

THE ROSS REPORT

C. O. Foss Makes Convincing Reply to Arguments of Montreal Engineer Regarding Musquash Power

Chief Engineer of N. B. Electric Power Commission Declares That Errors in Mr. Ross' Calculations Are Plain, and Says Engineer Did Not Even Go to Musquash or Examine the Water Shed-off Percentage—Shows That All Records Justify Belief That At Least 21,000,000 K. W. H. Available at Musquash.

To the Editor of The Times: Sir—The "report" of R. A. Ross, of Montreal, purporting to estimate in section 1 the available power of the Musquash development of the New Brunswick Electric Power Commission, calls for some comments by the engineers of this commission. His deductions, based partly on authentic engineering records and largely on theoretical text book assumptions, differ so widely from the practical deductions of our own engineers, including the firm of C. H. & P. H. Mitchell, of Toronto, and Mr. Henry Holgate (a former partner of Mr. Ross), consulting engineer to the commission, that in justice to the general public and to these engineers we shall be glad if you will publish these comments. It is unfortunate that the city of St. John should have gone to the expense of procuring this document which in so far as actual engineering data is concerned is a reproduction of published records by the water powers branch of the Department of the Interior, rainfall records of the Dominion meteorological office, and annual reports of the Hydro-Electric Power Commission of Ontario, all of which are available to anyone and all of which could have been had from this office for the asking. The calculations based on this data could have been made by any high school student to at least the degree of accuracy in the report. Mr. Ross deals with three features of the Musquash development—the amount of power available, the question of a steam standby, and the cost of distributing electricity for lighting purposes in St. John. His conclusions under the first two headings reflect upon all the engineers connected with the work, his method of dealing with the third question—of distribution—is apparent to all who read. The value of his estimates may be gauged by the fact that an item of 50 per cent of \$200,000, or \$200,000, is put forth as a mere guess. With this section of the report we are not directly concerned but shall confine our remarks to the two questions of available power and a steam standby. Mr. Ross as an engineer estimates the power available at Musquash at 17,000,000 k.w.h. for the dry year on record in the past fifty-nine years. We estimate it at 21,000,000 k.w.h. Mr. Ross as a theorist estimates the power for a like year at 6,000,000 k.w.h. Our engineers have confirmed their calculations to the realm of engineering. As an engineer he takes the lowest run-off records as gauged by the Dominion water powers branch, makes an error in the amount of head, in the efficiency factor of the generating unit, and even here guessing at the area of the drainage area which neither he nor any one else knows, he computes the available power at 17,000,000 k.w.h. in the dry year on record. In Table 1 of his report he states the static head on the east branch is 95 feet and on the west branch 117 feet, or an average of 102 feet. Our engineers compute the average between 95 and 117 to be 106. He goes on to state that with this head of 102 feet with a generator efficiency of 90 per cent and a wheel efficiency of 60 per cent, "which seems fair when considering the fact that on the St. John demands the load factor of the operating machines will be for many hours 93 per cent, or less, the number of cubic feet of water at the wheels necessary to generate one k.w.h. is 379 c.f. As a matter of fact at this assumed efficiency which is only 54 per cent over all it would require 705 c.f. per k.w.h. It might be pointed out that static head is the difference in elevation between tail water and head water and could not in any case be used directly to compute power. The actual working head is less than the static head by the amount of water lost in friction in racks, gates, pipes, etc. In this case, however, Mr. Ross has grossly underestimated the head supplied him by the commission and erroneously called it static. The generators have efficiencies guaranteed as follows: Full load 95 per cent, three-quarter load 94.2 per cent, one-half load 92.5 per cent. They have been tested before shipment, under the inspection of our engineers, and have exceeded their guarantee. We propose to operate no machine below three-quarter load except for brief periods and our overall efficiency would be 87 per cent of 84.2 per cent or about 82 per cent. We estimate our power on 80 per cent efficiency. The following shows how the engineers of the commission compute the available power: The water powers branch of the department of the interior have gauged the water on the Lepreau, and have published complete daily reports of the flow of this stream covering the period from April, 1916, to September 30, 1920. They have supplied the commission with the results from October 1, 1920, to September 30, 1921. From the figures for Lepreau the run-off of the Musquash streams can be very accurately estimated in the same proportion as the respective drainage areas: estimated from existing maps at ninety square miles for the Lepreau and seventy square miles for each branch of the Musquash. So that if the mean rate of flow of Lepreau for one year is 360 cubic feet per second, the rate for each branch of the Musquash would be 280 cubic feet per second for that same period. For the climatic year, October 1, 1920, to September 30, 1921, the mean discharge for the Lepreau was found to be 247 cubic feet per second. For this same period a gauging station was maintained by the water powers branch on the west branch of the Musquash river and the actual mean run-off obtained was 190 cubic feet per second. Seven-ninths of the measured mean flow of the Lepreau for this period is 192 cubic feet per second, proving beyond doubt the reliability of the basis of comparison between the two streams. On this basis the rate of run-off for each branch of the Musquash for three years is as follows:

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1917-1918—317 cubic feet per second. 1918-1919—232 cubic feet per second. 1919-1920—246 cubic feet per second, or for the whole period a mean flow of 265 cubic feet per second for each branch. In estimating the available power a rate of 180 cubic feet per second for each stream has been adopted. The net working head at full load on the east branch after allowing for pipe line losses and tidal effect is 95 feet, and on the west branch 117 feet. Assuming 80 per cent efficiency of generation, the west branch will develop 1,914 continuous h. p., or the two combined will develop 3,464 h. p. throughout every second of the year, of at the rate of 2,988 kilowatts throughout the year. This equals over 22,850,000 k.w. hours per year at the generating station, from which it is estimated that 21,000,000 k.w. hours can be delivered at St. John after allowing for all transmission losses. The apparent 20 per cent discrepancy between the estimate of our engineers and Mr. Ross is accounted for as follows: Four per cent, due to error in averaging head. Eleven per cent, due to low efficiency factor used by Mr. Ross, evidently because he had not familiarized himself with the layout of the plant. Two per cent, excessive estimate of transmission losses. Three per cent, to proportioning rainfall records and run-off between various years. Total, twenty per cent. Not content as an engineer with condemning the whole project by mathematical errors and ultra conservative use of the engineering data to hand, Mr. Ross goes into the realm of theory and predicts the amount of power from precipitation records obtained miles from the site and from an estimate of the drainage area based on existing maps which any land surveyor in New Brunswick knows do not truly represent the actual areas as surveyed. Why does Mr. Ross say that the gauging records on Lepreau river are incredible? They were obtained by one branch of the Dominion service and the precipitation records at St. John by another. There is no reason to doubt that both are correct. After stating that the gauging records on Lepreau are incredibly high, he suggests an explanation

"there might possibly be a stop over at high river levels from the West Musquash to the Lepreau, possibly by an underground fissure or boulder and gravel bed leak." We have elevations of both streams. The Lepreau river is two miles from tide water is higher than the Musquash four miles from tide water and still farther up the stream the greater becomes the comparative height of the Lepreau. If the water from the Musquash is leaked under ground into the Lepreau at a high elevation, overcoming gravity, it possesses peculiar qualities and will probably generate more power than engineers estimate. But Mr. Ross is not familiar with the physical features of the district he did not even go to Musquash to see if there is a development there. He did not examine the water shed to see what conditions might affect run-off percentage as most engineers would have done before discrediting a project. He expects the same percentage of run-off as obtains in streams through drainage areas that have a different soil formation, different slopes, different vegetable growth, and under various conditions of humidity. He does not know the drainage area, and the nearest precipitation records are those of St. John over thirty miles from some points on the drainage area. He reproduces a precipitation record, his table No. 5, as follows: Rainfall records at certain places in New Brunswick for years ending Sept. 30. Depth in Inches.

Table with 10 columns: Year, St. John, Sussex, Moncton, Fredericton Experimental Farm, Fredericton, Fredericton, Fredericton, Fredericton, Fredericton. Rows for years 1919-1921 and a mean.

Now this is without doubt an accurate statement of precipitation at these points in the province. It will be noted that in 1920 almost 50 per cent more rainfall was recorded at Fredericton than at the Fredericton Experimental Farm, about four miles below Fredericton. On an average 17 per cent more fell in Fredericton than at the Experimental Station. If rainfall varies from 17 per cent to 50 per cent over a distance of four miles in the level interior how much variation might be possible between the gauging station on Douglas Avenue, St. John, and parts of the Musquash drainage area thirty-five miles away? Mr. Ross thinks the variation will be so slight that it is more accurate to estimate run-off on these rivers from precipitation measured at St. John than from daily records of the actual run-off in the stream. Our engineers prefer the stream measurement method. So much for Mr. Ross's attempt to discredit by pedagogue discussion the work of various engineers connected with this project, and to do it without personally viewing the plant or the site. We might be permitted to suggest that it would have more to the point for the City of St. John to ascertain how to handle the power offered them at a guaranteed cost. We feel that we have employed sufficient engineers to carry out the development. There is one more feature of this report and one only, viz: the question of a steam standby, which concerns the Commission and we shall appreciate being allowed to discuss that question in the next issue of your paper. C. O. FOSS, Chief Engineer. St. John, N. B., February 16, 1922.

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MORE PNEUMONIA. New York, Feb. 16.—Pneumonia cases reported to the health department today numbered 347 compared with 292 yesterday, while influenza decreased to 564 new cases against yesterday's report of 806. Eighty deaths from pneumonia and twenty-one from influenza were reported. Since Jan. 1 there have been 16,975 cases of influenza here with 378 deaths. Pneumonia caused death of 2,312 of 6,157 persons it attacked this year. BANKERS WOULD MAKE HOLD-UPS A CAPITAL OFFENSE. Altoona, Pa., Feb. 17.—Laws making "hold-up" crimes a capital offense, "to act as a deterrent to those bent upon such villainy," were urged in a resolution adopted by Group 6, Pennsylvania Bankers' Association. The convention also opposed an act placing stamps on bank checks.

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MUTT AND JEFF—ON THE LEVEL, HAVEN'T SOME GUYS GOT FUNNY NAMES. By "BUD" FISHER. JEFF, WHO WAS THAT GUY YOU WERE TALKING TO JUST NOW? HELLO MUTT, WHY, THAT WAS MISTER CUCKOO! CUCKOO! WHAT AN ODD NAME! (TEE HEE) QUITE SO! AND IT FITS HIM TO A "T". HE'S CUCKOO ALL THE TIME! (TEE HEE) IT'S VERY SELDOM YOU FIND A MAN'S NAME FITTING RIGHT IN WITH HIS CHARACTER LIKE THAT! COME TO THINK OF IT I KNOW ANOTHER GUY WHOSE NAME IMPLIES JUST WHAT HE IS! THAT SO? WHAT'S HIS NAME? A. MUTT! (TEE HEE) HA! YOU BIG MUTT, YOU MISSED ME!