river would freeze over in severe weather, and the sheet of ice would rise and fall with the water just as it does in the St. John and similar rivers. Nevertheless, while the building of the dam was in progress, the question of large masses of ice moving with the current should be given every attention, and quite likely some special method of cushioning the blows from ice might have to be devised.

Considering the method of distributing the power available at Hopewell, Fig. 7, shows how centrally Hopewell is placed with reference to the centres of population of both New Brunswick and Nova Scotia.

The method of transmission carries with it no special problems, as we would undoubtedly use step-up transformers at the power house, transmit at about 30,000 volts with 3-phase current, and use step-down transformers at the delivery points. All this system has been so thoroughly thrashed out, and is in daily use all over Canada and under Canadian winter conditions, that it has become practically standard and needs no special consideration here.

Population and Power Requirements

The principal feature that should be considered in laying out the transmission lines would be one of expediency and proper return on the capital outlay of transmission lines and line losses. Undoubtedly, a main line should go west to St. John, with power for all intervening towns and villages of any size, and undoubtedly a main line should go east and south to Halifax with power for Sackville, Springhill, Amherst, Truro, etc., and also branch lines should go to Moncton, New Glasgow and Stellarton, as the present population would warrant this. The extension of branch lines to St. Stephen, Fredericton, Newcastle and Chatham is somewhat doubtful at present, but there are railways that well might be economically electrified toward all these points, and I have therefore included them in the preliminary estimate. I have prepared a table of the population that would be served by these lines, and the total works out at 250,000 inhabitants. With this as a basis we should now estimate the probable per capita use and thus obtain an estimate of the proper size of plant for the initial development at Hopewell.

When I prepared my first report on this subject, it was submitted to the well-known firm of Sanderson & Porter, of New York, a firm who specialize in the control and management of some 60 hydro-electric developments, and their condensed criticism was as follows:—

"We think your proposal from an engineering standpoint is sound and it is the only scheme for utilizing tidal power that seems practical, but we are rather in doubt as to whether the population served is sufficiently large to warrant the capital expenditure."

Now this was in 1914, and I presume Sanderson & Porter based their opinion on the per capita use of hydro-electric power in the United States, which works out at 0.10 h.p. per inhabitant, according to their text books. On this early report, and on their opinion, I based the letters to the newspapers that were published in St. John and Halifax, and in these letters I appealed for governmental help, since it seemed at that time that while my proposal was almost a commercial one, it was not conclusively so.

0.36 H.P. per Capita

Since last January, however, newer data has come to hand, and this data is accurate, as I presume it is, the complexion of affairs has changed and the Hopewell plant is really a good commercial proposition at the present time, and needs only the governmental help accorded by a good charter.

The data that I speak of shows the per capita use of hydro-electric power for every province of Canada and for the Dominion as a whole. It shows that British Columbia uses 0.36 h.p. per capita, Ontario 0.288, Quebec 0.267, and the whole of Canada 0.206 h.p., and these figures are for the total population and they should be increased at least 30% for the per capita use of population served. It will thus be seen that Ontario, per capita served, is using about 0.37 h.p. and Quebec about 0.35 h.p., and I think we may properly assume that 0.36 h.p. would be used by the inhabitant of the Maritime Provinces as soon as he is given really cheap electricity.

On this basis, then, the population of 250,000 would require 90,000 gross horse-power, or, say, 45,000 h.p. at the delivery points, and I think the initial development at Hopewell should be for 90,000 h.p., with every provision made for increasing the output, as already outlined in this paper, up to 200,000 gross horse-power as the population and demand increased, as they undoubtedly would when cheap power was available.

Cost of Initial Development

Turning to the question of costs, I have made an estimate of this as follows, and in accordance with the text books on the subject:—

Dam Cost in Cyclopean Concrete

	Western Dam.	
730	lineal feet at equivalent height of 38 ft. and $137 per lineal foot	$ 97,000
4,100	lineal feet at equivalent height of 65 ft. and $300 per lineal foot	1,230,000
	Eastern Dam.	
2,800	lineal feet at equivalent height of 65 ft. and $300 per lineal foot	840,000
2,000	lineal feet at equivalent height of 35 ft. and $120 per lineal foot	240,000
	Wing Dam.	
900	lineal feet at equivalent height of 30 ft. and $94 per lineal foot	84,600
10,530 ft.	Total cost,	$2,491,600

One well-known engineer who examined my first report, considered this too low a figure and thought $4,000,000 should be allowed for dams, and since we will remain uncertain about the dam cost, until borings are made, it will be best to allow this higher figure in the preliminary estimates.

The other items of cost can be more accurately estimated from the known cost of equipment in existing hydro-electric developments, and we have the following table of total estimated cost:—

Dams	$ 4,000,000
Lock in western dam	100,000
Sluices, gates, etc.	300,000
Power house of steel and concrete	200,000
Turbines, generators, etc., at $40 per gross h.p.	3,600,000
Transmission lines, etc.,	1,200,000
Preliminary dredging, dam, trench, etc.	100,000
Promotion, engineering fees, etc.	500,000
Auxiliary plant to supply head deficiency at sub-normal neap tides, say	1,000,000
Total cost of initial development to produce 90,000 gross h.p.	$11,000,000
Or cost per h.p. developed	$ 122.50

Cost of Subsequent Enlargement

The cost for subsequent development is much less, relatively, for in the initial development full allowance has had to be made for the final development in all items except turbines, generators and transmission lines, and the cost of a full development of 200,000 gross h.p. would work out at about $16,000,000, or $80 per gross h.p. In this estimate for final development, the cost of shovelling and dredging the Memramcook farming lands (which would be necessary as previously shown) is not figured, for it would be undoubtedly good policy to start this work as soon as the power house was in operation, and take the necessary cost out of the annual income.

In considering the charge that could probably be made to the consumer initially, we must consider the cost of steam power to the provinces, and I have it on good authority that the actual cost to the largest producers of electricity, by steam, was $60 per h.p.-year before the war, and would be about $90 per h.p.-year at the present time.

Suppose, now, we were to charge half this rate on the average, and place our charge at $45 per h.p.-year, this would