DR. CUTTEN'S SCHEME FOR WATER POWER FOR THE WHOLE PROVINCE

President Cutten of Acadia, in Address Before Commercial Club, Halifax, Outlined Scheme to Harness the Bay of Fundy Tides for Development of Hydro-Electric Power

Members of the Commercial Club were told at their weekly luncheon at the Halifax Hotel last week of a scheme to harness the Bay of Fundy tides for the development of hydro-electric power, cheap and practically unlimited. The address in which this scheme was outlined, was given by Rev. Dr. George B. Cutten, President of Acadia University, who together with Professor R. P. Clarkson, Ivan Curry, Professor of Engineering at Acadia, for some time past has been considering ways and means of making this oft-proposed development an actual fact.

Dr. Cutten and Professor Clarkson found that Cape Split on Minas Channel was the most suitable location for the successful fruition of the scheme and the President of Acadia told in a most interesting way the manner in which he though the tides could be profitably placed under control.

Reservoirs on Cliff Tops

The proposal is to place strong current motors at the base of the lofty cliffs of Cape Split to generate power to elevate sea water to reservoirs on the top of the cliff. That done, the rest is comparatively easy. The water from the reservoirs could be conducted to the power house at the base of this cliff and would go back again to the sea.

The title of Dr. Cutten's address was "Nova Scotia's Best Water Power, and its relation to Halifax." This relationship will be found in the theory that the value to Halifax from such power development would be that cheap power for the City would be assured and that, thanks to the central location of the proposed plant, the entire Maritime Provinces would benefit by it, thus benefitting Halifax.

A. H. Minshull, President of the Commercial Club, was in the chair, and presented Dr. Cutten a vote of thanks which was moved by Controller McKeen and Rod McColl.

Nova Scotia's Best Water Power

Dr. Cutten's address was as follows:

All thoughtful Nova Scotians, who have the interest of the Province at heart are at present much interested in water power. We all recognize, I think, that the future prosperity of the Province depends upon it. This is especially true when we consider post bellum conditions, and the great struggle for industrial supremacy which will then take place. Probably no land of its size in the would is richer in variety of minerals than is our Province. And with the coal and iron so easily available Nova Scotia should be the New England of Canada teeming with factories of all kinds. Unfortunately other provinces have financial advantages of us as far as our coal is concerned, and so long as that is true we must look for some other power and particularly some cheaper power. Water power is the direction toward which we naturally turn.

It is true that the water powers in Nova Scotia have not been fully developed on account of our plentiful supply of fuel and it is interesting to enquire the exact amount of water power we have in Nova Scotia. The Commission of Conservation (Report of 1910), estimate the possible development of water power in Nova Scotia to be only 54,000 h. p., much of which would not be available for a few months in summer. A little more detail of the Commission's Report might be of interest. In Nova Scotia there has been developed about 20,000 h. p. of water power. Of this 12,650 h. p. are used for pulp and paper mills, 2,700 h. p. for electric light, 350 h. p. for gold mining, and the remainder, about 4,000 h. p., for saw and grist mills.

In Maritime Provinces

In New Brunswick 13,000 h. p. has been developed from water power. Of this 56 per cent. is for use in small lots for saw, grist and pulp mills, and the remainder is used for electric plants. Of the latter, there is one development of 3,800 h. p., largely for use in the State of Maine.

In P. E. Island there are a few small developments of from 5 to 50 h. p. One electric plant develops 44 h. p. The total development is about 500 h. p. and that is about the limit of possibility.

At present the total water power development in the Maritime Provinces is 34,500 h. p. The steam development in Nova Scotia outside alone of Sydney is about 30,000 h. p. The possible development of water power in Nova Scotia is about 54,000 h. p. which would not be sufficient to carry throughout the whole year the total installation of steam and water power, which was then estimated by the Commission at 49,724 h. p., not including Sydney. That is, if all the inland water power of Nova Scotia were developed it would not provide power for the present need, and it would leave no opportunity whatever for future industrial development. It is of local interest to note that Halifax County alone had then installed 9,913 h. p., which is more than four times the amount of power which the Commission estimates any one of the present projected hydro-electric schemes could supply continuously.

Recently an advertising booklet of the Water Power Branch of the Interior Department has come to hand in which the estimates of the promoters of the various water power schemes are given, without verification by the Government. For example, they speak of the Gasperaux possibility as being estimated by some firm of engineers as capable of 8,000 h. p. development as against the Government estimates of 1,945 h. p. Even allowing for all glowing estimates of the power development of Nova Scotia the total will not reach more than 55,000 or 60,000 h. p. and will entail a great many expensive development at out of the way places in nearly all cases far from the industrial centres of the Province and of course out of the question so far as New Brunswick and Prince Edward Island are concerned. For beneficial results all would have to be controlled by one operating company.

The large New Brunswick developments are from 200 to 400 miles away from St. John and other industrial centres.

Two Million Horse Power

Unfortunately the Commission did not take note of Nova Scotia's best water power, nor did it give us an estimate of the possible power development. Unfortunately also, I am at this time unable to supply the deficiency in full. I can say this much, however, within a radius of three miles of one point in Nova Scotia, water power to the amount of 2,000,000 h. p. is available. I refer to a certain point on the Bay of Fundy and to the power of the tidal flow there. The remainder of the time at my disposal will be taken up with a discussion of the possibilites of utilizing this power.

What use has in the past been made of tidal power has been entirely through the means of large reservoirs, one of which is kept at high tide level and empties through power gates to the other kept at low tide level. This means is not satisfactory for continuous power unless the reservoirs are very large to prevent loss of head between tides, and the dams correspondingly expensive. For the Bay of Fundy this method does not seem to be feasible because of the cost and the necessary interferences with navigation. It is our proposal to use the tidal current flow rather than the head, in solving the problem.

Variation in the Tidal Flow

An examination of the rate of tidal flow in the Bay of Fundy shows a remarkable variation. The general rate in the middle of the Bay is between one and two knots. The maximum at Digby Gut is four knots. The highest rate is in Minas Channel, where the maximum rate is between eight and ten knots, i. e., between nine and eleven and one-third miles per hour, a rate of flow far surpassing the current of the swiftest streams and equalled by tidal current at only two other spots on earth. When we consider that the power increases as the cube of the rate of current flow this very high rate assumes larger proportions. It is evident then, that if any development of tidal power is to take place in a favorable location, it must be at Minas Channel.

I wish here to make a personal explanation. A little over a year ago at the Maritime Forward Movement in Amherst, I made the statement that it would pay the Governments of the Maritime Provinces to offer a prize of $1,000,000 to the person who would invent a workable motor for the utilization of the Bay of Fundy tides. This statement was much quoted and discussed. Needless to say the Government did not rush at this suggestion. The matter, however, would not be driven from my mind and I continued to consult with Prof. R. P. Clarkson, Ivan Curry Professor of Engineering at Acadia University, and together we have been working at the problem. The solution which I am to present to you is the result of his inventive genius.

Difficulties of Development

In the first place let me remind you of certain difficulties connected with the development of tidal power. For four periods in every twenty-four hours the tidal flow stops, and these periods do not recur at the same time every day. Some form of storage is therefore necessary. Storage batteries are prohibited on account of cost. A supplementary plant to operate at these times would have to be large enough to carry the peak load and therefore might as well be operated all the time.

In the second place the flow is not only entirely stopped for four periods in every twenty-four hours, but the tidal height is constantly changing and the rate of flow varies considerably. It would be difficult to adjust any direct connected machinery depending on tidal height or rate except to the lowest efficiency.

In the third place, any scheme of tidal power development must not interfere with navigation.

A power plant, then, for even a favorable tide like the Bay of Fundy must be adjusted as to give continuous, regular and sufficient power, with low cost of installation and operation and at the same time not interfere with navigation.

A visit to Cape Split reveals one of the grandest views in Nova Scotia. Perpendicular cliffs rise abruptly over three hundred feet. A detour of two miles is necessary before one can ascend the cliffs. Even one unacquainted with engineering easily recognizes that an ideal hydro-electric plant would be a reservoir containing an inexhaustible supply of water located at the top of this cliff and feeding to hydraulic turbines placed at the base of the cliff, these turbines discharging directly to the sea. This would do away with the flumes, penstocks, and tail races which are usually the most expensive part of a water power. Our problem is to supply this water.

The scheme arranged to overcome the difficulties above referred to is based on power generated by especially designed current motors in the swift currents at the foot of the cliff operating pumps to elevate sea water to reservoirs placed on the top of the cliffs. The water will then be conducted to the power house at the base of the cliff in the way common in hydro-electric plants. The whole stage of the process from pump to an electric light in a far away town is simply a combination of the municipal pumping plants and industrial hydro-electric plants and these are in continuous operation in may places.

Whether or not the pumps were operating, the flow from the reservoirs would be continuous and regular so that the irregularity of the tide would not affect the producing power. The novel features are: (1) The use of the rate of tidal flow instead of the head. (2) The general scheme for overcoming the irregularity of tidal flow and for solving the storage problem made possible by the contour of the land at this point and (3) The specially designed and highly effective current motor for providing the power.

Made Successful Tests

You say it's all right, and it all depends upon the motor. That is true. Current motors are not uncommon, our problem was to procure an efficient variety. Perhaps I cannot say more about the motor at present than to tell you that a large sized model has been constructed and tested with most satisfactory results. While it can be lifted by two men it is capable of developing 27 h. p. at Cape Split.

It is not necessary to say more about one further objection, interference with navigation, than this: the vessels entering Minas Channel keep as far away from Cape Split as possible, and consequently any power development there would not in the least interfere with navigation.

The simplicity of the scheme is apparent, for the motor, while most effective is equally simple. Safety may also be guaranteed by two independent reservoirs of great reserve capacity; and by three units of power in the motors, any two of which would operate the plant, all of which are protected by novel means from conceivable dangers.

With the simplicity naturally goes the low cost of installation and operation and consequently low interest charges. This in turn means cheap power. In the preliminary estimates which have been made, it appears that by this means power could be sold throughout the Maritime Provinces, far cheaper than by any other contemplated development, as well as furnishing sufficient power to provide the Province with the required expansion.

A Central Point

Cape Split is one of the most central points in the Maritime Provinces. Within a radius of 125 miles lie Antigonish, Yarmouth, Fredericton, Newcastle, and nearly all of Prince Edward Island. Transmission lines of about 85 miles each would reach Digby, Moncton, New Glasgow and Halifax. When we consider that in Ontario, electric power is being transmitted over 250 miles, these distances seem short.

It is also interesting to note that these four lines with a branch from Moncton to St. John touch large towns within 100 miles of Cape Split, having a combined population greater than that of any city in the Dominion except Montreal, and cover a territory having a greater population than either Montreal or Boston, and in fact exceeding the combined populations of Toronto, Ottawa, Winnipeg and Vancouver.

The advantages of this situation may be summed up as follows: 1. No obstruction to navigation; 2. Ideal location for power house; 3. The swiftest current; 4. The higest cliffs rising from the water; 5. The central position in relation to the needs of the Provinces; 6. Unlimited power and possibility of expansion; and combined with the advantages of this situation is a low cost of installation and operation on account of the simplicity of the scheme.

The Value to Halifax

I have presented this scheme only in outline, but you can readily see its advantage. The value to Halifax would be two-fold. Cheap power for the City would be assured, for according to the preliminary estimate electric power could be delivered in Halifax for an average of 2c. per kw. h. and return a splendid profit. That would mean that power in larger blocks for manufacturing industries, could be delivered for less than 1c. per kw. h.

But more important than that to Halifax is the development of the whole Province and of the Maritime Provinces. Not a hamlet can flourish without helping Halifax and as this power could be delivered over the entire Maritime Provinces at a very cheap rate, Halifax would inevitably feel the reflex influence. This is an opportunity for us to get together for the development of the Provinces.

"There is a tide in the affairs of men, which taken at the flood leads on to fortune." Evidently the poet here refers to the Bay of Fundy Tide.

THE TIME TO ACT

(Department of Agriculture, Dairy Division, Ottawa.)

The old saying has it "there is no time like the present." That this applies with telling force to the selection of good dairy cows, will be admitted by every thoughtful dairyman. Selection may be made on the evidence of certain well-known external indications of good milking qualities with special attention paid to the udder, loin, skin, barrel, etc.

But no matter how skilled the expert judge of dairy "quality" in a cow may be, he is not infallible as to the amount of hard cash that any one cow in the herd will earn in a year. He may be, the ordinary dairy farmer, too, may be considerably mistaken in his judgment. One system will give him accurate results, that of selection of dairy records. It is easy to weigh and sample, it is easy to add up a few figures for each cow, it is easy to compare such totals, and it is eminently satisfactory to know for certain which cows are best to keep and breed from.

Now is the time to act, prepare to keep records all season; write the dairy division, Ottawa, for free milk record forms, either three times per month, or daily. You will never regret it.

C. F. W.