made available.

The Beauharnois developments - with an ultimate combined capacity of 2,000,000 horsepower - are designed to supply the industrial, commercial and domestic requirements of Montreal and districts. In contrast thereto the developments of the Shawinigan Water and Power Company are primarily concerned with the pulp and paper and chemical industries of Grand'Mère, Three Rivers, Shawinigan Falls, Quebec City and other centres. During 1948 and '49 this company completed a 195,000 horsepower undertaking at Shawinigan Falls. The La Trenché Rapids development on the St. Maurice River is now nearing completion and will ultimately provide some 390,000 horsepower. The greater part of this power production will be utilized by the new titanium workings at Sorel.

In Ontario, power capacity during the past five years has increased by 840,550 horsepower - an increase of approximately 30 per cent. Virtually the whole of this increase is attributable to the Ontario Hydro-Electric Commission. During 1947 and '48 completed projects were limited to the improvement or enlargement of existing power developments - some 200,000 horsepower being added to three established plants. Meanwhile however, work continued on several new and significant developments. The year 1950 saw, in large measure, the culmination of this programme. The Des Joachims project was brought into operation with 420,000 out of an ultimate 480,000 horsepower. Initial development of the Pine Portage and George W. Rayner generating stations has been completed. Together they will add 136,000 horsepower. The Chenaux generating station has been brought into initial production with 40,000 out of a projected 160,000 horsepower. The La Cave development may be in partial operation by year-end - by 1952 it should add an additional 160,000 horsepower.

In total this five-fold expansion programme provided Ontario with an additional 596,000 horsepower in 1950, and will provide an additional 276,000 in 1951 - 160,000 in 1952 - and possibly another 80,000 in the years immediately following.

Spectacular though the Ontario and Quebec progress has been we should not be unmindful of developments in other provinces. Within the last five years they have added some 700,000 horsepower to our national total. The bulk of this increase - 420,000 horsepower - stemmed from operations in British Columbia. There such developments as the 620,000 horsepower Bridge River project and the 168,000 horsepower John Hart project have now been brought into partial service. Within the last five years British Columbia has increased power production by nearly 50 per cent - giving a provincial total of 1,300,000 horsepower. In Manitoba there has been a 40 per cent increase - giving a provincial total of 600,000 horsepower. Notwithstanding the lack of water sites in Alberta and Saskatchewan - with resultant use of steam and diesel plants - their hydro production has increased 78 and 23 per cent respectively. Across the Northwest Territories and northward to the Yukon, plant capacity has been almost doubled.

As one contemplates this vast expansion there appears every prospect that future developments will be called forth on a comparable scale. 1951 should see the installation of nearly one million horsepower - a rival year to 1943 when the immense Shipshaw development was brought into production. Sparked by the 600,000 horsepower Niagara development, the proposed 400,000 horsepower system of the Aluminum Company on the Peribonka, and the 330,000 horsepower of Beauharnois, the years 1952 to 1954 will provide an additional 1½ million horsepower. Large though this amount is, it does not include such projects as the Aluminum Company development for British Columbia which in itself would require some 1,600,000 horsepower.

In the light of these remarks it is desirable to point out that notwithstanding a most impressive expansion in power production - and an equally impressive and growing demand for power - we are far short of a full utilization of our national resources. By 1955 we will have developed about one-quarter of the economically available turbine capacity - that is, approximately 15 million horsepower out of 55 million. This presently unexploited margin of 40 million horsepower indicates that inexpensive water power which has been such an important factor in shaping our past industrial growth will be equally (if not more) important in years to come.

The large scale exploitation of the water resources of Quebec have placed that province in the forefront - having over one-half of Canada's installed turbine horsepower. In spite of this however, the potential resources of Quebec are far from exhaustion. The prospects are that Quebec will have cheap electric power capable of economic development for many years to come. On the Lachine and Soulanges section of the St. Lawrence River alone some 2,250,000 horsepower awaits development. Moreover, if need be, these sources could be exploited immediately in a manner similar to that used for the Beauharnois development.

In Ontario however the situation is different. Indications are that once present undertakings are completed there will remain but two major sources capable of economic development. The construction of one of these - the Sir Adam Beck Station No. 2 at Niagara Falls - has recently been made

possible by the ratification of the Canadian-American Niagara Diversion Treaty. By 1954 this station will be providing 600,000 horsepower for the Ontario Hydro system.

The only major power source remaining is that which would be made available by the construction of the St. Lawrence Seaway. The draft plans for the International Rapids section of the Seaway make provision for the development of 2.2 million horsepower to be divided equally between Ontario and the State of New York. Without this additional power Ontario may be obliged to place increasing dependency upon the production of electricity from steam power. Indeed the trend is already evident in the steam plants now being constructed in Toronto and Windsor. One cannot fail to be apprehensive of this trend when one considers the significant difference in cost. On a kilowatt hour basis, steam costs at the plant are approximately three times hydro costs at the source. It is therefore apparent that if Ontario must turn more and more to steam power as a source of electricity then provincial industry will be placed at a competitive disadvantage with Quebec and, possibly, British Columbia. Not only would this raise certain problems for provincial industry, but would raise problems with respect to international trade which are of national concern. The construction of the St. Lawrence Seaway and the realization of its hydro-electric power potential would mitigate power shortages for many years to come. In addition it would provide the many strategic and commercial advantages with which we have all become acquainted through the many years which have elapsed since the Seaway project was proven feasible.

We have been talking about the Seaway for a long time. The project has been agitating public opinion for over a hundred years. It has been the subject of discussions with the United States for the last fifty years. These negotiations culminated in the signing of an agreement by our two countries in 1941. This agreement provides for a 27' channel from the Head of the Lakes to Montreal, and the joint development of 2,200,000 h.p. of energy in the International Section of the River.

Canada believes that this Agreement is the best for all parties concerned. It was arrived at after careful studies by competent engineers, both Canadian and American. The President of the United States has asked Congress to ratify the Agreement. Within the last few days, approval has been strongly urged by the United States Secretary of State, Secretary of Commerce, Secretary of Defence, Secretary of the Interior, and Director of Mobilization. We in Canada are prepared to carry out our part of the Agreement, and we are hopeful that it will be implemented by Congress at the present Session.

The project is unquestionably urgent from the standpoint of National Defence. Without the Seaway there cannot be expeditious and economic movement of the large reserves of high grade iron ores in Labrador to the steel centres in the region of the Great Lakes. Shipyards along the Great Lakes are relatively well-protected but shipbuilding and ship repairing in those yards could not be advantageously increased without the Seaway, nor would relief be afforded to land transportation between Montreal and the Head of the Lakes in times of emergency.

Look at the map of North America and you will find that the Great Lakes - St. Lawrence Seaway lies almost in the centre of the five physiographic regions of the North American Continent. The upper end of the Seaway links the Canadian West

to the Atlantic seaboard and the American West to the Port of New York. It joins the wheat fields of Western Canada to the United Kingdom market.

When one realizes that more yearly tonnage passes through one of the bottlenecks in the Upper Lakes Region namely, the locks at Sault Ste. Marie, than through the Panama, Suez, Manchester and Kiel Canals put together, this gives some idea of the tonnage that is likely to come through when the development is completed. The building of the Panama Canal through the Isthmus of Panama, the construction of the Suez canal linking the Mediterranean with the Red Sea, were logical projects. They were the inevitable and the right thing to do, no matter at what cost. Once the proposal to construct the Deep Waterway in the St. Lawrence River to link the Great Lakes to the Atlantic Ocean, the verdict will be the same.

The prosperity of Canada is to a very large extent dependent upon industrial production, and the latter is impossible without power. Hence, the benefits of this great Waterway project to both Canada and the United States are incalculable.

The friendly relations existing between Canada and the United States for well over a century have been greatly enhanced by two world wars. These wars and particularly the last one have brought us together more than ever before. They have shown that on many problems not only do we think alike but frequently we act together. Such was the case of Ogdensburg, of the Joint Permanent Defence Board, of Hyde Park, of the Alaska Highway, of the Northwest Passage and perhaps more particularly in the air by means of our trans-border services. Our governments think alike on the development of the St. Lawrence Waterway. I believe the vast majority of our people think alike, but we must translate this thinking into action. We must act together upon it so that, to use the words of a great British statesman, in the days to come the Canadian and the American peoples will, for their own safety and the good of all, walk together in majesty, in justice, and in peace.

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