SOME NOTES ON POWER PRODUCTION*

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In Canada the total developed water-power is about 2,400,000 h.p., and the total available power in the populated area of the country is estimated at less than 10,000,000 h.p. If development continued in the future at the same rate as during the last 10 years, we might look forward to the utilization of the whole amount before long; but, on the other hand, the powers offering the cheapest development per horse-power, the most remunerative markets, and, speaking generally, the maximum of advantage, are usually developed first. Thus, unless a new market is developed, a power developed at a later date near important markets is forced to compete with competitors who are well entrenched, and who, frequently, are operating under more advantageous conditions than the newcomer.

Moreover, the steam plant, as compared with the hydro-electric, occupies to-day a much more advantageous position than it did, say, 15 years ago. The hydro-electric plant had a high initial efficiency, and, in that period, has only made an advance of, say, 10%; in addition, it has reached such a high efficiency that it is not susceptible of considerable improvement. Its capital cost has increased, owing to the increased cost of labor and materials. On the other hand, the initial low efficiency of the steam plant offered ample scope for improvement, and the lower first cost is due to the development of the steam turbine; it is also susceptible of further improvement, and that improvement may be confidently anticipated. Though costs have risen since 1915, at that date the capital cost of the steam plant was only one-half what it was 15 years earlier. In addition, the consumption of coal in the steam plant has been reduced by from one-third to one-half.

May Expect Slowing Down

Thus, unless under exceptional circumstances, such as the great powers of the Niagara and the St. Lawrence, which have inherent advantages, we may reasonably expect in the future there will be a slowing down in water-power development except when carried out on an extensive scale by the federal or provincial governments as, for example, on the St. Lawrence.

The original application, during the parliamentary session of 1909-10, for permission to develop the Long Sault rapids of the St. Lawrence, was made by a subsidiary of the Aluminum Co. of America, which has a monopoly of the manufacture of aluminum in the United States and Canada. The applicants stated that they intended to use the power in the manufacture of aluminum, and that they would develop 600,000 h.p., an amount not much less than then developed at Niagara Falls. On the other hand, a survey of the available markets indicated that the applicant company was really looking forward to the development of the electric art which would permit economic transmission to New York, Newark, Jersey City, Hoboken and other cities in that vicinity.

The opposition of the Commission of Conservation to the granting of this franchise prevented the alienation of this valuable national asset, which will now, in all probability, be developed for the benefit of the citizens of Canada and of the United States.

At the Industrial Congress in Calgary in August last, the writer stated that a survey of the situation showed that in Alberta, for the development and transmission of power on a large scale, the generation of electric energy by great carbo-electric units (that is, steam generated from coal) of 20,000 to 50,000 h.p. each in super-power stations, presented the maximum of advantage. This conclusion was based upon the assumption that the electric energy be generated from low-grade coals which it would not pay to ship, that the power stations be constructed near large mines, and that there be an abundant water supply for condensing purposes.

In Great Britain, the power section of the Coal Conservation Committee has recommended that the country be divided into 16 areas; that units of not less than 20,000 h.p. be used, and in the largest stations units of 50,000 h.p.; that the plants be constructed at the pit-head if a very inferior coal is to be used, or near a river or estuary where condensation facilities are best.

As an example of electrical distribution, Dr. W. A. Bone cites Greater London, with an area of 693 square miles and a population of 7¼ millions. In it there are 65 separate authorities supplying electric energy upon 49 different systems from 70 generating stations containing 585 engines, and distributed at 24 different voltages to the consumers, who are charged at one or another of 70 different rates. The average size of the generating units is only 843 h.p., and the average size of the generating stations is only 7,050 h.p.

Sunshine and the Tides

Much attention is being given the world over to the question of power production. In this connection, Sir Oliver Lodge has pointed out the serious disabilities connected with the development of power from such sources as sunshine and the tides. He says that he cannot regard "with hope the idea of merely converting it (sunshine) into low-temperature boiler-heat. The barrenness of the Sahara would be the only excuse for the extensive use of burning-glasses or mirrors, and it is, perhaps, the only kind of place where such an enterprise could rationally be contemplated. But then there are few parts of the Sahara where power is particularly wanted, and economy of transmission has a limit."

Respecting the utilization of the tides for the production of power, the late Lord Kelvin recognized the extreme slowness of tidal operation. He realized the vast size of the reservoir that would have to be filled and emptied every 12 hours, and the probability that the reclaimed land of the reservoir would be of more value than the power,—at least in any locality where the power was really wanted.

Sir Oliver Lodge suggests that, if a Dreadnought were attached by a long girder to rack-work machinery and hoisted up and down by the waves, it would give many foot-tons per minute, but he doubted whether any machinery would stand the strain. He says that the idea is probably absurd, but that it seems less problematical than the harnessing of the tides.

In his presidential address to the British Association, Sir Charles Parsons said:—

To Harness Atomic Energy?

"The nations who have exerted the most influence in the war have been those who have developed to the greatest extent their resources, their manufactures, and their commerce. As in the war, so in the civilization of mankind. But, viewing the present trend of developments in harnessing water-power and using up the fuel resources of the world for the use and convenience of man, one cannot but realize that, failing new and unexpected discoveries in science, such as the harnessing of the latest atomic and molecular energy in matter, as foreshadowed by Clerk, Maxwell, Kelvin, Rutherford and others, the great position of England cannot be maintained for an indefiinte period. At some time, more or less remote—long before the exhaustion of our coal—the population will gradually migrate to those countries where the natural sources of energy are the most abundant."

In 1904, Sir Charles Parsons suggested that borings be sunk in the earth to sufficient depth to permit industry to utilize the heat existing below the earth's surface. He suggested that a shaft be sunk to a depth of 12 miles. The estimated cost was about $25,000,000, and the time required for the work 85 years. Since then, bore-holes at Lardello, Italy, have been made which discharge large volumes of high-pressure steam which is used to generate 10,000 h.p.

The report of the Minister of Public Works of Canada for the fiscal year ended March 31st, 1919, has been tabled in the House of Commons, and shows a total expenditure of $21,395,500, of which $8,492,502 was charged to war accounts.

*Excerpt from address at the recent annual meeting of the Commission of Conservation.