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THE ST. LAWRENCE SEAWAY AND POWER PROJECTS

In April 1959, a 400-year-old dream was realized when ships began using the St. Lawrence Seaway. In the broadest sense the Seaway is a deep waterway extending some 2,300 miles from the Atlantic Ocean to the head of the Great Lakes in the heart of North America; strictly speaking, however, within the meaning of the legislation that permitted construction to begin, the St. Lawrence Seaway extends from Montreal Harbour to Lake Erie.

In the early part of the sixteenth century, the French explorer Jacques Cartier was turned back by the turbulent waters of the Lachine Rapids just west of what is now Montreal and forced to abandon his dream of finding the Northwest Passage and the route to the Far East. At various times during the intervening years, canals have been dug and locks built round the natural barriers to navigation that exist in the St. Lawrence River and the waters connecting the Great Lakes in the effort to make possible the use of the economical route provided by the Great Lakes basin for the transportation of goods in and out of this important part of the continent. The first such canals, built in 1783, were only two feet deep. By 1850, nine-foot canals had been completed in Canada right through to the Upper Lakes. By 1900, 14 feet was the regulation depth in these canals, though certain of them -- at Sault Ste. Marie, for example -- were deeper. In 1932, Canada completed the Welland Canal, 27 miles in length with a depth in some reaches of 25 feet. This canal and its eight locks overcome the difference in level of 326 feet between Lake Ontario and Lake Erie. Its construction may be considered as the first step -- a decisive one -- in the construction of the present Seaway.

The needs of commerce pointed to the desirability of providing even greater depths in the St. Lawrence canals, locks and connecting channels, and by 1959, as a result of the joint efforts of the Canadian St. Lawrence Seaway Authority and the United States Saint Lawrence Seaway Development Corporation, 27-foot depths existed from Montreal to Lake Erie. The improvements to the Welland Canal between Lake Ontario and Lake Erie round the barrier of Niagara Falls have been the sole responsibility of the St. Lawrence Seaway Authority. Deepening the channels above Lake Erie to Seaway standards was done by others, and now 27-foot depths are available into the Upper Lakes.

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While the Seaway development was in progress, the Hydro-Electric Power Commission of Ontario and the Power Authority of the State of New York completed works in the International Rapids Section of the St. Lawrence to convert into electricity the energy represented by the rapids west of Cornwall. The Barnhart Island-Cornwall generating plants produce 840,000 kw in each country.

History of negotiations

Negotiations between Canada and the United States aimed at developing these twin resources of the St. Lawrence River and the Great Lakes for the benefit of both countries began toward the end of the last century, though, as has been shown, piecemeal development of navigation by Canada in the Great Lakes basin had started centuries earlier. Power was first developed at Niagara at the turn of the century. In 1912, the Canadian Government decided to improve the Welland Canal to provide 27-foot depths with locks 800 feet long and 80 feet wide. Work began in 1913, was suspended during the First World War, and was finally completed at a cost of approximately \$132 million in 1932. In the same year, Canada and the United States signed the St. Lawrence Deep Waterway Treaty, which was to provide for the joint development of the resources in the Great Lakes basin in the interests of both navigation and power. In 1934, this treaty was rejected by the United States Senate.

After further studies, and impelled by the power needs created by war production, Canada and the United States signed the Great Lakes-St. Lawrence Basin Agreement in 1941, with the same object in view. This agreement, which, like its predecessor, was submitted to the United States Senate for approval, remained unratified up to 1949.

The 1941 agreement was intended, among other things, to permit the development, as a joint project, of the power resources latent at Niagara Falls, where, over the Falls alone, a 160-foot drop is available for the production of power. Since there was little prospect by 1949 that the agreement would be approved, a separate treaty was signed and ratified in 1950 setting forth the principles under which the water in the Niagara River could be turned into power by Canada and the United States.

At about the same time, the Canadian Government made it known that Canada was prepared to proceed with an "all-Canadian" waterway as far west as Lake Erie once the means had been found to have the power works constructed concurrently in the International Rapids Section of the St. Lawrence River. By December 1951, the St. Lawrence Seaway Authority Act and the International Rapids Power Development Act had been approved by the Canadian Parliament, the former authorizing the construction of navigation works on the

Canadian side of the river from Montreal to Lake Ontario as well as in the Welland Canal and the latter authorizing the Hydro-Electric Power Commission of Ontario (HEPCO) to join a United States power-generating entity in constructing the necessary power works in the International Rapids Section of the St. Lawrence River.

In 1952, in order to get the power project under way, the Canadian and United States Governments submitted joint applications for the approval of the International Joint Commission to the proposed power development, on the understanding that the Canadian Government would undertake to construct more or less concurrently, and to operate, all the works necessary to insure uninterrupted 27-foot navigation between Montreal and Lake Erie. Approval of this proposal was given by the International Joint Commission in an order of approval dated October 29, 1952.

In 1953, the U.S. Federal Power Commission granted a 50-year licence to the Power Authority of the State of New York (PASNY) for the development of the United States half of this power project. Because the order granting this licence was contested in the U.S. courts, it was not until June 1954 that PASNY had clear authority to join HEPCO in making a start on these works.

In the meantime, however, the United States Congress had enacted the Wiley-Dondero Bill (P.S. 83-358), which authorized and directed the Saint Lawrence Seaway Development Corporation to construct, on United States territory, all the 27-foot navigation facilities required to get shipping round the navigational barriers in the International Rapids Section. The situation thereby created required close consultation between the Canadian and the United States Governments in order to avoid a duplication of locks and canals. A number of compromises and accommodations were eventually worked out and embodied in a series of exchanges of notes, according to which the United States agreed to build a canal and two locks on United States territory to by-pass the Barnhart-Cornwall generating dam at the foot of the Long Sault Rapids and, in addition, to do some essential dredging elsewhere, while Canada agreed to build a lock and canal round the Iroquois Control Dam some 30 miles upstream and, in addition, to complete to a common standard all the necessary navigation facilities in Canadian territory, i.e. between Montreal and Cornwall and in the Welland Canal. The estimated cost to the United States of these works was about \$100 million, while the estimated cost to Canada was to amount to about \$200 million.

The first sod on the St. Lawrence Power Project was turned on August 10, 1954. Work on the Seaway began in September of that year. The Iroquois Lock was in regular use by May 1958 and the two United

States locks from July 4. First power came from the international power-houses on the latter date. Through-transit of the St. Lawrence Seaway began April 25, 1959, and the Seaway was opened officially by Queen Elizabeth II and President Dwight D. Eisenhower on June 26 of that year.

Navigation facilities Some idea of the magnitude of the work undertaken can be obtained by taking an imaginary voyage on a ship westbound from Montreal.

a) *St. Lambert Lock:*

Opposite the pool of Montreal Harbour can be seen the protecting dyke of the channel giving access to the Seaway, which begins just east of the Jacques Cartier Bridge, passes beneath the bridge and extends for three miles before reaching the first lock of the Seaway, the St. Lambert Lock, at the southern end of the Victoria Bridge. (At the Victoria Bridge are lift-spans and a system of rail and road traffic diversion.)

The St. Lambert Lock raises ships some 15 feet from the level of Montreal Harbour to the level of Laprairie Basin, through which the ship channel sweeps in a great arc eight and a half miles long between its protecting embankments to the second lock.

b) *Cote Ste. Catherine Lock:*

The Cote Ste. Catherine Lock, like the other six new Seaway locks and the seven lift-locks on the Welland Canal, has been built to the following standard dimensions: length 768 feet; length between stop signs in lock 715 feet; width 80 feet; depth over sills 30 feet.

This lock, to fill which 18.3 million gallons of water are needed, can be filled or emptied in approximately seven minutes. It lifts ships from the level of Laprairie Basin 33 to 35 feet to the level of Lake St. Louis. Its function is to by-pass the Lachine Rapids. Beyond it, the channel runs seven and a half miles before reaching Lake St. Louis.

Over this channel, at one point, tower the piers that give the Honoré Mercier Highway Bridge 120 feet of clearance for ships. Further upstream, the Canadian Pacific Railway bridge has had two lift-spans installed to allow for the passage of ships. These spans can be raised or lowered in a minute and a half.

c) *Lake St. Louis and Beauharnois Locks:*

Entering Lake St. Louis, the ship proceeds some 12 miles by dredged channels before reaching the Lower Beauharnois Lock at the west end of the Lake.

The minimum width of St. Lawrence Seaway channels is 180 feet between bridge abutments and 225 feet when provided with two embankments, to 800 feet in improved channels. The controlling depth in canals and channels is 27 feet.

The Lower Beauharnois Lock by-passing the Beauharnois Power-House lifts the ship 38 to 42 feet so that it may pass through a short canal to the Upper Beauharnois Lock, where it is again lifted 36 to 40 feet to the level of Lake St. Francis; after some 13 miles in the Beauharnois Canal, the ship enters Lake St. Francis. It sails westward for some 30 miles by dredged channels to the head of the lake.

All locks and channels to this point have been built by Canada's St. Lawrence Seaway Authority.

d) *United States locks:*

The ship canal leaves Lake St. Francis at the southwest corner and before long crosses the international boundary just opposite St. Régis, Quebec. From here to the first lock on the United States side is only five miles. Entering the Bertrand H. Snell Lock, the ship is lifted 45 to 49 feet into the Wiley-Dondero Canal (ten miles long) and is then lifted another 38 to 42 feet by the Dwight D. Eisenhower Lock into Lake St. Lawrence, the power-pool on which HEPCO and PASNY draw for the water used in the turbines at the Barnhart Island-Cornwall Power-House Dam, a mile to the north. The ship canal through Lake St. Lawrence passes where rapids once tossed the water into an angry foam.

e) *Iroquois Lock:*

At the western end of Lake St. Lawrence, the Seaway Authority of Canada has built a lock to allow ships to by-pass the Iroquois Control Dam. The lift here is only about one foot. Once in the waters of the St. Lawrence west of Iroquois, the ship channel meanders through the Thousand Islands past Prescott and Brockville, on to Kingston or Cape Vincent on Lake Ontario, and thence by the open waters of the Lake to the port of Toronto, industrial Hamilton and Port Weller.

f) *Welland Canal:*

From Port Weller on Lake Ontario to Port Colborne on Lake Erie is 27 miles. Through a series of eight locks (three of them twin locks in flight allowing passage of ships in both directions simultaneously), ships are raised through 326 feet to the level of Lake Erie.

West on the Seaway route lie the Lake Erie ports, the chief ones, such as Ashtabula, Cleveland and Toledo, being in the United States. Next ships pass through the Detroit River, where Detroit and Windsor face each other across the international boundary. Then north through Lake St. Clair and the St. Clair River, the route serves Sarnia and the Lake Huron and Georgian Bay ports, important to Canada's wheat trade.

Access to Lake Michigan from Lake Huron is by means of the Strait of Mackinac, but the through-route takes shipping north and west through the St. Mary's River, with a lift of some 20 feet by means of one of the four United States locks or the Canadian lock at Sault Ste. Marie, to Lake Superior. Beyond lies the long run across the open lake to the United States lakehead at Duluth-Superior or the Canadian lakehead at Thunder Bay, at the very heart of the North American continent, 2,300 miles from the Atlantic Ocean.

Seaway economy By most recent figures, new work on the Seaway proper from Montreal to Lake Erie will have cost Canada about \$340 million; work in the international reaches of the river will have cost the United States some \$130 million. (The two power entities will have spent \$600 million in developing the power at Barnhart -- \$300 million by HEPCO and \$300 million by PASNY. These sums, which have been raised by floating bonds and by other types of borrowing, will be financed out of revenues realized from the sale of power.)

To recover the costs of construction, operation and maintenance of the navigation works, tolls are charged according to a schedule, which is published. (The toll receipts from the operation of the Montreal-Lake Ontario portion of the Seaway are divided between Canada and the United States on the basis of the respective annual charges of the two national Seaway entities -- 73 per cent to the St. Lawrence Seaway Authority (Canada) and 27 per cent to the Saint Lawrence Seaway Development Corporation (U.S.). All lockage fees from transit of the Welland Canal accrue to the St. Lawrence Seaway Authority.

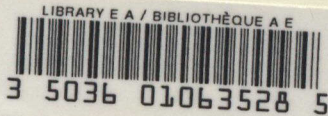
Traffic In the course of a navigation season extending between April 1 and December 15, the intensity of traffic grows as the upstream end of the waterway is approached. Some 53.7 million tons of cargo transited the Montreal-Lake Ontario section of the Seaway in 1972; on the Welland Canal section, nearly 64.2 million tons of cargo moved. The locks at the Sault have handled nearly 98.2 million tons of cargo during the 1972 navigation season. This waterway is primarily a bulk-cargo route; on the St. Lawrence Seaway itself about 90 per cent of the traffic is of this nature. From Sept-Îles and other St. Lawrence ports upstream between 12 and 13 million

tons of iron ore move to Hamilton, Ashtabula and other lake ports, where slightly more than 3 million tons move downstream through the Welland Canal to Hamilton and other lake ports. Approximately 21 million tons of grain from the Prairie Provinces and the American mid-Western states are carried from the head of the lakes and other lake ports to the Montreal, Trois Rivières and Quebec elevators and to markets abroad.

Furthermore, although United States ships move much of the Great Lakes cargo that does not come through the Seaway proper, about 50 per cent of the ships that sail the St. Lawrence Seaway are of Canadian registry.

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