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**SECURITY INFORMATION**

Poland's Coal and Steel Production

(as of mid-June 1952)



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**SECRET**POLAND'S COAL AND STEEL PRODUCTIONIntroduction

In the evaluation of the economic (and military) potential of a country, coal and steel are two of the fundamental factors. The production of these shows largely to what extent the country, based on its own, or easily obtained, raw materials, is able to carry through a domestic industrial expansion and/or to compete in the world markets as an economically important factor.

Poland, producing 7 percent of the world's coal, holds therefore a significant place in the present European economy. Only two countries (England and West Germany) are able to produce more coal. As an exporter of coal, Poland is even the most important nation. On the other hand, Poland is very much dependent on imports of iron ore, since the domestic production is able to cover only 10-15 percent of the consumption. Even considerable planned expansion of iron ore output under the 6-Year Plan (1950-1955) will cover only a further 10-15 percent of the need in 1955, because the iron and steel-consuming industries are also to be considerably expanded under the 6-Year Plan. Therefore, Poland's greatest procurement problem today is to obtain iron ore in exchange for its surplus production of coal.

1. Depositsa. Coal

Within the present boundaries of Poland, coal is found in two areas: Upper Silesia (Oberschlesien) and Lower Silesia (Unterschlesien) on the northern slopes of the Sudeten Mountains,

Before the war, Poland held an area of 2,200 square kilometers of the Upper Silesian coal fields, while Germany held the remaining 600 square kilometers in addition to the whole of the Lower Silesian field.

The coal fields of Upper Silesia lie north of the present Polish-Czech border, between the rivers Oder and Vistula, where the distance between the rivers is the shortest

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In the northern part, coal is mined at depths of from 20 to 300 meters. Farther south, coal is found at depths down to 2,000 meters. These figures,

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however, apply to known seams only. Probable seams in the whole territory are estimated to reach to a depth of 2,700 meters in the eastern part and 6,900 [sic] meters in the western part. Known seams in the fields of Upper Silesia are estimated to contain 20.5 billion tons of coal; the probable seams are estimated to contain 170 billion tons.

The Lower Silesian coal fields border on the present Polish-Czech boundary south of the town of Walbrzych. The seams here are very irregular, but generally lie at depths of less than 300 meters. Known seams are estimated to contain 1.24 billion tons; probable seams, a bare 3 billion tons.

The main difference between the two coal-bearing regions is that the coal of Upper Silesia, flame coal, is suitable only for fuel and not for the production of coke. The Lower Silesian fields contain bituminous coal.

b. Iron Ore

Iron ore is found in Poland in the region west of Czestochowa and in the area north and northeast of Kielce. Further scattered occurrences are found north of Rzeszow

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The probable fields are estimated to contain 59 million tons of iron ore, and the potential reserves, 30 million tons. The ore, however, is of a rather poor grade, the average content of iron being only 35 percent.

At Zabkowice southeast of Walbrzych there is a single deposit of magnetite; this iron ore contains 50 percent iron. This deposit, however, produces less than 10 percent of the total Polish production of iron ore.

Lastly, northwest of Walbrzych and east of Kielce occur deposits of pyrite containing about 50 percent sulfur and up to 45 percent iron. The production from these deposits is comparable to that from the magnetite deposits.

c. Other Raw Materials for the Production of Steel

The materials most important for the production of steel are nickel, chromium, manganese, vanadium, molybdenum, cadmium, and wolfram. These materials are added to the raw iron to impart the qualities necessary for the varied uses for which steel is employed.

Only insignificant quantities of manganese are found in Poland, these in

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fields south of Rzeszow and south of Kielce. Small quantities of nickel are found with the magnetite southeast of Walbrzych.

The remaining important minerals do not occur in Poland, except cadmium in the very large zinc deposits (cadmium content of 0.1-0.3 percent).

## 2. The Production of Coal and Iron Ore

### a. Coal

When Poland was established as a nation following the first World War, she received, through the demarcation of her boundaries, territories from Germany, Russia, and Austria-Hungary comprising several thousand square kilometers containing rich coal fields. This, at one stroke, made Poland third in importance among the coal-producing countries of Europe, following England and Germany.

In the years between the two world wars, the production of coal within the present boundaries of Poland was as follows, distributed between the territories received after World Wars I and II:

Table 1

### The Production of Coal within the Present Boundaries of Poland, 1913-1944

(in 1,000 tons)

<u>Coal Districts</u>	<u>1913</u>	<u>1923</u>	<u>1925</u>	<u>1932</u>	<u>1935</u>	<u>1938</u>	<u>1940</u>	<u>1940</u>
Krakov 1)	1,971	2,048	1,692	1,832	1,981	2,642	—x	} 14,716
Dombrowa 2)	6,834	7,419	5,729	5,502	5,428	6,696	—	
Polish Upper Silesia 3)	32,344	26,480	21,433	21,451	21,132	28,740		39,869
Teschen 4)	184	165	226	4a)	—	—	—	—
Poland (1938 borders)	41,333	36,112	29,080	28,785	28,541	38,087	—	44,585
German Upper Silesia 5)	11,091	8,745	14,274	15,278	19,042	25,983	26,390	28,572
German Lower Silesia 5)	—	—	—	4,232	4,770	5,307	4,949	4,320
Poland (1945 borders)	—	—	—	48,925	52,353	69,377	—	77,477

1) 1913-1919 Austria-Hungary, 1919-1938 Poland. 2) 1913-1918 Russia, 1919-1938 Poland. 3) 1913-1922 Germany, 1923-1938 Poland. 4) 1913-1921 Austria-Hungary, 1922-1938 Poland. 4a) From 1932 included in Polish Upper Silesia. 5) 1913-1944 Germany. —x) Here and below, no figures.

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Parallelling a steady decline in Poland's coal production during the years between the wars (disregarding the upward swing immediately preceding the war) which was due to the stiff competition in the European market during the economic crisis in the early 1930's, there was, however, an increase in productivity (see next paragraph concerning the emigration of miners in the years between the wars).

With 1927 as the base year, production per worker per day showed the following increase:

<u>Year</u>	<u>Index</u>
1927	100
1929	123.4
1932	130.0
1934	187.6
1935	194.2
1936	198.8

At the same time, within the then existing borders of Poland, the number of mines being worked decreased from 91 in 1925 to 85 in 1932 and to 64 in 1937.

During the war, the Germans carried out a policy of intensive production, during which all rational regard for both materiel and mines was abandoned. During the last years of the war, therefore, there was a considerable decline in productivity, even though production figures showed a steady rise. At the end of the war, destruction of buildings at the mines was 48 percent, and 63 percent of the technic al in the mines and associated factories was damaged or totally destroyed. In addition, a number of mines had been flooded as a result of battle action.

The greatest difficulties facing the Polish coal industry at the end of the war were lack of capital investment in the mines and associated factories and lack of manpower. The mines acquired from Germany accounted for over 40 percent of the coal production. The German miners employed in these mines were moved to Germany as a part of the great population shifts in Poland after the war, and since no less than 60,000 coal miners were involved, Poland had to look around for replacements. This, however, was difficult, because many thousands of Polish miners had emigrated to Germany, Belgium, and France in the years between the wars due to lack of employment in the Polish mines.

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Even though over 50,000 of these workers returned after the war, the shortage was still ~~is~~ felt, owing to the great plans for production. By means of the transfer of workers from agriculture, and thanks also to the workers' own enthusiasm, this difficulty was overcome.

While within the present boundaries of Poland, coal miners numbered 140,000-150,000 in 1938, in 1946 the figure had risen to 190,000-200,000; in 1947 to 201,900; and in 1948 to 205,200. The loss of 60,000 German miners has thus been canceled numerically, though productivity has far from reached the heights attained before the war. Nevertheless, a considerable increase in productivity has occurred in the postwar years. While in 1938 the output per man per day was 1,800 kilograms, the corresponding figure was 860 kilograms in 1946, 1,216 kilograms in 1947, and 1,327 kilograms in 1948. The reason for the low productivity may be partly due to lack of, or poor, equipment.

That poor equipment is a substantial drag on production is plainly shown by the large investments that have been made, or are planned, under the 6-Year Plan. Translated into 1937 values, the following investments in zlotys per ton of mined coal have been made in the postwar years.

<u>Year</u>	<u>1937 zlotys per ton</u>
1938	0.30
1945	0.36
1946	1.03
1947	2.02
1948	2.22
1949	2.50 (planned 2.67)
1950	3.47 (Plan figure)

Under the 6-Year Plan alone, an investment of 250 billion zlotys (current value) is planned, which corresponds to about 2,500 million ~~zlotys~~ zlotys at 1937 value.

[ There appears to be something peculiar here -- the original says that 250 billion (current value) (milliarder) zlotys ~~are~~ more or less equal to 2,500 "mill," zlotys at 1937 value.

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If "mill." is supposed to stand for "million", which seems most reasonable, it means that one 1937 zloty equals 100 <sup>current</sup> ~~current~~ zlotys--

On the other hand, if "mill."

is supposed to stand for "milliard, the abbreviation is most unusual. But that being the case, it means that ten 1937 zlotys equal one current zloty; this is not the case either

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Investments under the 3-Year Plan (1947-1949), which amounted to a total of about 45 billion zlotys at current value, were 10, 15, and 20 billion zlotys respectively for the years 1947, 1948, and 1949. The following table shows the percentagewise distribution of investments in the various segments of the coal mining industry.

Table 2Breakdown of Investments in the Operation of Coal Mines under the 3-Year Plan

(in percentages )

	<u>1947</u>	<u>1948</u>	<u>1949</u>
Underground (excavation, etc)	18.8	27.2	8.4
Underground equipment (machines, etc)	10.9	10.0	30.5
Surface equipment	12.3	5.1	9.8
Loading	8.0	14.5	7.3
Miscellaneous machines for coal processing	3.8	2.7	5.6
Coking plants	8.7	2.4	3.8
Power stations	10.5	6.0	10.3
Balance (Harbor loading equipment, mining equipment factories, etc)	27.0	32.1	24.3
<b>Totals</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

The above table shows plainly the development during the period covered. In 1947, effort was concentrated on rebuilding the mines themselves and the production of the most necessary mining equipment. This production has continued through the three years. At the same time, the work of underground reconstruction was further intensified during 1948, and large investments were made in loading installations and other transport material. During 1949, the main emphasis was

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placed on the installation of the necessary machines underground, while the same for above-ground machines had taken place already in 1947.

As a result of these efforts and investments, the production of coal in the postwar years has been steadily rising, as shown in the following table:

Table 3Poland's Production of Coal after the War

(in millions of tons)

<u>1938<sup>a)</sup></u>	<u>1944<sup>a)</sup></u>	<u>1945</u>	<u>1946</u>	<u>1947</u>		<u>1948</u>	
				planned	attained	planned	attained
69.4	77.5	27.4	47.3	57.5	59.1	67.5	70.3
<u>1949</u>		<u>1950</u>		<u>1951</u>			
planned	attained	planned	attained	planned	attained		
77.5 <sup>b)</sup>	74.1	77.0	78.0	82.0	82.0		

a) Poland's present territory b) This planned figure was changed to 74.0 in 1948.

The number of mines in production was 80 in 1946 and 1947, and 82 in 1948.

The most important coal mining centers in Upper Silesia are: Jaworzno, Dabrowa-Gorniczne, Katowice, Chorzow, Bytom, Zabrze, Gliwice, and Rybnik.

In Lower Silesia the most important centers are near the towns of Walbrzych (four mines) and Nowa Ruda (3 mines).

The following tables are given to furnish an impression of the distribution of production in the coal mines.

Table 41947 Production according to Size of Mines

<u>Annual Production (in 1,000 tons)</u>	<u>Number of Mines</u>
Under 200	4
200-400	14
400-600	17
600-800	16
800-1,000	14
1,000-1,200	7
1,200-1,400	4

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<u>Annual Production (in 1,000 tons)</u>	<u>Number of Mines</u>
1,400-1,600	3
1,600-1,800	1
<b>Total</b>	<b>80</b>

In 1947, the average production per mine amounted to about 740,000 tons, and two-fifths of the mines produced between 400,000 and 800,000 tons. The highest production in a single mine amounted to 1,625,000 tons.

Table 5Production Percentages according to Depth of Extraction

<u>Depth of extraction (in meters)</u>	<u>Percent of Production</u>
Under 100	2.8
100-200	17.5
200-300	24.3
300-400	25.8
400-500	17.6
500-600	7.8
600-700	3.9
700-800	0.3
<b>Total</b>	<b>100.0</b>

Thus, 50 percent of the total production originated at depths of from 200 to 400 meters. In Upper Silesia in 1947, the average depth of extraction was 325 meters.

The thickness of the ~~min~~ coal ~~seams~~ seams varied from 0.6 to 22 meters, but about 50 percent of the production originated from seams of 1-4 meters' thickness.

The 6-Year Plan. In order to attain the production goals set for 1955, 108.4 million tons of coal, considerable expansion, through extensive investments, is necessary. While efforts during the 3-Year Plan were concentrated mainly upon increasing production through increasing the number of workers and mines, the 6-Year Plan provides for, parallel to a continued increase in production, rationalization and extensive mechanization of operations and the installation of new machinery.

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Productivity, for example, is to be increased to 1,800 kilograms per worker per shift, from 1,300-1,400 kilograms before the inception of the plan. Thirty-six existing mines are to undergo a thorough mechanization and electrification of operations and improvement of ventilation conditions. The underground loading of coal alone, regarded as the heaviest work of all mine operations, is to be mechanized up to 66 percent, the percentage of mechanization having been 35 percent in 1950. By means of these improvements and expansions, production in 1955 is to be increased by 14.5 million tons.

The opening of 11 new mines is expected further to increase the production by 9 million tons in 1955. The estimated production of each new mine is 8,000-10,000 tons per day. Construction of three of these 11 mines was begun in 1950, and construction of five more in 1951. The first new mine, Wesola, is to start production in 1953; the next five in 1954, and the last two in 1955. The remaining three mines, on which construction has not yet begun, are not to go into full production until after 1955.

A total of 16,500 meters of shafts and 150,000 meters of drifts are to be dug. Twenty-six coal-digging machines, each of 1,000 kilowatts, of the "Donbas" type are to be installed. Such a machine, which automatically digs, crushes, and loads coal, can be served by six men. The first two are already installed. Thirty-four mine towers are to be erected, each having a carrying capacity of 200 tons. Sixteen closed (personnel) and 25 open (~~min~~<sup>coal</sup> car) elevator platforms, the latter having a tipping device, are to be installed.

Seventy existing coal cleaning and processing plants are to be repaired and expanded, and 14 new plants are to be built.

For the operation of compressed air drills and for ventilation of the mines, 45 large turbine compressors with a total capacity of 800,000 cubic meters per hour are to be installed. (At present there are 465 compressors with a total capacity of 3 million cubic meters per hour.)

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In addition, power machinery and transport materiel are to be built and installed on a large scale. In the Walbrzych territory, construction has been started on, inter alia, a railroad to bring coal directly from the mines to the coking plants. The remarkable thing about this railroad, however, is that it is being elevated above the terrain and buildings in order that it may pass freely through the hilly countryside. In places elevations of 36 meters are being considered.

Within the field of mining machinery production alone, expansion is to be carried out on such a scale that the value of production in 1955 will amount to 280 million zlotys (1937 value), as against 80 million zlotys (1937 value) in 1950.

b. Iron Ore

The production of iron ore in the prewar years reached the highest point in 1939 with 872,000 tons. At the same time, the production in the German territories later ceded to Poland amounted to a bare 400,000 tons.

One main reason that production was not larger, despite the rather large deposits, was essentially that the Polish iron and steel industry was dominated by foreign capital which considered increased production not worth the trouble, since the iron content of the ore generally was under 35 percent. Competition conditions and marketing possibilities may also have influenced the extent of production.

At the end of the war, 22 of the existing 40 iron ore mines were flooded, and production was slow in getting started.

Under the 3-Year Plan (1947-1949), a total of 27 mines were reopened, and several iron ore sorting and crushing plants were constructed.

Table 6

The Production of Iron Ore in Poland (in 1,000 tons)

1939	1945	1946	1947		1948		1949		1950		1951		1952		
			planned	attained	planned	attained	planned	attained	planned	attained	planned	attained	planned	attnd	
872	106	424	600	544	700	659	850	699	750	790	900	909	1,100	--	
<u>1955</u>															
planned	attained														
3,000	--														

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About two-thirds of the mines are located in the territory west of Czestochowa, a few near Walbrzych, and the remainder north of Kielce.

About four-fifths of the ore produced has an iron content of 25-32 percent. The balance of the production varies in iron content between 38 and 45 percent.

Under the 6-Year Plan, 35 new ore mines are to be opened up, and in 1955 a production of 3 million tons of ore is expected, which should cover 30 percent of Poland's requirement at that time.

c. The Utilization of Coal and Iron Ore

The total production of iron ore in Poland is utilized in the iron and steel producing industry. The domestic iron ore production covers 10-15 percent of the needs of the iron and steel producing industry, as against 35 percent before the war. (As regards the consumption of scrap iron, the opposite is the case today, in that at present 65 percent of the requirement is covered by domestic sources, as against 25 percent before the war.)

The coal production, however, is so large that a considerable portion of it can be exported. In exchange, Poland receives important raw materials, iron ore, for example, and numerous finished goods which cannot be produced domestically in sufficient quantities.

As shown in the following table of the distribution of coal as utilized, the domestic consumption, despite the terrific industrial expansion in the postwar years, has not increased to quite the same extent as this expansion. The principal reason for this is the coal export. Coal-saving measures [were] initiated and natural gas substituted for coal for the use of the population. A not ~~unimportant~~ reason for this was that suddenly in 1951 the postwar housing construction program completed a large number of accommodations which had been under construction for several years. This caused an increased demand for coal for the heating of houses.

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**SECRET**Table 7The Utilization of the Coal Production (in million tons)

Year	Total Production	Utilization x)		
		Export	Domestic Consumption	Brown Coal, etc
1938	38.1	11.7	26.1	0.3
1945	27.4	3.6	23.7	0.1
1946	47.3	14.7	29.9	2.7
1947	59.1	18.5	37.9	3.7
1948	70.3	25.6	42.8	1.9
1949	74.1	28.2	44.9	1.0
1950	78.0	28.0	49.1	0.9
1951	82.0	28.5	--	--

x) The years 1937-1948 (inclusive) include exports to overseas countries.

The breakdown, fairly constant each year, of domestic consumption is approximately as follows:

Consumed by the population	20 percent
Coal and coke industry	20 "
Gas and electric plants	15 "
Communications (excluding merchant marine)	20 "
Industry	25 "

### 3. Import and Export of Raw Materials

For Polish foreign trade, the export of coal and the import of iron ore has been much more important after the war than before.

Poland before the war was predominantly an agricultural country with poorly developed industries. The need for coal and iron ore was therefore considerably smaller than for finished goods. The import of iron ore amounted to only 2.7 percent of the total import, but import of scrap iron was greater, amounting to 7 percent of the total import, because Poland at that time was able to supply only 25 percent of its consumption of scrap iron from domestic sources.

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The export of coal in 1938 amounted to 11.7 million tons, which corresponded to 17 percent of the total value of exports. The most important items of export, however, were farm products, with 27 percent of the total. Timber exports had the same value as coal exports.

The possibilities for increased export during the years between the wars, however, lay within the coal industry, which Poland herself also realized (agriculture was already under great strain), and great efforts were expended with this in view. The most important results of this were:

- 1) Construction of the so-called coal "magistral", the railroad line Katowice-Gdynia.
- 2) The introduction of special railroad rates for coal for export.
- 3) The granting of state subsidies to the coal export.
- 4) Lowering of reloading expenses and shipping rates.

These efforts, which did not fulfill expectations, were fully carried out because both England and Germany occasioned Poland very serious competition in the European market. From 1925 to 1938, the Polish export of coal rose from a total of 8.1 million tons to 11.7 million tons.

a. The Import of Iron Ore and Scrap Iron after the War

When Poland took over the German territories lying east of the Oder-Neisse line, her iron and steel producing industry was almost doubled, and she was, as a result, even less able than before to provide herself with the necessary supply of iron ore from domestic deposits. From a 35-percent degree of self-sufficiency before the war, her degree of self-sufficiency decline to 10-15 percent. On the other hand, with regard to scrap iron the degree of self-sufficiency increased from 25 percent before the war to 65 percent afterwards because of the large quantities of scrap iron in the acquired territories. This latter condition, though, seems also to have changed recently. During the first years after the war, about 200,000 tons of scrap iron were collected annually in Poland, and in 1950 no less than 1 million tons. In 1951, however, the amount collected was considerably less. The import of scrap iron has also undergone unfavorable

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development in that the supplies received, which during the first years after the war amounted to about 400,000 tons per year, have also decreased.

The import of iron ore amounted to about 730,000 tons in 1937, of which 82,000 was manganese ore. In 1946 the import amounted to over 1 million tons, in 1947 to 1,470,000 tons, and in 1948 to 2,500,000 tons. The amount of manganese ore included was, in these years, a little less than the amount in 1937. During recent years, however, there appears to have taken place a considerable increase in the import of this very important ore.

The most important suppliers of iron ore were and are Sweden, the USSR, Rumania, and Norway. Thus, in 1948, the USSR supplied 43 percent of Poland's total import of iron ore and all of the import of chromium ore and manganese ore. In 1949, a total import of 1,600,000 tons from Sweden and the USSR was expected. In 1950, the USSR was to deliver 65 percent of the total import of iron ore, 40 percent of the import of chromium ore, and all the import of manganese ore.

b. The Export of Coal

After the war, the addition of new coal mines and deposits plus the partial disappearance of Germany as a supplier of coal caused a terrific increase in the demand for coal from Poland. Then there were Poland's own plans for industrial expansion, which presupposed import of the necessary machinery and other factory equipment, imports for which Poland could pay only with coal.

The result was therefore a considerable expansion of the Polish coal industry and coal export. Thus, in 1945 the coal export comprised 75 percent of the total export; in 1946, 63 percent; in 1947, 50 percent; and in 1948, 48 percent. The decrease may be attributed to the gradual revival of other exports, especially farm products and lumber. Nevertheless, the postwar figures are far above the 1938 figure of 17 percent, and clearly show the structural changes which have taken place in Poland after the war.

The most important buyers of Poland's coal are Sweden and the USSR, which together during the first ~~some~~ few years after the war took one-half of the total Polish export of coal.

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In 1946, Poland exported to the USSR, besides the regular delivery, 5,700,000 tons of coal, plus 2,300,000 tons which went on the USSR's account to other countries of the Eastern bloc, including East Germany. In each of the years 1947-1950 there was to be delivered, in the same manner, 13 million tons of coal (in 1947 changed to 6,500,000 tons annually), and thereafter 12 million tons (probably also changed) annually so long as East Germany remained occupied by the USSR.

These deliveries, which took place at very low prices, were to be regarded as a kind of payment for the turning over by the USSR to Poland of the entire Upper Silesian industrial region.

By a general commercial agreement, Poland in 1945 was to deliver an additional 5 million tons of coal and coke to the USSR, and in exchange was to receive 280,000 tons of iron ore, manganese ore, and chromium ore. The corresponding export for 1946-1947 was to amount to 1,300,000 tons of coal and coke. The following table shows the development of the coal export after the war, in totals and divided by regions:

Table 8Regional Breakdown of the Coal Export (in million tons)

Year	Total Export		Scandinavia			Western Europe	Eastern Europe	Central Europe
	Planned	Attained	Denmark	Sweden	Others			
1937	--	11.0	-----10.1-----				-----0.9-----	
1945	--	3.6	0.01	0.12	--	--	--	--
1946	13.5	14.4	0.6	1.6	--	--	--	--
1947	17.0	17.9	0.88	2.0	1.42	2.5	-----10.8-----	
1948	24.0	24.7	1.7	3.44	2.16	3.9	2.8	7.4
1949	26.0	26.8	1.45	2.2	-----13.85-----		-----9.3-----	
1950	--	26.5	1.6	--	--	--	--	-x)
1951	--	28.5	1.8	-----8.2-----			--	-xx)

x) However, to Austria 1.55. xx) 1.05

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**SECRET****4. The Production of Iron and Steel****a. The Production of Steel**

Before iron ore is turned into steel, it undergoes a number of technical processes, which here will be briefly sketched in order to clarify the problems of steel production.

The furnace plays an essential role in the production of iron. There are various types of blast furnaces, holding up to several hundred tons, as well as other types of furnace, such as the ~~Siemens-Martin~~ <sup>open-hearth</sup> furnace (200-300 tons), and the electric furnace.

A blast furnace of the largest type daily puts out about 1,000 tons of pig iron (Denmark's total consumption is about 600 tons per day), and the cost of firing and maintenance alone is so great that such a furnace is fired continuously for several years. Repairs, etc, must therefore be carried out while the furnace is in operation.

Before iron ore is dumped into the furnace, it is crushed in large crushing machines into lumps the size of a walnut in order to create a homogeneous material that will not fuse in the furnace. Thereafter it is transported in special cars up an incline to the top of the furnace and is dumped in, followed by the appropriate quantities of coke and lime. For the production of 1 ton of pig iron, 2 to 2.5 tons of iron ore and a little over 1 ton of coke are required.

The coke (cinders), the fuel value of which is higher than that of coal and the size of which permits better smelting, has as its purpose the production of the high temperature necessary to melt the iron in the ore

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The lime is added to bind the waste materials of the ore; hereby slag is formed, which floats atop the molten iron and which is tapped from the surface through a special hole in the furnace, later to be utilized in the production of chemical fertilizer (containing phosphorus).

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At certain intervals the furnace is tapped for liquid iron, which is either emptied directly into large portable crucibles to go on to further processing, or is poured into forms carried on conveyor belts in which the iron is hardened by, among other means, being sprayed with water. At the end of the conveyor belt, the iron, now solid but still red-hot, falls into cars and is sent on for processing in foundries.

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(During the blast furnace process, gas is formed, which is piped to purification plants which remove all impurities in the gas, which is then utilized both in the operation of the power plant of the steel works and for injection into the blast furnaces to sustain combustion.)

According to the carbon content, iron is classified as pig iron (2-6 percent carbon) and malleable iron (under 2 percent carbon). The first is utilized as cast iron, as it is hard but brittle. From malleable iron are produced wrought iron (0.03-0.6 percent carbon) and steel (0.6-2 percent carbon).

Iron from blast furnaces always contains over 2 percent carbon, and must therefore undergo further processing if it is to be utilized for wrought iron or steel.

The most important processes in the production of steel are the three following:

(1) The Bessemer process: The liquid iron is poured into a so-called converter (Bessemer pear, which has the form of an asymmetrical pear of 25-50 ton capacity), and, to the accompaniment of ear-splitting noise, air is blown through the liquid iron, whereby the carbon in the iron is burned out. Thereupon is added the quantity of carbon necessary to give the iron the desired degree of hardness.

This method, however, does not remove the phosphorus in the iron, and is therefore employed only for phosphorus-free iron.

(2) The Thomas process: This process also removes the phosphorus present in the pig iron. The converter is lined with dolomite, which prevents the added lime from corroding the walls of the converter. The lime combines with the phosphorus to form the so-called Thomas slag, which is used in the production of chemical fertilizer. This process is used particularly in Germany, where iron ore containing phosphorus is mainly used.

(3) In the <sup>open-hearth</sup> ~~Siemens-Martin~~ steel furnace, a mixture of crude iron, iron ore, and scrap iron may be used as raw materials. Especially in countries where old iron is utilized, this method is very common

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In order to make steel usable for the varied uses for which it is employed today, it is necessary to add to it various auxiliary materials which impart the the desired qualities (for example, manganese, to make it especially hard).

This addition takes place during the three above-mentioned processes, so that the steel, when it leaves the furnace in liquid form, needs only to be cooled until it solidifies, whereupon rolling may take place.

The table below shows how 100 tons of pig iron is gradually transformed by further processing.

Production of pig iron	100 tons
- <u>Of this as cast iron</u>	10 "
Pig iron for steel production	90 "
✓ <u>Scrap iron added</u>	40 "
Total pig iron	130 "
- <u>Of this for forging and casting</u>	10-15 "
Supplied to rolling mills	115-120 "
- <u>Balance: waste, shrinkage, etc</u>	20-30 "
Finished rolling mill products	90-100 "

Coke is produced from coal in special coking plants. Here there are a number of coke batteries, each consisting of up to 50 retorts. Coal is dumped into these retorts, which are then heated. Gas is given off by the coal, and the coal is transformed into coke. At the end of this process, the still glowing coke is pressed or tapped from the retorts and sprayed with water to promote cooling. The gas obtained, which most often is of poor quality, is, as a rule, used for heating the batteries.

b. The Iron and Steel Production before and during the War.

Within the territory which today comprises Poland, there were before and during the war the following number of iron and steel works, with production as indicated:

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**SECRET**Table 9Number of Iron and Steel Works and their Production (Production in 1,000 tons)

	<u>1925</u>	<u>1932</u>	<u>1936</u>	<u>1937</u>	<u>1938</u>	<u>1939</u>	<u>1944</u>
Number of iron and steel works	28	25	—	23	23	23	23
Production of pig iron	—	—	858	1,144	1,290	—	—
Production of ingot steel	—	—	1,616	1,972	1,983	1,855	2,988
Production of rolling mill products	—	—	1,140	—	—	—	—

The number of workers, which in 1925 amounted to 132,900, decreased in 1932 to 27,000, and rose again to 45,100 in 1937.

Of the above-mentioned iron works and steel works, eight were within the then-existing borders of Germany, with seven in Silesia and one in Szczecin (Stettin). The seven works employed 2,400 workers in 1939 and the works in Szczecin employed 300 workers.

In addition to the seven iron works and steel works with their associated rolling mills, there existed in 1939 in the German part of Silesia 19 cold-rolling mills employing 2,300 workers. (In cold-rolling, the temperature of the steel is lower than in hot rolling, giving a stronger product which may be made thinner and more precise, razor blades, for example.)

Divided between Germany and Poland, the production within the present borders of Poland was as follows:

Table 10The Iron and Steel Production Divided between Countries

(in 1,000 tons)

	<u>1925</u>		<u>1932</u>		<u>1936</u>			
	<u>Germany</u>	<u>Poland</u>	<u>Germany</u>	<u>Poland</u>	<u>Germany</u>	<u>Poland</u>		
Pig iron	—	315	—	199	274	584		
Ingot steel	—	782	—	564	475	1,141		
Rolling mill products	—	—	—	—	314	826		
	<u>1937</u>		<u>1938</u>		<u>1939</u>		<u>1944</u>	
	<u>Germany</u>	<u>Poland</u>	<u>Germany</u>	<u>Poland</u>	<u>Germany</u>	<u>Poland</u>	<u>Germany</u>	<u>Poland</u>
	420	724	497	879	—	—	236	—
	520	1,452	826	1,441	455	1,400	744	2,244
	—	1,076	740	1,069	272	—	364	—

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An impression of consumption in the production of iron and steel may be gained by examination of, for example, 1937. During that year, 1,382,000 tons of iron ore, 97,000 tons of manganese ore, 101,000 tons of scrap iron, and 775,000 tons of coke were consumed to produce 1,452,000 tons of ingot steel.

c. Development after the War.

After the last war, the Polish iron and steel producing industry was increased <sup>the</sup> by eight iron and steel works <sup>mentioned</sup> in the preceding section.

During the retreat of the German troops and the battles which took place at that time in southern Poland, the iron and steel works, Polish as well as German, were subject to great destruction. Some plants were up to 40 percent destroyed.

The first postwar plans therefore envisioned especially the reconstruction of this industry and of communications, since these two factors together were the basis for the rebuilding of war-ravaged Poland.

Three circumstances have especially favored the Polish iron and steel industry after the war:

- (1) The rich coal deposits in Silesia
- (2) The importation of Swedish ore via the Oder and the railroads to the coal districts
- (3) The large manpower reserves in rural districts.

On the other hand, the limited occurrences of iron ore in Poland constitute a severe handicap -- a situation aggravated by the fact that Polish iron ore contains only 30-35 percent iron. In recent years the USSR has also become an important supplier of iron ore, especially manganese ore.

The iron and steel works in Silesia obtained from Germany were, before the war, among the most modern in Europe, but they were too few in number to provide for the increased production anticipated by the Polish postwar plans. It became necessary therefore to carry <sup>out</sup> ~~extensive~~ extensive rebuilding, modernization, and expansion of the existing works, which during the war had been neglected technically, as the means and, above all, the money were not ~~is~~ available for such work. Poland was at that time, as was pointed out before, predominantly an

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agricultural country without much industry. Not until the German territories, with their large industries, were taken over were the conditions present for an expansion of the iron and steel works.

Immediately after the war, it was possible to utilize only 60 percent of the prewar capacity of the iron and steel works, but extensive investments as a part of the 3-Year Plan (1947-1949) rapidly made possible a greater utilization of the capacity. In 1947 alone, no less than 4.1 billion zlotys (1947 value) or 100 million US dollars was spent on such investments.

The results of these investments are clearly shown by the production figures for the postwar years.

Table 11Iron and Steel Production in Poland after the War (in 1,000 tons)

	1945		1946		1947		1948		1949	
	planned	attained	planned	attained	planned	attained	planned	attained	planned	attained
Pig iron	218	726	995	867	1,200	1,100	1,300	1,243		
Ingot steel	495	1,219	1,456	1,579	1,750	1,955	2,033	2,303		
Rolling mill products	332	796(a)	—	1,092(b)	—	990	1,300	1,498		
	1950		1951		1952	1955				
	planned	attained	planned	attained	planned	planned				
Pig iron	1,600	1,500	1,640	1,590	—	3,500				
Ingot steel	2,500	2,515	2,800	2,792	3,300	4,600				
Rolling mill products	—	—	—	—	—	3,200				

a) Of this, 65,200 tons of steel pipe

b) Of this, 74,200 tons of steel pipe

In 1946, there were in production 23 iron and steel works with a total of 72,300 workers, and in 1947 24 works with a total of 76,300 workers.

Under the 3-Year Plan, efforts were concentrated only upon the rebuilding of existing works, since the Polish economy could not spare the large amounts which would be required for new construction and modernization. In addition, such expansion would in itself make large demands upon the production from existing works, production which was already much needed for the reconstruction of Poland's other industries.

Not until the inception of the 6-Year Plan in 1950 was Polish industry

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rebuilt to the extent that expansion and modernization of the iron and steel works could be considered. Thus, during the whole 6-year period 1950-1955, six new, fully automatic, 600-ton blast furnaces, twenty 70-ton Siemens-Martin furnaces, and three pressing and rolling mills with a total annual capacity of 1 million tons of rolling mill products are to be built. In addition, an extensive automatization of production processes in existing works is to be carried out. Technical improvements will entail production of steels of higher quality which may form the basis for the output of metallurgical products which have not been produced before and better utilization of the waste products of iron and steel production.

As a result of these planned efforts, the production will show the growth indicated in Table 11.

#### 5. The Individual Iron and Steel Works

The number of iron and steel works and the labor force employed have been given above. Here only a recapitulation will be given in order to condense the information.

Table 12

Number of Iron and Steel Works and Labor Force Employed

	<u>1937</u>	<u>1946</u>	<u>1947</u>	<u>1948</u>
Number of works	23	23	24	28
Number of workers	45,100	72,300	76,300	—

As regards individual iron and steel works, refer to the list in Appendix 1. Only those on which further information is available will be treated here:

The Czestochowa Steel Works in the city of Czestochowa consisted originally of Handtke's Stahlwerk only, which had an annual capacity of 100,000 tons of pig iron. As a link in the 6-Year Plan expansions, the construction of a new division (designated No 2) was begun in 1950, and the division inaugurated in the summer of 1951. Previously there was only one Martin furnace, of the above-mentioned capacity of 100,000 tons of pig iron. The new division increased the capacity of the steel works to 360,000 tons of pig iron through the building of one more blast furnace.

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In the fall of 1951, still another blast furnace was put into operation. Four Siemens-Martin furnaces are included in the production increase.

During the last four years of the 6-Year Plan, one more division is to be built, whereby the capacity in 1955 is to be brought up to 1,100,000 tons. In addition, one rolling mill, one pig iron works, other metal shops, and a power plant are to be built. One division for the production of steel tubing was already under construction in the fall of 1951.

The steel works is to base its production on iron ore from deposits lying west of the city.

The Kosciuszko Steel Works in Chorzow (previously Koenigshuette) in the first postwar years had an estimated annual production of 50,000-60,000 tons of pig iron. This steel works, the first in line for expansion under the 6-Year Plan, has been modernized and partly rebuilt, including, among other things, the full automatization during 1950 and 1951 of a blast furnace, so that now its capacity is 250,000 tons of pig iron annually. In 1952, one more fully automatic blast furnace is to be erected. In addition, there are under construction one coking plant, one plant for the production of coal by-products, one blast furnace gas purification plant, one power plant, and one water purification plant, etc.

Among other things, this steel works produces railroad rails.

The Bobrek Steel Works in Bobrek-Bytomski (formerly Julienhuette) put into operation a rebuilt and modernized blast furnace in the summer of 1951. The capacity of this blast furnace has been increased by 50 percent by 100 percent mechanization.

The Labedy Steel Works in Labedy near Czestochowa (formerly Herminenhuetten), now rechristened "Joseph Stalin", is likewise to be rebuilt. After the rebuilding, the production is to amount to 600,000 tons of steel annually.

The Gliwice Steel Works, which was constructed during the war in a former steel foundry, had 1,000 workers already in July 1946. Connected with this plant is a large cable-rolling mill taken over from the Germans.

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The Stolczyn Iron Works in Stolczyn near Szczecin was dismantled by the Russians, but reconstructed by the Poles. Before the war it produced 150,000 tons of pig iron annually. In May 1947, the capacity was only 1,200 tons, in July of the same year it was 3,450 tons, and for the whole of 1947 about 23,000 tons. A blast furnace with an annual capacity of 35,000 tons was erected in 1948.

In 1949, a production of 100,000 tons of pig iron and ~~24~~ 24,000 tons of coke was ~~expected~~ expected. Operations are based on imported Swedish iron ore.

Before the war, the works employed 12,000 workers. In 1948, the employment of only 2,000 workers was counted on.

The Starachowice Steel Foundry in Starachowice, which is Poland's first fully mechanized steel foundry, put into production a rebuilt and modernized blast furnace in the summer of 1951.

Of other iron and steel works which are to be modernized and enlarged under the 6-Year Plan may be mentioned the Florian Steel Works in Swietochlowice (formerly Falvahuette), Andrzej in Zawadzkie (formerly Andreashuette), and Mala Panew in Ozimek (formerly Malapane-huette).

Finally there is the latest of the steel works in Poland, the as yet far from finished Nowa Huta west of Krakow. This steel works is the largest single investment in Poland under the 6-Year Plan. When finished, it is to produce 1,500,000 tons of steel [annually?]. All equipment for the construction of the works is to be delivered by the USSR as part of a larger credit agreement.

#### 6. The Production of Coke.

About 9 percent of the total production of coal is today utilized for the production of coke. Of the production from the Walbrzych mines alone, 40 percent is utilized for the production of coke, as this coal is particularly suited to this purpose.

The development in coke production has been as follows:

Table 13

Coke Production in Poland before and after the War (in 1,000 tons)

	<u>1932</u>	<u>1936</u>	<u>1938</u>	<u>1944</u>	<u>1946</u>	<u>1947</u>	<u>1948</u>	<u>1949</u>	<u>1950</u>	<u>1951</u>
Poland (1938 boundaries)	1,288	1,616	2,291	--	--	--	--	--	--	--

**SECRET**(Coke Production in Poland before and after the War (in 1,000 tons)

	1932	1936	1938	1944	1946	1947	1948	1949	1950	1951
German Upper Silesia	867	1,558	2,014	2,612	--	--	--	--	--	--
German Lower Silesia	788	1,116	1,369	1,478	--	--	--	--	--	--
Poland (1945 boundaries)	3,943	4,290	5,674	--	3,575	4,465	5,091	5,751	5,924	6,266

(The plan for 1952 provides for a production of 7,250,000 tons of coke)

As by-products of the production of coke, these are obtained: tar and tar products, crude benzol, ammonia, and gas.

Before the war, Germany possessed 11 of the then existing 20 coking plants, four lying in Lower Silesia and seven in Upper Silesia.

After the war there was no change in the number of coking plants, aside from the reconstruction after destruction, until the beginning of the 6-Year Plan, in which were planned both the expansion of existing works and the erection of new works. During 1950 and 1951, a new coke battery (about 50 coke ovens) was thus put into operation in the Makoszowy works at Zabrze. A new coking plant, so far having two batteries, was placed in operation in 1951 in Zdzeszowice.

The coking plant at Gliwice is to be further expanded by a number of batteries so that the production as early as 1952 is to be doubled that of 1950; in 1955 this plant is to be Poland's largest.

## 7. Education

The terrific expansion of Poland's coal mines and iron and steel producing industries brought with it great difficulties with regard to the manpower and technicians required to meet the planned increased production.

Conditions in the years between the wars had not encouraged the influx of qualified labor to these industries, and Poland faced therefore in 1945 not only an acute shortage of labor, but also, especially, of technicians and engineers. In order to overcome the deficiency in the latter categories, the mining academy, already established before the war, was considerably expanded. While in 1937-1938 there were 500 students, in 1950 the number was 2,800. The number of faculties was also expanded from two (mining and blast furnace operation) to several today, of which the most important are mining, blast furnace operation, electromagnetics

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in ~~the~~ mining and blast furnace operation, geology and geodetics, and mineralogy.

The labor shortage was barely covered in the early postwar years by the transfer of workers from other occupations (especially from agriculture) to the mining and blast furnace industries. A short period of training took place in the existing plants. However, not until the inception of the 6-Year Plan was the training of skilled workers for the iron and steel producing industries put on a rational basis. In 1950 no less than 12,000 workers and apprentices were scheduled ~~to~~ to take 282 courses for thorough training as iron and steel workers.

During the whole of the 6-Year Plan, a total of about 1,000 courses are to be established in order to train the many thousands of workers needed.

Each year a large number of men liable for military conscription are called up for a 2-year period of service in labor battalions. These formations are intended for commitment to those branches of the economy in which a shortage of labor threatens or in which there is danger that the production goal will not be met. The coal mines and the steel industry may, on equal footing with other industries, avail themselves of this, and several instances of this kind have already taken place.

#### 8. Wages and Social Measures

A very important link in the Polish iron, steel, and coal production is the activist movement, that is, ~~the~~ competition between the workers, or, more commonly, among labor brigades, to attain the highest production. The best results are rewarded with money and honors to encourage further efforts. On the other hand, for the workers the system has the undeniable weakness that the constantly increased production is slowly forcing upward the standard which forms the basis for judging a day's normal work. Thus, new norms for the coal mines were introduced on 1 October 1951. The minimum standard for extraction proper was increased on the average 10 percent (in certain cases 16 percent). At the same time, however, wages were increased 22 percent. The rewards for overfulfillment of the plans were also raised. Previously the latter amounted to 25 percent of the basic wage rate for reaching the production goal and 2½ times the normal rate for production above the standard.

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If an attempt is made to compare wages before and after 1 October 1951 on the basis of the above-mentioned rates, the following result is obtained (the standard and the basic wage rate both being set at 100 before 1 October 1951, and the standard at 100, but the basic wage rate at 122 after 1 October 1951):

<u>Production</u>		<u>Wages</u>	
<u>Before 1 Oct 51</u>	<u>After 1 Oct 51</u>	<u>Before 1 Oct 51</u>	<u>After 1 Oct 51</u>
100	about 90	125	about 110
110	100	150	152.5
120	110	175	minimum 183

This means, then, that the wages for fulfillment or overfulfillment of the new ~~norm~~ norm are higher in proportion to the old, while underfulfillment of the new ~~norm~~ norm (which in many cases would mean fulfillment of the old norm) gives a relatively smaller wage. The workers are thus forced to fulfill the new ~~norm~~ norm or suffer economic losses.

An important innovation took place within the Polish mining industry with the creation of the so-called "Miners' Charter". This is an attempt, with social-welfare overtones, to improve working conditions and at the same time increase production. The "Charter" is in three parts. The first deals with the problem of absenteeism, providing rewards to workers who have lost no time from work aside from approved sick leave, etc. The period for ~~judging~~ judging performance is 3 months and the reward to the individual worker, depending on his employment in the same mine for 1 year, 2-5 years, and over 5 years, amounts to 5-10 percent, 10-15 percent, and 15-20 percent respectively, of the regular wage.

The second part involves honorary privileges, that is, the introduction of rank among the workers, with uniforms bearing insignia of rank. For especially outstanding work, decorations are awarded.

Finally, in the third part, there are regulations governing pensions, vacations, and compensation for invalidism.

## 9. Organization

The leadership and control of the whole Polish economy is today placed in

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the hands of PKPG (Panstwowy Komitet Planowania Gospodarczego — National Economic Planning Committee). All ministries working with the economic affairs of the country are under the supervision of this committee. This includes also the Polish steel and coal production. Previously this part of the economic life of Poland was under the jurisdiction of four ministries, for the coal industry, for the power industry, for the iron and steel industry, and for the machinery producing industry respectively. In the spring of 1952, however, a change took place in this situation in that the former two are now combined into the Ministry for Mining and Power Production and the latter two into the Ministry for Heavy Industries. At the same time, the operation of the iron ore mines, previously under the jurisdiction of the iron industry, was shifted to the Ministry for Mining and Power Production.

The Ministry for Heavy Industries is broken down into subdivisions for the machine industry, power supply, and iron and steel works.

#### 10. Conclusion

The great rise in the planned figures from 1949 to 1950 (25 percent for steel and a scant 20 percent for pig iron) might point to over-optimistic planning. On the other hand, the coal production shows continued conformance to the plans, even though the plans seemed in advance to be rather optimistic. The question then arises whether purely technical difficulties might not have made themselves felt, perhaps not as directly regards the production facilities, as these might be supposed to have had approximately the capacity anticipated by the plans, but as regards the labor force, which in a steadily increasing degree must be made up of unqualified personnel as the production facilities gradually expand beyond the point where qualified iron and steel workers are available to fill the need.

Another problem which arises as regards the iron and steel industry is rearmament. If the published plans for Poland's economic expansion are to be realized, it would hardly be possible for Poland at the same time to embark upon rearmament on a large scale, in the form of an expanded production of weapons and other war materiel, let alone deliver steel to other countries for that purpose. On the other hand, it must certainly be supposed that deeper

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reasons lie behind the USSR's assistance in the building up of the Polish iron and steel industries than only to aid the country in carrying out its 6-Year Plan.

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**SECRET**Appendix IList of Iron and Steel Works in Poland

(March 1952)

	Name	Previous name	Location
1	Huta Baildon	Baildon-hütte	Katowice - Dabrowa
2	" Batory	Bismark-hütte	Chorzow
3	" Ferrum	Ferrum-hütte	Katowice - Dabrowa
4	" Florian	Falva-hütte	Swietochlowice
5	" Kosciuszko	Königs-hütte	Chorzow
6	" Laura	Laurahütte	Siemianowice
7	" Pokoj .	Friedenshütte	Nowy Bytom
8	" Zgoda	Eintrachthütte	Swietochlowice
9	" Zygmunt	Hubertushütte	Lagiewniki
10	" Andrzej	Andreashütte	Zawadzkie
11	" Bobrek	Julienhütte	Bobrek - Bytomski
12	" Gliwice	Oberhütte	Gliwice
13	" Joseph Stalin Labedy, Herminenhütte		Labedy
14	" Mala Panew	Malapane-hütte	Ozimek
15	" Zabrze	Donnermark-hütte	Zabrze
16	" Milowice	Hütte Milowice	Sosnowiec
17	Nowa Huta	-	near Krakow
18	Huta Bankowa	Bankhütte	Dabrowa Gornicza - "Feliks Dzierzynski"
19	" Bedzin	Eisenwerke Bedzin	Bedzin
20	" Katarzyna	Katarinahütte	Sosnowiec
21	" Renard	?	"
22	" Sosnowiec	Hulczuski-Werke	"
23	" Zawiercie	Hochofenwerk Warthenau and Eisenhütte Zawiercie	
24	" Czestochowa	Handtkes Stahlwerk	Czestochowa - "Boleslaw Rejzrut"
25	" Ostrowiec	Ostrowietzer Hochofen und Werke A.G.	Ostrowiec
26	" Stalowa Wola	Stalowa Wola	Stalowa Wola
27	" Starachowice	-	Starachowice
28	" Kara	-	Piotrkow
29	" Stolczyn	Eisenhütte Stettin	Stolczyn near Stettin

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1-15 are located in Upper Silesia

16-23 are located in the Dabrowa region

24-28 are located in the central territory south and west of Kielce

29 is located in Pomerania (Pomorze)

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