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Report on the question of coking coal and coke for the iron and steel industry of the Community

BRUSSELS 1969

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Summary

Foreword

For many years the question of the European Community's long-term supplies of coking coal and coke has figured prominently in the discussion on coal and energy policy.

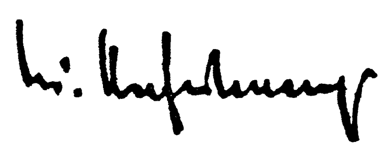
In the "Protocol on Energy Questions" concluded by the Governments of the ECSC Member States on 21 April 1964, the importance of this problem was particularly stressed.

In February 1967, the High Authority of the ECSC issued, with the unanimous approval of the Council, Decision No. 1/67 concerning coking coal and coke for the Community iron and steel industry; this Decision—which was extended in December 1968—is due to expire on 31 December 1969.

In order to enable the Community institutions to take any appropriate measures relating to future arrangements in the coking coal and coke sector for the period from 1 January 1970, it was necessary to have as clear as possible an analysis of the facts as regards market conditions, commercial policy and trends in this field.

The Commission hopes that the present study will provide a suitable and adequate basis for the decisions which now have to be taken. In its proposals for dealing with the problems involved, the Commission will be guided by the view that supplies of coking coal and coke for the iron and steel industry constitute a factor of importance not only in the common energy policy but also in the overall economic expansion. Here we have a particularly clear illustration of the energy policy's functional purpose which the Commission has already defined in "First Guidelines for a Common Energy Policy".

The present survey was passed to the Council of the European Communities on 25 March 1969. It is now made available to interested circles among the general public.



Chapter I

Present State and Technical Development Potential of the Iron and Steel and Coking Industries

1. The technical progress of both the iron and steel industry and the coking industry is a factor of decisive importance in estimating future coking coal(1) requirements and supplies. A reasonable forecast of development in both fields can be made for the period up to 1980.

The general consensus is that in this period the blast furnace used with oxygen blower converters will continue to dominate steel production. Its decisive advantages are high specific power (up to 2 million tons pig iron per year per furnace) and good thermal efficiency, which give low processing costs. Further improvements in blast furnace techniques are likely. On the other hand, it is still possible that the direct reduction of iron ores, e.g., in conjunction with electric furnaces, may open new prospects in this field.

The coking industry will continue to use mainly conventional techniques in horizontal chamber ovens, but current developments will result in a widening of the range of coal types suitable for coking. At the same time tests are in progress on the fabrication and use of briquettes in blast furnaces.

Blast Furnace Techniques

2. Coke fulfils various purposes in the blast furnace. It is a heat carrier and reducing agent, and forms a structure in the blast furnace which enables the molten ore to run down and the gas to flow upward. The coke must therefore meet high quality specifications (strength, grain structure, reaction capacity, etc.). In order to obtain a sufficiently strong coke, it is necessary to have a coking coal or coking coal mixture with adequate coking properties. Since coke must have a low sulphur content, the coal used must have a low sulphur content. Only a limited percentage of the world's coal reserves is therefore suitable for coking; the Community has substantial coking coal resources.

If coke alone is used, 450 kg are required to produce one ton of pig iron in the blast furnace under optimum technical conditions. This quantity could be reduced

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(1) The term 'coking coals' used in this study generally refers to those types and mixtures of coal which are actually converted to coke in the conventional coking processes. As a rule these are good coking coals with low and medium volatile components and a low sulphur content. In the Community they consist mainly of the types of coal placed statistically in Groups V and VI.

by about 10-15%, i.e., to roughly 400 kg, by the use of other energy carriers, and could be cut further by the use of pre-reduced ore.

3. Because of the improvement effected in the Moeller process, small coke, which was formerly used for domestic fires, is being used more and more in blast furnaces. This has raised the percentage of coke production which can be used in the blast furnace.

Coking Industry

4. Developments in the coking are directed, on the one hand, towards improving existing processes and, on the other hand, to introducing new processes. Coke of hard coal is still produced today almost exclusively by heating coal in the absence of air in so-called horizontal chamber ovens (conventional coking). However, usable smelting coke can be manufactured by this process only by the use of special types or mixtures of coal. Apart from the raw-material properties of the coal used, the coke quality is determined by the granular structure of the coal, the coking velocity and the dimensions of the furnace chamber. These factors must be taken into consideration in coking practice in order to obtain coke of the desired quality. In the past this was done more or less empirically. However, in recent years, partly with financial aid from the ECSC, the factors determining coke quality have been embodied in a mathematical formula. The application of exact mathematical rules in place of empirical rules for the processing of the coking coal burden has extended the range of coal types which can be used for the production of smelting coke, and has therefore increased the available supplies.

Further experiments relate to high-temperature coking. The coking temperature is raised in an attempt to shorten the fermentation time and thus coking costs by increasing the throughput. The coke produced in this way is small in size, and thus meets the requirements of modern blast furnaces.

5. A completely new development in coking practice might be based on continuous coking and the production of briquettes. Initial tests suggest that the use of briquettes of uniform size leads to an increase in blast furnace output, provided that the briquettes are sufficiently resistant to pressure and abrasion. These methods also make it possible to reduce the sulphur content of the coke considerably. The most suitable coals for briquette production are the weakly coking types, which have hitherto hardly been considered for coking.

Direct Reduction

6. Direct reduction is effective in a lower temperature range than blast-furnace techniques, and the reduction vessels are so designed that no solid and lump coke is required.

It should be noted that for the present the sponge iron obtained by direct reduction will not replace the pig iron produced in the blast furnace, but will be used in place of scrap in electric furnaces for making special steels. The further importance of direct reduction techniques lies in the fact that they can be used when no smelting coke is available or when the relatively low steel requirement does not justify the use of blast furnaces (below one million tons a year).

The data on anticipated future direct-reduction capacities are contradictory. The Battelle Memorial Institute has estimated that the world capacity may rise to 29 million tons by 1980. This would correspond to less than 5% of the estimated crude steel production.

Chapter II

Coking Coal and Coke Needs of the World's Steel Industry and Means of Meeting Them

Preliminary Observations

7. The world's coke consumption has hitherto been increasingly concentrated in the steel industry. In 1967, about 80 million tons, or about a quarter of the total world coke production (not including gas coke), was consumed outside blast furnaces. In the free-enterprise countries the figure is 21% (= 40 million tons), and it is likely to decline further, since small coke, which is exposed to lively competition from substitutes in the thermal use range,[1] is increasingly used in blast furnaces. Thus the world's entire coke and coking-coal requirements will in future be determined predominantly by the demand from the steel industry.

Crude Steel and Pig Iron Production

8. A regional study of the world's crude steel production in 1967—about 500 million tons,—shows that 70% was produced in the free-enterprise countries and 30% in the state-controlled trading countries (see Table 1). Within the first group the USA, the Community and Japan accounted for about 80% of the 1967 output.

In future the world's steel production will rise further. By 1980 the increase could amount to about 200 million tons for the free-enterprise countries, or 58%.[2] The electric steel percentage in the world's crude steel production could rise from about 14 to 20 during this period.

9. As a result of a comparatively more rapid expansion in the smaller steel-producing countries (India, Australia, African and South American countries) it is likely that the percentage of the above-mentioned three large steel producers will drop to about 70 in 1980, although a considerable increase in crude steel production is to be expected in Japan.

10. The growth in crude steel output is accompanied by a similar increase in pig iron production. The calculations in Table 1 are based on the assumption that there will be no major shifts in production towards the ore-supplying countries during the period covered by the estimates.

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(1) Other industrial users, domestic consumption, etc.
(2) Mean of the various hypotheses stated in Table 1.

Coke Requirements for Blast Furnaces

11. As pig iron production increases, the specific coke consumption of the blast furnaces will decline considerably further (see Table 2). The figures for 1980 are based on a specific coke consumption per ton of pig iron of 435-550 kg, depending on the country concerned. According to the different conditions in the various countries, these values are close to the physically possible lower limits. It is also assumed that the quantities of heating oil and natural gas delivered to the blast furnace will increase.

12. On these assumptions, the coke requirements of the steel industry (excluding sintering coke) in the free-enterprise countries would increase from 150 million tons in 1967 to about 190 million tons[1] (= +27%) in 1980 (see Tables 3 and 4). In the Community there would be a similar increase from 41 to 45 million tons (= +10%), while in the USA there would be a slight decline. The largest absolute increase in coke requirements would be in Japan, with about 15 million tons, and the largest relative increase in Latin America (+160%).

13. The share of the total coke output of the free-enterprise countries accounted for by blast furnace coke was 79% in 1967. On the basis of the assumptions stated in chapter 1 an estimate of about 85% for 1980 seems reasonable. The blast furnace coke needs of the steel industry (190 million tons) would then call for a coke production of 224 million tons. The coal required to produce this amount of coke would be 313 million tons, as against the 266 million tons coked in the free-enterprise countries in 1967. The increase in consumption would thus be 47 million tons of coking coal.

Before examining in detail which regions were primarily responsible for these increased requirements, and from what sources they could be met, we will first consider the question of the location of the coke producing regions and also the existing sources of supply for coking coal.

Coke Production and World Trade in Coke

14. The location of the coke producing regions (excluding gasworks) is given in Table 3. In 1960 the Community, with a production of about 74 million tons, was the world's greatest coke producer, accounting for 41% of the free-enterprise countries' production and 26% of the total world production. As a result of the decline in coke production in the Community to 64 million tons and the increase in other countries, the Community percentages fell to 34 and 21 respectively by 1967.

The coke-producing regions coincide largely with the consumer centres, i.e., with the location of the pig iron producers who are the main customers for the coke produced. Whenever this is not the case, there is inevitably a coke trade, dealing mainly in blast furnace coke (for details see Table 5). West Germany is by far the leading supplier. In the free-enterprise countries about 70% of this trade consists of

[1] Mean of various hypotheses on the future development of pig iron production and specific coke consumption.

intra-Community coke exchanges, i.e., suppliers and customers are both in the Community. Similarly the coke trade of the state-controlled trading countries is largely made up of internal exchanges within these countries. If the internal coke trade of the state-controlled trading countries and the Community is excluded from Table 5, only 3-4 million tons of coke remain as "world trade", i.e., only 1% of the total output. There are no significant sources of coke for the Community in the non-member countries.

15. The secondary significance of the coke trade is due to the following reasons :

(a) not only for economic reasons, but also in the interests of security of supply, works coke production has traditionally been linked to the steel industry, so that only limited quantities are sold freely;

(b) because of the quality requirements usually imposed on blast furnace coke, it is sensitive to transport and frequent reloading;

(c) from the price angle there are no openings in the world for an increase in the coke trade. (1)

It thus appears that the Community's blast furnace coke requirements could not in practice be met by purchases on the world market; so long as coke is needed in blast furnaces, the Community will continue to have to produce most of it itself.

The Future Development of World Coal Production

16. World coal production is mainly concentrated in four regions, namely, the USA and Europe among the free-enterprise countries and the USSR and China among the state-controlled trading countries. These areas account for about 80% of world coal production (see Table 3).

The share of the free-enterprise countries in world coal production was 52.5% in 1960 and fell to 48.4% in 1967; the share of the state-controlled trading countries rose correspondingly.

Admittedly, coal production in the free-enterprise countries increased by 8.5% (= 88 million tons) in the period from 1960-67, but the trend varied from region to region.

In North America production rose by 115.3 million tons, and there were increases in the free-enterprise countries of Asia, Africa and Australia; in Western Europe, on the other hand, output fell by about 74 million tons.

17. Although the outlets for coal will continue to be limited by the competition of petroleum, natural gas and nuclear energy, it is likely that the world's total coal production will rise in future, firstly because of the expected development of energy requirements and secondly owing to the special production conditions in particular regions. Exhaustive data on this expected rise are not available, but it is certain that the production structure will undergo further geographical modifications.

(1) See further discussion in sec. 51.

Within the free-enterprise countries, American output may reach a figure of about 800 million tons by 1980, while in other important production centres, such as the Community, the United Kingdom and probably Japan, a further fall in production is to be expected. It is therefore to be assumed that over this whole area the increase in output will be less than in the state-controlled trading countries. The plans for the USSR(1) foresee an increase in output from 587 million tons in 1967 (including 25% brown coal) to 700 million tons in 1975, and for Poland(2) a rise in pit coal production from 128 million tons to 180 million tons in 1980.

Coal Production Costs and Revenue

18. Coal production costs vary widely within the free-enterprise countries. They are relatively high in Western Europe, amounting on the average to 17.5 u.a./ton in 1967 within the Community (from 15 to 25 u.a./ton depending on the coalfield) and 11.7 u.a./ton in the United Kingdom. In other coal-mining areas the costs are considerably lower; for example average production costs in the US in 1967 were 5.1 u.a./ton, in Australia in 1965 about 6 u.a./ton and in South Africa in 1966 1.25-2.25 u.a./ton.

19. In the US, the UK and Australia coal revenues are about equal to production costs. In the Community, on the other hand, the production costs quoted above are offset by average revenues to the pit operators of only 14 u.a./ton.

The World Coal Trade

20. Despite the wide scatter in production costs and pithead prices referred to above, the international trade in coal is relatively slight (see Table 6). Measured as percentages of the production, the quantities of coal put on the international market are as follows:

	1960	1967
Free-enterprise countries	6.4%	7.8%
State-controlled trading countries	3.6%	4.6%

The reasons are to be found firstly in the sensitivity of coal to transport costs, which limits the competitive capacity of coal producers. Secondly, relatively large quantities of the product are tied up in long-term contracts and are not available for trade. Lastly, the volume of trade is restricted by regulations relating to economic policy.

(1) Five-Year Plan 1971-75.
(2) Nowe Drogi, No. 9/1967.

In view of the importance of transport costs, it is understandable that much the greater part of the world's coal trade takes the form of intracontinental exchanges. If in spite of this intracontinental trade still accounts for about one-third of the total volume, this is attributable to the special situation in the coking coal sector; the quantities exchanged being mainly used to supply steelworks.

21. The most important customers in the coal trade are Japan, Benelux, Canada, Italy and France. Between them, they account for about three-quarters of the coal trade in the free-enterprise countries. A total of 64% of the coal imported by these countries consists of coking coal. The United States, West Germany and Australia are the main suppliers outside the state-controlled trading countries. The export deliveries in 1967 amounted to 85% of the coal trade of the free-enterprise countries and 52% of the total world coke trade. Coking coals accounted for about two-thirds of the total exports of these three countries.

The exports of the state-controlled trading countries to the free-enterprise countries amounted to about 16 million tons in 1967 (see Table 6); the share of coking coals in these deliveries can be estimated at about 40%. The most important suppliers of and customers for coking coals are shown in Table 7.

22. The coal-mining industries of the US, the Community and Australia are of central importance for the supply of coking coal to the steel industries of the free-enterprise countries. If the Community were to lower its own output, it could no doubt fall back upon Polish and Soviet coal for supplying steelworks, but only, as is pointed out elsewhere to a limited extend (1). Since its coal lacks the qualities needed for conventional coking processes, the South African mining industry is out of the running as a supplier for the steel industry. Australia, on the other hand, has deposits of coking coal which are suitable for the steel industry, but in view of the transport costs it is questionable whether this coal could be shipped to Europe at competitive prices(2). The American coal-mining industry therefore occupies a key position in this respect because of its existing production and export potential and also by virtue of the quality and size of its reserves.

US Coking Coal Reserves (3)

23. All estimates of reserves are inevitably beset with uncertainties. According to data supplied by the Bureau of Mines, the total coal reserves of the US are estimated at 1,430,000 million tons, about half of this (about 660,000 million tons) being bituminous coal. Only a small proportion of this bituminous coal, however,

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(1) See 37 et sec.

(2) The following export prices and sea freight charges applied to Australian deliveries in 1967-68:
(a) prices of coking coal fob export port 1967: 8.6-10.8 u.a./ton,
(b) sea freight for coking coal Australia/ARA for certain quantities of iron ore 1968 about 3.5 u.a./ton in the triangular trade including the transport of US coal from Hampton Roads to Japan. There has hitherto been no movement of coal from Australia to Europe. On paper this would entail a freight rate of at least 4.5 u.a./ton, and this only on condition that there were a guaranteed loading rate of at least 15,000 lgt/day shinc and that ships of at least 60,000 tons could be used in combination.

(3) Quantities given in metric tons.

possesses the necessary coking properties and the relatively low ash and sulphur contents which are the characteristics of coking coal proper. Table 8 gives the total coking coal reserves as about 230,000 million tons, i.e., 35% of the total reserves of bituminous coal. The structure of these reserves as regards type, exploitability and geographical situation is shown below (for details see Table 8):

(in 1 000 million tons)

	high volatility 31%	medium volatility 22-31%	low volatility 14-22%	total
Total coking coal reserves	190.5	24.2	18.1	232.8
Total reserves of coal for metallurgical coke (1)	72.7	10.5	8.8	92.0
— exploitable fraction	33.2	4.8	4.0	42.0
— fraction in export regions	28.3	4.4	3.4	36.0

(1) Up to 8% ash and 1.25% sulphur content.

24. A total of 24% of American overseas exports of bituminous coal come from mining districts 7 and 8, i.e., mainly the coal fields of Virginia, southern West Virginia and East Kentucky. The remaining exports come from northern West Virginia and Pennsylvania. Some 90% of overseas coal deliveries pass through the port of Hampton Roads. In the above-mentioned coalfields, as may be seen from the above table, there are an estimated 7,800 million tons of exploitable reserves of the average and low volatility coal which is of particular interest to the European steel industry. These form nearly 90% of the US reserves.

The seams concerned are from 28 inches (71 cm) thick and lie at depths of up to 300 m.(1) It is questionable whether coal situated in seams less than 90 cm thick is economically workable. Bearing in mind, however, that the Bureau of Mines data are based on reports from the individual mining companies, which for various reasons have not thoroughly prospected the whole area, the given quantity of 7,800 million tons of exploitable reserves (low and medium volatility) may be considered realistic.

The above data relate to coking coal with a maximum of 8% ash and 1.25% sulphur content. It should be noted that over a long-term average the Community's steel industry has obtained from the US coking coals with 5-6% ash content and 0.75% sulphur content. There are no data as to how large a fraction these coal qualities make up of the above-mentioned reserves of medium and low volatility coal for metallurgical coke (7,800 million tons). According to some estimates, however, at least half of these reserves have a sulphur content of less than 1%. In addition, the USA possess large quantities of coals with sulphur contents of less than 1% in the reserves of highly volatile coal for metallurgical coke destined for export regions (28,300 million tons).

(1) The data on coal reserves at a depth of more than 300 m are contradictory. According to some estimates, almost 90% of the coking coal reserves are at depths of up to 300 m.

In order to be able to assess the long-term availability of these reserves for supplying the Community's steel industry, we must first estimate the probable demand to be made on these reserves by the USA and other non-Community countries.

Internal Demand for Coking Coals from the US Export Regions

25. The total deliveries of bituminous coal to American coking plants will, according to Bureau of Mines(1) estimates, rise only slightly up to 1980, i.e., 83,7 million tons in 1967 to 88 million tons. The inland deliveries from the export regions should not alter much either, since the structure of coal supplies to the coking plants has not altered much in the past either as regards the types of coal used (volatile component content) or their origin. In 1967 deliveries broke down as follows (in %):

(in 1 000 million tons)

	high volatility 31%	medium volatility 22-31%	low volatility 14-22%	total
I. Average breakdown of coal processed by US coking plants	64.4	13.4	22.2	100
II. Overall share of export regions in supplies to US coking plants	79.9	50.3	97.5	79.9

If these ratios are applied to the estimated coking coal requirement for 1980 of 88 million tons, the following picture is obtained:

Grade of coal	Breakdown		Percentage of coal from export regions million tons
	%	million tons	
High volatility	65	57.2	45.8
Medium volatility	13	11.4	5.7
Low volatility	22	19.4	19.4
Total	100	88.0	70.9

The reserves of high quality low and medium volatility coal for metallurgical coke in the export regions could thus be used up to 1980 for the supply of the domestic

(1) An Energy Model for the United States, information circular 8384.

coke industry up to an annual amount of 25 million tons. But these assumptions hold good only if during this period the new coke manufacturing processes now under development do not achieve an industrial break-through for economic reasons.

26. In view of the expected considerable increase in the amount of coal needed for the production of electrical energy in the USA, and on account of the clean air regulations, the fear is often expressed that an increasing proportion of the above reserves of low-sulphur low- and medium-volatility coal for metallurgical coke might be required for electricity production, and that this might lend to a marked restriction of the American coking-coal export potential. However, power plant needs can be mainly met by high-volatility coals with a low sulphur content(1); these qualities are also required for coal hydrogenation. These types of coal occur extensively in the export regions (28,300 million tons of low-sulphur high-volatility coal for metallurgical coke), so that no signs of scarcity are likely for this reason. Moreover, sulphur-rich coal can be used in power plants sited outside densely populated areas.

USA Coking Coal Exports to Non-Community Countries

27. In 1967 coking coal exports accounted for about two-thirds of American coal exports and broke down regionally as follows:

11.1	million tons Japan
5.8	million tons Canada
2.5	million tons Rest of Europe
2.4	million tons Latin America
21.8	million tons non-Community countries
8.5	million tons Community
30.3	million tons Total

The future development of exports to countries outside the Community will depend largely upon the demand of the rapidly expanding Japanese steel industry. As Table 4 shows, it is expected that up to 1980 there will be an increase in the coke consumption of steelworks in that country (excluding sintering coke) of about 15 million tons, corresponding to an estimated coking coal requirement of 22 million tons. Since Japanese coking coal production is only to be raised slightly(2), the additional import requirements up to 1980 should be at least 20 million tons. In 1967 imports were 24 million tons.

The Japanese coking coal imports have increased rapidly in recent years and the countries of origin have become increasingly dispersed (see Table 9). In view of the relative importance of freight costs both for raw material imports and for

(1) Coal delivered to power plants from the export regions comes principally from mining district No. 8, in which mainly high-volatility coal is produced. Low and medium-volatility coal for metallurgical coke is chiefly mined in district No. 7; the supply of power plant coal from this district is small.

(2) With a probable decline in total coal production.

export deliveries, the Japanese steel industry is trying to restrict its imports from the US, the previous main supplier, to the best qualities, and above all to expand the Australian mining industry by investments of its own (Queensland) in order to obtain a nearer source of supplies. In addition, they are increasingly importing Soviet, Canadian, and to a small extent recently Polish coking coal.

It is difficult to estimate the future import structure of Japan. On the basis of known contracts, 5-8 million tons of the estimated increased import requirement of 20 million tons might be covered by imports from the USSR, Canada and Poland.(1)

For quality reasons alone, it is hardly likely that the remaining quantity of at least 12-15 million tons annually could be supplied by Australia alone.(2) An additional demand for high-quality American coking coal is therefore to be expected. This is all the more probable in that the Japanese steel industry is endeavouring to participate indirectly or directly in American coal-mining companies.

28. As regards American exports to the remaining countries *outside* the Community, it should be noted that the additional coking coal requirements of the Latin American steel industry (see Table 4) will be covered mainly by US deliveries, owing to this sector's geographical situation. Deliveries of US coal via the Great Lakes should also play an increasing part in Canadian supplies, since the Canadian coal in the eastern regions is too expensive and the coal from British Columbia is not competitive owing to the greater cost of inland transport to the Canadian consumer centres as compared with US coal. The additional deliveries to the Canadian and South American steel industries might reach a total annual volume of 12-14 million tons by 1980. On account of their increasing needs, the steel industries of the remaining West European countries might also import additional quantities from the USA, so that the total increase in American coking coal exports to non-Community countries up to 1980 might be very cautiously estimated at 20-25 million tons.

A Quantitative View of the Possibilities of Supplying the Community with US Coal

29. An overall study must include a comparison between the reserves of low and medium-volatility coking coals in the American export areas with the above assumptions as to the future home requirements of the USA and foreign demand. Two basic assumptions will be made about Community imports, namely:

1) Stabilization at the present level of about eight million tons;

2) Import of 50% of the coal equivalent for the blast furnace coke required by the steel industry in 1980.

If, for simplicity's sake, the total assumed coking coal demand(3) in 1980 is compared with the reserves of 7,800 million tons of low and medium-volatility

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(1) The Canadian deliveries will be resumed on a larger scale than hitherto from the end of 1969 onwards, on completion of the loading facilities on the West coast (British Columbia).

(2) This remains true despite the fact that a group of Japanese steel and chemical companies recently concluded an import contract — the largest so far — covering the supply of a total of 85 million tons from Queensland over a 13 year period as of 1971-72.

(3) Disregarding the share of output not intended for coking.

coking coals in the USA export regions, then, on the basis of the two extreme values of 75 and 102 million tons, these reserves would last for 100 and 75 years respectively. If the demand for coal for metallurgical coke in the export regions of the USA were to be limited in future to coal with a maximum sulphur content of 1%, these reserves would still suffice for approximately half these periods.

(million tons)

	1967	1980	
		I	II
Deliveries to US coking plants	24.3	25	25
Export areas outside the Community(1)	21.8	42-47	42-47
Exports to the Community(1)	8.5	8	30
Total deliveries from export coal-fields	54.6	75-80	97-102

(1) It must be assumed that the total export deliveries are composed of low and medium-volatility coal.

Future Cost Pattern of US Coal

30. The figures given above make it clear that, from the purely quantitative angle, on the basis of the estimated size of the exploitable deposits, the supply of coking coal to the Community's steel industry from the US should present no problems up to 1980. However, this statement deals with only one aspect of the matter. Of much more decisive importance is the question, of how the cost of US coal will develop in future, should the Community lay off a considerable part of its coking coal production capacity and thus create an additional demand for US coal. The question must be considered from two angles, i.e., present production capacity and that which would have to be created.

31. Production costs(1) in American deep workings were remarkably stable over the long-term post-war period (average value fob mine: 1960—5.7 u.a./ton, 1967—5.7 u.a./ton, see Table 10). In the districts with mainly coking coal production (district No. 7) a similar trend was observed; the cost level was, however, higher there owing to the more difficult exploiting conditions (average value fob mine: 1960—6.6 u.a./ton, 1967—7 u.a./ton).

Since labour costs account for 55% of the total, future production costs will be largely determined by the relative development of wages and social security payments as compared with the output per shift. The production man/day in all the American deep workings rose by an average of 5.3% per year to 13.9 tons between 1960 and 1967, and in district No. 7 by 5.8% per year to 12.1 tons. Recently, however, there has been a decline in the growth rates. On the basis of various

(1) Only the value fob mine can be determined.

projects it is to be expected that this trend will continue and that there will be average growth rates of between 3 and 5% up to 1980(1).

On the other hand, there has recently been a marked increase in the hourly wage and in social security expenditure in the American coal-mining industry. In a wage agreement concluded at the end of 1969 for a three year period, average pay increases of 8% were agreed for each of these years,(2) thus exceeding the increases in shift output assumed above. It is impossible to make reliable predictions as to the scale of future wage rises. Apart from the general wage trend, they will be influenced by the shortage of labour in the mining industry. At present there are difficulties in ensuring the requisite net increase in the labour force of 5,000 to 10,000 men. For this reason it seems doubtful whether the expected smaller rise in productivity will continue to be sufficient to match the rise in wages. Even if we assume no considerable increase in material and capital costs, it is to be expected that there will be a rise in production costs in existing mines of about 1-2 u.a./ton by 1980.

32. Should the Community increase its coking coal imports from the USA, this additional demand could not be met without considerable new workings being opened up. Owing to the high specific investment costs for new mines this would imply a rise of about 1 u.a./ton in the costs of Community supplies.

33. The prices for *transport to the export ports* are at present 4.9 u.a./ton. However, a comparison with the freight charges for the transportation of coal to the American power plants on the East coast shows that even for export coal there is still room for freight charges to be cut by at least 1 u.a./ton.(3) This would, however, depend on two conditions:

(a) similar transport conditions, as regards regularity and quantity, to those for American power plant coal. This condition could be fulfilled by means of long-term supply contracts;

(b) similar competitive pressure to that exerted in the US on power plant coal by other energy sources. It is an open question whether such a competitive situation would develop among American coal producers after the laying-off of large parts of the Community's coking coal production.

As regards railway transport, it should be noted that the two companies which transport coal from the export coalfields to Hampton Roads are shortly to be merged.

34. As regards transport across the Atlantic also, there should still be some ways of reducing freight charges. At present the Hampton Roads/ARA freight charge amounts to 2.65 u.a./ton. It is assumed that the rationalization effected by the increase in the mean shipping tonnage in the decade up to 1980 will lead to a fall of about 0.5 u.a./ton in the average cost of transport across the Atlantic. On the other

(1) EEC Commission: "Tendencies of World Energy Economy" and other estimates.

(2) Rise in wage costs per day from 27 u.a. to 30 u.a. in the first year and by 2 u.a./day in each of the two following years. In addition, an increase in various social security payments, estimated at 1-2 u.a./day.

(3) EEC Commission: "Tendencies of World Energy Economy".

hand, transport in larger ships implies higher loading and unloading costs, so that the net possibilities of reducing the cost of transatlantic transport are likely to be very limited.

Taking an overall view of the various cost components, it must be concluded that there may be a rise in the cif ARA price of imported American coking coal of 1-3 u.a./ton by 1980.

Future Development of US Coal Prices

35. Price increases would be more likely to exceed the actual in costs if there were to be a heavy Community demand on the American market in addition to the new requirements of the steel industries of the rest of the world, thus creating a certain imbalance, at least temporarily. A review of the trend of export prices for American coal hitherto (see Table 11) shows that in periods of increased demand fob prices at the American export ports rose appreciably. If a similar pattern is assumed for the Community's steel industry, this would put it at a disadvantage on the international market unless its competitors—other conditions being equal—had to suffer similar increase in the price of their coking coal supplies. The question whether a similar price trend can be assumed in the case of the other steel producers cannot be answered with certainty for various reasons.

Since there is a possibility of cost increases especially in the new capacity which must be created, the *American* steel industry, for which no appreciable increased requirement is expected, is less exposed to the risk of a rise in cost than the foreign coking coal customers, who are largely dependent upon supplies from new pits. In addition, the size and nature of the deposits in the captive mines, from which 60% of the coal consumed by the American coke industry comes, are unknown.

However, there remains one open question, namely, whether competitive conditions with respect to *other* rivals, e.g., Japan, will remain unchanged. As has already been pointed out, the Japanese steel industry has in recent years undertaken a relatively wide geographical dispersion of its coking coal supply sources, and the recently concluded contracts suggest an even more intensive pursuit of this policy. Should the cost of American coking coal rise more steeply in future for the abovementioned reasons, the Japanese steel industry will then to a certain extent be able to turn to other sources of supply. The relative competitive position of the Community's steel industry would under these conditions deteriorate unless it too were able to scatter its coking coal supply sources in a similar way.

36. The future price trend of American coal supplies will doubtless also be affected by the situation with regard to property rights in respect of real estate, production, trade and transport. In 1950 the 15 largest companies accounted for 27% of the total output. As a result of increasing concentration this share subsequently rose to 50% in 1967. Concentration is also taking place at the colliery level(1); the share in production of the 50 largest collieries rose in the same period from 13 to 25%.

(1) The total number of collieries (production of bituminous coal and lignite) was about 5,900 in 1967; of these 281 large collieries (500,000 tons and upward) accounted for 59% of the annual output.

In a study of the property rights situation it is necessary to point out the large share in production which is under the control of the steel, electrical, chemical and other industries. Lately the petroleum industry has also acquired property rights in coal-mining companies, particularly in the three largest producers, namely, the Peabody Coal Co., the Consolidation Coal Co. and the Island Creek Coal Co., which in 1968 together accounted for about 27%, of the total coal production. The last two companies are the most important suppliers of export coal for the European and Japanese steel industries.

The coal export supply structure shows firstly that, out of a total of 5,900 pits, 400-500 are responsible for the production of export coal. In comparison, the number of actual exporters (producers and dealers) is very small, namely, 15. At this level, too, a certain concentration is to be observed. At present seven companies account for 87% of coal exports via Hampton Roads, 46% being in the hands of only four so-called producer-exporters.

Possibilities of Diversifying the Supply Sources of the European Steel Industry

37. *Poland*'s most important source of energy supplies is its extensive coal reserves, which to a depth of 1,000 m are estimated to total 85,000 million tons. The composition of the reserves, however, seems to be unfavourable, since they consist to 79% of coal for power production and to 17% of gas coal; only 3% are the typical coals for metallurgical coke. (1)

38. The long-term development plans for Polish coal production are as follows (in millions of tons) (2):

	1960	1967	1968	1970	1975	1980	1985
1) Coal	104.4	123.9	128.0	135	160	180	200
2) a) gas and coking coals (Grades 33-37)	19.4	28.3	30.1	33	48.5	(54)	
b) coking coal exports	—	2.1	..	..	10		
3) Line 2) a) as a % of line 1)	18.6	22.8	23.5	24.4	30.3	(30) (1)	

(1) Author's estimated minimum.

It can therefore be assumed that in the period 1967-80 gas coal and coking coal production will approximately double. This additional production of at least 26 million tons can be used to cover both the increased needs of the inland coking

(1) H. Machowski: Staatliche Preispolitik auf dem Steinkohlenmarkt in Polen nach 1945, Berlin 1967.

(2) Nowe Drogi, No. 9/1967.

plants, which are estimated at 7-8 million tons up to 1980,(1) and also a certain additional demand for coking coal on the world market.

39. Table 12 shows the past and estimated future pattern of coal exports with respect to the total domestic production. The export of coking coal, which began in 1965, reached in 1967 a level of 2.1 million tons, which were sent almost exclusively to free-enterprise countries (0.8 million tons to Japan, 0.6 million tons to the Community). The development of the Rybnik coalfield is of great importance for future exporting. In future the bulk of Polish coking coal production (Grades 35-37) will be mined here, i.e., 85% in 1985 as against 43% in 1965.(2) The total production of this district is to be increased from 17.4 million tons in 1965 to 51 million in 1985; the production of Grade 35 coking coal, the best quality, is to reach 11 million tons in 1975.

These planning figures or estimates indicate that in Poland larger quantities of high-quality coking coals will be available for export than hitherto; however, the actual amounts can only be roughly estimated. According to official data(3) total coal exports will attain a level of 36 million tons (1968: 26 million tons) by 1975, including 10 million tons of coking coal (including a certain quantity of gas coal). A further increase in the actual coking coal deliveries is to be expected up to 1975; as hitherto, they will go almost exclusively to free-enterprise countries. However, mainly for reasons of quality, it will not be possible even in future for a considerable part of the requirements of the Community's steel industry to be met from Polish sources.

40. With reference to price structures, it is to be assumed that Poland will continue to follow the policy applied on the export markets, whereby prices are adjusted more or less to market conditions at the place of consumption regardless of production costs, in order to obtain the maximum amount of foreign exchange, particularly from free-enterprise countries. On the other hand, this implies that the competitiveness of Polish coking coal is unlikely to be reduced even in the event of a relatively steep increase in production costs. On the other hand, for this reason and also for reasons of quality, Polish coal cannot be regarded as a price stabilizer.

41. It is almost impossible to assess the export prospects of the USSR on the basis of the available information. In the European part of the USSR there are extensive coking coal reserves, particularly in the Don Basin. Some 40% of the proven and probable reserves of 55,000 million tons in this area consist of cokable coal. In 1967 a total of 147 million tons of coking coal were produced (1960: 110 million tons), including 80.6 million tons in the Don Basin. Thus the earlier planning figures, which predicted a total coking coal production of 150 million tons in 1965 and 280 million tons in 1980, were not reached.

42. Under more recent contracts concluded with the Japanese steel industry, increasing quantities of coking coal will be exported, particularly from the Asiatic part of the USSR (Kuznetsk and Sakhalin); under the latest contract a total of

(1) Gospodarka Planowa, No. 9/1968.

(2) Wiadomosci Gornicze, No. 1-2/1968.

(3) Statement by the Director of the State Export Organization.

23 million tons are to be exported up to 1975 at fob prices of 9.5-13.5 u.a./ton. It is not known under what conditions additional quantities are available from the Don Basin for supplying the Community.

43. To sum up, it is clear that the Community's steel industry, in contract to that of Japan, has only slight possibilities of diversifying its sources of supply. It is probable that only limited quantities could be obtained from Poland and the USSR. Only the US can be considered as a potential large-scale supplier.

Chapter III

The Contribution of the Community's Coal-Mining Industry to Covering the Coking Coal and Coke Requirements of the Community's Steel Industry

Introduction

44. In Chapter 1 it was shown that no subsitute for the blast-furnace coke employed in smelting will be in use on any considerable scale before 1980. Thus the conventional coking process will maintain its central importance for the steel industry. While there are possibilities of obtaining coking coal on the world market, this is to all intents and purposes not the case with blast-furnace coke. The Community must therefore possess adequate coking capacity. The following chapter thus deals first with the problem of coking capacities and then with coking coal supplies.

A — The coke industry

Production and marketing of coke

45. A total of 65.1 million tons of coke were produced in the Community in 1968; the breakdown by country can be seen in Table 13. The steel industry, with 48.4 million tons[1] in 1968, is the Community's largest customer.

Coke production and the consumption of coal for coking purposes fell by 10% in the Community between 1960 and 1968. In comparison coal production dropped by 20.80% from 1960 to 1967 and coking coal production (Groups V and VI) by 23.4%. Relatively speaking, therefore, the coke industry took on a greater importance as a customer of the coal-mining industry; about 41% of the total coal deliveries on the Common Market in 1968 were to the coke industry.

Coking capacity at the end of 1968 amounted to just 70 million tons. Table 14 shows the capacity of the Community countries, divided up into colliery-owned, steelworks-owned and independent plants. For technical reasons this capacity cannot be 100% exploited. In 1967 the exploitation was about 87% of total capacity.

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(1) Including about 43.5 million tons blast-furnace coke.

46. In 1967 about 64% of the Community's coke production came from colliery-owned plants, 30% from steelworks-owned plants and 6% from independent plants (details in Table 15). The production structure of the Community's coking plants is thus fundamentally different from that of the US, Britain and Japan, where coke is mainly produced in steelworks-owned coking plants (for details see Table 16).

47. The ratio of coke production to coal consumption in the Community in 1967 averaged 1: 1.33 (see Table 15). The American average was 1: 1.44 and the corresponding British figure for colliery and steelworks-owned plants 1: 1.52 (see Table 16). The lower coke output in the US and the United Kingdom is due to the fact that they use higher volatility coal for coking.

48. There are also differences as regards the coke marketing structure between the Community and these countries. In the Community about 62% of all coke deliveries in 1967 consisted of blast-furnace coke to the steel industry. In the US the corresponding figure was 86%, and in the United Kingdom 48% (see Table 16).

The Relation between Coal and Coke Prices

49. The coking plants of the US, Britain and some parts of the Community are studied below from the angle of profitability and also with regard to the relative prices of coke and coking coal.

The study took in all the American coking plants, the pit coking plants in the United Kingdom and the pit coking plants of the Ruhr, Lorraine, Nord/Pas-de Calais and Belgium in the case of the Community.

There are major differences between these coking plants as regards coal input cost and coke revenue (following data for 1967)[1].

	Coal input cost u.a./ton coal	Mean coke revenue u.a./ton coke	Cost/revenue ratio. Tons of coke per ton coal coal = 1	Ratio coal input/ coke output
US	10.99	19.67	1.79	1.44
Britain	13.56	23.71	1.75	1.52
Ruhr	15.50	20.00	1.29	1.34
Lorraine	15.52	19.71	1.27	1.36
Nord/Pas-de-Calais	14.85	19.60	1.32	1.30
Belgium	15.41	19.90	1.36	1.33

Additional details can be obtained from Tables 17-19.

(1) Partly author's estimates.

The following points should be noted:

(a) In the American statistics the coal input cost in American coking plants is given as 10.99 u.a. per ton. It includes the pit-head price plus freight charges, which may be assumed to average about 4 u.a. for transport from the pit to the steelworks plant.

(b) The coal input cost for the United Kingdom and for the above-mentioned Community coalfields do not include freight charges since they refer only to colliery-owned coking plants.

The mean revenues for coke lie much closer together than the coal input costs. By comparison with the coal input costs, coke in the Community is appreciably cheaper than in the US or the United Kingdom.

In this connection it should be noted that the ratio between the list prices of coking coal and those of blast-furnace coke (see Table 20) for the Community coalfields is about 1: 1.33, i.e., slightly above the values of 1.29, 1.27 and 1.32 given in the above table for the Ruhr, Lorraine and Nord/Pas-de-Calais districts.

50. Up to a few years ago it could be assumed that the coke revenue of coking plants covered the coal input costs and that the revenue from coke by-products covered coking costs (conversion costs).(1)

If the American, British and Community coking plants are considered from this angle, it will be seen that the American and British coke prices are appreciably above the level corresponding to the quantitative ratio between coal input and coke output. The American and British coking plants have to charge much higher coke prices, since the revenue from coke by-products are not nearly sufficient to cover the conversion costs. It is only by price calculations of this kind that it is possible to cover the costs of coking plant operation completely. Most of the Community coking plants, on the other hand, run at a loss, since the coke prices are so low that they do not cover the equivalent coal input costs and at the same time the revenues from coke by-products are not enough to cover coking costs.

51. From the above figures it can be seen that, quite apart from the technical difficulties of coke transport and the shortage of supplies, the Community could not buy blast-furnace coke from the US or the United Kingdom for reasons of cost alone. With an ex-plant price of 20 u.a./ton blast-furnace coke in the US and at least 7.50 u.a./ton freight charges (internal freight in US and sea freight to Europe), the prices cif ARA would be about 27.50 u.a./ton; for British coke the price would be about 26 u.a./ton coke cif ARA.

52. The Community's steel industry thus obtains relatively cheap coke from the Community's coking industry, despite relatively high coal input costs. The reason is that although the revenue from coke by-products is still relatively high, the colliery-owned coking plants in almost all parts of the Community run at a loss. The revenue from coke by-products will continue to drop in future.

(1) The coking plants produce by-products, so that an exact calculation of the cost factor is not possible.

Coking plant capacity

53. The question arises as to how far the Community's coking-plant capacity could continue to fall in future without endangering the coverage of the steel industry's coke requirements.

According to the calculations in Chapter 2 the Community's coking plant capacity would have to be capable of producing 45 million tons of blast-furnace coke in 1980. Allowing for coke required for sintering and foundries, which will run to about 10 million tons, the coke requirements of the iron and steel industry will be about 55 million tons in 1980. To meet this need alone a coking-plant capacity of 58 million tons would be needed.

In an assessment of the future total capacity of the coke industry, the question also arises as to how far other forms of thermal coke consumption will fall. In 1968 some 16 million tons of coke were used for thermal application (industry, households, etc.). In addition, 2.6 million tons were exported to non-member countries in 1968 (see Table 13). If there were a coking plant capacity of only 55 million tons in 1980, it would be insufficient to meet the coke requirements of the other consumers, nor would there be any left over for export.

54. The coking plants of the Community are relatively out-dated, as can be seen from the data in Table 21.

In ascertaining the mean lifetime of batteries a distinction was made between those with top-charging and those with stamping (see Table 14). Thorough studies established a mean lifetime of about 22 years for the top-charging batteries and 17 years for stamping-type batteries. Accordingly it must be assumed that the batteries listed in Table 21 in the age-range 20-25 years and above will normally go out of service in the coming five-year period, and those in the age-range 15-20 years in the one after.

On this reckoning, the total capacity of the batteries at present in operation would by 1975 be reduced to about 60 million tons of coke as a result of plant being taken out of commission. By 1980 capacity would be reduced to 40 million tons, which would be insufficient to cover the calculated coke needs of the steel industry alone. The removal of a battery from service is not, of course, dependent upon age alone; if there is a large coke requirement, a normally obsolete battery can continue in operation, —though at increased cost and with reduced efficiency. But this expedient could not avert the need for new investments by 1980.

55. The long-term tying up of capital in coking plants combined with the uncertainty as to the technical and economic future of the metallurgical and coke industries and also operating losses in coking plants have led to a considerable decline in investment activity in the Community's coking industry in recent years. In 1960 the mean investment per ton of coke produced in the Community was 0.63 u.a.; in 1967 the corresponding figure was 0.39 u.a., the breakdown by country being as follows:

Germany	0.25 u.a.
France	0.53 u.a.
Italy	0.76 u.a.
Benelux	0.49 u.a.

On the other hand, depreciation due to wear and tear in the coking plants amounted on the average to 0.80 u.a. per ton annual output. The coking plants are thus suffering from wastage of real assets. The capital costs per ton of annual capacity amount to 15 u.a. for basic overhauls, 20 u.a. for the expansion of existing coking plants and 30 u.a. for complete new constructions.

B — The coverage of coking coal requirements

56. In order to outline the problem of meeting coking coal requirements it is essential to give a brief review of the development of the coal market.

General development

57. Despite government support, the demand for Community coke has for economic and technical reasons (rationalization of consumption) fallen considerably in recent years (see Table 22), and is likely to continue to decrease in future for the same reasons. It is impossible to forecast how far it will have dropped by 1980, because this will depend among other things upon future coal policy. However, estimates have been made of the steel industry's coke consumption and the corresponding coking coal requirements, since these can be deduced on the basis of purely technical and economic factors.

58. In accordance with the drop in demand, the Community's production fell by about 50 million tons between 1960 and 1967 (see Tables 23 and 24).

In 1967 about 134 million tons of Grade V and VI coking were produced within the Community. The consumption for coking purposes amounted to 85 million tons, of which 10 million tons were imported. This leaves 75 million tons of Community coal, of which according to the figures in Table 15 about 93% (= 70 million tons) were Grade V and VI. As estimated 2 million tons of Community coal were mixed in with Grade V and VI coking coal as non-baking and other coals. Thus, of the total Grade V and VI output (coking coal) of 134 million tons, 70 million tons were carbonized and 64 million fired.

Table 23 also shows that Germany is the Community's most important coking coal producer; in 1967 it produced 94 million tons (= 70% of the Community's total coking coal production).

59. In the last few years the Community's production has adjusted itself with a certain time-lag to the reduced demand. An easing of the situation set in in 1968, as illustrated by the fact that producers' coal stocks fell in this year by 5.5 million tons and coke stocks by 3 million tons. Thus at the end of 1968 the producers still had about 25 million tons of coal and 2.2 million tons of coke on their books. Shifts lost through lack of markets resulted in 1968 in a fall in production of only 1.7 million tons.

The situation of coking coal deposits and coking plants in relation to the steel industry's consumer centres

60. The major part of the Community's crude steel production is situated near the coalfields. The crude steel production of the coalfields of Lorraine, Northern France, the Saar, the Ruhr and Belgium amounted in 1967 to 57.4 million tons (about 64% of the total steel output). In 1967 these coalfields produced 126 million tons of Grade V and VI coking coal (= 95% of the Community's total coking coal output) and about 49 million tons of coking-plant coke (= 76% of the Community's total coke output). The remaining steel production is situated either in the interior of the Community, at some distance from the coalfields (17%), or on the coast (about 19%), where coking coal supplies are largely met by imports.

61. Owing to the remoteness of certain parts of the steel industry from the centres of coking coal and coke production there is an internal trade in coal and coke within the Community (see Tables 25-27 for coal and Tables 28-30 for coke). Some 80% of both the coal and the coke trated is German. Most of it comes from the Ruhr, which supplies top-grade coking coal to the Community at the lowest cost.

The development of prices of Community coking coal and coking coal from non-member countries

62. From 1960 to 1967 there was an average rise of 13-15% in the list prices of coking coal from Community coalfields, if the prices in the various national currencies are converted into units of account at the current exchange rates (see Table 20). The French coalfields, in which the list prices expressed in units of account rose by only 3-4%, was an exception here.

In 1960 coal generally fetched the list prices on the market. In 1967, however, the effective revenue(1) from coal sales fell below the list prices owing to price alignments and the discounts for coking coal granted under Decision No. 1/67.

63. The cif prices for US coking coal in Table 20, when compared with the list prices of Community coal — even without allowing for quality differences — show a price differential in favour of US coal. It is also evident that the cif import prices of US coking coal mixtures remained relatively stable between 1960 and 1967. In 1968 there were increases of about 1.15 u.a. per ton in the price of US coking coal mixtures. This is attributable to a tightening of coking coal supplies.

We must allude at this point to the problems raised by the evaluation of quality differences when comparing the prices of coking coals and cokes of different origins. These problems are treated in Annexe A.

The prices of Polish coking coal cif ARA, regardless of its lower quality, are below the cif import prices for US coal.

(1) With the exception of the German coalfields, the *cost* of Community production in 1967 was well in excess of the revenues. In the French and Belgian coal-mining industry the revenues in 1967 were only sufficient to cover 70% of production costs.

The special role of US coking coal

64. In company with Community coal, US coal imports into the Community have suffered in recent years from the general recession in coal demand and also from the substitution of coal from state-controlled trading countries. This can be seen from the following table of coke imports into the Community from the USA.

(in millions of tons)

	Total	Of which for coking	Including coal equivalent for blast furnace coke (¹)
1965	20.9	12.7	7.9
1966	18.5	11.2	8.5
1967	15.9	8.5	7.0
1968	11.8	..	..

(¹) Partly estimates.

In 1968 the greatest importers of US coal in the Community were Germany with 4.4 million tons and Italy with 3.9 million tons.

In 1967 the Community's steel industry consumed 5.2 million tons of US coal in steelworks-owned coking plants and 3.1 million tons in independent plants; only about 0.2 million tons were used in colliery-owned plants — mainly in Belgium and France — as non-baking coal for coking.

65. In spite of its small share in the Community's coking consumption, US coal determines the current price level for Community coal. This is because the steel industries of the Community, owing to the keen competition on the steel market, are no anxious not to buy their raw materials at prices above those of the world market. Decision No. 1/67 has helped the steel industry to obtain Community coking coal at world market prices.

66. Against the present cheapness of US coking coal compared with Community coal must be set the greater unreliability of supply, due mainly to the great distance involved and the various risks entailed. It should also be noted that it is easier to ensure a regular supply of coal of uniform quality from Community sources than from other countries.

Coking coal imports from state-controlled trading countries

67. The Community has imported the following amounts of coal from the state-controlled trading countries in the last few years (see page 34).

The two most important Community importers are Italy and France, which account for about 80% of the Community's total coal imports from state-controlled trading countries (further data in Table 31).

The coal from the state-controlled trading countries is sold at relatively favourable prices in the Community and used mainly for domestic purposes (Soviet anthracite) or as steam-raising coal. Only comparatively small quantities of coking coal were used in Community coking plants in 1968.

	1960	1967	1968
from the USSR	1.4	3.5	3.4
coking coal	—	0.6	0.4
from Poland	1.7	2.8	3.9
coking coal	—	0.8	1.6

The future development of coking coal imports from state-controlled trading countries will depend upon price trends and also upon the economic policies of Member States and the Community.

The future trend of production in Community coalfields according to government plans

68. The governments of the various Member States influence future supplies of Community coal both via their ownership systems and by measures of commercial policy and subsidization. According to our present knowledge of intentions, we must expect a fall in coal production and hence in coking coal production in the next few years in all the coalfields (see Table 32). In general, planning forecasts go up to 1972. In these programmes the governments of the Member States pay primary attention to regional and social requirements. It is probable that the Community's production will continue to fall after 1972 and that in 1975 it will be only 130-140 million tons. Data are lacking for forecasts up to 1980.

The future problems of the supply of coking coal to the Community

69. The question now arises of what conclusions can be drawn, as regards supplies of coking coal to the steel industry, from our present knowledge of production trends in the various Community coalfields. Since forecasts up to 1980 cannot be given owing to the lack of data, it is necessary to make model calculations in order to indicate the future problems of coking coal supplies. It will therefore be assumed that Community measures will be taken to ensure that the coking coal requirements of the steel industry continue to be met to about the previous extent from Community sources. An alternative calculation will assume that no such measures are taken in the case of coking coal supplies to the steel industry.

70. The following framework applies to both assumptions:

(a) In 1980 the blast-furnace coking coal requirements of the Community's steel industry will amount to about 45 million tons. If to this we add 10 million tons for sintering plants and foundries, we obtain a coke requirement of 55 million tons for 1980. This would correspond to a coal consumption of 74 million tons (86.6 million tons were coked in 1968).

(b) The Community's steel industry sells part of its production on the world market in competition with other steel producers. Thus, although not absolutely dependent upon low raw material and coke costs, it is nonetheless dependent upon all steel producers obtaining their raw materials at *relatively* equal prices, whether high or low. This is clear if we reflect that with present prices and blast furnace conditions, about 8-10% of the cost of crude steel in the Community is accounted for by coke costs. The variations in the prices of raw materials—and hence of coal and coke—are attributable to the particular local conditions of steel production.

71. On the first assumption, Community measures will ensure that Community coal is delivered to the steel industry at prices which correspond to the potential prices for US coking coal delivered to the Community coking plants (steelworks or colliery plants). Since the Community demand for US coal is assumed not to increase in future, it is unnecessary to assume an additional price increase for US coal over and above the increase in future production costs(1). The amount of aid needed would have to be based on the difference between the delivered price of Community coal and prices for US coking coal at the coking plant.

72. Of the approximately 74 million tons coal to be coked in 1980, about 10 million tons (assuming constant imports) will be imported, so that 64 million tons will have to be supplied by the Community.

If account is taken of the fact that the production of coking coal inevitably involves other, non-cokable types of coal and also low-grade coal, the Community production required to meet the coking coal needs of the steel industry in 1980 would have to be about 100 million tons, not allowing for any change in demand in other areas of consumption.

The mean production costs of the Community coalfields at present differ from one field to another by up to 10 u.a./ton. It must therefore be assumed that by 1980, in order to minimize the social costs to the Community, coal production will have been restricted to those fields with the most favourable long-term costs (apart from a certain marginal output in other fields), namely, the Ruhr, Aachen, Saar and Lorraine fields. These produced a total of 129 million tons of coal on 1967, including 106.6 million tons of coking coal (see Table 23). According to government intentions (see Table 32) the production of these four fields will amount to only 118.5 million tons in 1972. If this trend were to continue, production would approach the 100 million ton mark by 1975. If the assumption made continues to be valid after 1975, production should not decline any further.

73. The figure of 100 million tons for the Community would be conditional upon 64 million tons thereof being used to meet the coke requirements of the steel industry. In the remaining sectors (power plants, industry, domestic use, transport, gas works, manufacture of briquettes) a demand of 36 million tons could be met from

(1) Provided the demand from other countries does not increase more rapidly than assumed in Chapter II.

Community sources, if there is no marginal additional output in the remaining Community fields. In 1968 the demand in these sectors of consumption was about 110 million tons of Community coal (see Table 22).

On this assumption the bulk of the output would therefore be used to meet the coke requirements of the steel industry. Only a minor part of the coal production would be used for thermal purposes and would then come into sharp competition with oil, natural gas and imported coal.

The differences between the cost-covering prices for Community coal and the prices of imported coking coal are much less than those in the thermal range between Community coal and other energy sources. So long as these differences continue to exist, a preferential orientation of coal production towards coking coal for the steel industry would help to minimize the social costs entailed in the maintenance of this production.

74. On the second assumption, coking coal supplies would take place in future without the application of Community criteria. Developments in Germany are of particular importance here, since this country has the coking coal and coking plant capacity to supply the steel industries in other Community countries.[1]

If in future this capacity were to be directed primarily towards German requirements, certain supply problems would arise for the steel industries in various Member States. This is particularly true of countries having metallurgical industries with coking-plants installed on German coalfields. These steelworks would either have to continue to operate coking plants in Germany or to replace them by new plants elsewhere. Should they continue to maintain their captive plants in Germany, they would have the choice of supplying them with German coal or with coal from the other countries.[2] This might result in these steel industries having higher delivered prices for coke than the other Community steel industries. The construction of new coking plants would also entail additional burdens for these industries. As stated in Section 55, it is not yet possible to foresee whether such investments in new coking plant capacity could be refunded during their normal lifetime, or whether the depreciation period would not have to be shortened owing to progress in coking and metallurgical techniques.

The problems of supplying German coking coal to those Community steel industries which dispose of adequate coking capacity at the site of the smelting plants are less difficult. Here it is possible to decide by means of a profitability calculation whether these coking plants will in future be able to obtain their coal supplies more cheaply from other countries, or whether an appropriate German production capacity should continue to be maintained.

75. Such a decision will be mainly determined by future cost trends in the German coalfields and in the price of US coking coal.

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(1) As far as the supply of the German steel industry with coal and coke is concerned, the formation of the Ruhrkohle AG is intended to ensure its supplies of German coking coal by means of long-term contracts. Other parts of German coal production are tied up under the electricity supply laws.

(2) Table **33** shows in detail the probable structure of coking plants and coking coal production in the various Community coalfields in 1972.

In the first half of 1968 the average production costs in the Community's most important present and future coal-producing area, namely, the Ruhr, amounted to 14.50 u.a./ton over the total production,(1) without taking account of the subsidies granted in order to reduce costs.

Since 1958 the shift productivity of this region has shown a mean annual increase of 8.3%. In the same period the nominal production costs have remained stable, while output has fallen by about 25%. The mean annual productivity increase resulting from a rise in output per shift in the existing plants and from the closing of other plants has sufficed to offset both the rise in labour costs and the general increase in prices. During this ten-year period the wages per shift of underground workers in the Ruhr have risen annually by 6.4%.

If the shift wages continue to rise annually by about 6% up to 1980 and the general price level does not go up annually by more than 1%, then assuming constant production, the output per underground man-shift would have to increase annually by at least 8% in order to keep costs approximately stable. This would mean that the output per shift in the Ruhr, which was 3.8 tons (t = t) in 1968, would have to increase to 9.6 tons by 1980.

76. For the following two reasons the prices of coking coal from non-member countries are not directly comparable with the average coal production costs:

— The production costs for coking coal are higher than those for coal in general, since coking coal is mined at greater depths.(2)

— The scale of prices for the types and grades of coal produced is generally so arranged that the smaller profits on steam-raising coal are balanced by bigger profits on higher-quality coal. In the Ruhr price scale too, therefore, coking coal is about 1.50 u.a./ton above the mean production cost.

77. These present pit-head prices of 16 u.a./ton for Ruhr coking coal are to be compared with prices of 15 u.a./ton cif ARA for imported US coal.(3)

According to the calculations in Chapter 2 the possibility cannot be ruled out that the cif prices of American coking coal will rise between now and 1980 by about 1-3 u.a./ton. When calculating the cost of supplying existing Community coking plants with US coal it is necessary to add freight charges of an average of about 1.50 u.a./ton for transport from the ARA ports to the colliery and steelworks coking plants. Thus the delivered prices of US coal to Community coking plants would rise to 17.50-19.50 u.a./ton in 1980. Assuming constant production costs in the Ruhr region, Ruhr coal would thus improve its competitiveness in the intervening period.

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(1) It is assumed here that no account is taken of the state subsidies paid to the social insurance system of the mining industry in order to offset "abnormally" high social burdens under Article 2, Section 2, of Decision No. 3/65.

(2) This is also the reason why in the US coking coal is mined only in deep and not in opencast workings.

(3) These price data apply to differing coal qualities and cannot be compared with one another without a quality correction in favour of US coal.

Chapter IV

The Implications of Decision No. 1/67 as regards Supplies of Coking Coal and Coke for the Community's Iron and Steel Industry

Nature and purposes of the Decision

78. In the Protocol on energy questions dated 21 April 1964,(1) the governments of the Member States declared themselves resolved "to continue their efforts to work out and implement a common energy policy".

As regards coal, the governments requested the High Authority "to submit to them under the Paris Treaty, and to the extent that this is necessary, proposals concerning procedure for the application of a Community system of state aid". They also expressed the opinion "that the question of the Community's long-term coking coal supplies must be accorded particular attention by the Council".

The 1964 energy protocol served as a basis for the Protocol on coking coal and coke for the iron and steel industry dated 16 February 1967.(2) Although this Protocol affords evidence of the special attention which is being paid to this sector, it does not solve the long-term supply problem raised in the 1964 Protocol. What it does do is, having regard to the "present characteristics of the coking coal and coke market for the iron and steel industry", to provide for the introduction, "for a limited period", of a special system of aid in conjunction with "exceptional financial compensation" for internal trade.

On the basis of the 1967 Protocol, Decision No. 1/67 brought in a series of measures of restricted scope and duration. These measures take into account the common interests of the coal, iron and steel industries.

What the collieries needed was conditions which would enable them to lower their prices for coking coal and coke for use in steelworks blast furnaces without thereby causing over-hasty closure of collieries and thus hampering further efforts to adjust production.

What the Community's iron and steel foundries needed was a reduction of the inequalities in their supply conditions resulting from the differences in the Member States' coal import policies.

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(1) *Official Gazette*, 30 May 1964, pp. 1099-1100/64.
(2) *Official Gazette*, 28 February 1967, p. 561/67.

Effects of subsidies on the market for coking fines and blast-furnace coke

79. By extending the possibilities of price alignment afforded by Article 60 of the ECSC Treaty, Decision 1/67 enabled all coal-mining and coking enterprises to grant rebates on their prices and schedules for products delivered to the iron and steel industry; these rebates, however, must not result in delivered prices lower than those for coking coal from non-member countries or for coke produced from coking coal from non-member countries.(1)

Since in practice prices are aligned on the delivered price for coking fines from the USA or for coke manufactured from such coking fines, iron and steel enterprises which use Community coal and coke can obtain supplies on world-market conditions, with due allowance for their locations. This brings about more balanced conditions of competition on the steel market.

The Community's iron and steel industry has availed itself of the alignment rebates for almost all the blast-furnace coke produced from Community coal, i.e., 35 million tons of coke in 1967 and 36 million tons in 1968, the relevant deliveries in these two years totalling 41.1 and 43.5 million tons respectively (see Table 34).(2)

The consumption increase of 2.4 million tons (5.8%) was covered mainly by drawing on coking coal and coke stocks in the Community.

In addition, the amount of hard coal from non-Community countries which was used for the production of blast-furnace coke rose from 8.8 million tons in 1967 to 9.3 million tons in 1968, i.e., by 0.5 million tons.

This expansion in total consumption of hard coal from non-Community countries is derived from a decrease of 0.8 million tons (—10%) in imports of American coal and an increase of 1.3 million tons (+139%) in imports of coal from state-controlled trading countries, particularly Poland. There are even greater differences as between the various Community countries (see Table 35).

80. Independently of the trend in spot prices, the reference American coking coal price generally used for alignments in the Community rose only slightly between January 1967 and January 1969, namely, from 14 to 14.5 u.a./ton cif ARA. This is because the alignments are made on prices which are fixed in contracts concluded before 1 January 1967 and which, despite sliding-price clauses, have not entirely followed the spot price trend.

The favourable conditions enjoyed by the iron and steel industry in the United States and the increasing demand for American coking coal from countries outside the Community, particularly Japan, have made it impossible today to conclude long-term contracts on the terms obtained previously. According to available

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(1) The rebates granted in this way by the enterprises can be covered by a subsidy from the Member States ranging up to 1.70 u.a./ton coal. The maximum amount of subsidies permissible under the multilateral compensation arrangement is 22 million u.a./year.

(2) The differences between delivered and aligned quantities (6 and 7 million tons respectively) correspond substantially to the quantities of blast-furnace coke produced from coal from non-member countries.

information, the prices applied by the two major American producers of low-volatility coking coal (Pocahontas) for deliveries to Japan have developed as follows:

Price fob Atlantic coast in $/ton

1966 :	11.70/12.35
1967 :	12.35/12.69
mid-1968 :	13
beginning 1969 :	13.50

81. Decision No. 1/67 has no doubt succeeded in its purpose of making it easier to market freshly-produced Community coking coal. It is not possible to quantify the influence this may have had on imports of American coking coal, since on the one hand the fall in such imports has been accompanied by a rise in imports from state-controlled trading countries, and, on the other hand the additional coking coal and coke needs of the Community's iron and steel industry have been met in full from excessively high pithead stocks. There is no direct connection between the running down of stocks and the application of Decision No. 1/67, since the Decision expressly excludes stocks existing at 1 January 1967 from subsidization.

82. Decision No. 1/67 has not prevented a further rise in the Community's coking plants' losses as a result of the fall in proceeds from coal by-products. One reason for this is that Decision No. 1/67 took the prices and schedules ruling at 1 January 1967 as the reference prices for calculating a subsidy averaging a maximum value of 1.70 u.a./ton; another reason is that the grant of a subsidy was made conditional upon it being passed on *in toto* to the steel industry.

Conclusion

83. The report analyses in detail the problems inherent in coking coal and coke supplies for the iron and steel industry up to 1980. It sets out to state these problems objectively, and thus to facilitate the task of drawing up proposals for their solution.

As explained in Chapter 1, the coming decade was chosen as the period to be studied because it seems possible to predict the broad lines of technical development up to 1980 in the iron, steel and coke industries. It was assumed that the present processes for the manufacture of steel and coke would continue to be dominant at least up to 1980.

84. This implies that despite intensive developments in the direct reduction of iron ore, these new processes will not bring about any easing of the coke supply situation before 1980. Thereafter, however, they can be expected to be used on a larger scale, and to lead to a diminution in the world steel industry's coking coal needs, so that the problem of coking coal supplies would than assume a different aspect.

Attempts to improve and replace conventional coking processes aim at a similar effect, namely, that after 1980 coking coals in the present sense will no longer be used to the exclusion of other types of coal.

85. Chapter 2 proceeds on the assumption that the world's crude steel production will increase from about 500 million tons in 1967 to over 800 million in 1980. This will be accompanied by a rise in pig iron production from about 350 million tons to about 600 million tons and in coke consumption by the iron and steel industry from about 220 million tons to about 290 million tons.

While the overall coke needs of the world steel industry will thus rise during this period by about 70 million tons, those of the Community will remain fairly constant at about 45 million tons. There will be a rapid increase in the demand for coke in the free-enterprise countries, particularly in Japan. The state-controlled trading countries, for their part, will require an additional 30 million tons.

World reserves of coking coal are sufficient to satisfy increasing world requirements up to 1980. The tapping of new deposits in Australia and Canada, in conjunction with a better knowledge of the US coking coal reserves, means that previous assumptions as to the inadequacies of world reserves are no longer valid, at least for the period under consideration.

Despite the opening-up of new coking coal deposits in other parts of the world, the USA will continue to hold the key position as regards coking coal supplies. To all users on the world market who cannot obtain their supplies in full from cheaper sources, the USA will represent the marginal source. The situation varies, however, from one country or economic area to another. Thus, Japan, the second largest steel producer in the free world, will continue to depend upon imports from the USA to cover its marginal needs; at the same time, however, it will be able to secure a greater diversification of its supply sources by increasing its coking coal imports from Australia, Canada and the USSR. The Community cannot do this because of cost considerations. It will admittedly have certain facilities for importing Polish and Russian coking coal, but apart from its own capacities it can to all intents and purposes only fall back upon the US. There can thus be no question of any effective diversification of coking coal supplies where the Community is concerned.

86. Chapter 3 deals with the problem of coking plant capacities and coking coal production in the Community. It is first of all shown that the question of a sufficient coking plant capacity is one which arises in any event, whether the coking coal is in future produced within the Community or imported. An unduly rapid running-down of the Community's own coking coal production gives rise to severe problems of location and profitability in the case of some blast furnaces and coking plants, since about two-thirds of the Community coking-plant capacities are based on coal.

The economic position of the Community coking plants is deteriorating owing to the fall in proceeds from sales of by-products. This is all the more serious in that some coking plants are obsolescent, and certain investments will have to be made in replacements and new equipment between now and 1980. The decision on investments in new equipment is particularly difficult today, since the profitability of even new coking plants is not assured, and in addition the current developments in smelting and coking techniques make it impossible to predict with certainty whether such coking plants could be used to capacity for their normal lifetime.

As regards the Community's coking coal production, the problem is the inability of the Community product to compete with imported coal. An outline is therefore given of the difficulties which arise when an attempt is made to solve this problem at Community level, or when it is tackled from various national standpoints.

ANNEXES

Problems Connected with the Evaluation of Quality Differences in Coking Coal and Coke

The coking coal required by the Community's steel industries for the production of blast-furnace coke varies widely in such quality characteristics as the amount of ash, water, sulphur and volatile components contained and the coking capacity. A distinction should be made between those characteristics which influence the coke yield in the coking process (primarily water and volatile components) and those which mainly determine the chemical and physical properties of the coke (ash, sulphur, coking capacity, grain structure, etc.). These quality variations must be taken into account in making price comparisons, particularly when comparing Community and US coking coals, since the low-grade coal content of the US coking coal imported by the Community's steel industry is at present less than that of Community coking coal. There are also major quality differences within the Community itself. Whenever, therefore, a price comparison is made between coking coals of differing origins, a common quality denominator must always be adopted.

If it is desired to compare the quality of US coking coal with that of a given Community coal, it is necessary, setting aside for the moment the difficult question of assessing the coking capacity, to make an appropriate deduction for the higher quality of the US coal or to add something to the price of Community coal because of its greater low-grade coal content.

This compensation for quality differences can be effected either on the cif prices for the imported coal and the pithead prices for Community coal, or on the delivered prices of the coking coal at the place of consumption. The advantage of the latter method is that the low-grade substances in the coal also give rise to transport costs. The addition or deduction to be made is determined on the basis of coal converted to a condition free of low-grade substances, water and ash contents being first deducted from the gross weights. The ash content is usually assessed at one and a half times its value, since during coking the volatile components of the coal and the water, which together may form up to 45% of the gross weight, are removed, and the ash content of the coke is thereby correspondingly increased.

The method of calculation will be illustrated by a simple example, the following assumptions being made as to quality:

	US coking coal	Coking coal from Community District A
Ash	5%	8%
Water	5%	10%
Sulphur	0.7%	0.9%
Volatile components	24%	23%

The low-grade component (water and ash) would thus be as follows:

US coking coal	12.5%
Community coking coal	22 %

Thus 1,000 kg of US coking coal would be equivalent to 1,110 kg(1) of the reference Community coal, and 1,000 kg of Community coal to 860 kg of US coal.(2) An addition of 11%(3) for ash and water would therefore have to be made to the price of Community coal in order to offset the lower quality. Conversely, compensation can be effected by making a deduction from the US coking coal price. In our example this deduction amounts to 14%.(4) Hitherto a quality comparison has been relatively simple; evaluation is now made far more complicated, however, by differences in the sulphur and volatile component contents, to which must be added a number of other decisive factors as regards the chemical and physical properties of the coke.

The Commission therefore intends, after the conclusion of the current studies, to submit proposals on the evaluation of differing coking coal and coke qualities.

(1) $1{,}000 + \frac{875 - 780}{875} \times 1{,}000 = 1{,}110,$

(2) $1{,}000 - \frac{875 - 780}{780} \times 1{,}000 = 860.$

(3) $\frac{87.5 - 78}{87.5} \times 100 = 11\%.$

(4) $\frac{87.5 - 78}{78} \times 100 = 14\%.$

List of statistical tables

Table 1 — Pig Iron and Crude Steel Production

(Millions of tons)

	Pig iron production, incl. ferrous alloys					Crude steel production				
	1960	1967	1980 (1)			1960	1967	1980 (1)		
			I	II	III			I	II	III
A) *Free-enterprise countries*										
Community	54.0	65.9	87.5	90.5	93.5	73.1	89.9	120.0	124.0	128.0
United Kingdom	16.0	15.4	23.5	24.7	26.1	20.5	24.3	35.0	37.0	39.0
Rest of Western Europe	7.6	11.5	20.0	21.5	23.8	15.1	17.2	32.0	35.0	38.0
USA	61.1	79.5	98.0	101.0	105.0	91.9	118.0	145.0	150.0	155.0
Canada	3.9	6.3	12.2	13.0	13.8	5.3	8.8	17.0	18.0	19.0
South America	2.7	5.4	17.1	19.2	21.2	4.0	9.7	25.0	28.0	31.0
Africa	2.1	3.6	10.5	12.0	13.5	2.2	4.2	14.0	16.0	18.0
Middle East	0.3	—	0.6	1.2	1.8	0.3	0.1	1.0	2.0	3.0
Japan	11.9	40.1	73.0	76.6	80.5	22.1	62.2	100.0	105.0	110.0
India	4.2	7.1	12.8	15.2	16.8	3.3	6.3	16.0	19.0	21.0
Rest of Asia	—	1.9	2.6	3.9	5.8	—	2.2	4.0	6.0	9.0
Australia	2.9	5.1	9.6	10.4	11.2	3.7	6.4	12.0	13.0	14.0
Total (A)	166.7	241.8	367.4	389.2	413.0	241.5	349.3	521.0	553.0	585.0
B) *State-controlled trading countries*										
USSR	46.8	74.8	115.3	119.0	123.0	65.3	102.2	158.0	163.0	168.0
Other East European countries	13.4	20.7	38.9	40.2	41.5	20.7	33.2	58.0	60.0	62.0
China (P.R.)	27.5	15.0	36.0	40.0	44.0	16.5	14.0	45.0	50.0	55.0
Total (B)	87.7	110.5	190.2	199.2	208.5	102.5	149.4	261.0	273.0	285.0
C) World (A + B)	254.4	352.3	557.6	588.4	621.5	344.0	498.7	782.0	826.0	870.0

(1) I = low hypothesis;
II = intermediate hypothesis;
III = high hypothesis.

Annex to Table 1

The forecasts of crude steel and pig iron production in the various countries up to 1980 are based mainly on the following studies:

(i) Studies by various institutes of economics on the development of steel consumption and steel production in the major non-member countries (requested by the High Authority or the Commission).

(ii) High Authority of the ECSC: Die Lage auf den Stahlmärkten in Drittländern, (vol. 2, N° 1500/67).

(iii) ECE—Geneva: Le marché mondial du minerai de fer, STEEL/Working Document No. 332/Add. of 5 September 1967.

On the basis of the available information concerning the latest developments, the estimates worked out by the ECE from past trends were revised in an upward direction for certain regions such as Western Europe, Japan and India. For North America and the developing countries, on the other hand, the ECE forecasts do not appear to be fully attainable.

As regards the structure of steel production according to processes, it was assumed that in the free-enterprise countries the share of electric steel would rise from its present figure of about 14% to about 20% in 1980. In 1966 the various processes accounted for the following percentages of the total crude steel output in the most important producing areas:

Process	Community (1)	USA	United Kingdom	Japan
Basic Bessemer steel	35.5	—	0.1	—
Open-hearth steel	28.6	55.5	59.5	18.0
Oxygen-blown steel	23.4	32.6	26.5	62.7
Electric steel	12.5	11.9	13.9	19.3
Total	100	100	100	100

(1) On the basis of investment data, the following production structure is expected for 1971:

Basic Bessemer steel	23%
Open-hearth steel	20%
Oxygen-blown steel	44%
Electric steel	13%

Table 2 — Trend of Specific Consumption of Blast-Furnace Coke per Ton of Pig Iron

(*kg*)

	1960	1967	1980	
			I[1]	II[2]
A) *Free-enterprise countries*				
Community	890	620	480	520
United Kingdom	825	656	490	530
Rest of Western Europe	..	660	490	530
USA	749	639	460	500
Canada	..	555	440	480
Latin America	..	700	490	530
Africa	..	773	490	530
Middle East	..	—	500	540
Japan	617	496	435	475
India	..	845	500	550
Rest of Asia	..	790	500	550
Australia	..	608	440	480
Total (A)	..	620	470	510
B) *State-controlled trading countries*				
USSR	711	600	460	500
Other East European countries	..	710	480	520
Communist China	..	867	500	550
Total (B)	..	657	470	510
C) World (A + B)	..	632	470	510

(1) I = low hypothesis.
(2) II = high hypothesis.

Table 3 — World Survey for 1960 and 1967

(Millions of tons)

	Coal production (national statistics)		Coke production in coal equivalent (1)		Coke production (2)		Steel industry's coke consumption (1)		Coke consumption for steel (3) production in coal equivalent	
	1960	1967	1960	1967	1960	1967	1960	1967	1960	1967
A) *Free-enterprise countries*										
Community	234.0	184.6	96.6	83.8	73.9	64.0	48.0	40.9	62.9	53.6
UK	196.7	174.9	30.8	25.4	20.5	16.9	13.2	10.1	19.8	15.2
Rest of Western Europe	16.5	13.8	8.1	8.7	5.8	6.2	—	7.6	—	10.6
USA	391.5	506.8	79.6	84.4	55.3	58.6	45.8	50.8	70.0	73.2
Canada	8.0	8.5	4.9	5.6	3.5	4.0	—	3.5	—	4.9
Latin America	7.9	10.1	3.1	4.3	2.2	3.1	—	3.8	—	5.3
Africa	43.3	53.9	3.4	4.3	2.4	3.1	—	2.9	—	4.1
Middle East	4.5	6.2	0.8	1.5	0.6	1.1	—	—	—	—
Japan	51.1	47.5	12.0	29.4	8.6	21.0	7.3	19.9	10.2	27.9
India	52.7	68.9	6.7	12.0	4.8	8.6	—	6.0	—	8.4
Rest of Asia	10.6	17.2	0.3	1.4	0.2	0.1	—	1.5	—	2.1
Australia and Oceania	23.7	36.3	3.9	4.9	2.8	3.5	—	3.1	—	4.3
Total free-enterprise countries	1,040.5	1,128.7	250.4	265.7	180.6	190.2	—	150.0	—	209.6
B) *State-controlled trading countries*										
USSR	374.9	450.0	77.6	98.0	55.4	70.0	33.3	44.9		62.9
Rest of Europe	137.1	162.9	30.9	37.4	22.1	26.7	—	14.7		20.6
Rest of Asia	429.3	590.4	35.7	28.0	25.5	20.0	—	13.0		18.2
Total state controlled trading countries	941.3	1.203.3	144.2	163.4	103.0	116.7	—	72.6		101.7
C) World (A + B)	1,981.8	2,332.0	394.6	429.1	283.6	306.9	—	222.6		311.3

(1) Where no statistical data are available; coke production multiplied by 1.4.
(2) Not including gasworks coke.
(3) Not including fuel consumption for sintering.
(4) Where no statistical data are available; coke consumption multiplied by 1.4.

Table 4 — World Survey for 1967 and 1980

(Millions of tons)

	1967		1980					
	Steel industry's coke consumption (1)	Steel industry's coke consumption in coal equivalent (2)	Steel industry's (1,4) coke consumption: Hypothesis 1	Hypothesis 2	Mean value (3)	Hypothesis 3	Hypothesis 4	Coke consumption in coal equivalent (5)
A) *Free-enterprise countries*								
Community	40.9	53.6	42	45.5	45.3	45	48.5	59.3
UK	10.1	15.2	11.5	12.5	12.7	12.8	13.9	19.1
Rest of Western Europe	7.6	10.6	9.8	10.6	11.2	11.7	12.6	15.7
USA	50.8	73.2	45	49	48.7	48.5	52.5	70.1
Canada	3.5	4.9	5.4	5.9	6	6.1	6.6	8.4
Latin America	3.8	5.3	8.4	9.1	9.8	10.4	11.2	13.7
Africa	2.9	4.1	5.1	5.6	6.1	6.6	7.2	8.5
Middle East	—	—	0.3	0.3	0.6	0.9	1.0	0.8
Japan	19.9	27.9	31.8	34.8	35	35	38.3	49.0
India	6.0	8.4	6.4	7.1	7.8	8.4	9.3	10.9
Rest of Asia	1.5	2.1	1.3	1.4	2.4	2.9	3.2	3.4
Australia and Oceania	3.1	4.3	4.2	4.6	4.8	4.9	5.4	6.7
Total free-enterprise countries	150.0	209.6	171.2	186.4	190.4	193.2	209.7	265.6
B) *State-controlled trading countries*								
USSR	44.9	62.9	53	57.6	57.2	56.5	61.5	80.1
Rest of Europe	14.7	20.6	18.7	20.2	20.1	20	21.6	28.1
Rest of Asia	13.0	18.2	18	19.8	21	22	24	29.4
Total state-controlled trading countries	72.6	101.7	89.7	97.6	98.3	98.5	107.1	137.6
C) World (A + B)	222.6	311.3	260.9	284.0	288.7	291.7	316.8	403.2

(1) Not including fuel consumption for sintering.
(2) Where no statistical data are available: coke consumption multiplied by 1.4.
(3) Arithmetical mean of hypotheses 1-4.
(4) Hypotheses 1-4 are derived from the following combinations of assumptions as to the specific coke consumption and pig iron production (see Tables 1 and 2):
Hypothesis 1: minimum specific coke consumption/minimum pig iron production;
Hypothesis 2: maximum specific coke consumption/minimum pig iron production;
Hypothesis 3: minimum specific coke consumption/maximum pig iron production;
Hypothesis 4: maximum specific coke consumption/maximum pig iron production.
(5) Derived from the mean value for 1980 coke consumption.

Table 5 — Principal Exporters and Importers on World Coke Market(1)

(Millions of tons)

Exporters	1960	1967	Importers	1960	1967
A) *Free-enterprise countries*			A) *Free-enterprise countries*		
West Germany	10.9	7.7	Luxembourg	4.1	3.3
Netherlands	2.3	2.0	France	5.1	3.2
Other Community countries	1.2	0.8	Other Community countries	1.3	1.7
United Kingdom	1.1	0.5	Sweden	1.8	0.9
Other countries(2)	0.8	—	Austria	0.8	0.9
			Other countries(2)	3.8	2.4
Total free-enterprise countries	16.3	11.0	Total free-enterprise countries	16.9	12.4
B) *State-controlled trading countries*			B) *State-controlled trading countries*		
USSR	2.6	3.7	East Germany	2.5	3.2
Poland	2.1	2.4	Hungary	1.1	1.1
Czechoslovakia	1.3	2.2	Rumania	0.7	1.1
Other countries(2)	—	—	Other countries(2)	1.1	1.5
Total state-controlled trading countries	6.0	8.9	Total state-controlled trading countries	5.4	6.9
C) World trade (A + B)	22.3	19.3	C) World trade (A + B)	22.3	19.3

(1) Not including China and USA.
(2) Estimated.

Table 6 — Principal Exporters and Importers on World Coal Market([1])

(Millions of tons)

Exporters	1960	1967	Importers	1960	1967
A) *Free-enterprise countries*			A) *Free-enterprise countries*		
USA	34.3	45.6	Japan	6.2	24.3
West Germany	17.6	18.7	Benelux	11.2	13.0
Australia	0.8	10.0	Canada	12.3	14.0
Other Community			Italy	9.7	12.1
countries	5.9	5.1	France	10.1	11.6
United Kingdom	5.2	2.0	West Germany	6.7	7.8
Other countries([2])	3.0	6.0	Other countries([2])	..	20.7
Total free-enterprise countries	66.8	87.4	Total free-enterprise countries	..	103.5
B) *State-controlled trading countries*			B) *State-controlled trading countries*		
USSR	12.8	26.0	East Germany	8.1	8.5
Poland	17.5	24.0	USSR	4.8	7.8
Other countries([2])	3.5	5.0	Other countries([2])	..	22.6
Total state-controlled trading countries	33.8	55.0	Total state-controlled trading countries	..	38.9
C) World trade (A + B)	100.6	142.4	C) World trade (A + B)	100.6	142.4

([1]) Including briquettes.
([2]) Estimate.

Table 7 — Principal Exporters and Importers on World Coking Coal Market

1967

(Millions of tons)

Exporters		Importers	
United States	30.3	Japan	24.0
West Germany	9.5(1)	Italy	7.9
Australia	9.0	Canada	5.6
USSR	..	France	4.8
Poland	2.1	Netherlands	3.1
Czechoslovakia	2.0(1)	Belgium	3.0
Canada	0.8	Latin America	2.5-3.0(1)

(1) Estimate.

Table 8 — Estimated United States Coking Coal Reserves (As at 1 January 1965)

(in thousands of millions of tons)

State	Water-free volatile component content			Total
	High-volatility over 31%	Medium-volatility 22-31%	Low-volatility 14-22%	
I. Total reserves (1) of coking coal				
Kentucky	26.7	—	—	26.7
Pennsylvania	36.8	8.7	7.1	52.6
Virginia	5.2	3.0	0.6	8.9
West Virginia	77.1	8.8	7.3	93.1
Exporting areas total	145.8	20.5	15.0	181.3
USA total	190.5	24.2	18.1	232.8
I. Total reserves (1) of coal for metallurgical coke (2)				
Kentucky	21.0	—	—	21.0
Pennsylvania	2.8	1.6	1.3	5.7
Virginia	3.3	2.0	0.3	5.6
West Virginia	34.9	6.0	5.8	46.7
Exporting areas total	62.0	9.6	7.4	79.0
USA total	72.7	10.5	8.8	92.0
III. Total reserves of workable (3) coal for metallurgical coke				
Exporting areas	28.3	4.4	3.4	36.0
USA total	33.2	4.8	4.0	42.0

(1) Measured, indicated and inferred deposits.
(2) Sulphur content less than 1.25%; ash content less than 8%.
(3) In seams from 28" (71 cm), mean working losses 43%.

Table 9 — Japanese Steel Industry's Coking Coal Imports

(Millions of tons)

Country of origin	1957	1960	1965	1967	1968[1]
			a) in millions of tons		
USA	3.5	4.3	6.4	10.1	14.4
Australia	0.2	0.9	6.0	9.0	12.0
USSR	0.2	0.4	1.0	2.2	3.0
Canada	—	0.4	0.7	0.8	1.0
Communist China	0.3	—	0.4	0.9	0.8
Poland	—	—	—	0.7	1.0
Other countries	0.03	0.1	—	0.3	1.6
Total	4.2	6.2	14.6	24.0	33.8
			b) in %		
USA	83.4	69.8	43.9	42.1	42.5
Australia	4.5	14.3	41.3	37.5	35.5
USSR	3.7	7.2	7.0	9.2	8.9
Canada	—	6.8	5.0	3.3	3.0
Communist China	7.7	—	2.7	3.8	2.4
Poland	—	—	—	2.9	3.0
Other countries	0.7	1.9	0.03	1.2	4.7
Total	100	100	100	100	100

(1) Total coal imports for the USA: American export statistics data. Other data: MITI (Ministry for International Trade and Industry) estimate for the financial year 1 April 1968-31 March 1969.

Table 10 — USA: value of coal fob mine(1)

Year	in u.a./metric ton			Indices (1955 = 100)		
	USA total		District 7(2)	USA total		District 7(2)
	Total coal production	Deep workings		Total coal production	Deep workings	
1950	5.34	5.68	..	107.9	106.0	..
1955	4.95	5.36	5.92	100	100	100
1957	5.60	6.08	7.28	113.1	113.4	123.0
1960	5.17	5.67	6.55	104.4	105.8	110.6
1961	5.05	5.53	6.40	102.0	103.2	108.1
1962	4.94	5.41	..	99.8	100.9	..
1963	4.84	5.31	6.23	97.8	99.1	105.2
1964	4.91	5.42	6.42	99.2	101.1	108.4
1965	4.89	5.43	6.47	98.8	101.3	109.3
1966	5.00	5.57	6.77	101.0	103.9	114.4
1967	5.09	5.71	6.98	102.8	106.5	117.9

(1) Bituminous coal and lignite.
(2) Mainly deep-working of low and medium-volatility coal; share in 1967 overseas exports: 46%.

Table 11 — Trend of mean export prices([1]) for North American coal

(u.a./metric ton fob U.S. ports)

Destination	1955	1957	1960	1961	1962	1963	1964	1965	1966	1967	1968
Belgium-Luxembourg	9.92	11.70	10.19	9.78	10.06	10.52	10.49	10.46	10.57	10.65	11.35
Germany	9.70	11.18	10.20	10.10	10.04	10.07	10.27	10.20	10.25	10.43	10.56
France	10.17	11.74	10.07	10.23	10.71	10.31	10.85	10.74	10.76	10.21	10.42
Italy	9.58	11.53	9.61	9.80	10.12	10.43	10.69	10.79	11.03	11.31	10.29
Netherlands	9.59	10.89	10.07	10.16	10.04	10.01	10.10	10.22	10.33	10.45	11.02
Community	9.68	11.32	9.96	9.99	10.10	10.15	10.35	10.32	10.46	10.70	10.92
Japan	9.53	12.06	10.48	10.63	10.93	10.93	11.07	11.27	11.56	11.77	11.94
Total exports	9.38	11.02	10.01	10.06	10.09	10.06	10.14	10.22	10.24	10.57	10.79

([1]) Mean for all grades.

Table 12 — Poland: Coal production and exports

	Unit	1950	1957	1960	1965	1966	1967	1968	1970	1975
I — Coal production	Millions of tons	78.0	94.1	104.4	118.8	122.0	123.9	128	135	160
II — Coal exports	Millions of tons									
1. Comecon		15.1	6.8	8.5	11.4	12.2	12.6	..	..	..
2. Western Europe	”	9.6	6.3	8.0	9.3	9.5	10.2	...	..	..
of which: Community	”	2.2	2.0	1.7	1.7	2.1	2.8	..	..	..
Scandinavia	”	..	2.7	4.7	4.5	4.7	5.0	..	..	..
3. Other countries	”	1.8	0.3	1.0	0.3	0.7	1.2	..	..	..
4. Total	”	26.5	13.4	17.5	21.0	22.4	24.0	26	28	36
1. Comecon	%	57.0	50.7	48.6	54.3	54.5	52.5	..	..	..
2. Western Europe	”	36.2	47.0	45.7	44.3	42.4	42.5	..	..	..
of which: Community	”	8.3	14.9	9.7	8.1	9.4	11.7	..	..	..
Scandinavia	”	..	20.1	26.9	21.4	21.0	20.8	..	..	..
3. Other countries	”	6.8	2.3	5.7	1.4	3.1	5.0	..	..	..
4. Total	”	100	100	100	100	100	100	100	100	100
III — Line II(4) as a percentage of line (I)	%	34.0	14.0	16.8	17.7	18.4	19.4	20.3	20.7	22.5

Table 13 — Survey of Coke(1) Production and Marketing in the Community

(Millions of tons)

Deliveries to consumers	1960	1967	1968(3)
Coking plants's own consumption	2.9	1.4	1.3
Iron and steel producing industry(2)	50.2	46.4	48.4
Other industries	8.0	5.9	5.9
Domestic consumption including concessionary coke	9.5	9.2	9.2
Other consumers	2.1	0.9	0.7
Total deliveries to Community	72.7	63.8	65.5
Exports to non-member countries	4.0	2.6	2.6
Total	76.7	66.4	68.1
Variations in stocks and statistical differences	—2.8	—2.3	—3.0
Coke production	73.9	64.1	65.1
of which: Germany	44.6	35.2	36.3
France	13.6	12.4	12.3
Belgium	7.5	6.9	7.2
Italy	3.7	6.3	6.4
Netherlands	4.5	3.3	2.9

(1) Not including gasworks coke and semi-coke.
(2) Including coke for sintering.
(3) Provisional figures.

Table 14 — Community Coking Plants

(position as at 1 January 1969)

Country	Type of coking plant	Coking plants: tc (1)	Coking plants: st (2)	Number of batteries: in operation	Number of batteries: other (3)	Number of batteries: total	Input (2) 1967 Wet coal	Production (2) 1967 Wet coal	Share in Community production	Capacity 1968	Capacity utilization 1967
							1,000 t (4)	1,000 t (4)	%	1,000 t	%
Germany	Colliery	41	2	183	9	192	39 496	29 498	48.4	34 677	85.1
	Steelworks	6	3	28	6	34	5,889	4,504	7.4	5,469	82.4
		47	5	211	15	226	45,385	34,002	55.8	40,146	84.7
Belgium	Colliery	2	—	5	1	6	1,235	932	1.5	970	96.0
	Steelworks	10	—	32	1	33	6,646	5,107	8.4	5,640	90.5
	Indep.	2	—	3	—	3	784	595	1.0	655	90.8
		14	—	40	2	42	8,665	6,634	10.9	7,266	91.3
France	Colliery	9	2	49	1	50	10,220	8,039	13.2	9,126	88.1
	Steelworks	10	2	39	—	39	5,504	4,183	6.9	4,415	94.7
		19	4	88	1	89	15,724	12,222	20.1	13,542	90.3
Italy	Steelworks	5	—	19	—	19	5,007	3,966	6.5	4,320	91.8
	Indep.	4	—	20	1	21	2,835	2,179	3.6	2,548	85.5
		9	—	39	1	40	7,842	6,145	10.1	6,868	89.5
Netherlands	Steelworks	1	—	7	1	8	1,488	1,173	1.9	1,200	97.8
	Indep.	1	—	2	—	2	896	696	1.2	696	100.0
		2	—	9	1	10	2,384	1,869	3.1	1,896	98.6
Community	Colliery	52	4	237	11	248	50,951	38,469	63.1	44,774	85.9
	Steelworks	32	5	125	8	133	24,534	18,933	31.1	21,045	90.0
	Indep.	7	—	25	1	26	4,515	3,470	5.8	3,899	89.0
		91	9	387	20	407	80,000	60,872	100.0	69,718	87.3

(1) Top-charging.
(2) Stamping.
(3) Estimate of batteries under repair or closed down but capable of being recommissioned (number closed down: 10).
(4) Not including coking closed plants down in 1967 and 1968; this accounts for the statistical differences in coke production in Table 13.

Table 15 — Input for Coking and Coke Production

	Colliery-owned coking plants				Steelworks-owned coking plants			
	Coal input			Coke production	Coal input			Coke production
	Grades V + VI	Other grades	Total		Grades V + VI	Other grades	Total	
A — Year 1960								
Germany	49,104	681	49,785	37,082	8,759	1,170	9,929	7,533
Belgium	1,321	340	1,661	1,301	3,823	2,705	6,528	5,039
France	8,823	1,034	9,857	7,708	5,284	507	5,791	4,362
Italy	—	—	—	—	2,144	250	2,394	1,944
Netherlands	3,883	—	3,883	3,024	1,139	—	1,139	912
Community	63,131	2,055	65,186	49,115	21,149	4,632	25,781	19,790
B — Year 1967								
Germany	38,581	2,446	41,027	30,564	5,264	803	6,067	4,602
Belgium	982	261	1,243	932	6,334	312	6,646	5,107
France	9,675	917	10,592	8,039	5,001	508	5,509	4,183
Italy	—	—	—	—	4,661	346	5,007	3,966
Netherlands	1,883	—	1,883	1,445	1,488	—	1,488	1,173
Community	51,121	3,624	54,745	40,980	22,748	1,969	24,717	19,031

Note. The figures in this table are based on a special enquiry; hence slight differences compared with the figures in other tables were unavoidable.

(Thousands of tons)

Independent coking plants				All coking plants				
Coal input			Coke production	Coal input			Coke production	
Grades V + VI	Other grades	Total		Grades V + VI	Other grades	Total		
A — Year 1960								
—	—	—	—	57,863	1,851	59,714	44,615	Germany
1,549	19	1,568	1,199	6,693	3,064	9,757	7,539	Belgium
2,029	392	2,421	1,862	16,136	1,933	18,069	13,932	France
1,961	—	1,961	1,781	4,105	250	4,355	3,725	Italy
800	—	800	620	5,822	—	5,822	4,556	Netherlands
6,339	411	6,750	5,462	90,619	7,098	97,717	74,367	Community
B — Year 1967								
—	—	—	—	43,845	3,249	47,094	35,166	Germany
829	3	832	627	8,145	576	8,721	6,666	Belgium
532	26	558	424	15,208	1,451	16,659	12,646	France
2,835	37	2,872	2,179	7,496	383	7,879	6,145	Italy
896	—	896	696	4,267	—	4,267	3,314	Netherlands
5,092	66	5,158	3,926	78,961	5,659	84,620	63,937	Community

Table 16 — Survey of the Coke Industry in the UK and the USA[1]

(1,000 tons)

	USA			UK		
	Coke input	Coke production	Coke/coal ratio	Coke input	Coke production	Coke/coal ratio
Gasworks	..	..	..	16.2	7.0	1:2.31
Colliery-owned coking plants	—	—	—	6.1	4.0	1:1.53
Steelworks-owned coking plants	75.2	52.3	1:1.44	15.6	10.5	1:1.49
Independent coking plants	7.8	5.6	1:1.39	—	—	—
Beehive ovens	1.2	0.7	1:1.71	—	—	—
Total	84.2	58.6	1:1.44	37.9	21.5	1:1.76

Coke sales	USA Quantity	USA %	UK Quantity	UK %
Gasworks own consumption	..	..	0.6	2.9
Blast furnaces	51.3	85.6	10.1	48.1
Foundries	2.6	4.3	..	..
Other industries	1.1	1.8	5.6	26.7
Domestic sector	0.1	0.3	4.2	20.0
Coke dust	3.6	6.0	..	..
Other users	0.6	1.0	—	—
Exports	0.6	1.0	0.5	2.3
Total	59.9	100.0	21.0	100.0

(1) Since the figures come from different sources, they do not always agree with those in Table 3.

Table 17 — Calculation of US Coking Plants' Costs and Sales Proceeds

1967

	1,000 sh. tons		1,000 metr. tons
Coal consumption	92,800		84,170
Coke production	64,580		58,574
Coke yield		69.6%	
Quantitative coke/coal ratio = 1: 1.44			

	Sums	Per ton coke produced	Per ton coal input
	$1,000	$	$
A) *Costs*			
a) Coal input costs	924,721	15.79	10.99
b) Coking costs including profit	520,109	8.88	6.18
Value	1,444,830	24.67	17.17
B) *Sales proceeds*			
a) Coke	1,152,251	19.67	13.69
b) Coke by-products	292,579	5.00	3.48
Value	1,444,830	24.67	17.17
C) *Results*			
a) Extent to which coal input costs covered by proceeds of coke sales	+227,530	+3.88	+2.70
b) Extent to which coking costs not covered by proceeds of sales of coke by-products	—227,530	—3.88(1)	—2.70

(1) Estimate

Trend of sales proceeds	1963	1966
Coke	19.85	19.29
Coke by-products	5.16	5.17
	25.01	24.46

Table 18 — Calculation of British Colliery-owned Coking Plants' Costs and Sales Proceeds
1967([1])

	1,000 metr. tons	
Coal input	5,994	
Coke production	3,944	
Coke yield		65.8%
Quantitative coke-coking coal ratio = 1: 1.52		

	Sums	Per ton coke produced	Per ton coal input
	$1,000	$	$
A) *Costs*			
a) Coal input costs	81,250	20.60	13.56
b) Coking costs([2])	40,315	10.22	6.71
Total (a + b)	121,565	30.83	20.27
B) *Sales proceeds*			
a) Coke	93,530	23.71	15.60
b) Coke by-products	28,983	7.35	7.84
Total (a + b)	122,513	31.06	20.44
C) *Results*			
a) Extent to which coal consumption costs covered by proceeds of coke sales	+12,280	+3.11	+2.04
b) Extent to which coking costs not covered by proceeds of sales of coke by-products	—11,332	—2.87	—1.87

([1]) Financial year 1967/68. Monetary data converted on basis of £1 = $2.40; Quantitative data in metric tons.
([2]) Including proportion of interest service due to the Ministry of Power; estimated on the basis of capital investment.

Table 19 — Calculation of Community Mine-owned Coking Plants' Costs and Sales Proceeds [1] in 1967 (u.a. per ton of coke produced)

	Ruhr	Lorraine	Nord/ Pas-de-Calais	Belgium
A. Costs:				
a) Coal input costs	20.15	21.14	19.31	20.50
b) Coking costs	8.70	8.65	7.69	9.10
Total A	28.85	29.79	27.00	29.60
B. Sales proceeds:				
Coke	20.00	19.71	19.60	19.90
Coke by-products	6.50	7.46	7.10	8.70
Total B	26.50	27.17	26.70	28.60

[1] Partly own calculations.

Table 20 — Trend of Coal and Coke Prices

(u.a./ton) [2]

Origin	Coking fines			Blast-furnace coke		
	April 1960	January 1967	January 1969	April 1960	January 1967	January 1969
A. *Community*[1]						
Ruhr	14.47	16.68	16.50	19.07	21.89	21.65
Aachen	15.94	18.24	18.13	20.88	24.24	24.24
Saar	15.66	17.76	17.58	21.71	23.28	23.03
Belgium	14.60	15.20	15.20	22.80	23.50	25.50
Nord/Pas-de-Calais	14.08	14.59	14.59	19.66	20.26	20.26
Lorraine	14.18	14.79	14.79	21.48	21.99	21.99
Netherlands	13.42	15.33	—	18.55	21.55	—
B. *Imported coal*						
USA[3]: Pocahontas	..	15	16	—	—	—
Mixture	13.10	14	15.50	—	—	—
Poland	—	13	13.80	—	—	—

[1] Prices and schedules less turnover tax.
[2] Converted into u.a. at prevailing exchange rates.
[3] Cif prices ARA less turnover tax, on the basis of spot prices in the USA.

Table 21 — Coke Batteries in Community Countries by Types of Coking Plant and Lifetime Groups (1)

Country	Type of coking plant	Age Groups 0 - 5 Number	0 - 5 Capacity 1969 1,000 t	6 - 10 Number	6 - 10 Capacity 1969 1,000 t	11 - 15 Number	11 - 15 Capacity 1969 1,000 t	16 - 20 Number	16 - 20 Capacity 1969 1,000 t
Germany	Colliery	8	1,295	47	9,135	60	9,812	53	9,595
	Steelworks	—	—	6	1,101	7	1,416	3	974
	Total	8	1,295	53	10,236	67	11,228	56	10,569
	% capacity		3.2		25.6		28.1		26.4
Belgium	Colliery	—	—	2	352	1	206	—	—
	Steelworks	3	526	5	653	6	1,008	10	2,030
	Indep.	—	—	1	193	2	462	—	—
	Total	3	526	8	1,198	9	1,676	10	2,030
	% capacity		7.2		16.5		23.1		27.9
France	Colliery	2	382	16	2,686	17	3,232	11	2,088
	Steelworks	4	364	8	927	10	1,107	14	1,907
	Total	6	746	24	3,613	27	4,339	25	3,995
	% capacity		5.5		26.5		31.9		29.3
Italy	Steelworks	5	1,625	7	1,623	3	346	4	729
	Indep.	5	737	1	147	7	722	5	698
	Total	10	2,362	8	1,770	10	1,068	9	1,427
	% capacity		33.9		25.4		15.3		20.5
Netherlands	Steelworks	2	368	2	368	2	306	1	144
	Indep.	1	350	2	346	—	—	—	—
	Total	3	718	4	714	2	306	1	144
	% capacity		36.0		35.8		15.3		7.2
Community	Colliery	10	1,677	65	12,173	78	13,250	64	11,683
	Steelworks	14	2,882	28	4,672	28	4,183	32	5,784
	Indep.	6	1,087	4	686	9	1,184	5	698
	Total	30	5,647	97	17,531	115	18,617	101	18,165
	% capacity		8.1		25.1		26.7		26.0

(1) As these figures are derived from a special survey, they do not agree exactly with those in Table 14.

f Batteries (Years)						Total		Sahre of various coking plant types in capacity (%)	
21 - 25		26 - 30		31 and over					
Number	Capacity 1969 1,000 t	Number	Capacity 1969 1,000 t	Number	Capacity 1969 1,000 t	Number	Capacity 1969 1,000 t		
10	1,956	7	1,816	3	979	188	34,588	86.5	Germany
6	708	6	930	2	257	30	5,386	13.5	
16	2,664	13	2,746	5	1,236	218	39,974	100.0	
	6.7		6.9		3.1		100.0		
—	—	—	—	2	412	5	970	13.4	Belgium
2	522	2	280	5	620	33	5,639	77.6	
—	—	—	—	—	—	3	655	9.0	
2	522	2	280	7	1,032	41	7,264	100.0	
	7.2		3.9		14.2		100.0		
1	324	—	—	2	197	49	8,909	65.4	France
3	408	—	—	—	—	39	4,713	34.6	
4	732	—	—	2	197	88	13,622	100.0	
	5.4		—		1.4		100.0		
—	—	—	—	—	—	19	4,323	62.0	Italy
3	342	—	—	—	—	21	2,646	38.0	
3	342	—	—	—	—	40	6,969	100.0	
	4.9		—		—		100.0		
—	—	—	—	1	114	8	1,300	65.1	Netherlands
—	—	—	—	—	—	3	696	34.9	
—	—	—	—	1	114	11	1,996	100.0	
	—		—		5.7		100.0		
11	2,280	7	1,816	7	1,588	242	44,467	63.7	Community
11	1,638	8	1,210	8	991	129	21,361	30.6	
3	342	—	—	—	—	27	3,997	5.7	
25	4,260	15	3,026	15	2,579	398	69,825	100.0	
	6.1		4.3		3.7		100.0		

Table 22 — Trend of Coal Deliveries to Consumers in the Community

(Millions of tons)

	1960	1963	1967	1968 (4)
Consumption for briquette-making	13.3	17.9	10.0	9.9
Consumption for coking:				
in coking plants	98.2	94.2	85.0	86.6
in gasworks	9.3	8.5	4.2	3.5
Consumption for electricity production (1)	45.5	56.9	57.3	56.6
Pits' own consumption	9.6	8.2	5.5	5.0
Steel industry	3.8	3.6	3.2	4.0
Other industries (2)	34.7	32.0	19.5	18.4
Transport	12.4	10.7	3.9	3.3
Domestic sector (3)	26.6	33.3	20.9	20.0
Other consumers	4.9	5.9	3.8	3.4
Total	258.3	279.2	213.3	210.7
of which:				
— coal imported from non-member countries	17.9	34.0	24.3	21.7
— Community coal	240.4	237.2	189.0	189.0

(1) Including colliery-owned power plants, but not other industrial power plants.
(2) Including industrial power plants.
(3) Including concessionary coal.
(4) Provisional annual figures.

Table 23 — Trend of Coal Production(1) in the Community by Types of Coal (t = t)

(1,000 tons)

Coalfield/country	1960				1967			
	Grade V + VI (2)	Grade I + II	Other grades	Total	Grade V + VI (2)	Grade I + II	Other grades	Total
Aachen	2.1	2.8	3.7	8.6	1.5	2.4	3.4	7.3
Ruhr	106.4	8.6	4.8	119.8	84.5	7.8	2.2	94.5
Saar	12.7	—	3.5	16.2	8.0	—	4.4	12.4
Lower Saxony	0.3	1.0	1.2	2.5	—	1.2	1.1	2.3
Germany	121.5	12.4	13.2	147.1	94.0	11.4	11.1	116.5
Campine	9.4	—	—	9.4	8.8	—	—	8.8
Southern Belgium	2.3	8.0	2.8	13.1	0.6	5.7	1.3	7.6
Belgium	11.7	8.0	2.8	22.5	9.4	5.7	1.3	16.4
Nord/Pas-de-Calais	15.4	8.6	4.9	28.9	11.9	8.9	2.6	23.4
Lorraine	12.5	—	2.2	14.7	12.6	—	2.4	15.0
Centre-Midi	7.0	3.6	1.5	12.1	4.5	3.1	1.5	9.0
France	34.9	12.2	8.6	55.7	29.0	12.0	6.5	47.5
Netherlands	6.4	5.1	1.3	12.8	1.3	6.0	1.0	8.3
Italy	0.0	0.0	0.7	0.7	0.0	—	0.4	0.4
Community	174.5	37.7	26.6	238.8	133.7	35.1	20.3	189.1

(1) Not including small mines.
(2) For meaning of the term "coking coal" see Introduction.

Table 24 — Index of Trend of Coal Production[1] in the Community by Types of Coal

1967 (1960 = 100)

Coalfield/Country	Grade		Other grades	Total
	V + VI	I + II		
Aachen	71.4	85.7	91.9	84.9
Ruhr	79.4	90.7	45.8	78.9
Saar	63.0	—	125.7	76.5
Lower Saxony	—	120.0	91.7	92.0
Germany	77.4	91.9	84.1	79.2
Campine	93.6	—	—	93.6
Southern Belgium	26.1	71.3	46.4	58.0
Belgium	80.3	71.3	46.4	72.9
Nord/Pas-de-Calais	77.3	103.5	44.1	81.0
Lorraine	100.8	—	109.1	102.0
Centre-Midi	64.3	86.1	100.0	75.2
France	83.1	98.4	75.6	85.3
Netherlands	20.3	117.6	76.9	64.8
Italy	—	—	57.1	57.1
Community	76.6	93.1	76.3	79.2

(1) Calculated on the basis of Table 23.

Table 25 — Intra-Community Coal Exchanges in 1960

(1,000 tons)

Customer / Supplier	Germany	France	Belgium	Italy	Nether-lands	Luxem-bourg	Com-munity
Germany	—	6,651	2,019	3,242	2,754	154	14,820
France	606	—	232	37	49	48	972
Belgium	183	641	—	274	761	38	1,897
Italy	—	—	—	—	—	—	—
Netherlands	319	939	717	20	—	5	2,000
Luxembourg	—	—	—	—	—	—	—
Community	1,108	8,231	2,973	3,573	3,564	245	19,689

Table 26 — Intra-Community Exchange of Hard Coal in 1967

(1,000 tons)

Customer / Supplier	Germany	France	Belgium	Italy	Nether-lands	Luxem-bourg	Com-munity
Germany	—	5,808	2,914	2,866	4,582	51	16,221
France	355	—	152	16	130	5	658
Belgium	227	332	—	5	820	2	1,386
Italy	—	—	—	—	—	—	—
Netherlands	151	536	1,133	26	—	13	1,859
Luxembourg	—	—	—	—	—	—	—
Community	733	6,676	4,199	2,913	5,532	71	20,124

Table 27 — Intra-Community Coal Exchanges in 1968[1]

(1,000 tons)

Supplier \ Customer	Germany	France	Belgium	Italy	Nether-lands	Luxem-bourg	Com-munity
Germany	—	5,984	3,741	3,360	4,944	52	18,081
France	377	—	290	20	107	6	800
Belgium	220	607	—	5	256	1	1,089
Italy	—	—	—	—	—	—	—
Netherlands	196	556	1,024	15	—	11	1,802
Luxembourg	—	—	—	—	=	—	—
Community	793	7,147	5,055	3,400	5,307	70	21,772

(1) Provisional figures.

Table 28 — Intra-Community Coke Exchanges in 1960

(1,000 tons)

Supplier \ Customer	Germany	France	Belgium	Italy	Nether-lands	Luxem-bourg	Com-munity
Germany	—	3,881	70	34	320	3,520	7,825
France	7	—	13	26	—	—	46
Belgium	30	371	—	88	—	237	726
Italy	—	2	—	—	—	—	2
Netherlands	372	816	163	11	—	383	1,745
Luxembourg	—	—	—	—	—	—	—
Community	409	5,070	246	159	320	4,140	10,344

Table 29 — Intra-Community Coke Exchanges in 1967

(1,000 tons)

Supplier \ Customer	Germany	France	Belgium	Italy	Nether-lands	Luxem-bourg	Com-munity
Germany	—	2,611	55	229	130	2,505	5,530
France	8	—	24	18	12	—	62
Belgium	109	186	—	2	3	378	678
Italy	—	—	—	—	—	—	—
Netherlands	341	440	652	2	—	362	1,797
Luxembourg	—	—	—	—	—	—	—
Community	458	3,237	731	251	145	3,245	8,067

Table 30 — Intra-Community Coke Exchanges in 1968(1)

(1,000 tons)

Supplier \ Customer	Germany	France	Belgium	Italy	Nether-lands	Luxem-bourg	Com-munity
Germany	—	2,882	504	180	369	2,864	6,799
France	26	—	57	20	10	—	113
Belgium	52	171	—	2	3	358	584
Italy	—	28	—	—	—	—	28
Netherlands	173	242	688	3	—	271	1,377
Luxembourg	—	—	—	—	—	—	—
Community	251	3,323	1,249	203	382	3,493	8,901

(1) Provisional figures.

Table 31 — Imports of Hard Coal from non-member Countries

Purchases \ Deliveries		1964	1965	1966	1967	1968(1)	1964	1965	1966	1967
		United States					Poland			
Germany	1 000 t	6,285	6,471	6,039	6,124	4,363	365	380	389	376
	Index	100.0	103.0	96.1	97.4	69.4	100.0	104.1	106.6	103.0
Belgium	1 000 t	1,784	1,947	1,615	1,213	939	58	259	164	223
	Index	100.0	109.1	90.5	68.0	52.6	100.0	446.6	282.8	384.5
France	1 000 t	2,015	1,916	1,742	2,154	1,678	542	472	556	651
	Index	100,0	95.1	86.5	106.9	83.3	100,0	87.1	102.6	120.1
Italy	1 000 t	7,189	8,383	7,253	5,304	3,867	425	437	779	1,345
	Index	100.0	116.6	100.9	73.8	53.8	100.0	102.8	183.3	316.5
Luxembourg	1 000 t	—	—	—	—	—	—	—	—	—
Netherlands	1 000 t	3,187	2,205	1,872	1,096	999	223	221	169	206
	Index	100.0	69.2	58.7	34.4	31.3	100.0	99.1	75.8	92.4
Community	1 000 t	20,460	20,922	18,521	15,891	11,846	1,613	1,769	2,057	2,801
	Index	100.0	102.3	90.5	77.7	57.9	100.0	109.7	127.5	173.7

(1) Provisional figures.

(1.000 tons)

4	1965	1966	1967	1968(1)	1964	1965	1966	1967	1968(1)	**Deliveries** / **Purchases**	
Other non-member countries					Total						
305	745	612	578	864	7,455	7,596	7,040	7,078	5,735	1 000 t	Germany
).0	92.5	76.0	71.8	107.8	100.0	101.9	94.4	94.9	76.9	Index	
355	533	324	224	307	3,197	2,739	2,103	1,660	1,566	1 000 t	Belgium
).0	39.3	23.9	16.5	22.7	100.0	85.7	65.8	51.9	49.0	Index	
287	2,625	2,271	2,090	1,724	5,844	5,013	4,569	4,895	4,203	1 000 t	France
).0	79.9	69.1	63.6	52.4	100.0	85.8	78.2	83.8	71.9	Index	
786	1,394	1,948	2,444	2,211	9,400	10,214	9,980	9,093	8,168	1 000 t	Italy
).0	78.1	109.1	136.8	123.8	100.0	108.7	106.2	96.7	86.9	Index	
4	4	2	—	—	4	4	2	—	—	1 000 t	Luxembourg
741	1,088	461	244	681	5,151	3,514	2,502	1,546	1,917	1 000 t	Netherlands
).0	62.5	26.5	14.0	39.1	100,0	68.2	48.6	30.0	37.2	Index	
978	6,389	5,618	5,580	5,787	31,051	29,080	26,196	24,272	21,589	1 000 t	Community
).0	71.2	62.6	62.2	64.5	100.0	93.7	84.4	78.2	69.5	Index	

Table 32 — Community Coal Production[1]

(t = t)

(Millions of tons)

Coalfield	1960	1968	1972	1975	1980
Aachen	8.6	7.6	..	..	..
Ruhr	119.8	95.6	..	..	..
Saar	16.2	11.3	10.5	9.0[3]	..
Lower Saxony	2.5	2.5	..	2.0	..
Germany	147.1	117.0	106.0[2]	..	..
Campine	9.4	8.5	7.0	5.5	..
Southern Belgium	13.1	6.3	3.5-4.0	3.5	..
Belgium	22.5	14.8	10.5-11.0	9.0	..
Nord/Pas-de-Calais	28.9	19.7	15.5	10.0	..
Lorraine	14.7	13.8	12.5	12.0	..
Centre-Midi	12.1	8.4	5.0	3.0	..
France	55.7	41.9	33.0	25.0	..
Netherlands	12.8	6.9	3.0	1.5	..
Italy	0.7	0.4	0.4	0.4	..
Community	238.8	181.0	152.9-153.4	..	..

(1) Not including small mines.
(2) Estimated from the forecasts of the Federal Commissioner for the Coalmining Industry, on the assumption of constant coal imports.
(3) Target figure in second General Plan for the Saar.

Table 33 — Probable Coking Plant Structure and Coking Coal Production in the Community Coalfields in 1972([1])

Coalfield	Steel industry's blast furnace coke consumption([2]) (1967) Millions of tons	Coking plant capacities in millions of tons of coke (1972)				Estimated coking coal production (1972) Millions of tons
		Colliery-owned coking plants	Steelworks-owned coking plants	Independent coking plants	Total	
Germany						
Ruhr, Lower Saxony	12.7	28.4	4.3	—	32.7	72.0
Saar	2.1	1.8	3.2	—	5.0	6.5
Aachen	—	2.0	—	—	2.0	1.5
North-German coast	0.7	—	0.5	—	0.5	—
Southern Germany	0.8	—	—	—	—	—
Total	16.3	32.2	8.0	—	40.2	80.0
France						
Lorraine	7.5	2.8	3.6	—	6.4	2.5([3])
Nord/Pas-de-Calais	1.7	5.2	0.3	—	5.5	5.0
Coastal areas	1.8	—	1.5	—	1.5	—
Centre Midi	0.1	0.9	—	—	0.9	0.3
Total	11.1	8.9	5.4	—	14.3	8.0([3])
Belgium						
Interior	5.4	1.0	5.6	0.3	6.9	6.5
Coastal areas	0.2	—	—	0.3	0.3	—
Total	5.6	1.0	5.6	0.6	7.2	6.5
Italy	3.9	—	5.3	2.6	7.9	—
Netherlands	1.4	—	2.0	0.7	2.7	—
Luxembourg	3.1	—	—	—	—	—
Community	41.4	42.1	26.3	3.9	72.3	94.5

([1]) Estimated values.
([2]) Not including sintering coke.
([3]) Data supplied by Charbonnages de France; input for coking.

Table 34 — Coke Deliveries to Community Blast-Furnaces

1

Country	Coking plants	Count					
		Germany		France		Italy	
		1967	1968	1967	1968	1967	196
		1,000 t					
Germany	Colliery	10,182	11,342	2,302	2,544		
	Steelworks	6,162	5,987	—	—		
	Total	16,344	17,329	2,302	2,544		
France	Colliery			4,602	4,778		
	Steelworks			3,688	3,586		
	Indep.			153	76		
	Total			8,443	8,440		
Italy	Steelworks					3,349	3,4
	Indep.					280	2
	Total					3,629	3,7
Netherlands	Colliery			21	—		
	Steelworks			—	—		
	Indep.			287	154		
	Total			308	154		
Belgium	Colliery			—	—		
	Steelworks			—	—		
	Indep.			28	21		
	Total			28	21		
Community	Colliery	10,182	11,342	6,925	7,322	—	—
	Steelworks	6,162	5,987	3,688	3,586	3,349	3,4
	Indep.	—	—	468	251	280	2
	Total	16,344	17,329	11,081	11,159	3,629	3,7
	% =	39.7	39.9	26.9	25.6	8.8	8.

(1) 1967 : provisional figures; 1968: partly estimates.

(1)

ination

Netherlands		Belgium		Luxembourg		Community			
1967	1968	1967	1968	1967	1968	1967		1968	
1,000 t						1,000 t	%	1,000 t	%
	210	1	377	2,587	2,649	14,872	36.2	17,122	39.3
	—	—	—	—	—	6,162	15.0	3,987	13.8
	210	1	377	2,587	2,649	21,034	51.2	23,109	53.1
		9	25			4,611	11.2	4,803	11.0
		—	—			3,688	9.0	3,586	8.2
		—	—			153	0.4	76	0.2
		9	25			8,452	20.6	8,465	19.4
						3,349	8.1	3,460	7.9
						280	0.7	293	0.7
						3,629	8.8	3,753	8.6
254	148	325	213	354	266	954	2.3	627	1.4
1,050	1,170	—	—	—	—	1,050	2.6	1,170	2.7
—	—	192	317	—	—	479	1.1	471	1.1
1,304	1,318	517	530	354	266	2,483	6.0	2,268	5.2
		321	328	229	265	550	1.3	593	1.4
		4,602	4,989	101	—	4,703	11.4	4,989	11.5
		220	241	45	96	293	0.7	358	0.8
		5,143	5,558	375	361	5,546	13.4	5,940	13.7
254	358	656	943	2,970	3,180	20,987	51.0	23,145	53.1
1,050	1,170	4,602	4,989	101	—	18,952	46.1	19,192	44.1
—	—	412	558	45	96	1,205	2.9	1,198	2.8
1,304	1,528	5,670	6,490	3,116	3,276	41,144	100.0	43,535	100.0
3.2	3.5	13.8	14.9	7.6	7.5	100.0	100.0	100.0	

Table 35 — Approximate Coal Equivalent for the Community Steel Industry's Coke and Coke-Dust Consumption in 1967-1968 Based on the Commission's Own Calculations

(millions of tons)

Supplier country and coalfield	Year	Country of destination						Community			
		Germany	France	Italy	Netherlands	Belgium	Luxembourg	Total	%		%
I — *Community*											
Ruhr	1967	19.4	4.3	1.8	0.6	1.5	1.2	28.8	51.2	9.4	68.6
	1968	20.6	5.1	1.9	1.2	2.4	1.6	32.9	54.0	12.2	73.3
Saar	1967	2.0	1.1	—	—	—	0	3.1	5.5	1.1	8.3
	1968	2.1	1.4	—	—	0	0	3.7	6.0	1.5	9.2
Aachen	1967	0.4	0.3	—	—	0	2.0	2.6	4.7	2.2	16.3
	1968	0.5	0.1	—	—	0	2.0	2.6	4.3	2.1	12.6
Germany	1967	21.8	5.7	1.8	0.6	1.6	3.2	34.5	61.4	12.8	93.2
	1968	23.2	6.6	1.9	1.2	2.5	3.7	39.1	64.3	15.9	95.1
HBL	1967	—	4.0	—	—	0	—	4.0	7.2	0	0.1
	1968	—	3.6	—	—	0	—	3.6	5.9	0	0.2
HNPC	1967	—	3.1	—	—	—	—	3.1	5.4	—	—
	1968	—	3.1	—	—	—	—	3.1	5.0	—	—
France	1967	—	7.1	—	—	0	—	7.1	12.6	0	0.1
	1968	—	6.6	—	—	0	—	6.6	10.9	0	0.2
Campine	1967	—	0.1	—	0.1	4.4	0.4	5.0	8.9	0.6	4.4
	1968	—	0.4	—	0.1	4.4	0.2	5.1	8.4	0.7	3.9
Southern Belgium	1967	—	—	—	—	0.3	0	0.4	0.6	0	0.2
	1968	—	—	—	—	0.3	—	0.3	0.6	—	—
Belgium	1967	—	0.1	—	0.1	4.7	0.4	5.4	9.5	0.6	4.6
	1968	—	0.4	—	0.1	4.8	0.2	5.4	9.0	0.7	3.9
Netherlands	1967	—	0	—	0.2	0.2	0.1	0.5	0.9	0.3	2.1
	1968	—	—	—	0.2	0.1	—	0.3	0.5	0.1	0.8
Community	1967	21.8	12.9	1.8	0.9	6.5	3.7	47.5	84.4	13.7	100.0
	1968	23.2	13.7	1.9	1.4	7.4	3.9	51.5	84.7	16.7	100.0
II — *Non-member Countries*											
USA	1967	—	1.4	4.2	1.0	0.7	0.5	7.8	13.8		
	1968	—	1.0	3.5	1.3	0.6	0.5	6.9	11.4		
Poland	1967	—	0.0	0.2	0.1	0.1	0	0.4	0.7		
	1968	—	0.1	1.1	0.1	0.2	0	1.6	2.6		
U.S.S.R.	1967	—	—	0.6	—	—	—	0.6	1.1		
	1968	—	—	0.8	—	—	—	0.8	1.3		
Total Countries	1967	—	1.4	5.0	1.1	0.8	0.5	8.8	15.6		
	1968	—	1.1	5.4	1.5	0.8	0.5	9.3	15.3		
Total I + II — Mill. t	1967	21.8	14.3	6.8	2.0	7.3	4.2	56.3	100.0		
	1968	23.2	14.8	7.3	2.9	8.2	4.4	60.8	100.0		
%	1967	38.7	25.3	12.1	3.5	13.0	7.4	100.0			
	1968	38.2	24.3	12.0	4.8	13.5	7.2	100.0			

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