

# Canadian Coal and Its Competitors

By PHILIP A. KOLLER

INDUSTRIAL revolution in modern economic history is usually accompanied by a striking increase in coal consumption, especially in countries which have coal resources of their own. This is not true for Canada. The Dominion is going through a tremendous industrial revolution but its rate of coal consumption has been steadily falling before the war. Per capita consumption of coal in Canada was in:—

|           |      |             |
|-----------|------|-------------|
| 1913..... | 4.0  | metric tons |
| 1936..... | 2.3  | “ “         |
| 1943..... | 3.45 | “ “         |

But for the war with its huge increase in the demand for energy, Canada would not have regained the 1913 level.

The share of Canadian coal in the Dominion's total consumption of fuel was around 50% in the inter-war period and stands now at 37-38%. In 1939 Canadian production was about the same as in 1929; it rose during the first two war years, and is now falling, mainly due to a decline in Nova Scotia.

Consumption was at its peak in 1929, with 34.1 million short tons, falling off sharply during the depression, and rising during the war, until in 1943 it reached 44.9 million short tons. This is an increase of  $\frac{1}{3}$  since 1929.

In order to see these figures in their

true perspective coal consumption must be contrasted with the simultaneous development of industry. The gross value of Canada's industrial production was:

|           |                              |
|-----------|------------------------------|
| 1910..... | \$1,165,975,639 <sup>1</sup> |
| 1939..... | \$3,474,783,528              |
| 1943..... | \$8,393,000,000              |

This means that by 1939 the volume of industrial production had increased about three times, by 1943 by about seven times. Coal statistics do not explain this development. Canadian coal did not make any gains, and imports of U. S. coal, while rising during the war, were increased only from 14.99 million short tons in 1939 to 28.10 million short tons in 1943.

To answer the question, what energy has been the basis for the spectacular development of Canadian industry, the supply from other sources has to be examined.

Before doing so it might be useful to consider the relation between the various sources of energy on a world-wide scale during this period. For it is probable that in spite of her youth as an industrial nation Canada has been affected by the changes which have been experienced throughout the world.

TABLE I  
World Output of Energy Supply 1913-1935<sup>2</sup>  
In million metric tons of equivalent coal

| Year                        | Coal  | Lignite | Oil  | Natural Gas (Convent. estimate) | Fire Wood |       | Total |
|-----------------------------|-------|---------|------|---------------------------------|-----------|-------|-------|
|                             |       |         |      |                                 | Water     | Power |       |
| 1913.....                   | 1,216 | 46      | 77   | 24                              | 300       | 40    | 1,703 |
| 1929.....                   | 1,325 | 82      | 295  | 74                              | 250       | 103   | 2,129 |
| 1932.....                   | 955   | 60      | 256  | 63                              | 250       | 103   | 1,687 |
| 1935.....                   | 1,112 | 73      | 323  | 75                              | 250       | 131   | 1,964 |
| Percentages of total supply |       |         |      |                                 |           |       |       |
| 1913.....                   | 71.4  | 2.7     | 4.5  | 1.4                             | 17.6      | 2.4   | 100%  |
| 1929.....                   | 62.3  | 3.8     | 13.9 | 3.5                             | 11.7      | 4.8   | 100%  |
| 1932.....                   | 56.6  | 3.6     | 15.2 | 3.7                             | 14.8      | 6.1   | 100%  |
| 1935.....                   | 56.6  | 3.7     | 16.5 | 3.8                             | 12.8      | 6.6   | 100%  |

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1. *Canada Year Book* 1943-44, p. 363, and Hon. J. A. MacKinnon, *Gazette Review* 1944, p. 86.
2. From International Labour Office "The World Mining Industry," 1938, p. 32.

Coal remains by far the most important single source of supply although its total production after the depression—1280 million metric tons in 1936—is almost the same as in 1913 when it amounted to 1255 million metric tons. Coal recovered much slower from the slump than other commodities and thus its rate of consumption per capita of world population fell during this period from 0.70 to 0.57 metric tons per head.

The changed position of coal is still better illustrated by figures for the United States. The percentage for the total B.T.U. equivalent contributed by coal, natural gas, oil and water power in this country were:<sup>3</sup>

TABLE II

| Year | Natural |     |      | Water-<br>power | Total<br>% |
|------|---------|-----|------|-----------------|------------|
|      | Coal    | Gas | Oil  |                 |            |
| 1889 | 90.3    | 3.3 | 4.6  | 1.8             | 100.0      |
| 1913 | 84.3    | 3.5 | 8.9  | 3.3             | 100.0      |
| 1925 | 67.0    | 5.6 | 21.7 | 5.7             | 100.0      |
| 1936 | 53.3    | 9.3 | 28.1 | 9.3             | 100.0      |

Water power is rated in the table which shows developments up to 1936, at a constant fuel equivalent of 4 lbs. of coal per kwh. Since then the rate has fallen to 1.31 in 1942. Thus the actual share of water power is smaller. But it is evident from these figures that the per capita consumption of coal in the States has fallen from 5.1 metric tons in 1913 to 3.5 in 1936. This decline is more pronounced than the one indicated in Table I, for in the global statistics countries are included where use of coal is still rising such as Russia, India and Japan, and others where the rate changed little, as e.g. Germany.

The decreasing demand for coal—until the war—is to be accounted for not only by competing sources of energy but also by a number of other factors, such as progress that comes under the heading of "fuel economy," improved

efficiency in the creation of thermic (coal-based) electric power; savings in blast furnaces; substitution of remelted scrap for pig-iron, and of by-product coke for bee hive coke. Estimates of the losses which coal has suffered on account of these developments run into fantastic figures: it has been stated that the improved efficiency rate in generation of electric energy means savings of about  $\frac{1}{6}$  of the total world coal production.

There is, however, another side of the balance sheet. It shows items which indicate an increasing demand for coal: industrial progress in general, expanding use of electricity in its thermic form, new uses of automatic stokers, oil-coal mixture for shipping and eventually new uses of coal as raw-material.

Turning to Canada, we may expect shifts in the position of coal which are in keeping with the world wide trends and aggravated by the growing competition of U. S. coal. The relation between the various sources of energy can be seen from the following figures:

TABLE III

Supply of energy in Canada in Percentages of Equivalent Coal<sup>4</sup>

| Year | Coal  | Oil and     |  | Water-<br>power | Total<br>% |
|------|-------|-------------|--|-----------------|------------|
|      |       | Natural Gas |  |                 |            |
| 1927 | 65    | 11          |  | 24              | 100.0      |
| 1929 | 61    | 14          |  | 25              | 100.0      |
| 1931 | 55.75 | 16.75       |  | 27.5            | 100.0      |
| 1936 | 51.25 | 15.25       |  | 33.5            | 100.0      |
| 1939 | 50.0  | 17.75       |  | 32.25           | 100.0      |
| 1941 | 52.00 | 18.00       |  | 30              | 100.0      |
| 1942 | 52.60 | 15.7        |  | 31.70           | 100.0      |

During the war the share of oil and gas has somewhat decreased, due to export difficulties for oil from the United States; use of coal and water power has risen, the latter mainly due to new installa-

3. Compiled from table in International Labour Office, 1. c., p. 35.

4. Dominion Bureau of Statistics, Coal Statistics 1942 From table 26, p. 26.

tions. Canadian coal, shown as a separate item, would reveal a loss of more than  $\frac{1}{3}$  of its share during the period.

### Water Power

The outstanding factor, however, is the rise of water power. The figures reflect the rapid growth of new installed power. In

1925..... 4,549,383 H.P.

1943.....10,214,573 H.P.

were installed in hydraulic turbines in Canada. 90.3% of this capacity is installed in central electric stations which<sup>5</sup> produce 98% of all electricity sold in and exported from Canada. The amount of kwh generated rose from 18.09 billion in 1930 to 37.35 billion in 1942 and surpassed the 40 billion mark in 1944.<sup>6</sup>

Canada plays an outstanding part in the world as a user of hydro-electricity. In 1937 per capita consumption of this energy amounted in<sup>7</sup>

Great Britain to..... 414 kwh

U. S. A. "..... 771

Canada ".....2200

Ontario ".....2400

To-day this rate would be 3000--3500 for Canada and somewhere between 4000 and 4500 for Quebec. In 1942 even the actual domestic service consumption for Canada was 1,506 kwh per head.<sup>8</sup> The *Economist* has declared: "Horse power per head equals wealth per head." If there is any truth in that statement, Canada would not be too badly off. In terms of H.P. installed she took second place in 1938, while Quebec came fifth, sharing that place with Germany. If installed H.P. per head was made the basis, Quebec would occupy first place with 1.27 H.P., and Canada third with 0.75 per head.<sup>9</sup>

To appreciate this development it should be remembered that 1 installed H.P. makes possible the replacement of

0.9 to 1 ton of coal. The introduction of hydro-electricity, although in many cases required by the needs of certain industries, means very often a real displacement of coal. It is highly significant that the main development of water power occurred in the provinces of Quebec and Ontario, the foremost industrial centres of Canada and the battleground between Nova Scotia and U. S. A. coal. Of the total of 10 million H.P. installed in 1944 in Canada, 5,564 were located in Quebec and 2,749 in Ontario. Nature seems to have joined in the attack on Canadian coal and will continue to do so after the war. Essential war materials of about \$3.7 billions in Canada were mainly produced by water power.<sup>10</sup> Once it is freely available for peace time use, it will sell at almost any price to gain consumers. Water power constitutes one of our strongest assets in the struggle for competitive advantages on the world markets. An average price per kwh. of 0.40 cents in Quebec and 0.62 in Ontario gives Canadian industry a tremendous advantage over the main industrial areas of the United States.<sup>11</sup>

### Oil

The danger to coal from oil competition is of a different type, as it is largely dependent on the price relation coal-oil. The pre-war development of oil is spectacular. One of its main conquests is shipping. The percentage of oil burning vessels with Diesel motors in world shipping rose from 0.5% in 1914 to 65.3% in 1937. The share of oil burning vessels in newly constructed world tonnage rose from 2.0% in 1919 to 68.4% in 1937.<sup>12</sup> The resulting losses to coal for bunkering are severe and had a bad effect on Canadian consumption. Canadian railways did not use oil on a large scale, but as domestic and industrial fuel, oil made good progress before and during the war. During the 30's an increase of between 250-300 million gallons of oil took place

5. *Canada Year Book* 1942, p. 319; 1943-44, p. 327.

6. Hon. J. A. MacKinnon, 1. c., p. 86.

7. *Financial Times*, Oct. 20, 1944.

8. *Canada Year Book* 1943-44, p. 332.

9. E. Minville "Notre Milieu" Montreal 42, Chapter 9.

10. *Canada Year Book* 1943-44, p. 325.

11. Mr. J. Wilson, *Gazette Review* 1944, p. 62.

12. International Labour Office, 1. c., p. 86.

which was imported into the Eastern provinces and corresponds to somewhere between 1.5 and 2 million tons of replaced coal. The totals for Canada are considerably higher. They include the losses suffered by the railways through the competition of busses and trucks.

### Natural Gas

The impact of natural gas on coal should be judged mainly in the light of possible future developments. The ques-

|           | Alberta    | Ontario    | New Brunswick | Canada (in '000 cu. ft.) |
|-----------|------------|------------|---------------|--------------------------|
| 1926..... | 10,794,697 | 7,764,996  | 648,316       | 19,208,209               |
| 1942..... | 34,482,585 | 10,476,770 | 619,380       | 45,697,359               |
| 1943..... | 34,450,000 | 8,005,000  | 670,000       | 43,237,500               |

tion to what extent gas may be put to commercial use is still controversial. Views on long distance piping differ widely in spite of successful experiments, e.g. in Poland. Production and consumption in New Brunswick and Ontario have been constant over a long period and losses to coal in Canada are somewhere between 1 and 2 million tons. Only part of it is actual loss. Total production was:<sup>13</sup>

All these sources of energy have fed the expanding machinery of Canadian production and account for its rapid growth. But this is only part of the picture. If Canada's coal problem was made the subject of an exhaustive study, a still more complex set of conditions would have to be examined to explain the shift of coal consumption and the relative and absolute shrinkage of Canadian coal output. Pressure of competitive costs after the war may cause this trend to continue. It is too early to judge how far it may be offset in Canada by the growth of new industries, by increase of population, by better methods of using coal in automatic stokers, e.g. in order to replace American anthracite in domestic heating. The future of oil-coal mixtures in shipping is another open question.

Widely discussed at the present time is the question to what extent it will be possible to find "new uses" for coal. It is a controversial subject especially as far as the commercial profitability of the various projects is concerned. But Canada is certainly not yet on a level with other countries. Such an outstanding expert as E. W. Zimmermann estimated that Germany, due to her coal famine after the last war, has applied scientific methods to the use of nearly 45% of her coal.<sup>14</sup>

The figures for the U. S. A., Britain and Canada, respectively, are 30, 25 and 10%. These data which refer to the 1930's suggest that Canada has to undertake quite a bit of scientific work in order to catch up.

So far only changes in the demand for coal have been discussed. But to have a clear picture of the whole situation, changes affecting the supply of coal have to be given equal attention, all the more so as the problems involved are of great significance for Nova Scotia's mining industry.

Nova Scotian coal is handicapped by the difficult conditions of undersea mining as compared to the American bituminous coal which increasingly is won in surface (strip) mining. This differential must show in comparative costs. Only technical experts can decide how far this handicap can be overcome in future.

Labour is still the major item in underground mining, and its international ratio to the total cost of coal at the pit-head shows an average from 40-75%.<sup>15</sup>

In Nova Scotia, labour costs have been around 50% before the war and have risen since, as in most countries.<sup>16</sup> The

14. E. W. Zimmermann, *World Resources and Industry*, p. 483.

15. International Labour Office, 1. c., p. 163.

16. A. E. Cameron, *Public Affairs*, Vol. viii, No. 1, p. 7 ff.

13. *Canada Year Book* 1943-44, p. 315.

rise of the actual wage rate ought to be compared with that in competing mining districts, which is too complex a task for this brief survey.

Labour costs can be judged only in conjunction with labour productivity. As the official rate for Nova Scotia for 1942 the output per manshift is given as 2.080, and for all Canadian mining (including lignite) as 2.795 net tons.<sup>17</sup> It is known that to-day American bituminous and strip mining combined reach an average of more than 5 tons, whereas strip mining alone in some districts yielded over 12 tons in 1935.<sup>18</sup>

Responsibility for these results can be placed upon the men at work or upon the management. Opinions are, of course, widely divergent.<sup>19</sup> Another important factor affecting the supply side are the frequent labour stoppages of the last few years, which constitute another controversial question.

### Competition from the U. S. A.

The difficulties so far discussed have to be faced by all the coal producing countries and Canada is, in this respect, no exception; but the Dominion has, in addition, a problem of its own, and that is competition from the U. S. A. The quantities involved have been indicated in the introductory part. A more detailed analysis would show how Quebec and Ontario were supplied with Canadian coal, and how in pre-war times it had become necessary to maintain or partly expand this movement from the Nova Scotia mines by government subsidies. Protection by the existing tariff was not enough to meet the growing pressure from the States.

When war caused shortage of coal in Canada, it became imperative to use coal in its nearest markets. Nova Scotian coal withdrew to the Maritimes, leaving the industrial centres of Quebec and Ontario to U. S. coal or electricity.

The obvious problem is whether, and how far, these contested areas can be regained as markets for Nova Scotian coal. This lies at the basis of the discussion on subsidies.

### Conclusions

Summing up the discussion, it can be said that Canadian coal in general and Nova Scotian coal in particular will, in the post-war period, have to cope with great obstacles: rising costs of production, particularly in Nova Scotia; growing pressure by U. S. coal; and finally competition from other Canadian sources of energy supply, accentuated by the unique strength of water power.

How to reduce the cost of production is a highly complex problem, involving technical, economic, social and political considerations. Labour costs, working conditions, efficiency of management and labour come into play. Also the question of ownership has been raised. Whatever view is being taken, any rationalization would take considerable time. For the immediate post-war period even critics of present production methods will have to resort to public subsidies in order to overcome handicaps of price and distance in regaining the former markets. The alternative of higher protective tariffs against U. S. coal seems incompatible with the probable trend in international relations and, after all, Canada needs and will need U. S. coal.

With regard to competition from other sources of energy the situation is different. The interests of Canada's export industries will have to be carefully considered. Water power may be that natural advantage on which part of export manufacturing will be based. A great many domestic consumers may also decide in favour of this form of energy. Furthermore, no means have been found yet to defend coal against new forms of energy unless we think of Germany's large-scale undertakings to replace oil by coal by hydrogenation.

The problems of coal production, with all their implications, will find their solution in line with the development

17. *Coal Statistics for Canada 1942*, p. 33.

18. International Labour Office, I. c., p. 169-169.

19. Compare on mechanization A. E. Cameron's article quoted above—and review article on Prof. Keirstead's book "Impact of War on the Maritime Provinces of Canada," *Public Affairs*, Vol. VIII, p. 31.

which Canada's industry as a whole will take. But what position coal should occupy among the sources of Canada's fuel supply can only be determined through adoption of a national policy. Public support easily suggests public intervention or control. The history of the coal industry in various countries ought to teach advocates and opponents that in the inter-war period there was a distinct trend "towards combination and towards the public regulation of coal output and prices . . . away from a regime of free competition to one of control."<sup>20</sup>

These devices have proved to be compatible with any type of ownership. Extension of public support to Canadian coal simply means that Canada is falling in line with other countries whereas introduction of controls is not an economic but a political issue.

One of the problems needing further investigation is concerned with new uses of coal by which lost markets could be replaced. In other words, how can the most scientific utilization of coal as a raw material be secured? Pure scientists will prove that such possibilities exist for Canadian coal; operators will think in terms of economic prospects. Neither experience with hydrogenation in Germany nor with low temperature carbonization in England will solve this controversy, as profitability depends on markets for products from Canadian coal. This is one thing in a Germany devoid of coal, or in a vulnerable import country like England, and an altogether different

thing on this continent, the largest producer of oil from wells.

Those unconvinced by these arguments must be prepared to spend huge sums of public money for tests, as Germany did. Experts hope soon to learn to what extent costs of production have been reduced in war plants in Germany and Czechoslovakia. Who would not remember our doubts regarding American synthetic rubber in 1941, while to-day continued production of artificial rubber may be safely expected? Much discussion and testing is still needed in Canada; financing may again be a matter of national policy.

So far it has been assumed here that maximum production of coal is an indisputable goal and in the interest of all those who depend on coal directly or indirectly. There is, however, the view that coal remains an irreplaceable natural resource.

Some countries, like Poland, Britain and Germany, need coal as one of the major items in their foreign trade balance, maximum production of coal serving a special national purpose. In Canada coal does not play any such role. Furthermore, nature has provided us with a singular abundance of other sources of energy which we have learnt to use efficiently. Therefore, is not a policy indicated which would not push coal production beyond that limit given by the relation of coal to other energy sources? Particularly as long as scientific utilization of coal is not more advanced?

The time will undoubtedly come when we know the most scientific uses of coal under all conditions. Then we shall appreciate all existing resources, and may have to reorientate our whole coal policy.