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ECONOMIC INTELLIGENCE REPORT

SOLID FUELS IN THE USSR

CIA/RR 28

29 January 1954

CENTRAL INTELLIGENCE AGENCY

OFFICE OF RESEARCH AND REPORTS

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(ORR Project 5-52-I)

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SOLID FUELS IN THE USSR*

Summary

Solid fuels provide the main source of energy in the USSR. In 1950 they represented roughly 80 percent of the Soviet energy balance from primary sources, with coal accounting for nearly 65 percent, fuelwood about 10 percent, peat slightly less than 5 percent, and oil shale less than 1 percent. Petroleum hydrocarbons, including natural gas, provided nearly 20 percent, and hydroelectric power provided only 0.5 percent.**

In the Soviet economy, coal is the basic industrial fuel, required in large amounts in rail transport, ferrous metallurgy, and electric power generation. In the Fourth Five Year Plan (1946-50) these uses amounted to about two-thirds of total planned consumption in the USSR. Railroads, the major consumer group, use slightly less than 30 percent, much of it of very high ash content. Iron and steel plants use about 20 percent, the greater part in the form of coke. Electric power stations use about 15 percent, much of it of poor quality, including considerable amounts of brown coal.

The USSR now ranks second only to the US in the volume of coal output. Soviet coal production in 1952 amounted to approximately 301 million metric tons.*** More than one-fourth of this amount, however, consisted of brown coal and lignite, and the total, in terms of US hard coal (anthracite and bituminous coal),**** would equal only about 240 million

* This report contains information available as of 15 July 1953.
** These estimates refer only to current domestic production. Estimates referring to total supply, including net imports and stocks, would not differ greatly.
*** Tonnages throughout this report are given in metric tons.
**** The term hard coal is used in the European sense. In the US, anthracite is customarily referred to as hard coal, and bituminous coal as soft coal.

tons.* In 1952 the US produced 457 million tons of hard coal, in addition to a few million tons of lignite.

Soviet coal production in 1950, the last year under the Fourth Five Year Plan, exceeded the Plan figure by about 12 million tons. The goal for 1955, the last year under the Fifth Five Year Plan (1951-55), is an increase of 43 percent over 1950. The indicated objective of about 375 million tons production in 1955 and the more distant objective of 500 million tons set for 1960 appear possible of attainment on the basis of postwar experience. It is, however, more likely that 1955 output will be nearer 365 million tons and that it will be 1961 or 1962 before annual production reaches 500 million tons.

At present, the Soviet coal supply situation appears to be relatively satisfactory, except for coking coal. Current domestic production accounts for all but a small part of total supply. Coal stocks generally are low; it is doubtful that they are sufficient to last more than 30 days. Much of the coal mined in the USSR will not store satisfactorily, because of disintegration with loss of moisture or because of a tendency toward spontaneous combustion. Imports account for a very small part of Soviet supply. The chief Soviet coal imports come from Poland, which has furnished the USSR from 5 to 9 million tons annually since the end of World War II. Soviet exports have been negligible in the postwar period, although the USSR began shipments to Western Europe in 1949 and increased them by 1951 to more than 400,000 tons.

The USSR has large coal reserves. They were estimated before World War II at about half the size of the very large US reserves, and discoveries of many new deposits have been reported since that time.

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* The average heat value of US coal has been determined as approximately 13,100 British thermal units (Btu) per pound. The average heat value of Soviet coal in 1950 is calculated at 10,450 Btu per pound, which is assumed to be the average heat value also in 1951. For the comparison made above with US coal production, Soviet coal production in 1951 has been converted to an equivalent tonnage by the use of these values.

The only serious deficiency is the inadequacy of known deposits of good-quality coking coals, indicated in the Fifth Five Year Plan, which lists exploration for coking coal deposits in the same strategic category as exploration for nonferrous ore deposits. Over 90 percent of Soviet reserves, however, are in Asiatic USSR, and deposits of good-quality coal are so located that long-distance transport of coal is unavoidable. Mining conditions, moreover, are generally not particularly favorable in the USSR for the acquisition of good-quality coal in a relatively cheap and easy manner. There are thick deposits of brown coal in the eastern region which are being mined cheaply by strip methods, but to obtain good-quality coal it is almost always necessary to sink shafts or slopes. In nearly all the major producing districts and many of the minor producing districts the Soviet coal-mining industry also must reckon with one or more specific difficulties such as very thin or very thick or steeply pitching seams, unstable roof or bottom conditions, rock partings, excessive water, gas conditions, or susceptibility of the coal to spontaneous combustion.

Prospecting for coal deposits and the development of new coal mines in the USSR were accelerated by World War II, in particular by the nearly total loss during 2 years of the war of the important coal production from the Donets Basin (Donbas) and by the slow recovery of the heavily damaged Donbas mines, which did not regain prewar levels of production until the last quarter of 1949. The wartime and postwar development of other producing areas in the USSR is indicated by the fact that Donbas production, which accounted for 57 percent of total Soviet production in 1940, accounted for only 35.5 percent of total Soviet production in 1952.

European USSR still depends heavily on Donbas coal, much of which is moved long distances to supply the large demands of this great area. Out of 161.2 million tons produced in European USSR in 1952, the Donbas accounted for about 107 million tons, including virtually all the anthracite and most of the bituminous coal. The only other important source of bituminous coal in European USSR is the Pechora Basin, which increased production from some 400,000 tons in 1940 to nearly 13 million tons in 1952. The other important coal-producing region in European USSR, the Moscow Basin, produces lignite. The lignite, high in moisture, ash, and sulfur and low in heat value, is used chiefly in the generation of electric power. Since the Moscow Basin deposits, although of poor quality, are well located, coal production in the Moscow Basin also has increased greatly during and since World War II, the 1952 production of 33.6 million tons being more than 3 times the tonnage mined in 1940.

Asiatic USSR accounts for an increasingly important part of Soviet coal production. The chief producing regions in Asiatic USSR are the Urals area, the Karaganda Basin, and the Kuznetsk Basin (Kuzbas), which together accounted for about 72 percent of the 1952 production of Asiatic USSR. The rest of the production of Asiatic USSR is well scattered. The Urals area produced about 40 million tons in 1952, about one-third rather low-grade bituminous coal from the Kizel Basin and about two-thirds brown coal and lignite, together with minor amounts of anthracite and semianthracite. The Karaganda Basin produced nearly 19 million tons, and the Kuzbas about 42 million tons in 1952, including a large amount of bituminous coal suitable for producing coke, much of which is used in the Urals area.

In spite of Soviet efforts to develop mines near the market and to build up a market near the mines, the cost of transporting coal in the USSR remains high. The average length of haul for each ton of coal transported by rail was 694 kilometers in 1940 and 695 kilometers in 1946 and probably has not varied much from these figures in recent years. Practically all coal is transported from the mines by rail, and coal is the major commodity moved on the railroads. In 1940, coal and coke traffic on the railroads amounted to 106.9 billion ton-kilometers; the 1950 Plan figure was 143 billion ton-kilometers. Separate figures are not available for coal, but it constituted all but a minor part of the coal and coke traffic.

Within the limits imposed by unfavorable mining conditions, the USSR has had marked success in increasing productivity in coal mining during recent years. The Soviet coal-mining industry is becoming rather highly mechanized in the Soviet sense of the term, which includes the use of pneumatic picks and the blasting of coal from the solid, by which methods nearly half the underground output has been obtained in recent years. Although the Soviet industry has placed great reliance on, and may never be able to eliminate entirely, such relatively laborious methods of coal mining, the Soviet industry has made great progress in the use of coal-mining machinery. The single most important new development in Soviet coal-mining machinery is the so-called coal combine, designed to cut and load coal simultaneously without blasting. Coal combines, introduced in considerable numbers in the postwar period, are contributing to much higher labor productivity, and the Soviet industry intends to use them wherever possible, as well as other specialized machinery designed for cutting, loading, and transporting coal. All indications are that the USSR is capable of supplying all the coal-mining machinery necessary to carry out announced plans for increasing production and lowering costs.

In spite of mechanization, labor inputs represent a major element in the cost structure of the coal-mining industry. The wages offered to laborers in coal mines are the highest in the USSR. Several coal-mining areas, however, depend for the most part on forced laborers, women, and children. The number of mine workers is believed to be in the magnitude of 875,000, and the total number of workers associated with the industry probably would amount to more than 1 million.

The lack of adequate supplies of coking coal presents perhaps the most serious current technological problems in the Soviet solid fuels industries. Coke has several important industrial uses. Of a planned gross output of 30 million tons of coke for 1950, the Fourth Five Year Plan (1946-50) allocated 70 percent to ferrous metallurgy (20 million tons to blast-furnace operations, 1 million tons to foundry smelting) and the balance to nonferrous metallurgy, the manufacture of producer and water gas, and various chemical processes. Coke production may have fallen as much as 5 million tons short of meeting the 1950 goal and fell slightly short of it even in 1951, when production was about 29.5 million tons. It is possible to compensate to some extent for the lack of adequate supplies of straight coking coal by solving two problems, neither of which has been satisfactorily solved in the USSR. First, adequate coal-cleaning facilities must be established to prepare run-of-mine coal so that it may be used for coking or blending for coking. In this field, Soviet technology and plant construction have lagged badly. Second, satisfactory coal-blending practices must be developed to provide the best possible grade of coke. Soviet technology in this field, too, has not been entirely satisfactory. Failure to solve these problems has not prevented the iron and steel industry from meeting planned requirements, but the qualitative deficiency in coke supplies has affected production processes in iron and steel plants.

Fuelwood, peat, and oil shale are all of some local importance in the solid fuels supply of the USSR, primarily because their use reduces the tonnage of coal hauled long distances. Historically, fuelwood is the most important, although there are no very reliable statistics on its use. Under the Fourth Five Year Plan (1946-50), however, the USSR set out to reduce the production of fuelwood through improved technology in the production of lumber and through development of the wood-chemical industry and to substitute cheaper, more efficient mineral fuels. This aim may have been continued under the Fifth Five Year Plan. Peat, doubtless, will remain an important supplementary fuel, valuable for saving coal and coal haulage. The USSR produces more peat than all the rest of the world. The Soviet peat industry had its most rapid rate of growth during the early 1930's, and since that time the rest of growth has become gradually slower. In the Fifth Five Year Plan a relatively modest increase of only 27 percent over 1950 has been laid down for 1955. The USSR has large peat reserves, however, and continued development of peat mining can be expected, despite the low heat value of the fuel, as further improvements in technology lead to lower costs. Oil shale exploitation has been expanded since World War II, and it is of importance as a solid fuel for local use. It has been developed as a source of gas for industrial and domestic use in Leningrad and Estonian cities and also is exploited as a source of liquid fuel.

None of the solid fuels can be regarded as sensitive indicators of Soviet military intentions. Plans for continued expansion in production of all solid fuels (with the possible exception of fuelwood) during the Fifth Five Year Plan period are in accord with general objectives for industrial growth. Higher production of solid fuels, particularly coal and coke, will, of course, contribute materially to the basic industrial capabilities of the USSR.

I. Introduction.

In the USSR, solid fuels furnish about 80 percent of the energy derived from primary sources. Coal is by far the most important source of energy in the USSR, and it has been increasing in importance. Soviet data on the relative importance of the various primary sources of energy have been limited and conflicting, partly as a result of the difficulty in estimating the use of fuelwood. Table 1* presents statistics on the subject [redacted] These statistics do not cover hydro- 50X1
electricity, which is of minor importance in the USSR. It appears that

* Table 1 follows on p. 7.

the percentages given in Table 1 have been arrived at by conversion of the production of each kind of fuel to a standard fuel equivalent, which in the USSR is 7,000 kilocalories (Cal) per kilogram (kg), or 12,600 British thermal units (Btu)* per pound.

Table 1

Production of Primary Sources of Energy in the USSR 1/**
1932, 1937, 1940, 1950 Plan

Percent

	1932	1937	1940	1950 Plan
Coal	59.4	69.5	71.9	75.6
Fuelwood	19.9	13.6	13.9	9.7
Peat	3.7	5.8	6.2	6.2
Oil Fuel	17.0	11.0	7.9	6.3
Natural Gas				1.4
Oil Shale		0.1	0.1	0.8
Total	100.0	100.0	100.0	100.0

The figures given in Table 1 are at considerable variance with the estimates given in Table 2,*** [redacted] 50X1
[redacted] The only year for which Soviet data are 50X1
available giving the production of different fuels and conversion to standard fuel equivalents is 1937. Such estimates for 1937 are shown in Table 2 with modification for a breakdown between hard coal and brown coal and slight changes in production figures used for peat, oil shale, and fuelwood. The same heat-value factors as used [redacted] 50X1
for the different fuels in 1937 have been applied to the available production data for 1940 and 1950 so as to arrive at valid estimates of standard fuel equivalents.

* A British thermal unit (Btu) is the quantity of heat required to raise 1 pound of water 1 degree Fahrenheit.

[redacted] 50X1

*** Table 2 follows on p. 8.

Table 2

Estimated Distribution of Primary Indigenous Energy in the USSR by Sources 2/ 1937, 1940, 1950

Source of Primary Energy	Production (Thousand Units)	Standard Fuel Equivalent (Thousand Tons) a/*	Percent of Total Primary Energy
1937			
Coal (tons)			
Hard Coal	110,397 b/	105,660 c/	50.1
Brown Coal and Lignite	17,571 b/	8,780 c/	4.2
Total	127,968 b/	114,440 d/	54.3
Peat (tons)	25,000 e/	11,160 f/	5.3
Petroleum Hydrocarbons (tons) g/	30,480 h/	45,720 i/	21.7
Oil Shale (tons)	520 j/	200 k/	0.1
Firewood (cu m)	208,000 l/	38,730 m/	18.4
Hydroelectric Power (kwh)	4,200,000 n/	516 o/	0.2
Grand Total		210,766	100.0

* Footnotes for Table 2 follow on p. 10.

Table 2

Estimated Distribution of Primary Indigenous Energy
in the USSR by Sources 2/
1937, 1940, 1950
(Continued)

Source of Primary Energy	Production (Thousand Units)	Standard Fuel Equivalent (Thousand Tons) a/	Percent of Total Primary Energy
1940			
Coal (tons)			
Hard Coal	139,200 p/	133,235 c/	51.7
Brown Coal and Lignite	26,800 p/	13,400 c/	5.2
Total	166,000 b/	146,635	56.9
Peat (tons)	32,000 q/	14,285 f/	5.5
Petroleum Hydrocarbons (tons) g/	33,600 p/	50,400 i/	19.6
Oil Shale (tons)	2,686 j/	1,036 k/	0.4
Firewood (cu m)	240,000 l/	44,688 m/	17.4
Hydroelectric Power (kwh)	5,064,000 p/	622 o/	0.2
Grand Total		257,666	100.0

Table 2

Estimated Distribution of Primary Indigenous Energy
in the USSR by Sources 2/
1937, 1940, 1950
(Continued)

Source of Primary Energy	Production (Thousand Units)	Standard Fuel Equivalent (Thousand Tons) a/	Percent of Total Primary Energy
1950			
Coal (tons)			
Hard Coal	190,800 p/	182,200 r/	54.1
Brown Coal and Lignite	71,200 p/	35,600 r/	10.6
Total	262,000 p/	217,800 r/	64.7
Peat (tons)	35,700 q/	15,938 f/	4.7
Petroleum Hydrocarbons (tons) g/	43,900 p/	65,850 i/	19.5
Oil Shale (tons)	5,920 j/	2,283 k/	0.7
Firewood (cu m)	180,000 l/	33,516 m/	9.9
Hydroelectric Power (kwh)	12,660,000 p/	1,555 o/	0.5
Grand Total		336,942	100.0

a. The heat value of standard fuel equivalent in the USSR is 7,000 Cal per kg, or 12,600 Btu per pound.
b. Reported Soviet figure.
c. Estimated on the basis of approximately 6,700 Cal per kg for hard coal and 3,500 Cal per kg for brown coal and lignite.

Table 2

Estimated Distribution of Primary Indigenous Energy
in the USSR [redacted] 50X1
1937, 1940, 1950
(Continued)

d. Estimated on the basis of average value for total production of 6,260 Cal per kg, [redacted] 50X1
[redacted] 50X1
e. See section on peat. Also reported as 23.8 million [redacted] 50X1
f. Estimated on the basis of 3,125 Cal per kg, [redacted] 50X1
g. Crude petroleum, natural gas liquids, and natural gas.
[redacted] 50X1
i. Estimated on the basis of 1 ton of petroleum hydrocarbons equivalent to 1.5 tons of standard fuel, [redacted] 50X1
j. See Table 61 for production of oil shale.
k. Estimated on the basis of 2,700 Cal per kg, [redacted] 50X1
l. See Table 59 for production of fuelwood.
m. Estimated on the basis of 1.3 million Cal per cu m, [redacted] 50X1
[redacted] 50X1
o. Estimated on the basis of 8,139.5 kwh equal to 1 ton of standard fuel (860 Cal equal to kwh).
p. Estimates.
q. See Table 53 for production of peat.
r. Estimated on the basis of average heat value of 5,805 Cal per kg (10,450 Btu per pound) for total production and assuming average of 3,500 Cal per kg for brown coal and lignite.

It is believed that the estimates given in Table 2 are more in accord with the actual relationships of the various sources of primary energy than those shown in Table 1. It is pointed out that the proportion of energy from coal is estimated in Table 2 as a significantly lower figure than in Table 1, whereas that from petroleum is estimated at a significantly higher figure than in Table 1. The two tables agree, however, in indicating an increase in the importance of coal in the energy balance in 1950 as compared with 1940 and 1937.*

II. Coal.

A. General.

1. History.

a. Before World War II.

Coal mining in Russia started in the early part of the nineteenth century, and production began to increase rapidly toward the end of the century, but the peak production before World War I (in 1913) amounted to only 29.1 million tons. By 1920, because of the damaging effects of World War I and the Russian Revolution, production had fallen to 8.5 million tons. In the same year, the US produced 597.2 million tons, and the UK produced 233.2 million tons of coal. These figures indicate the magnitude of the increase in coal production that the USSR had to undertake if it was to become a great industrial power.

Steady progress was made in coal mining during the 1920's and 1930's. Production rose to 56.8 million tons in 1931 and to 166 million tons in 1940. In absolute terms, increases during the 1930's were particularly impressive. During this period, old mining fields were expanded, several new fields in the east were developed, and considerable quantities of new mining equipment and machinery were introduced.

The Donets Basin (Donbas),** the most important coal basin in the USSR, declined in relative importance during the decade preceding World War II. Although production of the Donbas increased

* These figures have not been adjusted to reflect heat value.
** See the map, USSR: Coal Deposits, inside back cover.

steadily from 41 million tons in 1931 to 94.4 million tons in 1940, its share of the Soviet total declined from 72 percent in 1931 to 57 percent in 1940. The Donbas has large reserves of good coal ranging from high-volatile bituminous to anthracite. Before World War II, Donbas coal was used by about 60 percent of the Soviet metal industry and railroad transportation, about 70 percent of the chemical industry, and about 50 percent of the electric power stations, together with most of the machinery-building factories located in and adjacent to the Donbas. 3/

The Kuznetsk Basin (Kuzbas) in West Siberia is the second most important coal basin in the USSR. In 1913 it accounted for only 774,000 tons of coal, or 2.7 percent of total annual production, but it increased production rapidly during the 1920's and 1930's, by 1931 reaching 5,459,000 tons (9.6 percent of the total) and by 1940 slightly more than 21 million tons (12.7 percent of the total). The Kuzbas was developed primarily to supply coking coal for the Urals and Kuznetsk iron and steel plants.

Soviet authorities rank the Karaganda Basin in Kazakh SSR third in importance.* The Karaganda Basin, which produces a fair grade of bituminous coal, had produced minor quantities of coal before World War I for the Spassk copper works (foreign-owned). It began production under Soviet auspices in 1930, when the railroad to Akmolinsk and Petropavlovsk was completed. This basin grew in importance because it is nearer to the Urals than is the Kuzbas and provides coal that is satisfactory for coking, although not of so good a quality as the Kuzbas coal. Production increased from only 11,900 tons in 1930 to 6.3 million tons, or 3.8 percent of the total annual production, in 1940.

Coal production in the Urals developed rather slowly. The Kizel, Chelyabinsk, and Karpinsk-Volchanka areas contain the principal coal deposits. In 1913, of 1,217,000 tons of coal produced in the Urals, 897,000 tons of bituminous coal came from the vicinity of Kizel, 317,000 tons of lignite from deposits near Karpinsk in the north Urals and the Chelyabinsk area in the central Urals, and only 3,000 tons of semianthracite from the Yegorshino deposits. By 1931 the Urals production was only 2,891,000 tons, but thereafter it

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* The Moscow Basin now produces nearly twice as much tonnage, but the Moscow fuel is a low-grade lignite.

developed more rapidly. By 1940 it had increased to 11,840,000 tons. Several other areas in the Urals were supplying coal in 1940, including the Dombarovsk and Poltavka - Bredy mines, which produce anthracite (possibly semianthracite), and a few mines in the Chkalov region, which produce lignite. The Urals have no coking coal, but the coals produced at Kizel are used for coking by blending them with other coals obtained from the Kuzbas and, more recently, from the Karaganda Basin, which is much nearer the Urals than the Kuzbas.*

In 1940, 2 regions in the west, the Donbas and the Moscow Basin, and 3 in the east, the Urals, the Kuzbas, and the Karaganda Basin, furnished 86.5 percent of the total Soviet production. The balance was scattered in many parts of the country from the western Ukraine to Sakhalin Island and from the far north to Central Asia. The Soviet policy was to develop local sources of fuel as much as possible and to reduce the need for long freight hauls. This policy was responsible for the development of many deposits of low-grade fuel, such as the Moscow Basin, which produced nearly 10 million tons in 1940.

Additional areas assuming importance before World War II were the following: (1) the Minusinsk Basin, south of Krasnoyarsk; (2) Cheremkhovo, in the Irkutsk Basin; (3) Suchan, east of Vladivostok; (4) the Artem Basin, north of Vladivostok; (5) the Kivda - Raychikhinsk mines in Amur Oblast; and (6) the mines at Chernovskiye Kopi in Chita Oblast. The first 3 areas produced bituminous coal, and the last 3 lignite. The output of each was from 1 million to 5 million tons in 1940.

Of still less importance were the Tkibuli deposit in the Georgian SSR, which had been mined since before World War I, although production had always been small, and the Tkvarcheli deposit in this same area, which was opened in 1935. Both produce bituminous coal and in 1940 had a combined output of 620,000 tons. In addition, there were mines operating in 1940 at 6 deposits in Central Asia, but the combined output was only about 1.9 million tons. The coal varies from lignite to low-grade bituminous. The remainder of the production came from a number of localities, none of which furnished much more than a few hundred thousand tons a year.

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* During World War II, a railroad was completed from the Karaganda fields to Magnitogorsk via Kartaly which shortened the distance considerably.

b. World War II.

In 1941 and 1942, the last 2 years of the Third Five Year Plan (1938-42), the USSR planned to produce 190.8 million tons and 243 million tons of coal, respectively. World War II intervened, however, and production was less than 140 million tons in 1941 and only about 77 million tons in 1942, the lowest production since 1933. The German invasion resulted in an almost total loss of Donbas output for 2 years, which led to acute fuel shortages and severe hardships. It is estimated that the USSR obtained from the Donbas only 1 million tons in 1942 and 4.2 million tons in 1943. The effects caused by the temporary occupation of the Moscow Basin by the Germans were minor in comparison and probably did not cost the USSR more than a few million tons. In 1943 the Moscow Basin produced 45 percent more than it had in 1940.

The coal industry of the Donbas was badly damaged during the war. In the Donbas, in 1940, the Peoples' Commissariat for Coal (Narodnyy Komissariat Ugol noy Promyshlennosti -- Narkomugol') controlled 314 primary large- and medium-capacity mines; about 2,000 small mines which belonged to other departments; and 72 other mines under construction, some of which had been put into partial use. Narkomugol' also owned 282 locomotives, 1,342 railroad cars, and 1,520 kilometers of railroad track. When the Red Army retreated in the autumn of 1942, the USSR had managed to evacuate to the east thousands of miners and some mining and power plant equipment and to destroy much of the mining facilities that remained. The result was that the larger mines could not be worked and became filled with water. The Germans attempted rehabilitation on a small scale, but were able to operate only the smaller mines, by primitive methods. According to Soviet estimates, they obtained only about 6.5 million tons in 1942 and 3.5 million tons during the first 8 months of 1943. When the Germans were forced to retreat, they completed the destruction by demolishing equipment, surface structures, and shafts. The Donbas also was a center of the machine-building industry, including coal-mining machinery which was produced at the Gorlovka Machine Construction Plant imeni Kirov, the Krivoy Rog Kommunist Mining Equipment Plant, the Toretsk Plant imeni Voroshilov, the Voroshilovgrad Mining Equipment Plant imeni Parkhomenko, and others.* These plants furnished hoisting equipment, cutting machines, ventilators, centrifugal pumps, belt and scraper conveyors, conveyor gears, and mine locomotives among other essential equipment.

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They supplied all local needs and a large portion of the needs of other coal basins. The Gorlovka Plant imeni Kirov was the major producer of cutting machines in the USSR. All these plants were totally or partially destroyed.

When the Germans were expelled completely from the Donbas on 5 September 1943, the USSR was confronted with a stupendous task of rehabilitation. The State Committee for Defense was well aware of the importance of the rapid recovery of the Donbas not only as a prerequisite to the recovery of industry in the southern USSR but also as a guarantee of the continuous movement of railroad transportation to the front. With these facts in mind, the State Committee for Defense passed a resolution giving high priority to the restoration of the coal mines, mining machinery plants, and mine development in the area.

According to the Minister of the Coal Industry, A.F. Zasyad'ko, 4/ the destruction in Donbas was as follows: 44 percent of the shafts were completely destroyed and 56 percent partly destroyed; 2,100 kilometers of mine tunnels were destroyed or flooded (flooded mine tunnels contained 250 million cubic meters of water, or about 6 times as much as in the French mines following World War I); 515 elevators and 570 principal ventilators were partly or completely destroyed; and 8 million cubic meters of industrial buildings and 3.6 million square meters, or 90 percent, of the living quarters were blown up or destroyed. A conservative estimate of total destruction cost was given as 31 billion rubles.

Zasyad'ko gave the following report of destruction in the Moscow Basin: over 50 percent of the principal shafts were destroyed; over 55 kilometers of mine tunnels were completely destroyed (flooded mines contained over 2 million cubic meters of water); 58 percent of the elevators, 55 percent of the ventilating fans, 94 percent of the compression equipment, and 85 percent of the electric substations were partly or completely destroyed; and 40 percent of the coal bunkers, 43 percent of the buildings, 48 percent of machinery buildings, 24 percent of buildings housing fan installations, and 68 percent of the living, social, and cultural facilities were completely destroyed. The total cost of the destruction was placed at 300 million rubles.

By 1944, 220 primary mines, which accounted for 70 percent of the prewar total output of the Donbas, were in process of reconstruction, and many of the machine and equipment plants had started operating. During the first year of liberation, about 100 primary mines and more than 300 kilometers of mine workings were restored. By the end of the year, 442 cutting machines, 567 conveyors, 90 electric locomotives, and many other machines were in use in the Donbas. In comparison, the Donbas had 2,800 cutting machines in 1940. By June 1945, 240 elevators, 253 ventilators, and 100 compressors had been constructed or repaired; 600 kilometers of mine workings were restored; about 200 million cubic meters of water had been pumped out; and about 1.3 million cubic meters of industrial buildings had been restored.

World War II caused feverish effort to expand output in the eastern regions of the country, although the increases apparently were not so great as the USSR announced at the time. In reviewing war conditions, Nicholas A. Voznesenskiy mentions that the Kuzbas did not increase output in 1941 and 1942, 5/ indicating that annual output was only about 21 million tons.

The same author also mentions that Kazakh SSR (including Karaganda) and Central Asia had a combined output of 9.4 million tons in 1942, as compared with 8.7 million tons in 1940. However, by 1945, the Kuzbas had pushed its production to almost 29 million tons, and the Karaganda Basin production had increased to 11.3 million, as compared with only 6.3 million tons in 1940.

The Urals more than doubled its production during the 5 war years and reached almost 25.5 million tons in 1945. Statistics on other regions in the east indicate no significant expansion during the war. The estimated increase in coal output between 1940 and 1945 in the eastern regions was from 59.2 million tons to 86.9 million tons, or an increase of nearly 47 percent.

During 1945 the Donbas produced about 36.5 million tons, and the Moscow Basin doubled its production as compared with 1940. The Pechora Basin showed the most rapid growth of any area, however, increasing its output nine times that of 1940. The completion of the railroad to Vorkuta (Pechora Basin) in December 1941 added an important source of coal supply to the USSR during the war.

Thus, in 1945, before the start of the Fourth Five Year Plan (1946-50), the USSR produced 149.3 million tons, or about 90 percent of the tonnage in the last prewar year, according to the best available estimates. Coal shortages had existed all during the war, and it had been necessary to allocate coal almost entirely to consumers that served war needs.

c. Postwar.

The Fourth Five Year Plan* established a great number of objectives for the coal industry. The more important ones were as follows: (1) a total coal production of 250 million tons in 1950; (2) the restoration of the Donbas by 1949, and production of 88 million tons in 1950; (3) the bringing into operation or starting of construction of over 300 new mines, with a total annual capacity of 115.3 million tons; (4) the opening of new coal fields; (5) the increase of production of coking coal to 57.7 million tons in 1950; (6) the increase in the number of machines used in the coal industry by 3 or 4 times the prewar number; (7) the improvement of coal quality by building 271 coal-cleaning plants with a total capacity of 175 million tons annually; and (8) the mechanical cleaning of 150 million tons of coal in 1950, comprising 53 million tons of coking coal (with ash content exceeding 7 percent) and 97 million tons of coal for electric power (with ash content exceeding 10 percent).

The Plan represented an ambitious program, considering the conditions existing at the end of the war. The task of restoring the Donbas to prewar capacity was a major undertaking in itself. Large quantities of equipment were required, which the USSR was in a poor position to provide. The USSR concentrated mainly on restoring production at the Donbas mines, which received the bulk of the available new equipment during the 1946-50 period.

Because draining the larger mines was a slow process, the smaller mines in the Donbas were put into operation first. All the mines in this area are shaft operations, and some of the largest mines exploit as many as a dozen or more seams. In the course of their development, the working faces had become more and more distant from the shafts, and quantities of water had to be drained from each level before mining could commence. Although coal was soon being extracted from the higher levels, water still remained in the deeper parts of some mines as late as 1950.

* See Appendix A for details of the Fourth Five Year Plan.

In 1949 the USSR announced that during the fourth quarter of the year the rate of output in the Donbas had reached the 1940 level. The production target for 1950 was exceeded. The USSR was successful, therefore, in attaining its primary objective, but it was accomplished only by an all-out effort, involving round-the-clock operation of mines and machinery.

Despite some shortcomings, production attainments during the period 1946-50 were considerable, even though they depended heavily on forced labor. Thousands of prisoners of war were impressed for mine work, and what they lacked in skill was made up for in numbers. Individual productivity in most cases was low, and generally the only remuneration was food, which the Soviet management used as an incentive to compel quota fulfillment. As these prisoners were repatriated, they were replaced by many women, youths, and political prisoners. Labor turnover was reported as rather heavy during this period.

As an incentive to greater productivity, the Russians have raised wages in the coal industry to the highest in the country and include bonuses for length of service as well as for exceeding work norms. The bonuses permit very high earnings in cases where the quotas can be greatly exceeded, because the pay rates increase in accordance with units of output above the norms. Stakhanovite crews have been able to earn very high wages as compared with the ordinary miners. As more workers exceed the norm and productivity increases, the standards are increased. There are frequent reports of the establishment of higher norms, which have been rising as workers become more skilled in the use of new machinery.

Labor productivity was low at the end of World War II, and the USSR reported in 1950 that it was still under the prewar level. This was caused by employment of large numbers of inexperienced workers, by poor condition of mining machinery, and, in many cases, by almost total lack of machinery.

d. Fifth Five Year Plan (1951-55). 6/

The announced objectives for the coal industry during the Fifth Five Year Plan are as follows: (1) to increase coal production 43 percent as compared with 1950 -- the 1955 target is about 375 million tons; (2) to provide in the coal industry for a more rapid increase in the production of coking coal, increasing in 5 years the production of coking coals by not less than 50 percent and increasing production capacity by 80 percent; (3) to increase the use of coal and oil shales for the production of gas (oil shale production is controlled by the Ministry of the Coal Industry); (4) to improve the quality of coal by increasing its concentration (cleaning) approximately 2.7 times in 5 years and by expanding substantially its briquetting; (5) to improve systematically the methods of working coal deposits by introducing on a wider scale coal-mining machines and equipment for comprehensive mechanization and to aim at further technical re-equipment of the coal industry and at a growth of labor productivity; (6) to develop in every way the mechanization of the heavy labor-consuming processes in coal mining, primarily the cutting and haulage of coal and rock during the tunneling of preparatory workings, as well as to introduce on a wider scale mechanized methods of propping walls; and (7) to increase the commissioning of the collieries' capacities by approximately 30 percent as compared with the Fourth Five Year Plan, which set a goal (probably not attained) of opening over 300 new mines with a capacity of 115.3 million tons.

2. Organization.

The coal industry was originally a part of the All-Union Peoples' Commissariat of Heavy Industry. A decree of the Presidium, Supreme Soviet USSR, of 24 January 1939, established the All-Union Peoples' Commissariat of the Fuel Industry, which included the coal, oil shale, and petroleum industries. A decree of 12 October 1939 subdivided the All-Union Peoples' Commissariat of the Fuel Industry into the All-Union Peoples' Commissariat of the Coal Industry USSR (Narkomugol') and the All-Union Peoples' Commissariat of the Petroleum Industry USSR.

Narkomugol' was split by a decree of 19 January 1946 into the All-Union Peoples' Commissariat of the Coal Industry of the Western Regions USSR and the All-Union Peoples' Commissariat of the Coal Industry of the Eastern Regions USSR. A decree of 28 January 1946 established the Peoples' Commissariat of Ministry of Construction of Fuel Enterprises USSR. The three commissariats became ministries on 15 March 1946. A decree of the Presidium, Supreme Soviet USSR, of 28 December 1948, created the present All-Union Ministry of the Coal Industry USSR by merging the three ministries created by the decree of 28 January 1946.* 7/

* See Appendix B for the administrative organization of the coal industry.

At the beginning of World War II, Narkomugol' controlled mines that accounted for about 90 percent of the production. The balance of the mines were under the jurisdiction of other industrial ministries, the NKVD, and local commissariats. At the present time, some mines are known to be operated by the Ministry of Local Industry in the various Republics and evidently produce for local consumption. It is believed that the Ministry of the Coal Industry currently controls about 92 percent of the production. The 1950 Plan called for production of 120 million tons in the western regions and 107 million in the eastern regions of the USSR. These figures, assumed to be for the Ministry of the Coal Industry only, represented 90.8 percent of total Soviet production of coal in the 1950 Plan.

The coal mines of the Ministry of the Coal Industry are under the administration of trusts that in turn are subordinate to combines, and these are under direct supervision of the Ministry, which has its main offices in Moscow.* There are 22 combines, and each controls from 2 to 12 trusts. There are 96 trusts which have been identified as belonging to specific combines. Several other trusts have been reported of which the controlling combine is not known.

Each trust may control from a few mines up to 50 or more. These trusts may, in some cases, have jurisdiction over a mine administration, which has several mines under it, although some administrations apparently are under the direct control of a combine, as are several in Primorskiy Kray in the Soviet Far East.

The central office of the Ministry draws up production plans for each individual combine, trust, and mine; prescribes methods of exploration of coal reserves; determines quality standards for coal; and prescribes official requirements with respect to production costs, payrolls, mechanization, and other matters.

The Ministry exercises absolute centralized control over all combines, trusts, and mines with the aid of annual, quarterly, and monthly programs for every technical aspect of the production process. The subordinate organizations, in turn, are required to make regular reports by the month, quarter, and year, corresponding to the plans set forth by the Ministry and declaring the extent to which each requirement has been fulfilled. It has been reported that, in practice, the control system is so complicated that the managers have not

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* See Appendix C for a list of combines and trusts with the number of mines in each.

sufficient time to translate every detail of the countless plans into figures at the end of each month.

The Ministry is divided into 10 or more main administrations, each with supervision over a particular phase of the coal industry and mining of oil shale. There are administrations for surveying, planning new mines, mine machinery, materials supply, cleaning and briquetting, transport, coal marketing, workers' supply, personnel, and the mining of oil shale. The construction of new mines is carried out by Shakhtstroy Trust and the building of living quarters by Zhilstroy Trust, both of which belong to the Ministry of Fuel Enterprise Construction. All managing, engineering, technical, and other personnel in coal mining and contiguous enterprises are assigned to the Ministry of the Coal Industry.

B. Supply.

1. Production.

a. Total Production.

Until recently the USSR had announced no absolute figures for total coal production for any year since 1940, when it was 166 million tons. This round figure is the one given by all Soviet sources except one, which furnishes what was probably the actual figure of 165,926,000 tons. Production of 300 million tons in 1952 was forecast by Malenkov in a speech during the autumn of 1952.

The first key to postwar output was given in a press announcement of 20 March 1949, which stated that 26.3 percent more coal was produced in 1948 than in 1940. 8/ This announcement would establish output in 1948 at about 209,650,000 tons. Increases with respect to the preceding year have been reported as 12.6 percent in 1949, 11 percent in 1950, 7.8 percent in 1951, and 6.7 percent in 1952. Production in 1949 is therefore estimated at 236.1 million tons; in 1950, at 262 million tons; in 1951, at 282.4 million tons; and in 1952, at 301.3 million tons. These estimates include anthracite, bituminous coal, lignite, and brown coal. They may be slightly in excess of actual production. Production in 1950 exceeded by about 4.8 percent the Fourth Five Year Plan (1946-50) goal for 1950, which was 250,030,000 tons. During the period covered by the Fourth Five Year Plan, production increased a total of 112.7 million tons, or an average of 22,540,000 tons annually.

b. Production of Various Coals.*

(1) Bituminous.

Most of Soviet coal production always has consisted of bituminous coal, which amounted to 153 million tons in 1950, or 58.4 percent of total production. The western regions furnished 74 million tons, or more than 48 percent, of the bituminous coal mined in the USSR. It is estimated that the Donbas produced 61 million tons; and the Pechora Basin, 10.85 million tons. The balance came from the Tkvarcheli and Tkibuli deposits in the Georgian SSR and a few other scattered areas.

The areas of important production of bituminous coal in the eastern regions include the following: Kizel Basin, in the western part of the Ural Mountains; Karaganda, in central Kazakh SSR; Kuzbas, in West Siberia; Minusinsk Basin, in Khakas Autonomous Oblast; Cheremkhovo, in Irkutsk Oblast; Bukachacha, in Chita Oblast; Suchan, in Primorskiy Kray; and various places in north and south Sakhalin. These production centers accounted for almost 94 percent of the estimated total production of 79 million tons in the east in 1950. Of this, the Kuzbas alone furnished about 43 percent. It should be mentioned that in the long distance from Voroshilov in Primorskiy Kray to the vicinity of Lake Baikal, bituminous coal is not produced at any point along the main line of the Trans-Siberian Railroad. It is produced at Bukachacha, in Chita Oblast, but this place is at the end of a branch line, 50 kilometers away.

Although sufficient data are lacking to estimate the production of coking coal by areas and by classes of coking coal for each area, it is known that nearly all the coals used for coking are mined in the Donbas, the Kuzbas, and the Kizel and Karaganda basins. Minor quantities of bituminous coal, produced at Noril'sk, Cheremkhovo, Bukachacha, Suchan, and Sakhalin Island, are consumed by coke plants. It is a fact that the best quality of coking coal is always in short supply.

(2) Anthracite and Semianthracite.

Anthracite is produced in the Donbas, in the Urals, and possibly in the Kuzbas. It is more likely, however, that semianthracite is mined in the Kuzbas. Mines are producing semianthracite in the Donbas and at Yegorshino in the Urals. There is one mine at Suchan which apparently produces a little semianthracite. It is estimated that 37.8 million tons of anthracite and semianthracite were mined in 1950, of which 34 million tons came from the Donbas.

* See Appendix D for estimates of production of various coals during 1950.

Nearly a third of the Donbas production was anthracite and semianthracite before the war, and the production is believed to be higher today. Indications are that coal production had increased more in Rostov Oblast, where much of the output of these coals is concentrated, than in the bituminous coal-producing areas in other parts of the Donbas.

There are four deposits in the Urals where anthracite or semianthracite coals are mined, but satisfactory data are not available for any of them. The output is not very important, however, and is estimated to have been 1.1 million tons in 1950, including 600,000 tons at Yegorshino, 350,000 tons at the Poltavka - Bredy deposits, and 150,000 tons at Dombarovskiy.

The production of anthracite (probably semianthracite) at certain mines in the Kuzbas [redacted] 50X1
[redacted] it is likely that the amount is relatively unimportant as 50X1
compared with bituminous coal. Production is arbitrarily estimated at 2.6 million tons in 1950.

The mine at Suchan in the Far East produces a so-called lean (low-volatile) coal, which, according to Soviet classification, is semianthracite. It is doubtful if the annual tonnage exceeds 75,000 tons.

(3) Lignite and Brown Coal.

During the last decade, Soviet coal production has consisted of a large proportion of lignite and brown coal. These lower rank coals comprised only 16 percent of the total output in 1940, but reached a peak of nearly 40 percent in 1943 during the German invasion, when almost all of the Donbas output was lost, and the USSR was forced to expand development of the low-quality deposits in the eastern regions. By 1950, with restoration of the Donbas mines to production, the share of lignite and brown coal in the total output had declined to 27.2 percent, but it apparently started to increase again in 1951. It is estimated that more than 28 percent of the total coal output in 1952 was lignite and brown coal.

The output of these coals in 1950 is estimated at 71.2 million tons, of which about 46 percent was mined in the western regions. The Moscow Basin is the most important producer of lignite in the USSR, with output estimated at 29.6 million tons. Three areas in the Urals -- the Chelyabinsk Basin and the Volchanka and Bogoslovsk deposits -- probably furnished close to 20 million tons. Other major producing areas include the Raychikhinsk-Arochka and Kivda mines in Amur Oblast (4.3 million tons); Karaganda Basin (about 2.5 million tons); Artem, near Vladivostok (2.5 million tons); the Angren mines in Central Asia (1.7 million tons); the mines at Chernvoskiye Kopi in Chita Oblast (1.2 million tons); and the Kansk Basin in Krasnoyarsk Kray (1 million tons). Brown coal deposits are being mined in various parts of the Ukraine. It was planned that the Ukraine would produce 6 million tons in 1950, but indications are that output was considerably less. The balance of production is scattered and probably amounted to about 6 million tons, or about 8.5 percent of the total production of lignite and brown coal.

Table 3* presents figures on the combined output of anthracite and bituminous coal and the combined output of lignite and brown coal in the USSR. Figures for years through 1934 are taken from published Soviet statistics 9/; figures for years since 1934 are estimates.

c. Production by Region.**

From 53.5 to 54 percent of Soviet coal production in 1950, 1951, and 1952 came from the western regions, which include the Pechora Basin, south of the Kara Sea, and the balance was from the eastern regions (Urals, Kazakh SSR, and eastward).

Five major basins and the Urals area account for about 85 percent of the total production. Table 4*** shows the production of these regions as given in the Plan for 1950 and as estimated for 1950-52.

d. Trends of Coal Production.****

During the last 3 years of the Fourth Five Year Plan, coal production increased an average of 26 million tons annually, and nearly 50 percent of the expansion was in the Donbas. The rapid increases in production were due mainly to the fact that the task of

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* Table 3 follows on p. 26.
** See Appendixes E, F, and G for estimates of Soviet coal production, given by area and year.
*** Table 4 follows on p. 28.
**** See Appendix H for coal production trends by areas, 1939-52.

Table 3

Coal Production in the USSR
1913, 1921-22 - 1952 a/*

Thousand Tons

				Percent of Total	
Year	Anthracite and Bituminous Coal	Lignite and Brown Coal	Total Production	Anthracite and Bituminous Coal	Lignite and Brown Coal
1913	27,987	1,130	29,117	96.1	3.9
1921-22	9,318	2,006	11,324	82.3	17.7
1922-23	10,524	2,176	12,700	82.9	17.1
1923-24	14,584	1,774	16,358	89.3	10.7
1924-25	14,903	1,617	16,520	90.2	9.8
1925-26	23,353	2,417	25,770	90.6	9.4
1926-27	29,452	2,823	32,275	91.3	8.7
1927-28	32,453	3,057	35,510	91.4	8.6
1928-29	36,589	3,478	40,067	91.3	8.7
1929-30	43,289	4,491	47,780	90.6	9.4
1931	50,741	6,011	56,752	89.4	10.6
1932	57,801 b/	6,889	64,690	89.3	10.7
1933	67,467 b/	8,866	76,333	88.4	11.6
1934	82,777 b/	11,383	94,160	87.9	12.1
1935	94,767	14,133	108,900	87.0	13.0
1936	109,707	16,693	126,400	86.8	13.2
1937	110,397	17,571	127,968	86.3	13.7
1938	113,690	19,198	132,888	85.6	14.4
1939	124,500	21,200	145,700	85.4	14.6
1940	139,200	26,800	166,000	83.9	16.1
1941	109,500	28,000	137,500	79.6	20.4
1942	49,250	27,750	77,000	64.0	36.0
1943	62,000	36,000	98,000	63.3	39.8
1944	86,000	42,000	128,000	67.2	32.8
1945	103,700	45,600	149,300	69.5	30.5
1946	115,600	48,600	164,200	70.4	29.6

* Footnotes for Table 3 follow on p. 27.

Table 3

Coal Production in the USSR
1913, 1921-22 - 1952 a/
(Continued)

Thousand Tons

Year	Anthracite and Bituminous Coal	Lignite and Brown Coal	Total Production	Percent of Total: Anthracite and Bituminous Coal	Percent of Total: Lignite and Brown Coal
1947	131,200	52,700	183,900	71.3	28.7
1948	150,450	59,200	209,650	71.8	28.2
1949	171,000	65,100	236,100	72.4	27.6
1950	190,800	71,200	262,000	72.8	27.2
1951	205,000	77,400	282,400	72.6	27.4
1952	215,800	85,500	301,300	71.6	28.4

a. During the period from 1921 to 1931, annual statistics represent production from 1 October through 30 September.
b. Includes 26,000 tons mined in Spitzbergen in 1932, 128,100 tons in 1933, and 222,000 tons in 1934.

Table 4

Coal Production of Principal Basins in the USSR
1950 Plan, 1950-52 Estimates

	Thousand Tons				Percent of Total Production			
	1950 Plan	1950 Estimate	1951 Estimate	1952 Estimate	1950 Plan	1950 Estimate	1951 Estimate	1952 Estimate
Western Regions								
Donbas	88,000 a/*	95,000	103,000	107,000	35.2	36.3	36.5	35.5
Moscow Basin	24,000	29,600	31,700	33,600	9.6	11.3	11.2	11.2
Pechora Basin	11,250	10,850	11,800	12,850	4.5	4.1	4.2	4.3
Total	123,250	135,450	146,500	153,450	49.3	51.7	51.9	51.0
Eastern Regions								
Kuzbas	35,500	36,625	39,500	42,000	14.2	14.0	14.0	13.9
Urals Area	30,750	34,500	36,900	40,000	12.3	13.2	13.1	13.3
Karaganda Basin	14,650	16,000	17,300	18,900	5.9	6.1	6.1	6.3
Total	80,900	87,125	93,700	100,900	32.4	33.3	33.2	33.5

* Footnotes for Table 4 follow on p. 29.

Table 4

Coal Production of Principal Basins in the USSR
1950 Plan, 1950-52 Estimates
(Continued)

	Thousand Tons				Percent of Total Production			
	1950 Plan	1950 Estimate	1951 Estimate	1952 Estimate	1950 Plan	1950 Estimate	1951 Estimate	1952 Estimate
Other b/	45,880 c/	39,425	42,200	46,950	18.3	15.0	14.9	15.5
Total USSR	250,030	262,000	282,400	301,300	100.0	100.0	100.0	100.0

a. Probably for mines under control of the Ministry of the Coal Industry only.
b. Eastern and western regions.
c. Probably includes considerable tonnage from mines in the Donbas that are not under control of the Ministry of the Coal Industry.

restoring the mines in the Donbas, which had been flooded and wrecked during the war, was much easier than developing such production from new mines.

In 1951, Donbas coal production is estimated to have increased only 8 million tons as compared with 11.9 million to 13.6 million tons annually during the previous 3 years. This was reflected in the total increase of only 20.4 million tons for the USSR in 1951. Output in the Donbas rose only about 4 million tons, or less than 4 percent, in 1952, which restricted the gain for the USSR to 6.7 percent, or less than 19 million tons. Indications are that Donbas coal production will increase at a slower rate than the Soviet average.

Table 5 shows the annual increases in tonnage during the years 1946-52 for the important productive basins and for other areas in the eastern and western regions.

Table 5

Estimated Annual Increase in Coal Production in the USSR
1946-52

Million Tons

	1946	1947	1948	1949	1950	1951	1952
Western Regions							
Donbas	10.96	9.03	11.87	12.60	13.00	8.00	4.00
Moscow Basin	0.60	1.90	2.39	3.01	2.70	2.10	1.90
Other	1.44	2.17	1.74	2.99	2.10	1.60	2.70
Total	13.00	13.10	16.00	18.60	17.80	11.70	8.60
Eastern Regions							
Kuzbas	0.98 a/	1.11	1.75	2.78	3.02	2.88	2.50
Urals Area	0.05 a/	1.60	3.25	2.25	2.00	2.40	3.10

a. Decrease.

Table 5

Estimated Annual Increase in Coal Production in the USSR
1946-52
(Continued)

Million Tons

	1946	1947	1948	1949	1950	1951	1952
Eastern Regions (Continued)							
Karaganda Basin	0.28 a/	1.32	1.15	1.07	1.45	1.30	1.60
Other	3.21	2.57	3.60	1.75	1.63	2.12	3.10
Total	1.90	6.60	9.75	7.85	8.10	8.70	10.30
Total USSR	14.90	19.70	25.75	26.45	25.90	20.40	18.90
Soviet Annual Increase (Percent)	10	12	14	12.6	11	7.8	6.7

a. Decrease.

e. Potential Production.

The Fifth Five Year Plan calls for an increase in coal production by 1955 of 43 percent as compared with 1950 and for an increase of not less than 50 percent for coking coal during the same period. The indicated goal for all coal is probably almost 375 million tons, but data are not sufficient to estimate the target for coking coal.

This assumed increase will amount to 113 million tons during the Plan, or an average of 22.6 million tons annually. Because 1951 and 1952 production was under that level, it will be necessary to increase production by an average of 25 million tons annually during the last 3 years of the Plan, and this may not be realized.

A longer range objective, which was mentioned some years ago by Stalin, is to attain an annual production of 500 million tons by 1960. If the output level is raised to 375 million tons in 1955, the annual increase during the 1956-60 period would have to average 25 million tons. Soviet accomplishments in the coal industry during the postwar period show what can be done when the situation demands that strong action be taken. It is believed that coal production can be raised to 500 million tons by 1960, providing the industry receives adequate allocations of labor, materials, and equipment, but it is more likely that the goal will not be reached before 1961.

Strip mining in the central and western parts of the Ukraine as well as in the eastern regions would permit rapid extension of output of low-quality fuel if the time element for getting these projects into production can be substantially reduced. It has taken 3 years or more to bring new strip mines into production because of the slowness in building railroad connections, power facilities, and housing. Also, it is probable that necessary types and quantities of strip equipment were not available. Once all facilities are ready, strip mining will permit production to reach the capacities of the equipment within a short time. On the other hand, the time required to develop a deep shaft mine and bring output up to capacity takes much longer. If it were known which mining areas were to get special consideration, it would be much easier to estimate future developments.

2. Imports and Exports.

a. Imports.

Soviet imports of coal were sizable before World War I. In 1913, imports amounted to 7,758,032 tons. In the decade before World War II, the USSR imported insignificant quantities of coal. The country depended entirely on its own production during World War II. The shortage of all fuels during the war was acute, especially in the western regions, where there was little output from the Donbas mines during 1942 and 1943. When the war ended, it was expected that the Donbas mines could not be restored to their prewar output level before 1950. Prospects of serious coal shortages which would hamper rehabilitation of the devastated areas were a real cause for concern, and the USSR recognized that large amounts of solid fuels were necessary. This situation resulted in demands on Poland for a commitment to furnish large quantities of coal at a low price.

According to the Soviet-Polish trade agreements of 16 August 1945, Poland became obligated to supply the USSR with 8 million tons of coal in 1946, 13 million tons annually during the period 1947 through 1950, and 12 million tons annually thereafter during the Soviet occupation of Germany. These figures included 6.5 million tons annually of so-called reparations coal, which the Russians obtained at a price of $1.25 to $1.30 per ton, or practically as a gift. The reparations coal reportedly was in compensation for the fact that the USSR did not remove certain plant installations and tangible property from the recovered territories of Poland as war booty during and following the period of their liberation by the Soviet Army in 1945. 10/ It was reported in February 1948 that a new trade agreement had been signed recently with the USSR, whereby reparations coal would remain at 6.5 million tons annually. Additional quantities have been furnished, although annual shipments have been less than the figures reported in the original agreement. The total quantities of coal called for in the original agreement were reduced, evidently in 1947. It is believed that Poland fulfilled the obligation with respect to reparations coal in 1952, although shipments to the USSR are probably continuing at about the same or higher levels as during previous years.

[redacted] shipments of coal from 50X1
North Korea and China to the USSR. Such imports by the USSR are probable, since China has an apparent surplus and could be supplying coal in payment for war material. [redacted] 50X1
on 22 August 1952 there was concluded a new Sino-Soviet economic agreement which called for exports of 3 million tons of coal annually, among other items, from Northeast and North China to the USSR. The agreement was to remain in force for 3 years. 11/ There are no satisfactory data available about the actual volume of these shipments. Imports from North Korea, if any, are relatively small. Available figures on coal imports in the USSR are shown in Table 6.*

b. Exports.

During the 1930's, Soviet exports of coal averaged under 1.7 million tons annually. The bulk of these exports was to European countries, among which Italy, Greece, and France were the more important purchasers, but nearly every country in Europe used some Soviet coal during the decade preceding the war. Of interest is the fact that the US ranked third as a customer, taking nearly 400,000 tons in 1935 and lesser quantities in other years. Japan bought between 100,000 and 250,000 tons annually, and the list of countries outside of Europe

* Table 6 follows on p. 34.

Table 6

Soviet Imports of Coal
1913, 1929-51

Year	Imports (Tons) a/	Year b/	Imports (Tons) a/
1913	7,758,032	1937-44	N.A.
1929	65,980	1945	5,242,000
1930	63,618	1946	8,880,000
1931	106,603	1947	8,600,000
1932	52,511	1948	7,500,000
1933	15,403	1949	8,600,000
1934	26,340	1950	9,000,000
1935	36	1951	8,755,000
1936	2,000		

a. Figures for 1913 and 1929-36 represent imports from all sources. 12/
b. Little, if any, coal is believed to have been imported during the period 1937-34. Figures for 1945-51 represent Polish exports to the USSR. Figures for 1945-46 are official statistics. 13/ Figures for 1947-49 are from a US report. 14/ Figures for 1950 and 1951 15/ are exports to unspecified destinations, but, presumably, all this coal went to the USSR. It is probable that the USSR imported some coal in 1950 and 1951 from China and possibly North Korea, in addition to unknown quantities of brown coal briquettes from East Germany in recent years.

included, among others, Egypt, Iran, India, China, Argentina, and Uruguay.

Soviet exports ceased at about the beginning of World War II, and the USSR did not come back into the coal export market until 1949. Statistics reveal that the USSR exported 10,900 tons of coal in 1949 to various European countries and 48,300 tons in 1950. In 1951 these exports were increased to 421,400 tons, France and Italy receiving about 80 percent of these deliveries.

Exports of Soviet coal in 1952 were possibly a little more than the previous year. It was reported that the USSR offered coal from Sakhalin Island to Japan at a price of $10 per ton. The first sales transaction, involving the delivery of 200,000 tons to a Japanese firm, was authorized by the USSR on 22 January 1952. 16/ Japan imported, however, only 29,731 tons from Sakhalin Island during the year. Available data on Soviet exports of coal, coke, and coal briquettes are given in Tables 7 and 8.*

Table 7

Soviet Exports of Coal, Coke, and Briquettes 17/
1913, 1930-38

Tons

Year	Bituminous Coal	Anthracite	Coke	Briquettes	Total
1913	97,488	N.A.	N.A.	528	98,016
1930	1,042,768	814,390	596	N.A.	1,857,754
1931	1,000,303	674,288	219	N.A.	1,674,810
1932	919,578	875,530	76	N.A.	1,795,184
1933	1,011,211	806,310	15	N.A.	1,817,536
1934	1,169,339	997,240	N.A.	40,618	2,207,197
1935	1,092,859	1,089,530	N.A.	66,035	2,248,424
1936	862,193	1,003,626	N.A.	N.A.	1,865,819
1937	469,693	803,519	N.A.	39,978	1,313,190
1938	426,928	N.A.	N.A.	N.A.	426,928

3. Stocks.

There are no data concerning the amount of coal stocks in the USSR. Fuel supplies, however, were very short during the war and for several years thereafter. It is improbable that there was any significant increase in stocks in terms of days' supply on hand before 1949, and there are still shortages in certain kinds of coal used for coking purposes. Overfulfillment of the 1950 output plan indicates

* Table 8 follows on p. 36.

Table 8

Soviet Exports of Coal and Coke to Non-Bloc Countries 18/ a/
1950-52

Tons

Destinations	1950 Coal	1950 Coke	1951 Coal	1951 Coke	1952 Coal	1952 Coke
Austria	0	0	0	9,500	8,854	0
Belgium	0	0	0	0	9,521	0
Finland	4,000	0	0	0	0 b/	0
France	28,800	0	190,700	0	198,800	0
Italy	10,200	0	150,200	0	N.A.	c/
Japan	0	0	0	0	29,731	0
Netherlands	0	0	28,700	0	N.A.	c/
Norway	0	0	0	1,200 d/	c/	N.A.
Sweden	0	0	32,700	16,200	N.A.	N.A.
Switzerland	5,300	0	19,100	1,800	N.A.	N.A.
Total	48,300	0	421,400	28,700	N.A.	N.A.

a. As reported by importing countries.
b. The USSR began shipments in December 1952 of 17,000 to 18,000 tons monthly, but possibly none arrived until January 1953.
c. Probably none.
d. Coke breeze.

that stocks increased that year, and there was probably some accretion in 1951 and 1952. A large part of Soviet production consists of coal that is unsuitable for prolonged storage. Certain kinds are easily susceptible to spontaneous combustion, and lignite, as well as brown coal, disintegrates to dust with loss of moisture. Furthermore, the good-quality bituminous coals and anthracite, which store better, are the very coals for which the USSR has the greatest need. On the other hand, exports -- consisting mostly of Donbas anthracite during 1950 and 1951 with addition of Sakhalin bituminous coal in 1952 -- are evidence that there is a satisfactory surplus, at least in some areas. It is likely that the USSR is taking advantage of the coal shortages and high prices in Europe and Japan to trade coal for commodities that are more urgently needed, even though there would be use for this coal in the USSR.

It is known that all the Satellite countries have very small stocks, which generally average less than 2 weeks' supply during many periods of the year. The USSR is believed to be in a better position with respect to coal than the Satellite countries because production has been exceeding expectations and because there has been no criticism of the coal industry for failure to satisfy needs, except for failure to provide sufficient quantities of specific classes of coking coal.

There is no reason to believe that the USSR is hoarding coal. The policy of maintaining large inventories of raw materials at plants is generally deplored. It is to be expected that coal stocks increase during the summer and autumn months and are lowest at the end of winter. Stocks of coke used to vary in this way. They reached 30 to 60 days' supply at the blast furnaces in the fall; by spring they had fallen almost to zero.

Stocks probably vary considerably between industries and plants. The major consumers of coal -- railroads, electric power stations, and ferrous metallurgy -- undoubtedly are given priority in obtaining fuel. The electric power stations burn poor-quality fuels, which will not store satisfactorily, and can be expected to carry relatively small stocks as compared with US plants. It is not unlikely that electric power stations generally carry only 1 to 2 weeks' supply and that many of those located close to mines would carry almost none. Railroads also burn a great deal of poor-quality fuel and probably do not have unusually large stocks. The iron and steel plants and some other industries may have on hand at times up to 3 months' supply.

It is difficult to estimate the over-all coal stocks in the country, because they vary from consumer to consumer and from time to time during the year. It is doubtful if the supply on hand at the end of 1950 was sufficient to satisfy the needs of the country for more than 2 weeks, which would be equivalent to about 18 million tons. It is believed that coal stocks have never exceeded 25 million tons in the USSR. These figures may be compared with figures for the US, where stocks normally are in the range of 60 to 85 million tons.

C. Consumption and Distribution.

1. 1950 Plan.

The USSR has issued few data with respect to consumption and requirements of coal by the economy. The Plan for 1950 stated that requirements would amount to 238.5 million tons, which are only 95.4 percent of the planned production. The balance of 11.5 million tons may have been intended for stockpiles.

The three major classes of consumers -- transportation, ferrous metallurgy, and electric power generation -- were expected to require 67.5 percent of total requirements in 1950, as compared with 67.7 percent in 1940. Transportation, the largest consumer, was to have received 27.2 percent of coal allocations; ferrous metallurgy, 25.2 percent; and electric power generation, 15.1 percent. The coal requirements of major consumers in 1940 and requirements of these consumers as given in the Plan for 1950 are indicated in Table 9.*

2. Consumption in 1950.

The paucity of useful data issued by the USSR renders the task of estimating requirements and consumption very difficult, especially for minor consumers. The problem of estimation is complicated, in part, by lack of information about (a) the quantities of hard coal and lignite that the major consumers were to use, (b) the actual quality of the coals consumed as compared with planned standards, (c) substitution of different kinds of coal for one another as well as for and with other fuels, and (d) changes in the efficiency of combustion equipment and fuel savings. It seems unlikely, for example, that the quality of coal was as high as had been planned, because of inadequate preparation, with the result that consumption would necessarily be higher than planned. Moreover, production was about 12 million tons greater than expected. Higher production not only permitted higher consumption, but contributed to it, since nearly all coal is moved by rail.

Despite the fact that sufficient basic data are not available, as yet, to permit calculations with an assured degree of accuracy as to consumption by regions and by consumer groups, an endeavor has been made to furnish some estimates of this consumption for 1950. These estimates, which are given in Table 10**, must be

* Table 9 follows on p. 39.
** Table 10 follows on p. 40.

Table 9

Soviet Coal Requirements 19/
1940, 1950 Plan

	Requirements (Million Tons)		Percent of Increase	Percent of Total	
	1940	1950 Plan	1940 to 1950	1940	1950 Plan
Transportation	49.0	64.9	32.4	30.6	27.2
Ferrous Metallurgy	39.4	60.1	52.5	24.6	25.2
Power Generation	20.1	36.0	79.1	12.5	15.1
Total	108.5	161.0	48.4	67.7	67.5
Other Uses	51.8	77.5	49.6	32.3	32.5
Grand Total	160.3	238.5	48.8	100.0	100.0

regarded as tentative. It should be emphasized that the entire subject of energy consumption in the USSR requires much more study. In time, with a better understanding of economic conditions in the USSR, it should be possible to furnish more reliable data than this first effort, which represents the only figures of this kind available.

The estimated consumption of coal mined in the USSR during 1950 was derived basically from heat and power requirements of the consumer groups. This approach leads to the use of the average heating value of 5,805 Cal per kg, or 10,450 Btu per pound, for Soviet coal. The use of this conversion factor tends toward overstatement of the tonnage requirements for consumer groups which normally require top-quality coal. It is believed that this overstatement would be significant only for the ferrous and nonferrous metals and alloys industries. On the other hand, the conversion factor leads to understatement of tonnage requirements in consumer groups which normally use low-quality coal. Understatement of requirements is believed to

Table 10

Estimated Consumption of Coal Produced in the USSR by Economic Regions and by Consumer Groups
1950

Thousand Tons a/

Consumer Group	Economic Regions b/ Ia	Ib	IIa	IIb	III	IV	V	VI	VII	VIII	IX	Xa	Xb	XI	XII	Total USSR	Percent of Total
Industrial																	
Ferrous Metals and Alloys	1,072		125	125	7,891	1,119	1,365	1,655	7,088	21,093	5,500	1,498	1,237	553	1,376	51,697	19.7
Cement, Lime, and Gypsum	243	92	141	189	1,124	126	125	564	919	508	162	162	146	243	664	5,408	2.1
Brick	268	100	155	208	1,238	137	138	619	1,013	560	179	179	160	268	733	5,955	2.3
Chemicals and Rubber Goods	186	59	29	30	825	59	476	236	1,322	1,129	372	147	1,120	59	30	6,079	2.3
Textiles and Leather Goods c/	576	99	140	289	902	51	43	484	2,937	228	412	20	42	9	7	6,239	2.4
Food Processing	211	31	181	154	1,318	294	96	241	1,020	89	166	143	231	55	120	4,350	1.7
Paper	963	385	230	385	193	39	39	115	655	308	39	76	39	39	347	3,852	1.5
Nonferrous Metals and Alloys	419				176		219		83	1,084	677	315			15	2,988	1.1
Unclassified Industrial	1,789	668	440	525	6,492	851	981	1,881	7,609	11,086	3,326	1,215	1,004	1,068	1,566	40,501	15.4
Total Industrial	5,727	1,434	1,441	1,905	20,159	2,676	3,482	5,795	22,646	36,085	10,833	3,755	3,979	2,294	4,858	127,069	48.5
Transportation																	
Rail d/	5,680	2,272	994	994	19,738	4,970	284	3,337	9,088	7,668	4,118	2,272	2,272	3,479	3,834	71,000	27.1
Water e/	816	192	716		578	230	96	500		125	171	37	37	38	2,486	6,022	2.3
Total Transportation	6,496	2,464	1,710	994	20,316	5,200	380	3,837	9,088	7,793	4,289	2,309	2,309	3,517	6,320	77,022	29.4
Thermal Electric Power	1,367	442	219	310	7,551	900	346	1,961	8,030	12,130	3,244	1,398	202	1,367	1,658	41,125	15.7
Municipal, Commercial, Domestic, Military, and Agriculture f/	730	150	1,713	50	802	1,310	1,997	1,941	714	170	842	595	1,079	713	3,978	16,784	6.4
Grand Total	14,320	4,490	5,083	3,259	48,828	10,086	6,205	13,534	40,478	56,178	19,208	8,057	7,569	7,891	16,814	262,000	
Percent of Total	5.5	1.7	1.9	1.2	18.6	3.9	2.4	5.2	15.5	21.4	7.3	3.1	2.9	3.0	6.4		100.0

a. Average heat value 10,450 Btu per pound, or 5,805 calories per kilogram.
b. Defined as follows: Ia, Northwest; Ib, North; IIa, Baltic; IIb, Belorussia; III, South (Ukraine and Moldavia); IV, Southeast (Lower Don and North Caucasus); V, Transcaucasus; VI, Volga; VII, Central; VIII, Urals; IX, West Siberia; Xa, Kazakhstan; Xb, Central Asia; XI, East Siberia; and XII, Far East.

c. Does not include consumption in the manufacture of finished products.
d. Includes only the consumption in locomotives.
e. Includes consumption in inland waterway and marine transportation and bunkers.
f. Includes only consumption on state farms.

be significant only for thermal electric power. In other consumer groups, variations in quality requirements or the lack of quality requirements probably would lead to consumption of coal equivalent roughly to the average heating value.

In general, the data in Table 10 were derived by applying consumption factors per unit of production in an economic activity so as to arrive at national totals. Owing to the lack of Soviet data for many economic activities, it was necessary to use consumption factors for comparable industries in the US. These US factors had to be adjusted before applying them to Soviet industry because of the different pattern of primary sources of energy in the two countries. In the USSR, approximately 65 percent of the total energy is obtained from coal, whereas in the US, coal furnishes less than 50 percent of primary energy requirements. Adjustment for this difference provided compensation for the greater use of coal and the lesser use of oil and natural gas in industries of the USSR compared with those in the US.

The regional distribution for each consumer group was derived by apportionment of its coal consumption in accordance with the regional distribution of its activities. In consideration of regional supplies of other fuels such as peat, fuelwood, oil shale, oil, and gas, arbitrary adjustments were made in the regional consumption pattern for coal in the consumer groups which presumably would utilize these substitute fuels.

The estimated pattern of consumption of coal was related to the coal production in 1950 by totaling the consumption for all determined consumer groups and subtracting this total from the production total. The remainder, or 15.4 percent of the total production, was assigned to the industrial category as "unclassified" because most of it would be used for industrial purposes.

This relation of consumption to total production in 1950 represents an understatement of actual consumption because neither foreign trade nor changes in stocks were taken into account. Although exports were negligible, about 9 million tons were imported from Poland, and there were possibly minor tonnages shipped in from China. The resultant trade balance would more than offset an increment in stocks, so that total consumption was possibly as high as 267 million tons.

The foregoing explanations serve to show the general lack of information on the subject of consumption. The estimates given, however, even though not particularly accurate, do have some value in showing the relative needs for coal in various economic regions. As would be expected, the largest consumption of coal falls in the regions of greatest industrial activity. The Urals area, Economic Region VIII,* consumes 21.4 percent of the coal. It is followed in order by the Ukraine in Economic Region III, with 18.6 percent, and the Central European area, Economic Region VII, with 15.5 percent of the total. These 3 areas combined required an estimated 55.5 percent of the coal.

Industrial uses in total represent the largest major consumer category and require slightly less than half of the coal. Of the industrial consumers, the ferrous metals and alloys group are by far the largest consumers. The bulk of the coal taken by ferrous metallurgy is used in making coke.

Actual motive power in transportation required 29.4 percent of the coal. Of this, the operation of railroad locomotives requires by far the largest part (80 to 90 percent) and represents the largest single use of coal in the country.

The electric power industry is also one of the largest consumers. In consideration of the fact that power stations generally burn the lowest quality of coal available to an area, it would not be surprising if they consumed as much as 19 percent of the tonnage produced in 1950.

3. Distribution in 1950.

Attention has been called to the weaknesses in present estimates of 1950 consumption of coal in the USSR. Despite such weaknesses, it is illuminating to compare 1950 consumption figures with production in each economic region. When this is done, it is possible to get a clearer understanding of the reasons why coal represents such an important item in railroad transport, especially the reason for the long-haul factor, and to see what are the surplus and deficit positions in the various economic regions. A comparison of production and consumption by economic regions is given in Table 11.**

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** Table 11 follows on p. 43.

Table 11

Comparison of Coal Production and Consumption
in the USSR by Economic Regions
1950

Thousand Tons

Western Economic Regions	Production	Consumption	Surplus	Deficit
Ia	935 a/*	14,320		13,385 a/
Ib	10,850	4,490	6,360	
IIa	0	5,083		5,083
IIb	0	3,259		3,259
III and IV b/	98,440 c/	58,914	39,526	
V	1,775	6,205		4,430
VI	50 c/	13,534		13,484
VII	29,600	40,478		10,878
Total	141,650	146,283	45,886	50,519
Domestic Balance				4,633
Imports			9,000	
Exports				49
				4,682
Net Surplus			4,318 d/	
Eastern Economic Regions				
VIII	34,500	56,178		21,678
IX	37,575 e/	19,208	18,367	
Xa	17,500	8,057	9,443	
Xb	4,275	7,569		3,294
XI	14,250	7,891	6,359	
XII	13,000	16,814		3,814
Total	121,100	115,717	34,169	28,786
Net Surplus			5,383 f/	

* Footnotes for Table 11 follow on p. 44.

Table 11

Comparison of Coal Production and Consumption
in the USSR by Economic Regions
1950
(Continued)

a. Includes production of 185,000 tons of Spitzbergen coal, not all of which was available to Region Ia, and 750,000 tons carried as unallocated in Table 64, p. 233.
b. Combined because Donbas output cannot be divided satisfactorily between the two regions; part is in Ukraine, and part in Rostov Oblast in Region IV.
c. An amount of 50,000 tons, carried as unallocated in Table 64, p. 233, has been transferred to Region VI.
d. It is possible that the actual net surplus approached this figure, but it is more likely to have been between 2 and 3 million tons.
e. Includes 950,000 tons carried as unallocated in Table 64, p. 233, but part of it may be produced in Regions XI and XII.
f. The figure should not be considered as the amount that went into stocks, because some coal from the Urals must have moved into Regions VI and VII, and actual consumption was probably somewhat higher, since eastern coal is below average in heat value.

Economic Regions Ia, Ib, IIa, IIb, and VII take in the northern and central parts of European USSR, and Region VI is the region of the Volga River, extending southward from the area of Kazan to the Caspian Sea. Each of these economic regions, with the exception of Ib, which is the region that includes the Pechora Basin, is a deficit area. However, all of the Pechora coal, except what is used locally, must be transported long distances. Pechora coal is hauled as far as Leningrad, but most of it is probably going to the area north and east of Moscow, taking in the cities of Gor'kiy, Ivanovo, Kostroma, Yaroslavl', and Vologda as well as others.

Coal from Spitzbergen is probably unloaded at Murmansk and Archangel and possibly a few other points in the north. The coal mined at Borovichi and Selizharovo contributes little to meeting the needs of Economic Region Ia, which includes Leningrad. It is believed that Polish coal must go to supply a large part of the requirements of Regions Ia, IIa, and IIb, which include the Baltic Republics and Belorussia. It would seem, however, that 10 to 12 million tons of Donbas coal must also be moved into these regions.

Regions III and IV have a surplus of around 40 million tons, owing to the Donbas output. This coal not only moves to the northwest but also must go to meet a large part of the requirements of the central industrial area (Region VII) and the Volga area (Region VI). The Volga area is particularly dependent on Donbas coal, since it has almost no coal production. The southern Caucasus area (Region V) is another area which has inadequate indigenous production and must depend mainly on Donbas coal.

In the eastern areas, only the Urals area, the Central Asiatic republics, and the Far East show deficit balances. The Urals probably had to import between 20 and 23 million tons in 1950. This coal came from Karaganda in central Kazakhstan and the Kuzbas in West Siberia, distances of 1,200 to 2,000 kilometers. It is probable that between 7 and 8 million tons of coal from Karaganda and between 13 and 17 million tons from the Kuzbas had to be transported to the Urals in 1950.

The mines in Central Asia (Region IX) cannot supply all needs in the regions, and it is necessary to use coal from Karaganda and the mines in south Kazakhstan at Lenger and Kilitomashat. Kuzbas coal has also moved into Central Asia over the railroad south from Novosibirsk to Frunze. This line passes through the eastern part of Kazakh SSR, where Kuzbas coal is also used.

The economic regions for which estimates are least reliable are East Siberia (Region XI) and the Far East (Region XII). It is believed that consumption is more nearly in balance with production than comparison of the estimates of production and consumption would indicate. However, there was possibly some coal moving eastward from Cheremkhovo into the Far East. It is known that Kuzbas coal moved to the Far East as late as 1948, but this has been unnecessary, apparently, since then.

From the foregoing, it is evident that coal traffic is heavy in the USSR. The railroads move all but a very small part of the tonnage. Information available with respect to railroad transport of coal and coke is presented in Table 12.*

In view of the fact that coal production in 1950 was 12 million tons over plan and coke production was as much as 5 million tons under plan, it is estimated that coal and coke together represented at least 147 billion ton-kilometers of traffic on the railroads in 1950.

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* Table 12 follows on p. 46.

Table 12

Railroad Transport of Coal and Coke in the USSR 20/
1940, 1945-46, 1950 Plan

	Average Length of Haul (Kilometers)		Amount Hauled (Billion Ton-Kilometers)	
Year	Coal and Coke	Coal Only	Coal and Coke	Coal Only
1940	701	694	106.9	N.A.
1945	693	672	65.0	N.A.
1946	N.A.	695	N.A.	N.A.
1950 Plan	650	N.A.	143.0	N.A.

The estimate is based on the assumption that the average length of haul for coal and coke was 650 km, although it probably was somewhat higher. The development of local coal deposits, such as those in the western Ukraine, is intended to reduce the necessity for some coal traffic, but expanding coal and coke production as well as a continuing long-haul factor can be expected to create a growing burden for the railroads.

D. Reserves, Quality, and Deposits.

1. Reserves. 21/

a. General Reserves.

The latest year for which figures are available that give total coal reserves and include a regional breakdown is the year 1937, when the USSR presented estimates at the Seventeenth Session of the International Geological Congress, which was held in Moscow.* Total geological reserves were estimated at 1,654 billion tons (estimated to a depth of 1,800 meters below the surface), a figure equivalent to approximately half the reserves of the US, or about one-fifth of the world total. Reserves that were classified in "actual"

* See Appendix I.

and "probable" categories constituted only 7.9 percent and 17.8 percent, respectively, of the total geological reserves.*

It is evident that the USSR has huge coal reserves. However, nearly 91 percent of the Soviet coal reserves, as estimated in 1937, are located in Asiatic USSR. According to the estimate, the Kuzbas and the unexploited Tungus Basin each have about 25 percent of these reserves, and the important Donbas, 88.9 billion tons, or 5.4 percent. Total Soviet reserves were classified 81.8 percent as bituminous, 5.5 percent as anthracite, and the balance as lignite and brown coal. Of significance is the fact that, although 97 percent of the anthracite reserves are found in the Donbas and the Kuzbas, bituminous coal and lignite deposits are distributed in all the larger regions of the country.

Since 1937, and especially during World War II, there has been intensive exploration for minerals of all kinds in the USSR, and as a result there have been many discoveries. The Soviet press reported in 1943 that 1,800 new coal deposits had been discovered since 1937. New ones are reported each year. Nearly all these new deposits are found in Asiatic USSR.

The Soviet government undoubtedly values its coal reserves much higher now than it did in 1937. Some significant

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* Only such reserves were classified as "actual" for which, besides data on the extent and thickness of coal seams, there were reliable grounds for the judging of their persistence at depth. Classified as "probable" were reserves of deposits (or of their separate parts) for which were available more or less definite data for the determination of the extent and thickness of seams. As a result, a considerable part of the reserves classified as "probable" in 1913 estimates approached, according to the degree of accuracy of these estimates, the "actual" reserves of a number of countries. Classified as "possible" were reserves for which sufficient data were available for their expression in figures. Thus a considerable part of the reserves referred to the category of "possible" approach, by the character and quantity of data available, close to the "probable" reserves of a great majority of the countries, according to the estimates made for the world in 1913. 22/

discoveries include deposits in the Tuva Autonomous Oblast, which are claimed to exceed those of the Donbas in size, and in the Pechora Basin, whose reserves have been reported as high as 120 billion tons, or more than 3 times the 1937 estimates for this area. Prospecting has found extensions of coal deposits in old producing regions, as, for example, in the Donbas, the Moscow Basin, and the Suchan Basin.

The USSR classifies its coal resources according to standards adopted by the Twelfth Session of the International Geological Congress of 1913. 23/ It is customary in the USSR to refer to a particular class of coal by the word Mark, as, for example, Mark K (koksovyy -- coking). The letter is the first letter of the Soviet name for a class or kind of coal. These classes of coal are differentiated in general by the range of volatile content as determined on an "as received" basis, or inclusive of moisture and ash. The Soviet system of classes, or marks, of coal is shown in Table 13,* but may not include all the subclasses.

b. Coking Coal Reserves.

The reserves of high-quality coking coal in the USSR are quite limited, and it has been necessary since before the war to blend different varieties of coal, including coals with little or no coking characteristics, in order to increase supplies. Despite this practice, there has not always been sufficient coking coal available during the postwar period.

The reserves of Class K coals, which have the best coking characteristics, are small in relation to the reserves of so-called suitable coals, which include varieties of coal that will make satisfactory coke when blended with other varieties. Suitable coking coals include bituminous coals of Classes K, PS, PZh, and G.

Soviet authorities have been very much concerned about the fact that Soviet industry has been consuming the better classes of coking coals at a rate disproportionate to the minor share that reserves of these classes comprise of the total Soviet reserves of suitable coking coal. Table 14** presents figures published in a Soviet

* Table 13 follows on p. 49.
** Table 14 follows on p. 49.

Table 13

Soviet Classification of Coals a/

Class	Character	Volatile Content (Percent)
A (antratsit)	anthracite	3 to 5
T (toshchiy)	lean b/	Less than 17
PS (parovichno-spekayushchiysya)	steam-caking (bituminous)	12 to 18
K (koksovyy)	coking (bituminous)	18 to 26
PZh (parovichno-zhirnyy)	steam-fat (bituminous)	26 to 36
SS (slabo-spekayushchiysya)	weakly caking (bituminous)	N.A.
G (gazovyy)	gas (bituminous)	36 to 44
D (dlinno-plamennyy)	long flame (low-quality bituminous or subbituminous)	More than 42
B (buryy)	brown coal	

a. Broad classifications only. There are a number of designations for grades of coal within each class.
b. Includes semianthracite and apparently some low-volatile bituminous.

Table 14

Coal Reserves and Coal Utilization in the Donbas and Kuzbas

Percent

	Class G	Class K and Class PZh	Class PS
Donbas			
Share of Total Soviet Reserves	52	34	14
Used in Coking	8	72	20
Kuzbas			
Share of Reserves	70	17	13
Used in Coking	10	82	8

periodical of April 1948 to illustrate the situation in the Donbas and the Kuzbas.

The demand by industry for only Class K and PZh coals during wartime and extending into the postwar period threatened to bring about a very serious shortage of these coals and resulted in an ultimatum by technicians that a greater proportion of inferior blending coal had to be utilized in order to meet requirements. Repeated emphasis on the development of means of utilizing Class G coal, the lowest blending type, points to the seriousness of the problem in making coal available for the expanding requirements of the metallurgical industry. The coal industry maintains that under present mining conditions it is more economical to mine at various levels than to follow one seam to exhaustion. This practice has resulted in less concentration on the production of the most desirable coals.

The Donbas, the Kuzbas, and the Kizel and Karaganda basins produce all but a minor part of the coals consumed by the coke ovens in the USSR. Coals that are suitable for coking are found in other scattered localities, including Vorkuta, Noril'sk, the Georgian SSR, the Irkutsk Basin, Bukachacha, the Bureya Basin, Suchan, and Sakhalin Island. All of these areas may provide relatively small quantities of coal for coking purposes.

The Kuzbas has the only coals that can be coked without preparation. Coking coals of the other areas, including the Donbas, are characterized by high ash content and generally high sulfur. The Urals area has no coking coals, and its large metallurgical industry depends on coking coal shipped in from other areas. It is a serious transport requirement to ship coal to the Urals area from the Kuzbas and the Karaganda Basin. Large quantities of Class G coals are mined in the Kizel Basin, and these are blended with coals from the Kuzbas. A mixture for coking purposes is obtained by blending 80 to 85 percent Kizel coal with 15 to 20 percent Kuzbas coal. The coke produced with Kizel coal at Gubakha, however, is not satisfactory for smelting pig iron. The dependence on distant transport of millions of tons of fuel annually for the metallurgical industry is a strategic weakness of the Urals economy.

2. Quality of Production.

The average quality of Soviet coals has declined considerably since the prewar period. This decline can be ascribed mainly to the much higher proportion of lignite that is mined. In 1940, lignite comprised only 16.1 percent of the total output, as compared with 27.2 percent (estimated) in 1950. Bituminous and subbituminous coals constituted about 58.4 percent of the total in 1950, and anthracite and semianthracite made up the balance of 14.4 percent.

The coals of the USSR, in general, are characterized by high ash content. It has been reported that the ash content of coal shipped to the Ministry of Electric Power was reduced from 17.1 percent in 1945 to 15.9 percent in 1950 and that shipped to the Ministry of Transportation was reduced from 24.21 percent in 1945 to 23.05 percent in 1950. About 80 percent of the coal used for coking was mechanically cleaned in 1950, and the ash content was much less, ranging from about 8 percent for Donbas coal up to 10.9 percent for Karaganda coal. 24/

Reducing the impurities in some of the Soviet coals is a serious problem. The sulfur content of the Donbas coal averages 2.4 percent, and cleaning will not reduce these impurities by more than 0.2 to 0.7 percent. The coals of Tkvarcheli (Georgian SSR), of Karaganda, and of Kizel contain high-average ash content in raw coal (18 to 22 percent) as well as in the different sizes. A characteristic of the coals of these basins is that the ash is inherent, which makes cleaning difficult and necessitates crushing to a size of from 12 to 20 millimeters (mm) in order to obtain more or less satisfactory cleaning results. The problem of sulfur elimination is serious in the coals of the Urals, which contain an average of 6 percent. Washing will reduce the sulfur content to only about 3.5 percent.

Cleaning the Kuzbas coals does not present a serious problem. Many of them contain only 8 percent ash and do not require cleaning. Those coals that do have a high ash content are not too difficult to wash.

The coals in East Siberia and the Soviet Far East apparently receive almost no preparation. According to numerous prisoner-of-war reports, they are not very good quality and contain considerable rock. It may be assumed that they store poorly and do not burn efficiently. Although the coals of the Bureya Basin can be used for coking, they contain a high percentage of ash, which cannot be reduced sufficiently to make them particularly desirable.

3. Principal Deposits. 25/

a. Donbas (Eastern Ukraine and Rostov Oblast).

(1) Location.

The Donbas coal deposits are located in the administrative districts of Stalino, Voroshilovgrad, and western Rostov in an area of about 25,000 square kilometers, lying along a northwest-to-southeast axis 380 kilometers long with a breadth varying up to a maximum of 165 kilometers.

(2) Reserves and Types of Coal.

The 1937 estimate of reserves in the Donbas was 88.9 million tons, which comprise only 5.4 percent of total Soviet geological reserves. Geological reserves have been estimated to a depth of 1,820 meters below ground level: that is, to 1,490 meters below sea level. Included in the estimates are seams exceeding 0.25 meter in thickness. Limiting the estimates by including only seams thicker than 0.5 meter and by going no deeper than 1,350 meters below ground level reduces the estimated total reserves from 88.9 to 39 billion tons, so that there are possibly 50 billion tons in the total which may not be feasible to mine.

Table 15* shows the proportion of reserves according to class of coal, estimated in the geological reserves and the workable reserves.

Coking coal that will coke without blending (Class K) comprises only 4.1 percent of the geological reserves, and Class PS, which is used for coking, amounts to 8 percent of the total.

Class D coal is found in the northern sector of the coal basin (the Lisichansk area). Class G coal occurs in the adjacent Rodakovo - Uspenskaya area and in the western reaches of the coal fields in the Krasnoarmeyskoye district. The three classes of bituminous coal of greatest value to heavy industry are found chiefly in the Stalino - Makeyevka area and in the central areas (60 percent) and also in the following areas: Seleznyevko, Almaznaya - Mar'yevka, the Krasnodon - Sorokin district, and to some extent in the Rodakovo - Uspenskaya district. The entire central and eastern deposits (with the exception of those in the Krasnodon - Sorokin district, which

* Table 15 follows on p. 53.

Table 15

Proportion of the Various Classes of Coal to the Total Coal Reserves of the Donbas

Class of Coal	Percent of Total Geological Reserves	Percent of Total Workable Reserves
Anthracite (Class A)	30.2	27.2
Semianthracite (Class T)	17.0	18.7
Bituminous		
Coking Coal (Classes PZh, K, and PS)	22.6	24.9
Gas Coal (Class G)	27.8	26.5
High-Volatile Coal (Class D)	2.4	2.7
Total	100.0	100.0

form a wedge into the northeast section of the coal basin) are composed of anthracite exclusively, which is a high-grade industrial fuel but little suited for coking. The most important anthracite districts are Chistyakovo, Snezhnoye, Krasnyy Luch, Bokovo, Dolzhanskaya, Novoshakhtinsk, and Shakhta.

(3) Quality and Analyses.

The Donbas coals are characterized by high percentages of sulfur and ash content. Sulfur content averages approximately 2.4 percent. Ash content averages around 15 percent but goes as high as 23 percent. There have been many complaints on the quality of the coal, and preparation facilities have been capable of handling only a fraction of the production.

Table 16* shows the approximate chemical analyses of Donbas coal.

* Table 16 follows on p. 54.

Table 16

Chemical Analyses of Donbas Coal

Class	Volatile Content (Percent) a/	Chemical Composition (Percent) Carbon	Hydrogen	Nitrogen	Sulfur	Cal per kg b/
D	45.0	77.0	5.4	1.8	5.0	7,730-7,445
G	39.5	81.0	5.5	1.6	4.0	8,080-7,790
PZh	30.5	85.5	5.2	1.6	3.0	8,440-8,165
K	23.0	87.0	4.9	1.6	3.0	8,540-8,280
PS	16.5	89.0	4.5	1.6	2.5	8,580-8,345
T	12.5	91.0	4.1	1.5	1.2	8,560-8,345
A	4.0	94.0	1.9	0.7	1.5	8,140-8,040

a. Volatile content is given as percent of combustible mass.

b. The heat values appear to have been determined on an ash-free or on a moisture- and ash-free basis.

(4) Coal Measures.

There are about 200 coal beds in the Donbas, but only 30 to 40 are workable. These beds vary in thickness throughout the basin, but most of them are thin -- about 70 percent are between 0.45 and 0.5 meter thick. It is seldom that beds are as much as 1.5 meters thick, and 2 meters is exceptional thickness. The average thickness of the producing seams is not more than 0.95 meter (about 3 feet).

(5) Mining Conditions.

Not only are the seams steeply pitching, but most of them have a number of rock partings, which complicate the mining and cleaning of the coal. Water is abundant in some mines, and for the Donbas as a whole it is necessary to pump out approximately 2 tons of water for every ton of coal produced. Furthermore, increasing quantities of gas are being encountered, especially in the deeper mines.

As the development of the mines increases, shafts are becoming deeper. The depth of several exceeds 1,000 meters.

b. Moscow Basin.

(1) Location.

The Moscow Basin is located in the center of the European part of the USSR. The coal-bearing strata spread out in the form of a wide arc from the vicinities of Borovichi and Selizharovo to Moscow Oblast and extend partly into Smolensk Oblast. The distance from the northwestern to the southeastern boundary of the basin is more than 1,000 kilometers. The coal-bearing strata cover about 1,200 square kilometers.

(2) Reserves and Types of Coal.

Geological reserves were estimated in 1937 at 11.9 billion tons in the southern part and 500 million tons in the western part, but only about 36 percent were classified as actual and probable reserves.

The coals are of two types: "smoky" lignites and boghead (cannel) coals. The boghead coals are found in the form of lenses 0.3 to 0.5 meter thick within the lignite deposits.

(3) Quality and Analyses.

The lignites are of low quality and consist of about 30 to 32 percent moisture, 26 to 28 percent ash, 3.7+ percent sulfur, and the balance is organic material. The heat value averages about 2,900 Cal per kg on a working-fuel basis.* Physically, these

* Some good data with respect to heat values of various Soviet coals were published in 1943. Data are furnished for all the important coal-producing areas with the exception of the Donbas. The heat value is given for so-called working fuel, which reflects more accurately the actual quality. Working fuel is interpreted to mean coal as received for use; hence, its heat value would be on an "as received" basis, including moisture and ash. References to heat value of working fuel, which are given in the remainder of this report, are from a Soviet book published in 1943 under the name of P.F. Weber (editor).

lignites are porous, do not stand transport, and pulverize easily. Their quality is lower than that of any produced in the US.

(4) Coal Measures.

The southern part of the basin -- the Moscow Basin proper -- has the main industrial coal-producing districts in the basin. The main workable bed occurs there in the lower part of the coal-bearing stratum. The bed consists of a number of lenses 3 to 4 meters thick and, in exceptional cases, 6 to 19 meters thick. The lenses vary in size from very small ones to those covering 10, 15, and 20 square kilometers. There are some lenses 12 to 13 kilometers long. In addition to the main bed, there are others, some of which are of industrial interest.

(5) Mining Conditions.

The main seam is horizontal and is located at a depth of 25 to 70 meters but is surrounded by clays, dry sands, wet sands, and quicksands. The part of the seam worked is characterized by winding contours. The seam itself is frequently broken by karst holes, the result of hydrological action. In a great part of the area, the coal-bearing stratum contains considerable water and thus requires special drying devices during development work; for example, numerous drains must be used in the roof and floor of the mines. Working a seam more than 3 meters thick is a special problem in the Moscow Basin. The roof is unstable at all mines and buckles the posts. Also, the condition of the bottom is poor, as it generally consists of soft clays which become permeated with water and will not support timbers.

c. Pechora Basin (Komi SSR).

(1) Location.

The Pechora Basin is located in the northeastern part of European USSR in the basin of the Pechora River and its tributaries. The coal-bearing region is bounded by the northern Urals on the east, the Timanskiy Kryazh (Timan Ridge) on the west, and the Barents and Kara seas on the north.

(2) Reserves and Types of Coal.

The estimates of 1937 were 20 billion tons of bituminous coal and 16.5 billion tons of lignite, but more recent data place the total geological reserves as high as 120 billion tons.

(3) Quality and Analyses.

The quality of the coals in the basin varies considerably. Low-volatile coals are found in the eastern and northeastern parts of the basin, coking coals toward the west, and lignite in the western and southwestern parts. At Vorkuta, there are coals suitable for coking purposes (Class PZh). These coals may be analyzed as follows: moisture, 1.3 to 3.5 percent; ash, 8.5 to 15 percent; sulfur, 0.7 to 0.9 percent; volatile matter, 28.5 to 31.5 percent; and heat value, 7,130 to 7,620 Cal per kg. [redacted], however, gives heat values of run-of-mine coal from various mines at Vorkuta, and the average is only 6,260 Cal per kg on a working-fuel basis. 50X1

(4) Coal Measures.

The basin is mainly an area of rather large anticlinal and synclinal folds which are closely associated with the structural elements of the northern Urals, Timan, and Poy-Khoy mountains. Permian period coals, found in the eastern and northeastern parts of the basin, are the most valuable. Several closely defined deposits are found in the basin of the Usa River and its tributaries. Some of these are the Vorkuta, Adz'va, Intova (Inta), Kozhim, Pechen, Plesh, Shor, Zaostern, and Sharin deposits. The best explored area is the Vorkuta deposit, where 11 workable beds 0.6 to 3.8 meters thick are known. In the Adz'va deposit, as many as 30 beds are known, ranging from 0.4 to 4.5 meters in thickness.

(5) Mining Conditions.

In the Pechora Basin the principal mines are at Vorkuta, north of the Arctic Circle, in an almost barren region where the permafrost has been reported to exceed 160 meters in thickness. Living conditions are so harsh that mining has had to be performed by forced labor. It seems highly improbable that sufficient voluntary workers could be obtained for coal mining in this cold and isolated region.

d. Tkibuli Deposit (Georgian SSR).

(1) Location.

The Tkibuli deposit in Georgian SSR is 44 kilometers northeast of Kutaisi, with which it is connected by railroad.

(2) Reserves and Types of Coal.

Reserves have been reported to contain 170 million tons of bituminous coals, which are classified as gas coals. The average heat value of these coals was reported to be 4,680 Cal per kg on a working fuel basis.

(3) Coal Measures.

The deposit contains some thick coal seams which dip at angles ranging from 18 to 45 degrees. Individual coal seams vary from 1 to 8 meters in thickness and contain numerous rock partings.

(4) Mining Conditions.

The coal beds are said to be readily subject to spontaneous combustion.

e. Kizel Basin (Urals).

(1) Location.

The Kizel coal-bearing area includes a part of the western Urals belt, stretching from the Yayva River on the north to the Vil'va River on the south, an area about 100 kilometers long and 15 to 20 kilometers wide. Although the entire area covers about 2,000 square kilometers, the main coal-bearing strata cover only 1,400 kilometers. The area is connected by the Chusovaya - Kizel - Solikamsk branch line with the Molotov - Sverdlovsk rail line. The principal mines are located near Kizel, Polovinka, and Gremyachinsk.

(2) Reserves and Types of Coal.

In 1932 the Urals Coal Commission estimated Kizel region reserves at 2,711,645,000 tons, counting beds 0.6 meter thick and to a depth of 1,800 meters. This figure includes 628,140,000 tons in beds running down to 1,000 meters in depth. In 1937, reserves were announced at 3,435 million tons. The Kizel coals are bituminous (Carboniferous period) and include some of the cannel variety. They belong largely to Class G, but a small percentage can be classified in Class PZh.

(3) Quality and Analyses.

The Kizel coals are characterized by high ash and sulfur contents but, despite these unfavorable factors, are used to make coke by blending with coals from the Kuzbas. Analyses of the coals show the following average composition: volatile matter, 29 to 35 percent; moisture, 1.5 to 3 percent; ash, 15 to 30 percent; sulfur, 4 to 8 percent; and heat value, 6,160 to 7,000 Cal per kg. The heat value of the run-of-mine coal, however, averages only 5,600 Cal per kg on a working-fuel basis.

(4) Coal Measures.

There are 7 to 10 coal beds. The number of workable beds differs from sector to sector, varying from 1 to 5. The thickness of the workable beds varies from 0.5 to 2 meters and occasionally reaches 5 to 7 meters. The beds are generally noncontinuous, a characteristic which, apart from genetic conditions of deposition, is associated with structural causes. Because of this characteristic, the area of an individual coal seam varies between 5,780 and 1 million square meters per square kilometer. The coal beds in some places are free of rock partings and in other places have many. The rocks of the coal-bearing strata are comparatively hard.

(5) Mining Conditions.

Hydrogeological conditions for exploitation work are very complex. The location of the coal-bearing strata in a stratum of limestones, which are very karstic, and the presence of water in the coal-bearing strata themselves create the danger that a shaft suddenly may be flooded. The rocks of the coal-bearing strata contain so much water that gushers result when shafts are sunk. In addition, folds, faults, and variability in the thickness of the coal beds further complicate exploitation work.

f. Bogoslovsk Deposit (Urals).

(1) Location.

The Bogoslovsk deposit is located 438 kilometers north of Sverdlovsk and is connected to the northern Urals railroad via Serov. The mining center is at Karpinsk, where there are several large strip mines.

(2) Reserves and Types of Coal.

Reserves are reported to consist of 350 million tons of lignite (Jurassic period).

(3) Quality and Analyses.

The lignite averages 30 percent moisture. Ash and sulfur content on a moisture-free basis averages 17 percent and 0.5 percent, respectively. The heat value averages 6,500 Cal per kg on a moisture- and ash-free basis. The run-of-mine coal, however, varies from 3,220 to 3,460 Cal per kg and averages about 3,295 Cal per kg on a working-fuel basis. This lignite is better than Moscow Basin lignite, but not so good as that produced at Chelyabinsk.

(4) Coal Measures.

The lignite is in a bed up to 38 meters in thickness.

g. Chelyabinsk Basin (Urals).

(1) Location.

The Chelyabinsk Basin extends for almost 150 kilometers along the eastern slope of the Urals from Chelyabinsk to Troitsk. It is a typically enclosed basin, and its boundaries are undefined (1946). The important mining centers are Korkino, Kopeysk, Yemanzhelinka, and Chelyabinsk.

(2) Reserves and Types of Coal.

Reserves, according to prewar data, were 1.8 billion tons of lignite, but new deposits have been discovered, so that the estimate is probably higher today.

(3) Quality and Analyses.

The lignite, as mined, contains the following: moisture, 18 percent; ash, 14 percent; sulfur, 0.7 percent; and heat value, 4,500 Cal per kg. Another source shows that the average heat value of the fuel produced was only 3,847 Cal per kg and varied from 3,250 to 4,550 Cal per kg on a working-fuel basis.

(4) Coal Measures.

In general, the coal-bearing stratum includes 10 or 11 workable beds with a total thickness of 25 to 35 meters. The coal beds reach thicknesses of 20 to 40 meters -- sometimes, as at Korkino, of more than 100 meters -- but have many rock partings. The coal seams vary in both thickness and structure because of peculiarities in the formation of the deposits in that area. The Chelyabinsk Basin is characterized by the presence of numerous folds, the axes of which form a number of anticlines. In addition, the seams are broken by steplike faults. The thicknesses of the various seams vary greatly, since there are many rocky layers which likewise vary in thickness. They often divide a coal seam into a number of thinner seams or stratify it so much that it loses industrial value. Most of the seams dip from 8 to 30 degrees.

(5) Mining Conditions.

Mining conditions are hazardous, because all the seams have a tendency toward spontaneous combustion and also because of the weak roof and the pitching nature of the coal beds. Approximately 70 percent of all coal mining is in dipping seams more than 1.5 meters thick. Except for a few large strip mines at Korkino, the mines are all shaft operations.

h. Yegorshino Deposit (Urals).

(1) Location.

The Yegorshino deposit is located in the east-central part of the Urals and extends for about 150 kilometers from Yegorshino station in the north to the Bagoriak River in the south. The maximum width of the deposit is only 2 kilometers.

(2) Reserves and Types of Coal.

Reserves, including those of other deposits, are reported at 55 million tons. The coals at Yegorshino are semianthracite.

(3) Quality and Analyses.

It is reported that all coals along the eastern slope of the Urals are characterized by a low sulfur content (up to 1 percent) and high ash content (up to 40 percent). The coals of the Yegorshino deposit contain, on an average, the following: moisture, 2 to 3 percent; ash, 18 to 19 percent; sulfur, 0.5 to 1 percent; volatile matter, 7 to 8 percent; and heat value, 7,000 Cal per kg. The heat value of run-of-mine coal, however, averages only 6,130 Cal per kg on a working-fuel basis.

(4) Coal Measures.

The Yegorshino deposit is the most important of the anthracite deposits along the eastern slope of the Urals. It contains 10 to 15 workable beds, as against only 1 to 7 in each of the other deposits. The thickness of the beds in the belt varies from 0.7 to 4.5 meters and in rare cases reaches 8 meters.

i. Poltavka - Bredy Deposits (Urals).

(1) Location.

The Poltavka - Bredy deposits are in a coal belt in the southern Urals that varies from 1 to 30 kilometers in width, and the total area covers 1,800 square kilometers.

(2) Reserves and Types of Coal.

Reserves of the Bredy deposit have been estimated at 252 million tons. The coals are reported to be anthracite but may be semianthracite.

(3) Quality and Analyses.

Analyses of these coals indicate that they are probably good fuel if the impurities can be reduced. The ash content reaches 44 percent in the Poltavka coal and 31 percent in the Bredy coal but averages 25 percent and 20 percent, respectively. The heat value of the Bredy coal averages 7,950 Cal per kg, and that of the Poltavka coal is reported to be 7,650 Cal per kg. These heat values may be on a moisture- and ash-free basis.

(4) Coal Measures.

Individual coal seams number more than 30, and they vary from 0.10 to 5.5 meters in thickness. There are 10 to 15 workable beds, and they vary in thickness from 0.7 to 3 meters. Correlation of individual beds is reported to be extremely difficult. The complex structure and insufficient exploration probably account for the difficulty.

j. Dombarovka Deposit (Urals).

(1) Location.

The Dombarovka deposit is located 60 kilometers southeast of Orsk in Chkalov Oblast and on the branch railroad from Orsk to Dombarovka.

(2) Reserves and Types of Coal.

[redacted] these coals as anthracite, 50X1
but they may be semianthracite. The reserves are between 75 and 100 million tons.

(3) Quality and Analyses.

The quality is impaired by impurities, since ash content is more than 25 percent.

k. Karaganda Basin (Kazakh SSR).

(1) Location.

The Karaganda Basin is located in the northeastern part of Kazakhstan, 230 kilometers southeast of Akmolinsk. The coal-bearing area is well defined and covers about 2,000 square kilometers. It is divided into two series -- the Karaganda (upper) series and the Ashlaryk (lower) series.

(2) Reserves and Types of Coal.

Reserves were estimated in 1937 to amount to 51.4 billion tons of bituminous coal and 1.3 billion tons of lignite, of which 68.2 percent was included in the categories of actual and probable reserves.

(3) Quality and Analyses.

The bituminous coals belong to Classes PZh, PS, and K. The coal beds vary in quality, and a large amount of rock, which increases sulfur content, is found in the beds, especially those of the Ashlaryk series. Coking coals occur in the southern, Churubay-Nura, part of the basin. Analyses of the coals show the following contents: moisture, 0.76 to 2.71 percent; ash, 12 to 36.7 percent (in the Karaganda series, not more than 20 percent and on an average, 16 percent); volatile matter, 26 to 33.6 percent; sulfur, 0.45 to 1.54 percent; and heat value, about 8,000 Cal per kg. On an ash- and moisture-free basis the coals contain 84.7 to 88.8 percent carbon. The average heat value on a working-fuel basis of all run-of-mine coal (including lignite) produced is 5,880 Cal per kg. The Classes PZh and PS bituminous coals average 6,020 and 5,980 Cal per kg, respectively. Washing the PZh coals increases their heat value to 6,495 Cal per kg.

The Novyy seam is regarded as the best seam of coking coal, and there are several others that are suitable for coking, but the high ash content of most of the seams requires that they be cleaned. The ash content increases with stratigraphic depth of the seams. The coals of the Karaganda (upper) series are lower in ash than those of the Ashlaryk (lower) series.

The sulfur content of the Karaganda coals is generally not high. In most coal beds it is less than 1 percent but occasionally reaches 1.5 percent and in some beds exceeds 3 percent.

Analyses of the lignite show the following contents: moisture, 15.3 to 24.2 percent; ash, 8.4 to 35.9 percent; and volatile matter, 45 to 66.4 percent. The heat value of the run-of-mine lignite varies from 3,720 to 3,960 Cal per kg and averages 3,840 Cal per kg on a working-fuel basis.

(4) Coal Measures.

The Karaganda (upper) series contains 34 coal beds, of which 15 are considered workable. These have a useful thickness of 30 meters and a total thickness of 39.3 meters. The Ashlaryk (lower) series contains 26 coal beds, of which 13 are workable. The workable beds have a useful thickness of 18.4 meters and a total thickness of 25.6 meters.

The important Novyy seam varies from 1.7 to 2.2 meters in thickness. The Upper Marianna seam is 7.8 meters thick, and the Feliks seam is 4 meters thick. Seams dipping at an angle of 8 to 15 degrees and 0.8 to 8.3 meters thick predominate in the basin.

Karaganda also has some lignite beds. One of these, the Federovskiy bed in the central part of the basin, is 20 to 25 meters thick and has been exploited entirely by strip mining for some time.

(5) Mining Conditions.

The bituminous coal seams are made up of alternating layers of coal, shale, and, occasionally, sandstone. Conditions for exploiting the seams are generally favorable, and underground water is not excessive, but the rocks covering most of the coal beds are generally unstable. Because of the advanced stage of crumbling of these rocks, it is expected that there will be an increase of water in some areas.

1. Kizyl-Kiya Deposit (Central Asia).

(1) Location.

The Kizyl-Kiya deposit, in Kirgiz SSR, is about 65 kilometers south of Andizhan on a branch-line railroad and 46 kilometers from Gorchakovo Station, which is on the railroad from Kokand to Andizhan.

(2) Reserves and Types of Coal.

Reserves amount to 1.4 billion tons of lignite.

(3) Quality and Analyses.

The lignite contains 16 to 28 percent moisture (average content about 25.5 percent), 1.8 percent sulfur, and 35 percent volatile matter. The ash content averages 14.2 percent in moisture-free coal. Heat value averages 6,850 Cal per kg on a moisture- and ash-free basis, but the average heat value as determined on a working-fuel basis is only 4,275 Cal per kg.

(4) Coal Measures.

The main seam averages up to 10 meters thick and ranges from 6.5 to 10.9 meters within the operating mines. It is divided into benches by a streak of clay. Clayey shales and sandstone occur in the roof of the seam.

m. Kok-Yangak Deposit (Central Asia).

(1) Location.

The Kok-Yangak deposit, in Kirgiz SSR, is 75 kilometers northeast of Andizhan and is connected with Andizhan by a 109-kilometer railroad line via Dzhalal-Abad.

(2) Reserves and Types of Coal.

Reserves were reported to total 650 million tons. The coals are reported to be gas-type bituminous.

(3) Quality and Analyses.

Analyses show that the coal contains 14 percent moisture, 2 percent sulfur, 16 percent ash, and 25 percent volatile matter. The heat value of run-of-mine coal produced in two mines is reportedly 5,105 Cal per kg on a working-fuel basis.

n. Sulyukta Deposit (Central Asia).

(1) Location.

The Sulyukta deposit is located in Kirgiz SSR about 135 kilometers southwest of Kokand. A branch-line railroad 25 kilometers long extends from Proletarsk Station, which is on the railroad from Samarkand to Kokand.

(2) Reserves and Types of Coal.

Reserves are reported to consist of 100 million tons of lignite.

(3) Quality and Analyses.

The lignite of the Sulyukta deposit is better than that found at the Kizyl-Kiya and Shurab deposits. It averages about 19 percent moisture and on a moisture-free basis averages 10.3 percent ash and 1 percent sulfur. The heat value averages 7,060 Cal per kg on a moisture- and ash-free basis. The run-of-mine coal averages only 4,820 Cal per kg on a working-fuel basis, but the average for all coal is only 4,685 Cal per kg because of lower heat value of a large proportion of fine sizes.

(4) Coal Measures.

There are 3 coal seams, 1 of which is 4 to 4.5 meters thick and consists of relatively clean, lustrous coal. Thickness varies, however, and the angle of dip ranges from 23 to 70 degrees. The roof of the seam contains clayey shales.

o. Tash-Kumyr Deposit (Central Asia).

(1) Location.

The Tash-Kumyr deposit is located in Kirgiz SSR, 70 kilometers north of Andizhan, and is connected with it by a railroad line 91 kilometers long.

(2) Reserves and Types of Coal.

Reserves were estimated at 390 million tons. The coal produced at the No. 1 shaft was classified as gas-type bituminous.

(3) Quality and Analyses.

This coal has the best quality of any produced in Central Asia. Analyses show 9 percent moisture, 9 percent ash, 0.6 percent sulfur, and 35.5 percent volatile matter. The heat value of run-of-mine coal on a working-fuel basis is 5,780 Cal per kg.

p. Shurab Deposit (Central Asia).

(1) Location.

The Shurab deposit is located in Tadzhik SSR. It is 63 kilometers southwest of Kokand on a branch line, 54 kilometers long, from Mel'nikovo Station, which is on the Samarkand Railroad.

(2) Reserves and Types of Coal.

Reserves were reported as 40 million tons of lignite.

(3) Quality and Analyses.

Analyses show that the lignite contains 27.7 percent moisture, 10.6 percent ash, 1.8 percent sulfur, and 30 percent volatile matter. On a working-fuel basis the heat value averages 4,035 Cal per kg, ranging from 3,615 Cal per kg at shafts 3, 4, and 6 to 4,340 Cal per kg at shaft 8.

(4) Coal Measures.

There is 1 seam which has an average thickness of 12 meters and reaches 19 meters in places. The seam dips, for the most part, at a slight angle. Clayey shales occur in the roof and floor of the seam.

q. Angren Deposit (Central Asia).

(1) Location.

The Angren deposit is located in Uzbek SSR, 38 to 50 kilometers southeast of Tashkent, on a branch-line railroad to the district.

(2) Reserves and Types of Coal.

There are large reserves of lignite at this deposit.

(3) Quality and Analyses.

Analyses show the following: 9 to 37 percent moisture, 36 percent ash, 0.6 to 5 percent sulfur, 17 to 29 percent volatile matter, and 4,500 to 5,500 Cal per kg.

(4) Coal Measures.

The deposit contains a dipping seam of friable lignite, 40 to 60 meters thick.

(5) Mining Conditions.

Water is a serious problem, since the workings are close to the Angren River.

r. Kuzbas (West Siberia).

(1) Location.

The Kuzbas is located in West Siberia, southeast of the city of Novosibirsk. The coal-bearing strata, covering an area of 26,700 square kilometers, are located in a syncline bounded on the northeast by the Kuznetskiy Ala-Tau Mountains, on the southwest by the Salairskiy Kryazh (Salair Ridge), and on the south by spurs of these ridges. On the northwest, the basin is open and merges with the West Siberian Lowland. In the north-south direction, the basin extends for 300 kilometers, and it is up to 100 kilometers wide. The Tom' and Inya rivers flow through the middle of the basin.

(2) Reserves and Types of Coal.

In size of reserves, the Kuzbas is the most important in the USSR. Geological reserves in 1937 were estimated at 450 billion tons, or about 25 percent of the total Soviet reserves. Anthracite reserves amount to 54 billion tons, and the rest is made up of different types of bituminous coal. Only about 10 percent of the geological reserves are included as actual and probable reserves. There are lignites in the basin, but no estimate was given of their reserves.

(3) Quality and Analyses.

The Kuzbas coals are considered to be the best in the USSR, and there are many beds of coal which are suitable for making metallurgical coke. The low ash content of 3 to 10 percent and the low sulfur content of about 0.5 percent enhance their value for this purpose. An unfavorable factor is a phosphorous content of from 0.0085 to 0.339 percent in the run-of-mine coal.

Information that is available for 45 mines shows none produced any anthracite and only 3 mines, belonging to the Kybystevugol' Trust, produced Class T coals, presumably semianthracite. The rest of the mines produced bituminous coal of various classes. The heat value of all the coals on a working-fuel basis was given as 7,000 Cal per kg, which is the same as for standard fuel. The reported basin averages for various classes of coal are as follows (in Cal per kg): Class D, 6,260 for run-of-mine coal; Class G, 6,690 for run-of-mine coal; Class K, 7,215 for run-of-mine coal; Class K_2, 7,285 for run-of-mine coal; Class PZh, 7,125 for run-of-mine coal; Class PS, 7,100 for run-of-mine coal; Class SS, 6,960 for run-of-mine coal; Class SS Domestic, 7,410 for sizes larger than 40-mm; and Class T, 6,485 for run-of-mine coal and 6,560 for all sizes. Coal with the lowest heat value (5,805 Cal per kg) was run-of-mine coal from Shaft 11 of the Molotovugol' Trust, and that with the highest (7,530 Cal per kg) was weakly coking blast-furnace coal in larger than 40-mm sizes from Shaft 4 of the Kaganovichugol' Trust. The majority of the mines in Stalinugol' Trust and Kaganovichugol' Trust produced coal with heating values in excess of 7,000 Cal per kg.

(4) Coal Measures.

There are 3 coal-bearing series of rocks in the Kuzbas, containing 83 workable beds of coal with a total thickness of 166 meters. The Conglomerate series (Jurassic) contains about 10 beds with a total thickness of 13 meters, the Yerunakov series (Permian) contains 45 workable beds with a total thickness of 13 meters, and the Balakhon series (Permian) includes 28 workable beds with a total thickness of 78 meters.

The thickness of the series and the amount of coal they contain vary considerably in different areas. In some areas, where the coal beds are concentrated in a relatively thin stratum and where the beds reach a thickness of 18 meters or more, the series have an extraordinarily high coal content. The Prokop'yevsk area, with a coal content of 10 percent, is an example.

Coal seams dipping at an angle of 55 to 70 degrees predominate in the Prokop'yevsk - Kiselevsk sector, which is the most important producer of coking grades of coal. In that particular area there are 22 to 26 workable beds with a total thickness of 75 to 80 meters. The "Moschny" seam is 13 to 15 meters thick, a few others are 7 to 9 meters thick, and there are several from 3 to 5 meters thick. Other mining districts, which include Osinniki, Leninsk - Kuznetskiy, Kemerovo, and Anzhero-Sudzhensk, also have some very thick coal seams.

The Kuzbas consists, in general, of a large syncline. In the central part of the basin, the depositions occur comparatively evenly. But, toward the outer borders of the basin, where all the older series crop out on the surface, the folding becomes more complex (except on the northeastern border). A number of faults and overthrusts adds to the complexity of the structure, and in the borderlands of the basin there are further complications from microstructural dislocations of the coal beds. The beds are largely uncorrelated in the basin because of the complex structure, but also because studies of the beds are incomplete.

(5) Mining Conditions.

All the mines operated in the Prokop'yevsk - Kiselevsk area are gassy. The seams mined in that sector are dusty and have a tendency to spontaneous combustion, all of which factors represent explosion hazards. Furthermore, mining is difficult and dangerous because of the great thickness and extreme pitch of the beds. Other mining centers in the Kuzbas are confronted with similar difficulties, although exploitation conditions do vary widely, being dependent on the geological structure and the thickness of the beds.

Mining conditions are apparently more favorable in the northern part of the basin. The mines of Leninugol' Trust in the Kemerovo sector have seams that dip only from 8 to 12 degrees. The seams are not so thick as in some other places and are therefore easier to work, and the roof is firmer.

s. Minusinsk Basin (East Siberia).

(1) Location.

The Minusinsk Basin is located in the Khakas Autonomous Oblast of Krasnoyarsk Kray, near the confluence of the

Abakan and Yenisey rivers. The basin is bounded on the east by the Vostochnyy Sayan Mountains, on the south by the Zapadnyy Sayan Mountains, and on the west by the Kuznetskiy Ala-Tau Mountains. The mines are located at Chernogorsk.

The basin is connected with the main line of the Trans-Siberian Railroad by the Achinsk - Minusinsk branch of the Krasnoyarsk rail line; with the city of Krasnoyarsk, 500 kilometers to the north; by the Yenisey River; and with the Arctic Ocean through the port of Igarka.

(2) Reserves and Types of Coal.

Reserves were established at 20.6 billion tons of bituminous coal, according to the 1937 estimate, and about 70.8 percent were included under actual and probable reserves.

(3) Quality and Analyses.

The coals of the basin belong to Class D and Class G coals, and none are coking grade, although they display coking qualities. They are excellent fuel for power stations and can be used in the chemical industry, since they contain up to 13.5 percent tar. The coals, on the average, contain 6 percent moisture, 7.5 to 12 percent ash, and 42 percent volatile matter. The average heat value on a working-fuel basis of Class D coals from 4 shafts averages 5,765 Cal per kg for run-of-mine coal.

(4) Coal Measures.

The structure of the basin is exceptionally simple, and faults seldom interrupt the continuity of the rocks. The dip of the coal-bearing strata does not exceed 12 to 14 degrees and usually is 7 to 8 degrees or less.

The Yenisey-Abakan syncline, covering about 800 square kilometers, is of the greatest industrial value. Of less interest is the Abakan syncline, covering about 300 square kilometers. In addition, there are several smaller coal areas, such as the Altay syncline, and the area in the Volchiy Mountains.

In the better explored Yenisey-Abakan syncline, 58 coal beds with total thickness up to 33.2 meters are known. The thickness of each of the 16 to 19 workable beds is not less than

0.7 meter, and their total thickness is about 20 meters. It can be expected that many more coal beds will be found in certain coal-bearing series that have not been explored. The Chernogorsk series, with five workable coal beds, has been of greatest industrial importance.

t. Kansk Basin (East Siberia).

(1) Location.

The Kansk Basin is located near the city of Kansk. It extends about 250 kilometers in a north-south direction, is about 200 kilometers wide at its widest point, and covers an area of about 40,000 square kilometers. The mines are located at Zaozernyy.

(2) Reserves and Types of Coal.

In 1937, reserves were estimated at 400 million tons of bituminous (more probably low-grade subbituminous) coal (Permian period) and 41.6 billion tons of lignite (Jurassic period).

(3) Quality and Analyses.

The lignites are very crumbly and break into fines. They contain 28.0 to 36.5 percent moisture. The ash content in moisture-free coal lies in the range of 4.5 to 14.5 percent with an average of 8 percent, and sulfur averages 0.5 percent. Heat value averages 6,700 Cal per kg on a moisture- and ash-free basis, but the heat value on a working-fuel basis was reported to average only 3,815 Cal per kg for run-of-mine lignite produced at 3 shafts.

(4) Coal Measures.

There are 5 to 7 beds, which generally are up to 9 meters thick. In exceptional cases, as in the Borodinsk deposit, they run up to 20 meters thick.

(5) Mining Conditions.

The friability of the coals and the abundance of water in the rocks represent the greatest difficulties in mining the deposits. In the vicinity of Zaozernyy, coal is near enough to the surface for strip mining.

u. Chulym-Yenisey Basin (East Siberia).

(1) Location.

The Chulym-Yenisey Basin is located in Krasnoyarsk Kray between the cities of Mariinsk and Krasnoyarsk. It is separated from the Kansk Basin by the Yuzhno-Yenisey (Southern Yenisey) Mountains, and the southern border is formed by the Kuznetskiy Ala-tau and the Krasnoyarsk Mountains. The basin is about 400 kilometers long from east to west, is 300 kilometers wide, and covers an area of about 20,000 square kilometers. There are, apparently, a few local mines in the vicinity of Krasnoyarsk.

(2) Reserves and Types of Coal.

Reserves in 1937 were estimated at 43 billion tons of lignite. [redacted] the reserves are mainly lignites and that part of them are mixed humic and sapropelic (boghead) coals.

(3) Quality and Analyses.

The lignite is probably similar in quality to that of the Kansk Basin. The ash content ranges from 20 to 40 percent. The heat value in wet coal is reported to be 4,000 to 5,000 Cal per kg and in dry coal, 5,000 to 5,500 Cal per kg, but the heat value on a working-fuel basis is evidently much less than in the Kansk Basin.

(4) Coal Measures.

Information is not available.

v. Irkutsk Basin (East Siberia).

(1) Location.

The Irkutsk Basin in East Siberia extends from the city of Nizhneudinsk to Irkutsk. The Trans-Siberian Railroad services the basin for a distance of 500 kilometers. On an average, the basin is about 80 kilometers wide and covers an area of about 35,000 square kilometers. The mines are centralized at Cheremkhovo.

(2) Reserves and Types of Coal.

Reserves have been reported to be 56 billion tons. Most of the coals are bituminous, mainly Classes D and G, but some are satisfactory for coking. Lignites are found in the northwestern part of the basin, and large amounts of sapropelic (boghead) coals are found among the humic coals.

(3) Quality and Analyses.

Information shows that Class D bituminous coal is mined at Cheremkhovo. The average heat value on a working-fuel basis at 8 shaft mines was 5,510 Cal per kg for run-of-mine coal.

(4) Coal Measures.

The rock strata in the northeastern part of the Irkutsk Basin lie almost horizontal, but toward the southwest there is increased folding, and overthrust faults occur. The coal beds, in general, have irregular thickness. The most uniform beds in the lowest productive coal-bearing series reach thicknesses of 7 to 8 meters. The thickness of the beds in the upper levels does not exceed 2 to 3 meters. The seams contain a considerable number of rock partings.

There are two coal seams in the Cheremkhovo deposit, which are separated by argillite or, less often, sandstone and clays. The Glavnyy, or lower seam, is persistent through almost the entire deposit and consists of a great number of layers of coal alternating with layers of rock that make up 25 to 27 percent of the seam. This seam lies horizontally, is up to 8 meters thick, and is covered by overburden varying in thickness from 5 to 60 meters. The Malvyy, or upper seam, lies in the form of separate lenses above the Glavnyy seam. It varies in thickness from 0.5 to 2.5 meters and averages 0.65 meter. The coal seams are separated by 1 to 3.8 meters.

(5) Mining Conditions.

In the Cheremkhovo area, both deep and strip mining are practiced, the former predominating. In the opencast sites, the overburden is becoming thick, and larger excavating equipment is required. Underground mining conditions appear to be satisfactory.

w. Lena Basin (East Siberia).

(1) Location.

The Lena Basin is located in Yakut ASSR along the Lena River and its tributary Vilyuy and Aldan rivers. It covers an area of 40,000 square kilometers, the greater part of which lies along the left bank of the Lena. This area is a relatively narrow belt up to 100 kilometers wide, stretching along the Verkhoyanskiy Kherbet.

(2) Reserves and Types of Coal.

The estimates of 1937 placed reserves at 132.9 billion tons of bituminous coal and 70.3 billion tons of lignite, but only about 10 percent were included as actual and probable reserves.

(3) Quality and Analyses.

The coals vary in quality, ranging up to coking varieties. Analyses are not available.

(4) Coal Measures.

All the known outcrops and coal deposits (there are over 100 of them) in the Lena Basin had been only slightly studied as recently as 1946. Two deposits have been opened in the past 20 years -- the Sangar deposit about 1930 and the Kangalsk deposit sometime later. The Kangalsk deposit generally has 2 to 3 coal beds. On rare occasions there are more beds. The beds occur either perfectly horizontal or slightly undulating. A few insignificant faults are present. The Sangar deposit has dozens of coal beds, and, although they are not very thick, they show adequate regularity throughout.

x. Bureya Basin (Khabarovsk Kray).

(1) Location.

The Bureya Coal Basin is located in Khabarovsk Kray, along the upper reaches of the Bureya River and partly along the Tyrma River, west of the city of Komsomol'sk. The basin covers an area of about 7,000 square kilometers.

(2) Reserves and Types of Coal.

Reserves were estimated in 1937 at 26.1 billion tons of bituminous coal, of which only 4.2 billion were included in categories of actual and probable reserves.

(3) Quality and Analyses.

The Bureya coals are claimed to be mostly coking coals, but their value is seriously impaired by the high percentage of impurities which are exceedingly difficult to remove. On an average, the coals have the following contents: moisture, 2 to 7 percent; ash, 16 to 20 percent; sulfur, 0.2 to 0.5 percent; volatile matter, 30 percent; and heat value, 5,473 to 7,436 Cal per kg.

(4) Coal Measures.

The coal-bearing strata are divided into the Urgal series, which is 1,100 to 1,200 meters thick and contains workable coal beds, and the Chemchuka series, which is about 100 meters thick and contains 8 unworkable coal beds with a total thickness of 3 to 8 meters. Two deposits have been identified in the Urgal series. One of these is the Umal'ta deposit, with not less than 30 beds ranging from 0.15 to 3.5 meters in thickness. Nine of these, with thicknesses of over 0.75 meter, are workable. The other, the Urgal deposit, has 17 to 19 workable beds. The coal beds contain a considerable number of rock partings.

y. Suchan Basin (Primorskiy Kray).

(1) Location.

The Suchan Basin is located 140 kilometers east of Vladivostok. Suchan, an old coal-production center, is located not far from the mouth of the Suchan River, which flows into the Nakhodka Cove of the Gulf of Amerika.

(2) Reserves and Types of Coal.

A prewar estimate of reserves gives a figure of 300 million tons, but it is probable that they are much greater because the extent of the coal-bearing area has been expanded as the result of much prospecting. Most of the coals are bituminous, but there is possibly some semianthracite. Lignites also are present.

(3) Quality and Analyses.

The quality of the coals varies greatly. At the Suchan mines, a change in quality occurs frequently even within a restricted area. This frequent change is evidently associated with the massive intrusions of igneous rocks in the area. Coals in the northeastern part of the basin contain more volatile matter than those in the southwestern part. The increase is from 6 to 10 percent volatile matter in the southwest to 30 percent in the northeast. The ash content varies between 8 and 30 percent.

Reported heat values for run-of-mine coal on a working-fuel basis are as follows (in Cal per kg): average of all coal, 5,525; Class PZh from Shaft Tudagou, 6,145; Class PZh from Shafts 3, 10, and 16, 5,730; Class G from Shaft 20, 5,235; and Class T from Shafts 1 and 22, 5,355. The Class T coal is low-volatile and may or may not include semianthracite.

(4) Coal Measures.

The coal beds have been strongly crumbled and broken by a number of light structural dislocations and porphyry intimations. At Suchan, up to 13 coal beds with thicknesses of 0.65 to 1.4 meters are known, and 5 to 7 of these with a total thickness of 6 to 9 meters are workable. In the northern parts of the basin, up to 22 gently dipping coal beds have been identified. The existence, however, of porphyry veins negates any assumption that exploitation conditions there will be more favorable.

E. Mining Technology.

1. General.

Conditions in the USSR, in general, are not particularly favorable for the acquisition of high-quality coal in a relatively cheap and easy manner. There are thick deposits of lignite and brown coal which can be worked economically by strip (surface) mining, but, in the past, weather conditions have kept the excavating equipment idle a considerable part of the time.

Coal produced in underground mines must be exploited through shafts or slopes. There are a few places where horizontal coal seams of workable thickness can be exploited through adits driven into hills or mountains as is done frequently in the Appalachian region of the US. Nearly all the major and many of the minor producing districts in the USSR have at least one or more unfavorable factors which contribute to difficult and hazardous mining, such as very thin seams, very thick seams, steeply pitching seams, rock partings, unstable roof or floor conditions, excessive water, gas conditions, or susceptibility of the coal to spontaneous combustion.

2. Underground Mining.

a. Production.

The output of deep-mined coal has declined from 96.2 percent of the total production in 1940 to 88 percent in 1951. Table 17 gives the estimated tonnage and percent of total production of deep-mined coal for selected years.

Table 17

Estimated Production of Deep-Mined Coal in the USSR a/*
1913, 1922, 1927, 1932, 1937, 1940-51

Year	Tons	Percent of Total Soviet Production
1913	28,932,000	99.36
1922	11,120,200	98.20
1927	31,984,500	99.10
1932	66,302,000	99.40
1937	125,519,400	98.10
1940	159,691,300	96.20
1941	130,668,400	95.03
1942	68,454,400	88.90
1943	85,512,140	87.26
1944	112,867,650	88.18
1945	131,915,000	88.36
1946	146,643,550	89.31
1947	164,874,400	89.65

* Footnote for Table 17 follows on p. 80.

Table 17

Estimated Production of Deep-Mined Coal in the USSR a/
1913, 1922, 1927, 1932, 1937, 1940-51
(Continued)

Year	Tons	Percent of Total Soviet Production
1948	188,885,900	90.10
1949	213,279,050	90.33
1950	234,000,000	89.31
1951	248,400,000	87.96

a. Strip-mine production was determined from Soviet data, and such estimates were deducted from total production to furnish deep-mined output.

b. Mine Construction.

With the First Five Year Plan (1928-32), the USSR embarked on an extensive program of building up the coal industry. The number of new mines developed or planned has increased during each succeeding period, as shown in Table 18*. Since relatively few mines have been stripping operations, the figures represent largely the data for underground mines.

Some information on construction of deep mines in the Donbas in the early part of 1950 is given in Tables 19 through 21.**

Mine construction is known to have lagged during the period of the Fourth Five Year Plan. Intentions to build up capacity at an increasing rate are evidenced by the increased production of coal planned during 1951-55. The construction plan for 1951 called for putting into operation deep and strip mines with a total capacity of 38 percent higher than new mines in 1950 and coal-cleaning and briquetting plants with a capacity 184 percent higher than new plants in 1950. Also, capital investment was to be 18.6 percent greater than in 1950. 26/

* Table 18 follows on p. 81.
** Table 19 follows on p. 81; Tables 20 and 21 follow on p. 82.

Table 18

New Mine Construction in the USSR
1929-50

Period	Number of New Mines Put in Operation	Productive Capacity of New Mines (Tons per Year)	
		Total	Average
1929-32 a/	138	53,262,000	386,000
1933-37 a/	145	74,524,000	514,000
World War II b/	173 c/	N.A.	N.A.
1946-50 d/	325 e/	115,300,000	355,000

a. 27/
b. 28/
c. Eastern regions.
d. 29/
e. Approximate.

Table 19

Planned Construction Costs of New Mines in the Donbas
by Capacity of Mine and Depth of Shaft 30/
1950

Planned Annual Capacity of One Mine (Tons)	Depth of Shafts (Meters)	Cost of Construction and Assembly Work (Million Rubles)
300,000	200	90.0
600,000	415	134.8
1,000,000	730	239.7

Table 20

Planned Length of Construction Time of Mines in the Donbas 31/
1950

Capacity (Tons per Year)	Time Required (Months)			
	Development	Sinking of Mine Shafts	Other Construction Work	Total
300,000	5	8	23	36
600,000	6	15	27	48
1,000,000	7	27	32	66

Table 21

Planned Distribution of Investment Costs of Mines in the Donbas 32/
1950

Million Rubles

Period of Construction	300,000-Ton Mine	600,000-Ton Mine	1,000,000-Ton Mine
First Year	24.0	28.0	32.5
Second Year	30.0	34.0	36.0
Third Year	36.0	41.5	39.2
Fourth Year	0	31.3	53.0
Fifth Year	0	0	58.0
Sixth Year	0	0	21.0
Total	90.0	134.8	239.7

[redacted] the scope of capital construction has become tremendous. The volume of work actually completed in 1949 exceeded the capital investment of 1948 by 17.5 percent, and the amount planned for 1950 was to exceed that of 1949 by 29 percent. 33/ Another source stated that capital investment in 1950 was four times as great as in 1946. 34/ 50X1

c. Number of Underground Mines.

Before World War II there were over 300 large mines and about 2,000 small shafts in the Donbas which were under Narkomugol'. 35/ [redacted] there were 314 large mines in the Donbas. 36/ There were other mines in the Donbas which were not administered by Narkomugol'. All of the mines in the Donbas were probably underground operations. Although no figures are available as to the number of deep mines in other parts of the country, it is believed that there were between 350 and 400. 50X1

Since the prewar years, the number of mines in the Donbas may have declined. Many of the small mines may have been worked out. It appears, moreover, that the USSR has been constructing large mines and thus would not need such a large number in the Donbas. The total number of mines in other coal-producing areas is believed to be at present between 700 and 750. The total number in the USSR may exceed 3,000.

d. Mining Systems.

In all the important coal basins in the USSR the deep seams are mined by sinking either shafts or slopes. Shafts are vertical openings through the strata that overlie a coal seam. If the seam is not far below the surface, it is sometimes reached by means of an inclined shaft or slope. Available information does not indicate that slope mines are very common in the USSR, because underground mining is nearly always at depths more than 50 meters below the surface. Relatively few coal mines in the USSR have been developed as drift mines. Drift mines are constructed by driving tunnels into horizontal or slightly pitching coal beds that outcrop on a hill or mountain side, and there are few beds known to be so situated in the producing districts.

Conditions in Soviet coal basins are not so favorable as in most mining areas of the US and are similar to those found in

Europe. Soviet mining generally is done by the longwall system, as distinguished from the shortwall, or room-and-pillar, system, which is common in the US. The US method is to drive long, narrow rooms through the coal seams, leaving pillars of coal to support the roof and, in some cases, drawing the pillars to permit caving, thus relieving roof pressure on other working areas. The longwall system consists of working long coal faces which may exceed 300 meters, although 90 percent of the faces worked in Soviet mines are less than 200 meters in length. The longwall system is more suitable to working the thin, pitching seams found in the USSR, which lie at great depth and are subjected to heavy rock pressure. This system necessitates heavy posting close to the working face, since caving follows in the worked-out areas.

Data available for deep mines under the Ministry of the Coal Industry show that 54.5 percent of the output of these mines in 1949 was by complete extraction, which is also referred to as the continuous system. In mining of coal by this system, a wide working face, generally about 100 meters long, is driven along the strike of the coal seam. It is used to work thin seams, 0.5 to 1.3 meters thick, or, where a seam is pitching, it will be used as a series of levels advancing parallel with each other. With this system it is possible to put into operation a new line of the face with the least expenditure of time to prepare the level.

The continuous system is used chiefly in the Donbas, where 92.3 percent of the coal was produced in this way in 1949 as compared with 93.6 percent in 1940 and 45.3 percent in 1926-27 in prerevolutionary mines. With hand labor and the difficulties of moving coal up to the intermediate haulageway, the length of the face did not exceed 30 to 40 meters. As a result of the introduction of the cutting machine, the length of the face was increased. Conversion to the long face became particularly advisable with the use of conveyors at the faces. In the Donbas, where conversion to mechanized methods of excavation was first carried out, the average length of the face has changed as follows: 56 meters in 1928, 70 meters in 1932, 93 meters in 1937, and 109 meters in 1941. 37/

In a number of instances the length of the face has become equal to the height of the level. In many mines of the Donbas and other basins the individual faces were as long as 200 to 300 meters or more -- for example, Mine No. 18 imeni Stalin in the Donbas, Mine imeni Kalinin in Kizel, and others. It is claimed that working longer faces has the following advantages: the movement of coal to the haulageway is simplified, the most favorable conditions for using machinery are created, and the need for preliminary work is reduced to a minimum. 38/

To work sharply pitching seams of thin or medium thicknesses, the continuous system with overhead face usually has been used. By the beginning of 1935, about 20 to 22 percent of all coal produced was mined by this method. Most of the coal produced by the continuous system of working with overhead face was from the Donbas, but this system was employed also in the Kuzbas. The relative importance of the sharply pitching seams worked in the Donbas was kept approximately at the same level for many years; this is also true of the continuous system with excavation by overhead face. The changes introduced into this system during the years of the First Five Year Plan (1928-32) consisted in somewhat increasing the height of the level and in eliminating the intervening blocks of solid coal within the limits of the level. 39/

In mining seams of medium thickness, 1.3 to 3.5 meters, the system most widely used in the USSR is that of working by long pillars along the strike. This system is a retreating longwall operation as contrasted with the continuous system, which is an advancing longwall operation. The long-pillar system requires advance development of entries and crosscuts so as to block out large areas of retreating long faces from the outer limits of the blocked-out area. A modification of this system, of minor importance in the Donbas, is known as the paired-drift system.

According to the 1934 face inventory, 25.5 percent of all coal in the Soviet coal industry was mined by the long-pillar system. This system was most widely used in Primorskiy Kray (about 65 percent), East Siberia (62.2 percent), the Kizel region (50.6 percent), and the Moscow Basin (50.7 percent) and in other regions for which sloping seams of medium thickness and a weak roof were characteristic. In 1949, 26.8 percent of the coal was extracted by this system. 40/

In the Donbas the share of coal mined by the long-pillar system (including paired-drift) has declined with the technical modernization and accumulation of experience in mechanizing the faces. In the prerevolutionary period (1913), 50.9 percent of the total coal mined in the Donbas was mined by this system. Thereafter the proportion declined as follows: by 1931, 14.2 percent; at the beginning of

1935, 12.7 percent; and in 1940, 5 percent. In 1946, however, 5.4 percent of the coal mined in the Donbas was produced by the long-pillar system. 41/

The possibilities for the use of the long-pillar system have improved with the creation of economically suitable and efficient machinery to drive entries. Under this system the haulage drifts are permanently located in solid blocks of coal, which is of great importance in mining seams more than 1.2 to 1.5 meters thick with a weak roof and in seams in which there are faults.

Under the long-pillar system, there is a considerable saving in the expense of keeping the mined-out section open as compared with the continuous system. 42/ Under the latter system, there have been considerable difficulties in keeping the haulage entries open. Under these longwall systems, Soviet practice involves the advance of extraction from the area of the shaft toward the boundaries of the mine area, with the result that the area between the working faces and the shaft becomes caved and it becomes a problem to hold the roof through which the haulageways are driven. This necessitates heavy expenditures in maintenance of the entries. Plans in 1951 called for new mines to be developed in such a way that entries are driven to the boundaries of the mine areas and the coal would be extracted on the retreat, or toward the shaft instead of away from it. This system involves a much longer period before the mine can commence to furnish sizable production and may be difficult to follow in practice when there is a need for coal.

Another system of extraction, known as the inclined-layer system, is of some importance. In 1949, 8.9 percent of the output from mines under the Ministry of the Coal Industry was mined in this way. It is used mainly in thick coal beds that are inclined as much as 40 degrees. The coal is removed in benches worked to the raise and corresponds to overhand stoping. In many mines the bottom bench of the bed is removed between levels, and the worked-out area is backfilled. The next higher bench is then removed and backfilled, and this process is repeated through the entire bed. In other mines, extraction is started on the top bench of a bed, and the lower benches are worked successively. In these mines, no backfilling is done, as the roof is permitted to cave after the entire bed has been mined. 43/

Very thick coal beds, which are nearly vertical or steeply pitching, are sometimes mined by the system referred to as horizontal-layer. This system corresponds to top slicing with backfilling which is kept close to the working face. Only 0.3 percent of the Ministry's production was mined in this way in 1949 as compared with 0.7 percent in 1940.

The more common practice of mining such coal beds is by a method which the Russians call the shield system. It is similar to underhand stoping under the protection of a shield, which supports the overlying caved material. The shield is a steel frame covered by several layers of timber. Its descent is controlled by removing the supporting coal in the side pillars and on the hanging and foot walls. The output with this system has increased from 0.5 percent of the total underground production at Ministry mines in 1940 to 3.2 percent in 1949.

Very little coal is produced by the room-and-pillar system, as evidenced by the fact that only 2.7 percent of the output in 1949 was extracted in this way. Of about the same importance is the short-pillar system, which is probably the same as or similar to the bord-and-pillar system used in European mines.

Table 22* shows the percentages of coal produced by the various systems at mines of the Ministry of the Coal Industry.

Table 23** shows the percentages of coal mined by the various systems in the Donbas.

[redacted] the long-pillar
system was applied to 29 percent of the total mining in Rostovugol' Combine in the Donbas. The volume of work in maintaining and repairing mine workings was considerably less when this system was used. It made possible an extensive introduction of roof control by complete caving. In the continuous system, partial backfilling is extensively adopted to preserve the haulage drifts. If complete caving is used in the continuous system, the supports of the haulage drifts are broken and, in places, entirely crushed, and particularly

* Table 22 follows on p. 88.
** Table 23 follows on p. 89.

Table 22

Coal Extraction by Mines
of the Ministry of the Coal Industry in the USSR
According to Mining Systems
1940, 1946-49

Percent

System	1940	1946	1947	1948	1949
Continuous a/	62.7	50.3	52.5	54.1	54.5
Long-Pillar b/	26.1	27.5	27.9	25.3	26.8
Inclined-Layer c/	5.2	8.2	7.0	9.0	8.9
Horizontal-Layer d/	0.7	0.3	0.1	0.2	0.3
Shield e/	0.5	4.2	3.9	3.5	3.2
Room-and-Pillar	0.4	2.7	3.6	3.5	2.7
Short-Pillar f/	3.9	6.3	4.4	3.7	2.9
Other	0.5	0.5	0.6	0.7	0.7
Total	100.0	100.0	100.0	100.0	100.0

a. Also referred to as the complete extraction system. It corresponds to the advancing longwall mining method in US terminology.
b. Also referred to as the long-column system. It corresponds to the retreating longwall mining method in US terminology, as applied to sections of a mine. Entries are developed, forming large rectangular pillars, which are extracted generally by working long faces along the strike. Included in the data is coal mined by the paired-drift system, which is a modification of the long-pillar system.
c. This system corresponds to overhand stoping. A thick seam with a pitch up to 40 degrees is mined in benches worked to the raise, starting either at the top or at the bottom of the seam.
d. Thick, almost vertical coal beds are removed by underhand stoping accompanied by backfilling close behind the working face.
e. A thick, almost vertical seam of coal is extracted by underhand stoping under a shield that rests on coal pillars and is a protection against caved material. The shield descends as the supporting coal is removed.
f. This is possibly the bord-and-pillar system. Pillars are removed by splitting and slicing on the retreat.

Table 23

Coal Extraction by Various Mining Systems
in the Donbas
Selected Years, 1913-49 44/

Percent

	Continuous System				
Year	Steeply Inclined Seams		Other	Long-Pillar and Paired-Drift Systems	Other Systems
1913	20.0		24.4	50.9	4.7
1926-27	20.6		24.7	49.3	5.4
1937		92.8 a/		6.5	0.7
1940		93.6 a/		5.0	1.4
1945	16.13		79.3	1.3	3.27
1947		92.5 a/		5.7	1.8
1948		92.0 a/		6.1	1.9
1949		92.3 a/		6.5	1.2

a. Total of continuous system.

in the case of secondary settling. This system puts the mine face out of use for a long time and causes large expenditures of money and labor in restoring the workings.

The long-pillar system is the most suitable for working sloping Donbas coal seams, including thin ones. Preparation of the mine field with the use of coal- and rock-loading machines does not encounter difficulties. Repair of workings is cheap, operation of machinery is dependable, and labor productivity is high. 45/

Table 24* shows the percentages of coal mined by various systems in the Kuzbas.

[redacted] coal losses during 50X1
actual mining operations were reduced from 31 percent in 1948 to 19 percent in the third quarter of 1950 in mines of the Kuzbassugol' Combine in the Kuzbas. Coal losses in the Prokop'yevsk - Kiselevsk area, where, for the most part, thick, steeply pitching seams are mined, were reduced

* Table 24 follows on p. 90.

Table 24

Coal Extraction by Various Mining Systems
in the Kuzbas
1940, 1946-49 46/

Percent

System	1940	1946	1947	1948	1949
Continuous	10.4	22.6	22.4	26.1	22.7
Long-Pillar	67.3	37.4	37.5	34.2	39.2
Inclined-Layer	9.0	7.7	6.4	6.0	7.5
Horizontal-Layer	5.1	1.1	0.8	1.0	2.1
Shield	3.6	19.9	19.9	19.6	20.0
Room-and-Pillar	1.0	8.7	10.8	10.0	5.2
Short-Pillar	3.5	2.5	1.9	2.3	2.3
Other		0.1	0.3	0.8	1.0
Total	99.9 a/	100.0	100.0	100.0	100.0

a. Total of figures given.

from 34.3 percent to 21.2 percent. 47/ The figures refer to the total coal in the workings that was not extracted.

An analysis showed that coal losses decreased in 1950, as compared with 1948, when steeply pitching seams were worked by a system including caving of the side rock, as follows: by using the shield system, from 31.5 percent to 26 percent; by using the long-pillar system, from 27.9 percent to 18.3 percent; by using the inclined-layer system, from 33.4 percent to 21.8 percent; and by using the horizontal-layer system, from 32.5 percent to 16.8 percent.

In Kuzbas mines, operations at 90 mine faces were fulfilling the task of backfilling worked-out areas in mining thick, steeply pitching coal seams. At half the working places the backfilling resulted automatically from slides of material from higher levels. The hydraulic method was used at 13 places, the pneumatic method at 11 places, and backfilling machines were used at 21 working places. 48/

The Russians have brought out a machine, model MZ-1, which is designed for backfilling work in thick seams mined by the horizontal-layer system. This machine has a belt roller which is curved and has four rollers, including a tension roller. The productivity of this machine is 65 cubic meters per hour. 49/

The Soviet systems of mining are less wasteful of coal resources than those used in the US. The USSR is concerned about conservation and goes to great expense to remove from a bed as much coal as is possible, as evidenced by the extent of mining by complete extraction. Furthermore, many shafts mine more than one coal seam at a time. Some Donbas mine shafts are working 20 or more seams. Another factor of significance is the practice of working seams of inferior quality before mining more desirable coals, if extraction of the latter would prevent recovery of coals from the better beds.

e. Mechanization.*

(1) General.

The geological conditions associated with coal-bearing formations in the USSR have greatly affected not only mining conditions in general but also the development of mechanization in particular. Since geological conditions are more like those in Europe than those in the US, Soviet designers have had to be selective in adapting machines developed in the US, the other country most actively interested in mechanization, and they also have had to solve certain problems independently. The Donbas, for example, has numerous thin coal beds, which lie at great depth, do not generally lie horizontal, and in many cases pitch very sharply. Such conditions are like those found in western Europe. The Kuzbas has very thick coal beds, as in the Upper Silesian Basin in Poland, although the beds in the Kuzbas are steeply pitching. These factors, as well as others, account for the fact that the USSR has not been able to use entirely the same machinery used in the US, where the bulk of the coal is produced from seams between 3 and 10 feet in thickness, which are nearer the surface and relatively flat and hence can be mined much more easily and economically. The USSR has

* See Appendix J for estimated inventories and production of Soviet underground mining equipment.

50X1
50X1

obtained different types and models of coal-mining machinery from foreign countries, and some of these have been copied, but the Soviet industry has done considerable development on its own. It has made progress in mechanizing all phases of underground mining, which includes essentially four operations -- cutting, drilling and blasting, loading, and transporting to the surface.

The USSR started to build cutting machines, mine locomotives, hoists, and some other equipment during the First Five Year Plan (1928-32) and by 1937 had become self-sufficient. At the beginning of World War II, cutting machines and pneumatic picks were used to mine about 75 percent of the deep-mined output, and conveyors were used to transport about 60 percent of the coal in the working places, but there was almost no mechanical loading. A start had been made to build machines, which the Russians call combines, designed to cut and load coal without blasting, but there were relatively few in existence, and none was satisfactory.

Since the end of the war the USSR has concentrated on mechanizing the coal industry. In no other industry have Soviet efforts to mechanize been greater, or even as great. The Soviet industry has made notable progress. It claims to have solved some difficult problems, one of which is the mechanical mining of thin seams by the Donbas combine. The USSR still does not have a satisfactory machine for simultaneous cutting and loading in thick seams. Neither does it have a satisfactory shortwall cutting machine, although it is possible that it is more interested in constructing a combine for shortwall mining, which would both cut and load the coal, than in constructing a coal cutter, which would only cut the coal.

(2) Mining.

The USSR claims that the process of cutting and blasting coal was 98.5 percent mechanized in 1950, 50/ as compared with 94.8 percent in 1940 and 62.6 percent in 1932. These figures include both coal that was mined with pneumatic or electric picks and coal blasted from the solid, which was probably drilled with mechanical equipment. The balance of the coal that was mined, which amounted to only 1.5 percent in 1950, is assumed to be the amount that was produced by hand mining or pick work and possibly by hydraulic mining. The latter method has been used to a slight extent in recent years in a few mines. Blasting from the solid is contrary to US practice.

According to Soviet figures, the mechanization of extraction has been at high levels in all major producing areas since before World War II. It has exceeded 95 percent in most cases and has been rated at 100 percent in the Urals area and in the Karaganda Basin since 1947. The high degree of mechanization claimed by the Russians, as shown by figures presented in Table 25, must be discounted to the extent that the coal blasted from the solid and that dug with pneumatic picks have accounted for from 35 to more than 50 percent of extraction in past years. These methods are not considered to be mechanized mining by US standards.

Table 25

Mechanization of Processes of Coal Extraction in the USSR by Major Regions 51/ a/
Selected Years, 1913-49

Percent

Year	Donbas	Moscow Basin	Urals	Kuzbas	East Siberia	Central Asia	Karaganda	Total USSR
1913	2.0	b/	b/	b/	b/	b/	b/	1.7
1927-28	19.4	2.6	20.6	1.8	0.7	b/	b/	16.5
1932	70.4	55.7	47.2	43.4	63.9	45.8	0.3	62.6
1933	75.2	56.8	56.8	52.7	71.5	56.5	3.9	67.6
1937	90.0	74.7	88.2	95.8	100.0	86.2	91.1	89.5
1938	88.1	82.7	95.1	93.0	100.0	87.1	99.5	90.0
1939	91.3	90.1	98.0	95.5	100.0	88.4	99.8	93.0
1940	93.5	94.1	99.6	96.1	100.0	96.7	99.2	94.8
1941	94.3	94.3	99.4	96.7	94.7	98.8	100.0	95.5
1942		79.7	99.2	96.1	92.4	94.8	99.9	94.1
1943	21.0	86.9	97.8	96.2	91.9	95.2	99.6	90.8
1944	65.9	88.7	99.6	96.4	92.3	96.3	99.2	88.8
1945	87.8	90.8	99.7	96.8	93.2	98.1	99.9	93.2
1946	94.3	93.1	99.9	97.8	92.6	96.7	99.9	95.6
1947	96.7	95.0	100.0	98.3	94.7	98.3	100.0	97.0
1948	97.4	96.2	100.0	98.3	95.0	98.2	100.0	97.4
1949	98.3	98.9	100.0	98.0	95.4	99.9	100.0	98.1

a. Includes extraction by blasting and by pneumatic or electric picks.
b. Probably none.

Data have been furnished which give a breakdown in percentages of the quantities of coal produced by different methods of extraction, and it is assumed that they pertain to deep-mined coal. The figures reveal that slightly less than 50 percent of the coal was mined with cutting machines and combines in 1949 as compared with 56.2 percent in 1940. The decline can be attributed to war losses of machinery in the Donbas and the relatively increased importance of coal production in the other coal fields where there was less use of cutting machines and combines. Of significance is the fact that less than 35 percent of the coal produced outside of the Donbas during the war years 1942-44 was mined with cutting machines.

The use of pneumatic picks as well as some electrical picks has accounted for about 10 percent of the annual production in the years since World War II. Coal extracted by this method in 1949 was about 24 million tons, which was 4.5 million tons more than the previous year but 6.7 million tons less than in 1940.

The proportion of coal that was mined by blasting -- assumed to be from the solid face, without previous undercutting -- which had risen to 44.6 percent in 1945, declined to 37.2 percent in 1949. Blasting is the breaking of coal with explosives which are inserted in holes drilled in a coal face either with hand augers or with pneumatic or electric drills. It is assumed that the coal extracted under the category of blasting is exclusive of that which is shot fired after undercutting with machines or mined in any way with pneumatic picks.

Table 26* furnishes reported percentages of production by various methods of extraction for the years 1932, 1933, and 1937-49 and calculations of the tonnages, based on estimates of deep-mined coal production for those years.

During 1950 and 1951 there were considerable increases both in percentage and amount of coal produced by combines, cutter-loaders, and coal planers. Combines would have accounted for the bulk of this coal. By November 1951, 1 out of every 4 tons produced in the Donbas was being mined with combines. 52/ It is believed that these machines may have produced 35 million tons or more in 1951, which is a little more than 14 percent of the underground production.

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* Table 26 follows on p. 95.

Table 26

Deep-Mined Coal Production in the USSR by Method of Extraction 53/ a/*
1932, 1933, 1937-49

		Coal-Cutting Machines											
		Combines, Cutter-Loaders, and Coal Planers		Heavy Cutters		Light Cutters		Pneumatic Picks b/		Blasting c/		Hand Mining d/	
Year	Deep-Mined Production (Thousand Tons)	Thousand Tons	Percent	Thousand Tons	Percent	Thousand Tons	Percent	Thousand Tons	Percent	Thousand Tons	Percent	Thousand Tons	Percent
1932	64,302	0	0	26,235	40.8	579	0.9	6,044	9.4	7,395	11.5	24,049	37.4
1933	N.A.	0	0		40.9		0.8		10.8		15.1		32.4
1937	125,519	0	0	57,990	46.2	628	0.5	20,585	16.4	33,137	26.4	13,179	10.5
1938	N.A.	0	0		50.9		0.5		17.0		20.9		10.7
1939	N.A.	0	0		54.0		1.0		17.9		18.6		8.5
1940	159,691	160	0.1	88,149	55.2	1,437	0.9	30,820	19.3	27,307	17.1	11,818	7.4
1941	67,168 e/	f/	f/	35,129	52.3	537	0.8	12,896	19.2	13,568	20.2	5,038	7.5
1942	67,454 e/	f/	f/	22,799	33.8	607	0.9	11,670	17.3	20,304	30.1	12,074	17.9
1943	81,312 e/	f/	f/	23,743	29.2	488	0.6	9,920	12.2	28,622	35.2	18,539	22.8
1944	90,468 e/	f/	f/	31,121	34.4	271	0.3	8,956	9.9	39,987	44.2	10,132	11.2
1945	131,915	132	0.1	50,261	38.1	527	0.4	13,323	10.1	58,834	44.6	8,838	6.7
1946	146,644	147	0.1	60,124	41.0	587	0.4	14,518	9.9	64,963	44.3	6,305	4.3
1947	164,874	495	0.3	73,863	44.8	g/	g/	16,982	10.3	68,588	41.6	4,946	3.0
1948	188,886	944	0.5	87,643	46.4	g/	g/	19,644	10.4	75,743	40.1	4,911	2.6
1949	213,279	9,598	4.5	96,189	45.1	g/	g/	24,100	11.3	79,340	37.2	4,052	1.9

* Footnotes for Table 26 follow on p. 95.

Table 26

Deep-Mined Coal Production in the USSR by Method of Extraction 53/ a/
1932, 1933, 1937-49
(Continued)

a. Tonnages given by method of extraction are calculated from reported percentages applied to production as indicated. The assumption is that percentages were applicable to the output of deep-mined coal.
b. Assumed to be dug from the solid without blasting.
c. Assumed to be blasted from the solid.
d. The figures are residual and are assumed to represent that coal which was mined without the aid of any mechanical equipment or blasting.
e. Reported percentages were based on output exclusive of Donbas, which is not included in these figures.
f. Negligible, if any.
g. Not reported separately; included with heavy cutters.

The fact that large percentages of coal are mined by blasting and pneumatic picks reflects the difficult mining conditions existing in many mines. The working of pitching coal seams, which are either thin or very thick, has been mostly responsible for such mining methods. It is believed that cutting machines would have been used in the past, because of their much greater productivity, if natural conditions had been more favorable.

The old GTK-model cutting machines, which were made before and during World War II, have been superseded by more efficient types. The KMP-1 cutting machine was developed for cutting thicker seams of coal, and the first tests of the MV-60 were made in 1948. Both machines are longwall cutters and have proven to be successful, according to Soviet claims.

Very little use is made in the USSR of shortwall cutting machines, which are designed to cut narrow working places, as is customary when working by the room-and-pillar system in the US. The number of these machines is relatively small, and their operation is confined mostly to development work. The models that have been made in the past were unsatisfactory, but it is probable that there is more interest in experimenting with a different type of machine for development, as evidenced by the fact that a few models of combines have been made for this purpose. Soviet practice in development work with a shortwall cutter generally is to use it in conjunction with either a mobile coal loader or a rock loader.

Combines are designed to cut and load coal simultaneously without the need for blasting. Experimental models, built before the war, were unsatisfactory, but the so-called Donbas combine, first tested in August 1948, is claimed to be highly satisfactory, and more machines of this model than of any other are in use. Many failures have attended the development of combines, and as yet the USSR does not have a good machine for use in thick coal. The Donbas combine is designed for seams of soft and average hardness and 0.8 to 1.5 meters thick. However, it is used in thick seams in the Moscow and Karaganda basins, in the Kuzbas, in the Urals, in the Far East (Primorskiy Kray), and elsewhere.

In the middle of 1947, there were only 20 combines in operation, and these were mainly Makarov models, the first of which were brought out about the time the war ended or shortly thereafter. The Makarov combines were designed and built in the Karaganda Basin at the Voroshilovgrad Plant imeni Parkhomenko and were introduced in the Karaganda mines. Three models have been built, of which the largest is for seams 1.85 to 2.1 meters thick. All of these machines have been troublesome, but they are possibly still being built.

Longwall cutters operate with the cutter bar turned at a right angle to the body of the machine. The KMP-1 cutter became the basic component of the later Makarov combines, which have had either 2 or 3 cutter bars and addition-breaker bars. The Donbas combine is based on the MV-60 cutting machine and has an elongated ring-type cutter bar which cuts the top, bottom, and back of a coal block. Most of the Donbas combines cut to a depth of 1.4 meters, although some are made to cut deeper. New types of combines, which offer good prospects of success [redacted] have been tested in 50X1 the last few years. One of these machines is designed like the "Colmol," built in the US, but it is much smaller. Another machine has been built for use in thin and steeply pitching seams. It is to be expected that modifications of existing models as well as machines embodying changes in basic design will be built to meet special conditions, but the Soviet industry apparently is well satisfied that it has solved the problem of mechanical mining in thin seams.

The productivity of Donbas combines averaged 4,779 tons in June 1950 in the Donbas mines. 54/ It was reported in March 1951 that the norm in the Stalinugol' Combine (in the Donbas) was 5,000 tons monthly, but output was only 3,000 to 4,000 tons, although Donbas combines had yielded 10,000 tons monthly. 55/ Another report mentions that combine operators of 15 leading pits in the Stalinugol' Combine had already attained an output of 10,000 tons monthly per combine, which was more than double the norm. 56/ It was announced in August 1951 that a miner in the Donbas had cut 13,000 to 15,000 tons in a month with a Donbas combine and that a miner in the Kuzbas, in competition with him, had cut 20,050 tons. 57/ In January 1952 a crew set a new record for the Donbas by cutting 16,000 tons as compared with a quota of 12,740 tons. 58/ In early 1952 the production of the Donbas combine had increased twice in 2 years, and the goal in the Kuzbas was 25,000 tons. 59/ Productivity of combines increased 19 percent in 1951. 60/

The foregoing figures indicate a wide range of productivity for the combines. The average per machine, however, is believed to be less than 6,000 tons monthly, which is considerably more than is obtained with cutting machines, especially in thin seams.

The norm of a cutting machine in the western areas of the USSR was 3,050 tons monthly in 1947, but the average productivity was only 2,378 tons in 1946 and 2,837 tons in October 1947. In 1940 the average productivity of coal cutters in Stalino Oblast in the Donbas was 4,113 tons per month. 61/ It was reported in February 1948 that the capacity of cutting machines was 30 percent lower than in 1941. 62/ Their productivity has continued to be lower on the average than in 1940. However, productivity must be greater where thicker seams are mined, as in many fields in the eastern areas. A miner in the Karaganda Basin set a record of 22,705 tons with a coal cutter in June 1949. 63/ The newer KMP-1 and MV-60 machines were reported to be much superior to the older GTK-3 machine. By August 1950, about one-third of all the old cutting machines were to have been replaced by the newer machines. 64/

[redacted] the percentage 50X1 of extraction done with cutting machines in the Donbas was to reach 75 percent in 1950, as compared with 68 percent in 1940. 65/ The Donbas combines have been such a success, however, that cutting machines may become less important than they have been.

The Russians have modified cutting machines by attaching a plow, which permits loading about 75 to 80 percent of the coal. The machines, called cutter-loaders, are run across the face to undercut the coal before blasting. After blasting, they are run in reverse, with the plow serving to push coal onto the conveyor. A good many of these machines are in use.

In 1946 the USSR started to build coal planers, which are devices that extract coal by drawing a wedge-shaped cutter back and forth across the coal face by means of two winches placed at opposite ends of the face. The coal falls into a conveyor placed parallel with the face. It is estimated that 43 of these machines were made up to the end of 1949, but there has been almost no mention of them since, and it is assumed that they were not particularly successful.

(3) Loading.

Before the end of World War II the amount of coal and rock loaded by machinery in deep mines in the USSR was relatively small. In 1940, only 0.1 percent of the total coal production was mined with combines. On this basis the volume of mechanically loaded coal in 1940 might be estimated at about 160,000 tons. There were probably a few track-mounted rock loaders in use which may have loaded some coal, but their production would have been insignificant.

In an article of January 1949, A.F. Zasyad'ko, Minister of the Coal Industry, stated that until recently there had been no mechanization of some important processes, including the loading of coal and rock at the face, except to a minor extent in development work.* Such tasks, in addition to the delivery of reinforcing timber, required more than 40 percent of the general amount of work spent on exploitation. 66/

Soviet coal- and rock-loading equipment may be classified as follows: machines that cut and load coal, which include coal combines, coal planers, and cutter-loaders; mobile coal loaders, of which one model is used predominantly; a coal loader used in the USSR with a conveyor; and rock loaders.

Production of mobile coal loaders was started in 1947. The most common one is the model S-153, which is caterpillar mounted and in most respects a copy of a US machine. There is one Soviet model of a duckbill, the KUP-48, but there is almost no mention of it, and the assumption is that very few units of this type are in use.

At the beginning of 1949 there were 300 pieces of coal- and rock-loading equipment in use, 67/ and by the end of 1951 there were almost 1,600 in operation, of which 66 percent were rock loaders and 34 percent were coal loaders. More than 80 percent of all rock-loading machines were used in the Donbas. The whole park of rock-loading machines was divided into three types: UMP-1 (55 percent), EPM-1 (24 percent), and PML-5 (21 percent). 68/

* Development, or preparatory, work consists essentially of driving a series of entries to open up blocks of coal and usually involves the shooting and handling of considerable rock, especially in low coal seams, in order to get sufficient height for movement of coal, machinery, materials, and men. Entries are generally driven through the coal seam, but there is probably a great deal of development in solid rock at Soviet mines, particularly in the Donbas.

Between 1949 and 1951 the extent of development of entries and crosscuts with use of mechanical loading equipment had almost doubled for the mines of the Coal Ministry and nearly tripled in the Donbas. The increases in volume of mechanization in development work during 1950 and 1951 as compared with 1949 are shown in Table 27.

Table 27

Index of Mechanization in Development Work in Coal Mines in the USSR, 1949-51 69/ a/

Percent

Mines	1949	1950	1951
Ministry of the Coal Industry	100	156	193
Donbas	100	192	292
Kuzbas	100	148	169
Moscow Basin	100	143	125
Karaganda Basin	100	150	225

a. 1949 = 100 percent.

The increase in the extent of mechanized development work in comparison with the extent of basic general development is shown in Table 28.*

The foregoing figures indicate that in the first quarter of 1952 more than a third of all basic development work of the coal industry (exclusive of shaft sinking) and more than 45 percent of all basic development work in the Donbas were conducted with mechanized loading of coal and rock. The average rate of driving entries and crosscuts is 1.5 times higher with mechanized loading than with manual methods. 70/

In the 3 years before March 1952 the time spent on conducting development work with mechanized loading increased

* Table 28 follows on p. 102.

Table 28

Extent of Mechanized Development as Percent of General Horizontal Development Work in Coal Mines in the USSR 1949-51, March 1952 71/

Percent

Mines	1949	1950	1951	March 1952
Ministry of the Coal Industry	17.1	24.6	31.6	37.3
Donbas	14.8	25.7	37.5	45.7
Kuzbas	42.7	46.3	64.6	71.5
Karaganda Basin	17.5	27.5	38.9	42.2

22.3 percent in the coal industry as a whole and 22.5 percent in the Donbas. In 1951, as compared with 1950, the time spent on development work with manual loading did not change but with mechanized loading grew 10 percent. 72/ It may be inferred that the extent of development work done with mechanized loading increased at least as much as the increase in the time element.

It was reported in January 1950 that loading machines in the Kuzbas, as a rule, operated only 1½ to 2 hours per shift and were idle the rest of the time because of poor ventilation at the mine faces and because of a lack of empty mine cars. It required only 2 or 3 minutes to load a car, but it took 15 to 20 minutes to shift cars by hand. Some mine faces provided with combines were idle 30 to 47 percent of the time. 73/ [redacted] 50X1
in the Moscow Basin, there were more S-153 loading machines idle than were in operation. The S-153 could load 1 ton per minute, but existing conveyors and small locomotives could not keep pace with this performance. 74/ In August 1949 there were 50 S-153 loaders in operation in the Moscow Basin, and the number was to be tripled during the following year. 75/

From the foregoing, it is evident that transportation has been a problem, but all indications are that conditions improved considerably during 1951 and 1952.

The bulk of the coal that is mechanically loaded is done with combines, coal planers, and cutter-loaders. It is estimated that in 1949 these machines loaded about 9.6 million tons, or 4.5 percent of the underground production. In addition, unknown quantities of coal were loaded with rock loaders and mobile coal loaders, but since the productivity of these machines was low at the time, the total was probably not more than 11 million tons.

[redacted] coal loading at the mine face had been mechanized 16.1 percent. 76/ It was also reported that the volume of mechanized coal loading had increased 50 percent in 1951 as compared with 1950. 77/ By November 1951 it was claimed that in the Donbas 1 ton out of every 4 was being mined with combines. 78/ 50X1

It may be concluded that up to 25 million tons were mechanically loaded in the Donbas in 1951 and that the total for the USSR may have exceeded 45 million tons.

(4) Haulage.

The transport of the bulk of the coal output in shaft mines, which accounts for all except a minor part of the underground production, may be divided into three stages -- conveyance from the working face to the main haulageway, transport to the shaft, and elevation to the surface.

The principal means of moving coal from the working faces in Soviet mines are by conveyors or by gravity. Available data show that only 2.9 percent of the underground output during the years 1947-49 was moved from the working face in cars hauled by locomotives. The tonnage loaded into cars at the working faces, including that loaded into those either pushed manually or moved by winches, was only about 9 or 10 percent of the total quality of coal transported underground in 1949.

More evidence of the steeply pitching character of the coal seams and difficult mining conditions is to be found in figures showing that about 27 percent of the coal was moved out of working places by gravity in recent years. This would necessitate in many cases the use of steel chutes, requirements for which must be large, although much of the coal undoubtedly slides and rolls over the natural surface. Shoveling by hand, probably in stopes, accounted for a low percentage of the total quantity transferred. The movement by gravity and hand shoveling contributes to a high percentage of fine coal and dust.

In 1949, 62.5 percent of the coal was moved by conveyor, as compared with 61.2 percent in 1940 and 52 percent in 1937.

Table 29* shows the percentages of coal transported by different methods from the working faces in 1949 and previous years.

Conveyors are of three types -- scraper, shaker, and belt. The Fourth Five Year Plan (1946-50) called for a considerable replacement of the shaker conveyors -- declared to be slow and inefficient -- with scraper conveyors. The proportion of coal moved with scraper conveyors was to be increased up to 64 percent by the end of 1950, as against 25 percent in 1945. At the same time, the proportion of coal conveyed with shaker conveyors was to decrease from 32 percent to 13 percent. 79/ By the end of 1951, scraper conveyors comprised 90 percent of the total conveyors on the faces. 80/

It is probable that the Donbas has 50 percent or more of the total number of face conveyors in the Soviet coal industry. An indication of their length is to be found in figures relating to the length of mine faces using combines, which were reported for the Donbas in May 1950. Mine faces using combines fell into the following categories: up to 100 meters, 17.4 percent; 100 to 125 meters, 27.2 percent; 125 to 150 meters, 19.5 percent; 150 to 200 meters, 27.2 percent; and over 200 meters, 8.7 percent. Thus, 82.6 percent of the Donbas mine faces where combines were operating were more than 100 meters long, and 2 St_2-11 scraper conveyors were required for each of these. For the 8.7 percent above 200 meters, 3 conveyors had to be used. 81/ Since these conveyors could handle only 60 tons of coal an hour and were criticized for being slow and inefficient, replacement with new conveyors was considered necessary. One of the new models, the SK-30, with a productivity of 100 tons per hour and a length of 180 meters, had been designed for operation with combines and would make possible the use of only 1 conveyor at the majority of working faces. 82/

In May 1950 there were 17 different types of scraper conveyors in use, 83/ and several other models were introduced later. A number of models are of the reversing type which is used to transport timber to the working place.

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* Table 29 follows on p. 105.

Table 29

Movement of Coal from Working Faces
in Mines of the USSR by Method of Conveyance 84/
1932-49

Percent

Method of Conveyance	1932	1933	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949
Cars Loaded at Face and Pushed by Hand	14.6	13.6	7.2	8.2	5.9	4.7	5.0	10.5	11.4	10.4	9.9	9.3	N.A.	N.A.	N.A.
Shoveled by Hand a/	12.6	11.5	5.1	6.0	5.3	4.9	4.8	5.5	14.6	11.1	7.3	4.2	N.A.	N.A.	N.A.
Total Manual	27.2	25.1	12.3	14.2	11.2	9.6	9.8	16.0	26.0	21.5	17.2	13.5	10.2	8.6	6.4
Conveyors	35.8	38.6	52.0	53.9	58.7	61.2	60.7	54.9	48.4	52.2	54.4	55.0	58.7	60.3	62.5
Winches	4.1	3.6	2.5	1.5	1.0	0.9	0.9	0.5	0.5	0.9	1.1	1.3	1.2	1.4	1.3
Locomotives b/	1.7	2.1	1.2	0.8	0.8	0.7	0.7	1.7	1.9	2.0	2.0	2.7	2.9	2.9	2.9
Gravity	31.2	30.6	32.0	29.6	28.3	27.6	27.9	26.9	23.2	23.4	25.3	27.5	27.0	26.8	26.9
Total Mechanized	72.8	74.9	87.7	85.8	88.8	90.4	90.2	84.0	74.0	78.5	82.8	86.5	89.8	91.4	93.6
Total Transport	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

a. Hand shoveling is done principally in steeply pitching working places or in pits.
b. Mechanized placement of cars.

The transport of coal in main haulageways is predominantly in cars hauled by locomotives. Soviet data show that 85.5 percent of the coal loaded in 1949 was hauled in that way. Cable haulage accounted for 9.6 percent, and conveyors for only 0.4 percent. The amount hauled by mechanical means reached 95.5 percent. The balance of 4.5 percent included 3 percent by animal (horses) haulage and 1.5 percent by manual car pushing. By the end of 1951, nearly 90 percent of all coal extracted in the mines was transported with the aid of electric locomotives, 85/ of which locomotives with coupling weights of 10 and 14 tons constituted about 25 percent. 86/ In 1940, 67.2 percent of coal hauled was by electric locomotives, and 24.1 percent was hauled by horses.

Table 30* shows statistics for 1949 and previous years of the coal hauled in main haulageways by different methods in percent of total coal loaded.

It was reported in 1948 that manual and horse traction would be replaced completely with electric locomotives. New and more powerful types of electric locomotives were to be used extensively. Mechanization of underground haulage in the principal haulage tunnels in the Moscow Basin in 1947 had reached 100 percent and was to be completed in the Donbas by the end of 1950. 87/ In the Donbas, electric locomotives were to be substituted for cable haulage. By the end of 1949 there were to be introduced not less than 600 gathering locomotives, each weighing 2 tons. 88/

Table 31** shows the degree of mechanized haulage in the Donbas on 1 June 1950 as compared with 1 June 1941.

Shortages of small locomotives for shifting cars at the discharge end of conveyors was responsible for retarding production in 1949 and 1950. This work was being done to a large extent by hand pushing. It was reported that by the end of 1951, shunting (shifting) operations were mechanized at 72 percent of all loading points. Also, in more than 300 sloping passages with a total extent of nearly 150 kilometers and along 290 kilometers of horizontal passages, workers were transported in special mine cars. 89/ A Soviet article of the early part of 1950 stated that in the next 3 or 4 years shunting was to be mechanized further, to between 80 and 100 percent. Two-ton trolley locomotives were to be used for this purpose. 90/

* Table 30 follows on p. 107.
** Table 31 follows on p. 108.

Table 30

Development of Different Methods of Haulage
in the Coal Industry of the USSR 91/
1932-33, 1937-49

Percent of Total Loaded a/

Year	Unmechanized Haulage: Manual b/	Horse	Total	Mechanized Haulage: Electric Locomotive	Conveyor	Cable c/	Total
1932	11.5	58.9	70.4	17.8	0	11.8	29.6
1933	11.1	52.0	63.1	12.9	0	24.0	36.9
1937	5.0	41.4	46.4	38.8	0	14.8	53.6
1938	1.7	36.7	38.4	51.9	0	9.7	61.6
1939	0.8	29.8	30.6	60.3	0	9.1	69.4
1940	0.7	24.1	24.8	67.2	0	8.0	75.2
1941	0.7	19.8	20.5	71.4	0.5	7.6	79.5
1942	1.9	17.8	19.7	69.3	0.6	10.4	80.3
1943	3.6	14.5	18.1	73.7	0.5	7.7	81.9
1944	8.9	7.6	16.5	74.3	0.9	8.3	83.5
1945	8.5	5.0	13.5	76.0	0.6	9.9	86.5
1946	5.8	6.2	12.0	77.5	0.4	10.1	88.0
1947	3.7	5.2	8.9	79.1	0.3	11.7	91.1
1948	2.4	3.8	6.2	82.3	0.2	11.3	93.8
1949	1.5	3.0	4.5	85.5	0.4	9.6	95.5

a. Transported on main haulageways.
b. Pushing of cars by hand.
c. Rope haulage.

Table 31

Degree of Mechanized Haulage in the Donbas 92/ a/
1941, 1950

	1 June 1941	1 June 1950
		Percent
Mechanized		
Electric Locomotives	45.5	80.5
Conveyors	1.1	2.0
Winches	9.9	10.5
Subtotal	56.5	93.0
Nonmechanized	43.5	7.0
Total	100.0	100.0

a. Entry haulage.

In 1949 there were more than 6,000 kilometers of underground track in Soviet coal mines, and 1,000 kilometers were changed over to heavier rails. [redacted] in 1951 preparatory work with mechanized loading was done for more than 700 kilometers, or about one-third of the general volume of preparatory work. 93/ This statement could be interpreted to mean that about 2,100 kilometers of entries were driven in 1951. It is evident that requirements for steel rails, bonding material, trolley wire, and steel for bracing entries have been heavy.

During 1948 there was begun the large-scale use of metal arched bracing in entries. By the beginning of 1949 there were some shafts of the Donbas in which metal frames and reinforced concrete supports were being used, amounting to a total of 5 to 8 kilometers of workings. By the end of 1949 there were to be 300 kilometers of workings with such supports. In the largest mine repair works in the Donbas, special shops had been organized for producing metal arched reinforcing. 94/ [redacted] the extent of preparatory work (entries) supported by metal, reinforced concrete, and other new types of props increased in 1951 more than 30 percent over 1950. 95/ The Minister of the Coal Industry reported in 1951 that more than 800 kilometers of entries were supported by new types of props. Their use not only reduced the use of timber but also significantly improved the condition of mining, improved transportation and ventilation, and sharply decreased the number of workers occupied in repair and replacing props.

The production of a shaft mine is limited to the capacity of its hoisting equipment. Locomotives haul the cars to the bottom of the shaft, and they have to be transported to the surface at most mines. The time required to raise the loads and lower the empty cars depends mainly on the depth of the shaft and the speed of the hoisting equipment.

Not many data are available about the types of hoisting equipment in use at Soviet mines. Hoisting equipment has a relatively long life, although cables must be replaced frequently. It is not known how many shaft hoists are made for coal mines each year. In the early 1930's the Russians were making 90 to 110 annually, and the quantities must be much higher today. It is believed that at least 200 are needed annually. On 15 September 1934 there were 221 steam hoists and 570 electrical hoists in use. The trend was to install more electrical hoists, and it is believed that very few of the steam type are now in use. A report of August 1950 mentions that the Novo Kramatorsk Plant imeni Stalin in Elektrostal' had sent its electrical mine hoists to every coal field in the USSR. Since the plant first began production of this machine in 1944, it has gradually cut production time. In 1950, 9 men could assemble 2 to 3 machines in a month. 96/

The capacity of a shaft hoist will vary, depending on the depth of the shaft. One of the largest mines in the Donbas produced 4,004 tons on 21 December 1951, the greatest amount mined in its existence. 97/ This tonnage would represent close to the capacity of the largest hoists in the Donbas, where the shafts are relatively deep. The imeni Stalin shaft in the Kuzbas, which is probably the largest in the country, produces in excess of 2 million tons annually. Shafts in the Kuzbas are not deep, and the same size hoist could handle far more coal in a day in the Kuzbas than is generally the case at Donbas mines.

f. Underground Mining Equipment.

(1) Cutting Machines.

(a) General.

The USSR started to build coal-cutting machines during the First Five Year Plan (1928-32). The principal cutting machines manufactured from 1930 to 1937 were the heavy cutting machines DT and DTK2 and later the more effective model, the GTK-3M, built by the Gorlovka Machine Building Plant imeni S.M. Kirov. 98/ In addition to these earlier models, which were designed for longwall cutting, some machines also were built for cutting at narrow working faces. The latter actually were used in development work.

The first Soviet cutting machine for development work was the DL light-bar percussion rotary cutting machine made by the Gorlovka plant in 1932-33. This machine was not widely accepted, because of its low productivity. The next light cutting machine, the BSh type, was not widely accepted, because it was underpowered. The next in line, the LVSh-2, also was underpowered. 99/

The first model of a heavy-duty universal cutting machine, the GVU, mounted on caterpillar treads, was developed by the Gorlovka plant in 1939. This machine was designed for vertical cutting as well as horizontal cutting and was tested in driving entries. After several changes in this model, an improved universal cutting machine, the VTU-1, passed its tests in 1941. It was not put into production, however, until after World War II. 100/

The USSR has produced relatively few shortwall cutting machines, a type customarily used in the US. Shortwall cutters are advantageous in the room-and-pillar system, where the face is relatively narrow and machines are used to cut numerous room faces. Since Soviet mines usually have the longwall system, there is limited use for shortwall cutters, except in development work, where a machine is generally used to cut the face of two entries and the crosscuts between them.

The ShVD-46 and the later ShVD-48 models are shortwall cutters, but it is probable that only a relatively small number have been made. [redacted] experiments at many 50X1
mines showed that the ShVD-46 machines were not suitable for

development work at faces only 3 to 4 meters wide. So much time was consumed in operating the machine as to complicate other work at the face and decrease the machine's effectivness. This type of machine could not be used in the Moscow Basin. The VTU-1 was too heavy, awkward, and overpowered for effective use in medium-hard seams, which are cut both vertically and horizontally, not only in the Moscow Basin mines but also in others. 101/ A new machine of the BSh type, with a power increase of 10 to 12 kilowatts and a strengthened bar and cutting chain, might successfully replace the VTU-1 for this type of mining.

The GTK-3M has been the machine used for cutting most of the coal in recent years, but production of this model ceased several years ago. These machines are being replaced by improved models developed during and since the war. The KMP-1, MV-60, and the GTK-35 are in serial production. It is not certain that the USSR is producing any other models of cutting machines at the present time. All evidence seems to indicate that relatively few Soviet shortwall machines are in use and that production of the VTU-1 universal cutter was discontinued. Data on production of coal with light cutting machines have not been shown separately since 1946, and it is assumed that the tonnage has declined to the point where little, if any, coal was produced with the light cutters in 1952.

(b) Models.

The principal models of cutting machines in use are the GTK-3M, the MV-60, and the KMP-1. The GTK-3M, a longwall cutting machine, was built at the Gorlovka plant. Although its production has stopped, it is probable that more of these than of any other model are in use. The body of the machine is 2.48 meters long, and the height is 0.72 meter. The weight, with a 2-meter cutter bar, is 2 tons. The hourly motor capacity is 25 kilowatts, but continuous motor capacity is only 16 kilowatts. It appears from the specifications that the GTK-3M had too little power and was too high for work in many Donbas coal seams.

The MV-60 also is a longwall cutting machine. In the beginning of 1947, nine of these were made by the Gorlovka plant. After trials in the mines and some changes in the electrical part of the machine, mass production started early in 1948. The machine is powerful and designed for working low seams. It is only 0.4 meter in height and has a top feed speed of 1.4 meters per minute. The motor now has an hourly capacity of 65 kilowatts and a continuous motor capacity of 30 kilowatts. The machine has enough power to cut coal of any degree of hardness, [redacted] The cutter bar cuts to a depth of 2 to 2.5 meters, and the machine is equipped with a mechanical bug duster. The MV-60 is also used as a basic part of some combines. 102/ 50X1

The KMP-1 longwall cutting machine was developed during the war and is mass-produced at the Kopeysk Machine Building Plant imeni S.M. Kirov, in the Urals. It has a mechanical bug duster and a reinforced cutter chain and is intended to be used mainly for cutting hard coal. The KMP-1 has a pulsating feed transmission, permitting regulation from 0 to 0.86 meter per minute. It weighs 2.3 tons and has a height of 0.75 meter. 103/ It can use a cutter bar that varies in length from 1.6 meters up to 5 meters. Most of the cutter bars are probably 2 meters long, but cutter bars, 3, 4, and 5 meters long have been used successfully in the Pechora mines. 104/ With slight modification this machine becomes a cutter-loader, the VPM-1.

The VTU-1 universal cutting machine was produced by the Krasnoyarsk Machine Building Plant imeni Voroshilov, but there has been no mention of any production since 1949. It is mounted on caterpillar treads and can be used for both top and bottom cutting and also vertical cutting. A top cut can be made 1.44 meters from the floor. It is a long and heavy machine -- its over-all length with cutter bar is 6.62 meters, and its weight is approximately 6 tons. Presumably there is no present production, because it is too heavy, slow, and difficult to operate. It is used primarily in development work.

(c) Number in Use.

The number of cutting machines in Soviet coal mines increased from 549 heavy machines and 268 light cutting machines in 1927-28 to 3,442 and 608 (estimated), respectively, in 1940. The inventory in 1951 is estimated at 4,800 heavy cutting machines and only 50 light cutting machines.

The inventory of machines is always greater than the number in use at any time, mainly because many machines are down for repairs. This is indicated by data on average monthly productivity, which show that the quantity of machines needed to obtain the production is far less than the number in the park.

(d) Productivity.

Machine productivity varies considerably, depending mainly on the thickness of the coal seam and the depth of the cut across the face. [redacted] the 50X1 productivity of coal-cutting machines in the Donbas had not been increasing rapidly enough. The average monthly productivity of coal-cutting machines in the coal mines of the western regions was 2,837 tons in October 1947, as compared with 2,378 tons in 1946. The established average norm was 3,050 tons in 1947. In 1940 the average productivity of coal-cutting machines in the mines of Stalino Oblast (the Donbas) was 4,113 tons per month. At Mine No. 27 of Snezhnyanantratsit Trust the average productivity had reached 10,300 tons in December 1947. Before World War II a good machine operator turned out more than 20,000 tons of coal per month. 105/ [redacted] 50X1 there were no fewer 50X1 coal-cutting machines in the Donbas mines than there were before the war, but states that their average productivity did not exceed 75 to 80 percent of prewar productivity. In Sovetskugol' Trust the productivity of the coal-cutting machines averaged only 2,544 tons monthly, while in the leading Rutchenkovugol' Trust the average was 4,024 tons, although mining conditions were identical. 106/ By December 1949, machines in Stalinugol' Combine in the Donbas had achieved only 3,300 tons monthly, while in other mines the monthly productivity had been as high as 12,000 tons. 107/ In contrast to these low productivity figures, [redacted] miners in the 50X1 Donbas were paying compliments to the KMP-1 coal-cutting machine. Some of the machines were cutting 16,000 to 18,000 tons of coal per month. 108/

Monthly productivity of cutting machines in eastern regions has been higher than in the Donbas, and the average for the USSR must now be greater than several years ago. It is believed that average monthly productivity in 1951 of cutting machines was still not more than 3,500 tons in the Donbas.

(2) Combines.

(a) General.

Before World War II the USSR built a number of machines designed to cut and load coal simultaneously. Various types of combines have been made, but most of them are basically cutting machines with modifications of the cutter bar to cut and shear coal from the solid without blasting. Most of the models have had two or more cutter bars with additional breaker bars, but the popular Donbas combine has a looped cutter chain. The coal either drops or is forced onto a conveyor, which transfers it to a point in the haulageway where the cars are loaded.

(b) Models.

The prewar models included the Yatskikh Ya-3 and Ya-4, the S-5, the B-6-39, the Serdyuk S-24, and the PK-1 development combine. Some dozens of the S-24 model were made in 1938-40 and were used in the Donbas and the eastern coal basins. 109/

There have been built about 20 models of combines since World War II, but the major part of the production has consisted of the Donbas and Makarov machines. Most of the others may be considered as experimental models that have never been put into serial production and have probably proved to be unsatisfactory.

The Donbas combine was introduced in 1948 and has proved very successful [redacted] It is intended for use in coal of soft and average hardness, without rock partings that require separate extraction. It is designed for cutting seams from 0.8 to 1.5 meters in thickness, but thicker seams in the Kuzbas have been mined by using one machine to cut an upper bench and another to cut a lower bench. The machine is being used in a growing number of mines in many coal fields. 50X1

The Donbas combine is built around the MV-60 cutting machine, whose cutting section is equipped with a looped or U-shaped bar, a breaker rod with 2 or 3 shearing disks, and a scraper-loader placed at the rear. The regular depth of a cut is 1.4 meters, although the machines may be made on special order to cut at greater depth. The scraper-conveyor-loader is looped like the cutter bar, and loading is accomplished without much scattering of the coal or interference from timbering. A brigade or crew of workers operating a Donbas combine numbers 7 to 10. Only 1 man is required as operator, and from 3 to 5 are needed for timbering. 110/

The Makarov combine, designed by S.S. Makarov, formerly a mechanic at the Karaganda Mines, is second to the Donbas combine in importance, but it has given a great deal of trouble. After tests of experimental models from 1944 to 1946, three models --

the KM-4, the KM-5, and the KM-6 -- were put into serial production. The KM-4 was built originally of three GTK-3M coal cutters, placed one above another. The KMP-1 cutter later became the basic component. The KM-4 is intended for use in seams 1.85 to 2.1 meters thick. The KM-5 machine is designed for seams 1.15 to 1.3 meters thick and is built from two cutting machines with the top cutter bar turned down near the end. The KM-6 model is for use in seams 1.5 to 1.85 meters thick. 111/

Other models built since World War II include the following: AMV-1, VNAT-2, VNATI, VOM-1, VOM-2, UKA-1, ZAL-1, PK-1, VOM-2M, UKA-2, ZAL-ZS, KMP-1 (2 bar), UKMG-1, UKT-1, KKP-1, PK-2M, and PPK-1. 112/ The first eight in the list are believed to have been either experimental models or models of which production in quantity has ceased.

The PK-2M and PPK-1 models are designed especially for development work. The first is built for horizontal development of thick seams of average hardness, and the other is intended for horizontal development in rock. 113/

The VOM-2M is built around the MV-60 cutter, which is run on its side to save space between the coal face and the props. It is made for mining seams 2 to 2.5 meters thick, such as are encountered in the Donbas and in the Moscow Basin. The cutter is adjustable from 1.3 to 2.5 meters and cuts an average depth of 1 meter. 114/

The UKMG-1 was designed for working thin seams, 0.35 to 0.6 meter thick. The cutter chains are fitted with blades in addition to bits, and the machine runs in reverse in order to load coal. The cutter chains cut the thin seams to their full height, move the coal out, and load it onto a face conveyor. 115/ The UKT-1 is another model for thin seams, 0.4 to 0.7 meter thick. This machine has rotating bits that bore the coal from the face and throw it directly onto the face conveyor. 116/

The KKP-1 is a unique combine that was introduced about 1949 or 1950 for use in steeply pitching seams. It operates on compressed air and consists of a heavy frame on which is mounted a circular disk, fitted with three special cutters instead of the usual chain and picks. The frame is suspended in such a way that the disk shears the coal at an angle instead of in terraces. Gravity carries the cut coal down a chute and at the same time allows the machine, guided by a hoist, to settle to the bottom of the seam as the cutting proceeds. 117/

(c) Number in Use.

It is estimated that over 650 combines were produced in the 1945-51 period. The USSR has mentioned that about 300 combines were in use by the end of 1950, and the park was estimated to be 460 by the end of 1951. Many machines, however, were unsatisfactory and may have been scrapped.

(d) Productivity.

It is difficult to generalize about the productivity of combines because each model is designed for operation under particular conditions. The Donbas combine, however, is being used in thicker coal seams than it was intended for because it is, undoubtedly, the best combine that the Russians have at the present time.

The monthly productivity of the Donbas combines for the Ministry of the Coal Industry as a whole increased from 3,246 tons in the first quarter of 1949 to 4,488 tons in the second quarter of 1950. In June 1950 it reached 4,658 tons, thus exceeding the 1950 goal. The best results that were obtained by the Donbas enterprises during June 1950 with the use of Donbas combines were as follows 118/: the Stalinugol' Combine, 5,056 tons; the Artemugol' Combine, 5,460 tons; the Voroshilovgradugol' Combine, 4,120 tons; the Donbassantratsit Combine, 4,754 tons; and the Rostovugol' Combine, 4,648 tons. Considerably higher productivity with the Donbas combine has been reported in some cases.

The average length of mine face employing the combine in the Donbas mines owned by the Ministry of the Coal Industry was 131 meters in June 1950. The average length of mine face employing the combine for each Donbas combine during the same month was as follows: the Stalinugol' Combine, 151 meters; the Artemugol' Combine, 151 meters; the Voroshilovgradugol' Combine, 108 meters; the Donbassantratsit Combine, 116 meters; and the Rostovugol' Combine, 108 meters.

[redacted] the average daily productivity of a Makarov GKM-5 machine was 200 to 230 tons daily. 119/ Productivity has been reported as high as 20,000 tons per month in the 50X1

Kuzbas with a combine assumed to have been a Makarov machine. [redacted] 50X1
[redacted] monthly productivity up to 14,000 tons at 50X1
the Karaganda Basin, where these machines are more commonly used.

A KKP-1 combine working in the Donbas was reported to have extracted 6,116 tons in a month. 120/ During October 1950 a UKT-1 combine, which may come into fairly common use for mining the thin Donbas seams, produced 3,509 tons. The labor productivity of the cutting unit operators was 8.41 tons, and labor productivity per shift of the workers along the mine face was 3.2 tons. 121/

The average productivity of coal combines in the USSR is still probably less than 6,000 tons monthly but considerably higher than the productivity of cutting machines.

Tests of the PK-2M development combine during 1950 resulted in cutting a maximum of 19.15 linear meters when operating a little more than 21 hours in 1 day. A total of 306 linear meters was attained in a 23-day period, 122/ indicating that it was idle only a small part of the time. Such productivity is considerably better than can be reached by usual methods.

(3) Coal Planers.

(a) General.

The Soviet coal planer has been copied from a German model and is used for cutting and loading coal in seams that are 0.75 to 1.6 meters thick. The machine consists of a wedge-shaped plow or cutter, two low-speed winches, a portable scraper conveyor, pneumatic jacks to move the conveyor, and a compressor. A winch is placed at each end of a coal face which is up to 170 meters long, and they alternately pull the plow back and forth across the face. The plow scrapes coal to a depth of 0.2 meter and a height of 0.45 to 0.65 meter with each pass of the cutter. The coal drops onto the conveyor, which moves it away. It operates satisfactorily in soft coal that breaks easily, and especially where the coal breaks freely from the roof. If the coal above the cut sticks to the roof, it must be broken away with picks or by blasting. 123/

(b) Models.

In 1946 the Voroshilovgrad Planning Bureau of the State Institute for Planning Coal Machines developed, for the first time in the USSR, two variants of the coal stripper, the US-2 (welded) and the US-3 (cast). 124/ Later, a few US-4 machines were made.

It is believed that only an experimental model of the US-2 was built in 1946 or 1947. The US-3 was considered, evidently, to be a better machine, for a great many were made in 1948.

(c) Number in Use.

There is no information that any coal planers have been made since 1948, and the total number that have been built in the USSR is estimated at only 43. It is probable that production was discontinued because combines proved more successful.

(d) Productivity.

The planer can make in 15 minutes a cut 100 meters long which yields about 20 tons of coal. The conveyor has a maximum capacity of 100 tons an hour. The subsidiary operations required for each planing cycle, such as transferring the conveyor, setting the jacks, and clearing the tracks, require about 20 to 30 minutes. 125/ Tests at several Donbas mines showed that productivity for the planer averaged from 3,150 to 3,330 tons per month during the last half of 1948 as compared with about 2,000 to 2,500 tons of coal per cutting machines at the same workings. 126/

(4) Cutter-Loaders.

(a) General.

The Russians have produced some machines, called cutter-loaders, which are modifications of the standard longwall cutting machines with a plow attached to load the coal. The machine cuts the whole face, moving on a tilted carriage along the frame of a scraper conveyor laid parallel to the face. The cutter chain carries out the coal cuttings from the kerf and loads them directly onto the conveyor. Because the machine is inclined toward the face, a triangular section is left beneath the bar. When the coal is blasted from the face, some falls onto the conveyor. This coal, together with the cuttings, comprises about 35 percent of the coal obtained from a cut. Another 40 to 45 percent of the coal is loaded by running the machine in reverse, operating as a loading machine. To do this, the bar of the machine is fastened diagonally to the direction of travel, and a mold-board is affixed to its top. As the machine moves downward with the cutter chain operating in reverse, the coal is thrown by the plow and the cutter chain onto the scraper conveyor. The remaining coal (20 to 25 percent) from the triangular section at the foot of the face and the coal pulled down from the face are loaded onto the conveyor by hand. 127/

(b) Models.

All machines in use are believed to be the model VPM-1, an adaptation of the KMP-1 cutting machine. Tests had been made of the model BNU, based on the GTK-3M cutter, but it proved to be inferior to the VPM-1, and further tests were canceled. 128/

(c) Number in Use.

The first model was constructed in 1946, and 51 machines are estimated to have been made in 1947. Since then, about 100 to 125 are estimated to have been built annually. The total production in the period 1946-51 is placed at 477, and it is believed that this figure would represent the probable inventory at the end of 1951.

(d) Productivity.

Data are not available regarding productivity of the cutter-loader, but it can probably produce more coal than a cutting machine, assuming that it permits faster loading and stands idle for shorter periods of time.

(5) Coal Loaders.

(a) General.

The Soviet coal industry uses two different types of machines for loading purposes in underground mines, and they are employed mainly in development work. One type of machine is a mobile coal loader, and the other type is similar to the mucking shovel used in metal mines for loading ore and rock. The latter type is discussed under rock loaders, although it is also used for loading coal. It is probable that nearly all coal loaders consist of the model S-153. Another model is the O-5.

(b) Models.

The S-153 is patterned after a US machine and is used in large numbers in the mines as well as outside for loading coal and various other materials. It is used primarily in coal mines for development work and at room faces in seams with a thickness of 1.3 meters or more. Many of these machines are in use in the Moscow, Karaganda, and Cheremkhovo basins; in the Kuzbas; and probably in the Chelyabinsk mines and elsewhere.

The S-153, which is made at the Sverdlovsk Transport Machinery Plant, has been in series production since 1947. It is mounted on caterpillars and has a height of 0.92 meter. Its height is one reason why it is not particularly suitable for use in the Donbas. The loading device consists of two mechanical arms that pull the coal onto a scraper conveyor, which passes the coal over the top of the machine to be loaded into cars at the back end. The machine has a hydraulic system with which it can lift and lower the gathering head, lift and lower the end of the unloading conveyor, and swing the end of the unloading conveyor 45 degrees to either side of the longitudinal axis of the machine. 129/ During 1949 a good many of these machines were idle in the Kuzbas for lack of oil pumps. There was also considerable idleness in the mines of the Moscow Basin.

The O-5 is built in the Svet Shakhtera Mining Equipment Plant at Khar'kov. It has 2 motors, in contrast to 1 in the S-153. The loading head is hinged to the machine head and is raised and lowered by means of a jack. On each side of the loading head is a bar with an endless loading chain and gathering arms, and it has self-contained belt conveyor. The boom comes in 2 models, a curved one which can be used for loading into cars, and a straight one for loading into conveyors. 130/

(c) Number in Use.

It is estimated that the number of coal loaders increased from about 66 in 1947 to 543 by the end of 1951. The estimates are based on a Soviet report that coal was loaded mechanically at almost 1,600 development faces by the end of 1951 and that coal-loading machines accounted for 34 percent of the total. The number of coal-loading machines in service had increased 8 times in the previous 4 years.

(d) Productivity.

The S-153 has a rated capacity of 50 tons per hour, and the 0-5 of 80 tons per hour. However, lack of adequate transport undoubtedly prevents many of the machines from being operated at capacity.

(6) Rock Loaders.

(a) General.

Rock loaders are used mainly in Soviet coal mines in the loading of coal and rock in development work. The machines travel on tracks, and loading is done with a small bucket which scrapes up material as the machine is moved forward. The model UMP-1 has a bucket which is tilted, and the material slides onto a conveyor which discharges it into a mine car at the back of the machine. The model EPM-1 has a rocker-type bucket which is raised over the machine and discharges material directly into a car at the back of the machine.

(b) Models.

The UMP-1 is mass-produced by the Tomsk Electromechanical Plant imeni V.V. Vakhrushev under the type number OM-510. The machine weighs 8.5 tons and is built for a track gauge of either 600 or 900 millimeters. It is powered by an electric motor with a capacity of 20.5 kilowatts and has a bucket with a capacity of 0.15 cubic meter. 131/

The EPM-1 is produced by the Toretsk Mining Equipment Plant imeni Voroshilov at Druzhkovka. Its weight is given as 5,030 kilograms in horizontal operation and 4,040 kilograms in operation on an incline. It is built in three track gauges -- 550, 575, and 600 millimeters. This machine has 2 electric motors, each with a capacity of 10.5 kilowatts running at 25-percent duty cycle. The capacity of the shovel is 0.2 meter. 132/

The PML-5 model is in series production in a plant of the Ministry of Transport Machine Building. It is similar in design and operation to the EPM-1, although it has some variations, of which an important difference is that it has 2 pneumatic motors, each of 10 horsepower. It has a weight of 2.75 tons and is built for a track gauge of 600 millimeters. The shovel capacity is 0.2 cubic meter.

(c) Number in Use.

It is estimated that the number of rock loaders in use has increased from about 50 in 1947 to about 1,050 in 1951. [redacted] coal was loaded mechanically at almost 1,600 development faces in 1951 and that rock loaders constituted 66 percent of the total. The number of rock loaders had increased 21 times in the last 4 years.

(d) Productivity.

The rated capacity of each model of rock loader is as follows: the UMP-1, 30 to 40 cubic meters per hour; the EPM-1, 30 to 45 cubic meters per hour; and the PML-5, 20 cubic meters per hour. There are no data available with respect to actual productivity of each machine. Poor transport facilities, however, could restrict their output considerably.

(7) Underground Haulage Locomotives.

(a) General.

The customary method of transporting coal in Soviet underground mines is in trains of small pit cars of 1- to 3-ton capacity hauled by locomotives that weigh from 2 to 14 tons. It is reported that nearly 90 percent of all coal extracted in the mines was transported with the aid of electric locomotives by the end of 1951. At 72 percent of all loading points shunting operations were mechanized. 133/ The high percentage of coal hauled by electric locomotives represents that transported in main haulageways. In the longwall system, conveyors are generally used in the working places and discharge the coal into pit cars placed in the haulage entries.

The Soviet mines have been using lighter-weight locomotives than have US mines, but the trend is to heavier rails and locomotives.

Battery locomotives are used extensively where there is considerable gas or there is use of pneumatic equipment in extraction. Before World War II there were, evidently, more battery locomotives than trolley locomotives in use, but the latter are now more numerous.

Small locomotives weighing 2 and 3.2 tons are used for placing cars at loading points and for haulage in auxiliary entries, but larger locomotives weighing from 6.5 to 14 tons are used, generally, in main entry haulage. Plans call for using more 10- and 14-ton locomotives.

(b) Models.

The majority of the locomotives are trolley type and use 250-volt direct current. The models II-TR-2 and II-TR-3 weigh 6.5 and 7 tons, the models YU-10-600 and YU-10-900 weigh 10 tons, and the model IV-TR-4 weighs 14 tons. A small locomotive weighing 3.2 tons is the I-TL-1m, which is used for spotting cars. The battery locomotives include the small AK-2 "Karlik" model, which weighs 2 tons; the II-AR-1 model, which weighs 8 tons; and the II-AR-2, which weighs 8.5 tons.

In 1950 the Russians announced the development of an alternating-current locomotive, the KE-1, which is built at the Toretsk Plant at Druzhkovka. It is equipped with two squirrel-cage induction condenser motors and uses the mechanical part of the II-TR-2 locomotive as a base. An advantage of the new locomotive is that no complicated transformer units are necessary. It is built for a track gauge of 600 millimeters and weighs 6.5 tons. 134/

(c) Number in Use.

In 1951 the coal mining industry had almost four times as many electric locomotives as in 1940. About 35 percent of the total reportedly were in sizes ranging from 10 to 14 tons. The number of mine locomotives in 1940 has been reported at 1,855, of which 846 were trolley locomotives and 1,009 were battery type. Therefore, it is estimated that there were about 7,400 at the end of 1951, of which about 1,300 were in the category of heavy locomotives.

(8) Conveyors.

(a) General.

Conveyors are used extensively in Soviet coal mines because of the longwall system of extraction and because of the fact that many seams are thin and pitching. In 1949, 62.5 percent of the coal was loaded at the working face into conveyors. Less than 10 percent was loaded into cars at the working face. Conveyors are used mainly where the coal is mined; they are used very little to haul coal in main haulageways.

Soviet mines employ scraper, shaker, and belt conveyors. Shaker conveyors were the most common type in use until recently. During the period 1930-37, they consisted of the DK-5, DK-15, and DK_2-15 models. According to Zasyad'ko, shaker conveyors had low productivity and were being replaced by scraper or chain conveyors, which had been developed in 1948 and 1949. 135/ Zasyad'ko stated in 1948 that coal moved with scraper conveyors would increase by the end of 1950 up to 64 percent of the coal moved in working places against 25 percent in 1945. The coal moved by shaker conveyors was to decrease from 32 percent to 13 percent in the same period. 136/ By the end of 1951, chain conveyors represented 90 percent of the conveyors at the coal face. 137/ This announcement would indicate that a good many shaker conveyors have been replaced in recent years.

(b) Models. 138/

The Soviet industry has experimented with about 20 different models of scraper conveyors since World War II and has probably placed most of these in series production. Smaller machines with a capacity of 25 to 50 tons per hour include the following: ST-5, ST_2-5, ST_3-5, ST-6, ST-10, STS-3, STS-5, SKT, SKT_2-6, SKT_3-6, and SKTD. The last is 170 meters long and can haul along a passage dipping 12 degrees, but the others are 100 meters or less in length, and rated capacity is for horizontal haulage.

In the intermediate range, with a capacity of 60 to 65 tons per hour on horizontal haulage, are included the following models: ST-11, ST_2-11, and STZ-11. Each of these models is 70 meters long, although the ST_2-11 is also built with a length of 100 meters for use where there is a dip of 10 to 12 degrees. A reversing conveyor with a capacity of 60 tons per hour is the serially produced SKR-11.

Larger scraper conveyors are the STP-30, STR-30, and SK-30 models. The first two are 100 meters long and have an hourly capacity of 120 tons in horizontal operation, and the STR-30, which is a reversing conveyor, is also built in a length of 130 meters and has a capacity of 70 to 100 tons per hour when operated along a dip of 10 to 12 degrees. The SK-30 model has an hourly capacity of 100 tons and can be operated up to a length of 180 meters in haulage along a passage dipping 10 degrees.

A number of other models of scraper conveyors have been built for trials and include the Kuzbas, KSKO, SKM-1, SPK-16, SKT-36, and SK-20 models.

Belt conveyors are used to some extent in underground mining, but they are in more common use at strip mines. The RT-5 and RT3-5 models are rated at 60 tons per hour over a distance of 30 meters on a level grade. These models employ 3-ply belting 600 millimeters in width. The RTZ-15 model is rated at 100 tons per hour under similar conditions and is said to be capable of operating over a distance of 200 meters. It has a 4- or 5-ply belt, 700 millimeters in width. This would be long enough for more than 90 percent of the longwall faces in the Donbas mining region. For coal seams more than 1.2 meters in thickness, where the output is relatively high, the RTU-30 conveyor has been developed. This conveyor is said to be capable of delivering 80 to 180 tons per hour, depending upon the size of the driving unit used. It requires a belt 700 millimeters in width and can be extended to 300 meters in length. 139/

Heavier belt conveyors are also built and probably are used mainly on steep slopes. These heavier conveyors have capacities of 250 and 300 tons per hour. Models of large conveyors include the LKU-250 and the RTU-300, which are evidently made for underground mines. Models KRU-250, KRU-300, and KRP-300 are being used in strip mines.

(c) Number in Use.

At the beginning of 1940, the mines in the western regions of the USSR had 5,500 conveyors, and the Donbas had 6,200 when World War II started. It is probable that there were at least 7,000 conveyors in the coal mines in 1941.

By the end of 1949 there were 10,000 scraper conveyors and 4,000 belt conveyors in the coal mines. 140/ Many of these belt conveyors were in use at strip mines.

(9) Mine Cars.

(a) General.

Only a small part of the coal loaded at the working face goes directly into mine cars. Conveyors generally are used to transport the coal to the haulageways, but very little use is made of conveyors in the main haulageways. The long underground transport of coal is in mine cars.

(b) Models.

The main types of mine cars used in deep mines during the war had a capacity of 1 ton, 141/ but mechanization doubtless is forcing the use of larger cars. 50X1
"Shakhstroy" cars with capacities of 1, 2, and 3 tons usually were used in coal mines. 50X1
The specifications of coal cars are given in Table 32.* 142/

(c) Number in Use.

A Soviet article of September 1950 stated that the park of mine cars of 1- to 1.2-ton capacity was 4.5 times that of 1941. During the same time, there had been a 20-percent increase in larger cars and a 10-percent decrease in the number of mine cars with a capacity less than 1 ton. As a result of improvements and expansion, the Donbas mine rolling stock had achieved a capacity of 526 tons per 1,000 tons of coal mined as against 395 tons in 1941. At the same time, the average number of mine cars running to one mine face had increased from 52 to 63. 143/

Assuming that Donbas production averaged about 180,000 tons daily in 1941, the capacity of the cars would have been about 77,000 tons. It is believed that the average capacity of each car in use at that time was about 3/4 ton and the number in use in the Donbas was at least 100,000. The western regions were reported to have had 112,000 pit cars in use in 1941. The capacity of the mine-car park in 1950 may have been 140,000 tons or more in the Donbas, and the number of cars may have exceeded 150,000.

* Table 32 follows on p. 127.

Table 32

Capacity and Size of Cars
Used in Underground Mines in the USSR

Capacity (tons)	Dimensions (mm)	Weight (kg)	Track Gauge (mm)
1.1	2,400 x 880 x 1,150	595	600
2.2	3,223 x 1,240 x 1,150	1,120	900
3.3	3,895 x 1,320 x 1,300	1,560	900

The Fifth Five Year Plan called for the production of 565,000 mine cars, 144/ which is an indication of requirements. Although no data are available as to the number of mine cars in use, it is probable that there is a minimum of 400,000.

3. Strip Mining.

a. Production.

The USSR has been producing coal at strip mines* since before World War I, but the quantity was relatively unimportant until World War II. The first strip mine on an industrial scale was organized at the Bogoslovsk deposit in the Urals, where 185,000 tons were mined in 1913. By 1932, strip-mine production had risen only to about 388,000 tons. Thereafter it increased more rapidly, reaching 6,308,700 tons in 1940, which still amounted to only 3.8 percent of total annual production of coal. World War II caused a great rise in demand for fuel in the eastern regions of the USSR, especially in the Urals, and strip-mine output jumped rapidly, since new capacity could be developed in strip mines in considerably less time than in shaft mines. By 1945, production was in excess of 17 million tons. Since the war, strip-mine production has continued to increase, though at a lower rate. In 1949 it amounted to almost 23 million tons. The 1950 Plan called for a further increase of 25 percent as compared with 1949, indicating that the goal probably was 28.5 million tons. It was reported in 1951 that output had increased 5 times in the last decade, which would

* Strip mines are also known as open-cut and surface mines.

make 1951 production about 34 million tons, or 12 percent of total annual production.

Estimates of strip-mine production are given in Table 33. It should be noted that nearly all strip-mine production

Table 33

Estimated Production of Strip-Mine Coal in the USSR
1913, 1922, 1927, 1932, 1937, 1940-51

Year	Production (tons)	Index a/	Percent of Total Soviet Production b/
1913	185,000 c/		0.64
1922	203,800 d/		1.80
1927	290,500 d/		0.90
1932	388,000 d/		0.60
1937	2,448,600 c/	100	1.90
1940	6,308,700 c/	258 e/	3.80
1941	6,831,600 f/	279	4.97
1942	8,545,600 f/	349	11.10
1943	12,487,860 f/	510	12.74
1944	15,132,350 f/	618	11.82
1945	17,385,000 f/	710	11.64
1946	17,556,450 f/	717	10.69
1947	19,025,600 f/	777	10.35
1948	20,764,100 f/	848	9.90
1949	22,820,950 f/	932	9.67
1950 Plan	28,500,000 g/		N.A. h/
1950	28,000,000 i/		10.69
1951	34,000,000 j/		12.04

a. 145/
b. Calculations based on estimated production during 1941-49 period.
c. Reported figures. 146/
d. Calculations based on reported percentages.
e. Index given by source was 252.
f. Calculated from index figures based upon reported production in 1937.
g. Reported in early 1950 that Plan was 25-percent increase over 1949.
h. The Plan for 1950 was probably revised upward from the original goal of 250 million tons.
i. Doubtful if Plan was met.
j. Increased 5 times in past 10 years. 147/

in the USSR has consisted and probably will continue to consist mostly of lignite and brown coal.

As late as 1947, and perhaps as late as 1949 or even 1950, there was no strip mining of coal, at least on an important scale, in the western regions of the USSR. All strip-mined coal had been produced in the eastern regions, where it amounted in 1945 to 21.7 percent of the tonnage produced 148/ (in Ministry mines only, apparently). It is estimated that about 25 percent of all coal mined in the eastern regions in 1951 was strip mined. The only significant production of strip-mined coal in the western USSR is in the Ukraine, for which development began about 1948.

In April 1948, large strip mines were producing at the following locations: Korkino, Bogoslovsk, and Volchanka fields in the Urals; the Mikhaylovka deposit (references are made also to the Federovskiy deposit) in the Karaganda Basin; Angren in Central Asia; Cheremkhovo in the Irkutsk Basin; and the Raychikhinsk-Arochka field in Khabarovsk Kray. In 1950 there were additional mines operating at Veselovka (Veselovskiy pit No. 1), which is near Bogoslovsk, and also at Irsha-Borodino, 20 kilometers from Zaozerny, in the Kansk Basin. Small-scale strip mines have been operating for some time, evidently, at Gremyachinsk in the Kizel Basin in the Urals, in the Kuzbas, in the vicinity of Prokop'yevsk, and at Lermontovka in south Sakhalin.

The situation at the brown coal deposits in the Ukraine is not clear, but it is probable that there was some strip-mine production in 1950.

b. Construction.

During 1949-50, construction of strip mines was underway at Nazarovo in East Siberia; at Ekibastuz in Kazakh SSR in East Siberia; in the Kuzbas; and in the Baydakovsk, Semenovka-Golovkovsk, and Yurkovka deposits in the Ukraine. Also, one or more deposits in Bashkir ASSR and the Krasnosel'skiy pit, both in the Urals area, were being developed, but there was probably little, if any, output before 1951.

Capital construction plans for new pits have not been fulfilled. Only three pits were put into operation in 1950. One of these was the Veselovskiy pit No. 1. Lags in construction of briquetting plants also have limited the performance of many pits mining lignite intended for briquetting. The shortage of coal-cleaning plants has made it impossible, in a number of cases, to mine already uncovered coal seams. When coal is mined under these circumstances, rock has to be removed manually, thus sharply reducing labor productivity. 149/

The time set by the Ministry of the Coal Industry for constructing open pits is unusually long, generally 3 or 4 years, but in some cases 5 or 6 years. The Veselovskiy pit No. 1 was under construction from 1943 to 1949, and the Volchanka No. 4 mine from 1945 to 1949. Several pits started in 1946 had not been completed by June 1950. Inadequate supplies of electric power during construction of the Baydakovskiy and Yurkovskiy pits in the Ukraine, as well as others, prevented complete utilization of available excavators and of electric haulage and interfered generally with development. Another reason for slow development has been the necessity of building railroads, highways, machine shops, and housing. However, the large Karaganda No. 4 and Volchanka No. 1 pits were constructed in 11 and 13 months, respectively. 150/

The cost of constructing open pits in 1947 was only 40 percent of the cost of shaft construction in the Urals, 7.0 percent at Karaganda, and 67 percent at Cheremkhovo. Also, the cost of producing a ton of strip-mined coal was about one-third that of a ton of deep-mined coal. In the eastern areas in 1947, strip-mined coal was 35.7 percent cheaper than deep-mined coal. 151/ Part of this lower cost is because of higher productivity of labor, which is 2.5 to 3 times as great in strip mining as in shaft mining. Lower cost factors should result in continued development of strip mining, despite the poor quality of coal exploited.

c. Number of Strip Mines.

There were at least 34 strip mines operating in the USSR in 1950, and there probably were 7 or more others under construction. The largest individual mines are in the Urals, where there have been 10 or more operating at Karpinsk (Bogoslovsk deposit), Volchanka, and Korkino.

d. Thickness of Seams and Overburden.

The seams which are being worked and the overburden in the strip mines are generally thick. It is probable that a few thin seams, such as those at Gremyachinsk in the Urals, are strip mined, but the coal in these seams is bituminous. The lignite and brown coal beds range in thickness from about 5 meters up to as much as 200 meters, as at Korkino. The ratio of overburden removed varies from about 0.5 cubic meter to more than 4 cubic meters per ton of coal. The average ratio is about 2 cubic meters per ton of coal.

The known mines and thickness of coal beds and overburden at important deposits are given in Table 34.*

e. Volume of Overburden Removal.

The growth of strip mining and the use of larger excavators have led to the removal of more rock per ton of coal production. It is significant that the volume of rock excavated in 1950 was 6 times as much as in 1940, whereas strip-mined coal output increased only about 4.5 times. In other words, rock removal increased from 1.5 cubic meters per ton of coal mined in 1940 to 2 cubic meters per ton in 1950.

Table 35** shows figures of the removal of overburden and the bucket capacity as well as productivity of excavators for the years in which information is available.

Table 36*** shows the estimated quantities of coal mined and overburden removed at the various strip-mining areas in 1950. All figures are tentative, but are in about the proper magnitude.

f. Methods and Equipment.

Open-cut mining is the most highly mechanized branch of the coal industry, according to a Soviet statement of September 1951, 152/ but no doubt it always has been, since power shovels do the major work of removing the overburden and loading the coal. It was not until the postwar period, however, and especially in the last few years, that the strip mines began to receive equipment that was capable of working the thick coal beds efficiently.

It is a fact that only a few years ago 85 percent of the excavators had bucket capacities of less than 2 cubic meters, and the other 15 percent ranged from 2 to 5 cubic meters. Table 37****

* Table 34 follows on p. 132.
** Table 35 follows on p. 134.
*** Table 36 follows on p. 135.
**** Table 37 follows on p. 137.

Table 34

Number of Strip Mines and Thickness of Coal Seams and Overburden at Principal Producing Fields in the USSR
1950

Location	Mines	Seam Thickness (Meters)	Overburden (Meters)
Urals			
Bogoslovsk	Nos. 1, 2, 3, and 5	8-38 (28 average)	Up to 70
Veselovka a/*	Veselovskiy No. 1		
Korkino	Nos. 1 and 2	30-200	
Volchanka	Nos. 1, 2, 2-bis, 3, and 4	26	
Krasnosel'skiy	1 mine	41.2	9
Kazakh SSR			
Karaganda	Nos. 1, 2, and 4	Up to 17	Up to 30
Central Asia			
Angren	1 mine (probable)	Up to 40	
West Siberia			
Kuzbas	Opytnyy, Krasnobrodskiy, and Ziminskiye	Thick	

* Footnotes for Table 34 follow on p. 133.

Table 34

Number of Strip Mines and Thickness of Coal Seams and Overburden at Principal Producing Fields in the USSR
1950
(Continued)

Location	Mines	Seam Thickness (Meters)	Overburden (Meters)
East Siberia			
Irsha-Borodino	1 mine (probable)	15-20	16-29
Cheremkhovo	Khramtsovskiy No. 1, 1-bis, and East	7 (many partings)	20-70
Khabarovsk Kray (Far East)			
Raychikhinsk	Sorokin, Dovskoy	5	5-60
	Sever, East, Land Tokinskiy	5	60% under 35
Arochka b/	Nos. 4, 5, 6, 7, 8, and East	5	60% under 35
Sakhalin Island (Far East)			
Lermontovka (formerly Tomarigishi)	1 mine (probable)	N.A.	N.A.

a. Near Bogoslovak in Bogoslovsk field.
b. Near Raychikhinsk.

Table 35

Volume of Overburden Removal
and Use of the Registered, Inventoried Park
of Strip-Mine Excavators in the Coal Industry in the USSR a/
Selected Years, 1917-51

Cubic Meters

Year	Volume of Overburden	Bucket Capacity of Excavators	Annual Productivity per Cubic Meter of Bucket Capacity
1917	250,000	9.2	27,200
1921	270,000	9.2	29,300
1924	436,000	9.2	47,400
1929	960,000	9.5	101,000
1932	1,305,000	14.3	91,000
1933	1,778,000	33.0	54,000
1934	2,389,000	48.0	50,000
1936	3,159,000	55.2	57,500
1937	2,960,000	56.0	53,000
1940	9,402,000	128.2	73,300
1941	13,343,000	152.2	88,000
1942	11,541,000	156.9	73,600
1943	14,279,000	170.6	84,000
1945	22,800,000 b/	641.0 c/	N.A.
1950	57,000,000 b/	N.A.	N.A.
1951	68,000,000 d/	N.A.	N.A.

a. The figures given for years 1917-43 are [redacted] possibly primary overburden only. 50X1 50X1
b. In 1950, heavy bucket excavators removed 40 million tons of rock, which was about 70 percent of the entire amount of dumping work in Soviet mines. The volume of overburden removed in 1950 was 2.5 times as great as in 1945. 154/
c. Excavating equipment in operation in 1945 was 2.3 times that operating in 1940. The total capacity was five times as great. 155/ A large part of the increased capacity was acquired in Germany and Manchuria at the end of World War II.
d. Based on ratio of 2 cubic meters per ton of coal mined.

Table 36

Strip-Mine Production and Removal of Overburden in the USSR
Estimates, 1950

Location	Coal Production a/* (Thousand Tons)	Ratio of Overburden per Ton of Coal (Cu M) b/	Overburden Removed (Thousand Cu M)
Ukraine c/	2,000 d/	3.5	7,000
Urals			
Karpinsk (Bogoslovsk)	2,000	2.6	5,200
Volchanka	6,500	1.7	11,050
Korkino	6,000	0.6	3,600
Gremyachinsk	250	3.0	750
Bashkir ASSR	e/		f/
Krasnosel'skiy	e/		g/
Uzbek SSR			
Angren	1,000	0.5	500
Kazakh SSR			
Karaganda	2,500	1.6	4,000
Ekibastuz	h/		
West Siberia			
Kuzbas	300	2.0	600
East Siberia			
Irsha-Borodino	600	1.5	900
Nazarovo	100 i/	1.5	150

* Footnotes for Table 36 follow on p. 136.

Table 36

Strip-Mine Production and Removal of Overburden in the USSR
Estimates, 1950
(Continued)

Location	Coal Production a/ (Thousand Tons)	Ratio of Overburden per Ton of Coal (Cu M) b/	Overburden Removed (Thousand Cu M)
East Siberia (Continued)			
Cheremkhovo	2,500	3.5	8,750
Far East			
Raychikhinsk - Arochka	4,000	3.5	14,000
Lermontovka	250	2.0	500
Total	28,000		57,000

a. Figures are in relative magnitude.
b. The ratios for most of the larger producers are [redacted] determined approximately from other data (Korkino and Angren). Ratios for other fields are arbitrary, but cover is heavy in the Ukraine and probably at Gremyachinsk. 50X1 50X1 50X1
c. Information is given for the entire Ukraine area, but strip mines are located at Baydakovsk, Semenovka - Golovkovsk, Yurkovka, and Veselo-Ternovskiy.
d. It is not definitely known that any strip mines produced coal in 1950, although mines had been under construction since the end of the war. However, there must have been considerable removal of overburden. The estimate is subject to wide error.
e. There could have been some production.
f. Probable excavation.
g. During the first 9 months of 1950, 676,900 cubic meters were removed by hydraulic mining and bulldozers.
h. Possible production; under development for several years.
i. Uncertain; small, if any.

shows the relative number of various-sized excavators operating in Soviet mines probably about 1947 or 1948.

Table 37

Capacities of Excavators in Use in the USSR 156/

Bucket Capacity (Cu M)	Percent of Total Number of Excavators
Less than 0.5	20
0.5-0.99	35
1.0-1.99	30
2.0-5.0	15

The small size of the excavators has restricted the height of the benches that could be worked to 8 to 10 meters. This small equipment also has been responsible to a considerable extent for the condition that nearly all rock had to be transported from the workings. The Russians refer to this as the transport method. They are attempting to reduce the use of this method by employing larger equipment that can dump the rock into worked-out areas. The transport of rock has been done mainly by direct loading into railroad cars and hauling these some distance to be dumped, or, in several places, by using conveyors to move both rock and coal. The extent of railroad track at certain operations is great. At Korkino, it is reported to be 100 kilometers. 157/

When World War II ended, the USSR acquired a considerable number of Japanese, German, and American power shovels. Various types and sizes have been used, powered by steam, diesel, gasoline, and electricity. Many of the older shovels apparently are wearing out and are being replaced with new and larger Soviet machines.

The SE-3 electric power shovel with a bucket capacity of 3 cubic meters and the ESh-1 dragline with a bucket capacity of 3.4 cubic meters were reported to be in use at all mines in January 1952. 158/ Use of the SE-3 excavator resulted in an increase in the height of the benches to 18 to 20 meters. It has a rated capacity of between 200 and 250 cubic meters per hour. The ESh-1, also electric, has a rated capacity of 350 cubic meters per hour. It was planned to make available in 1950-51 excavators with a bucket capacity of 2 to 3 cubic meters to replace low-powered models.

Small diesel-powered shovels of 0.5-cubic-meter bucket capacity are built in 3 models. These, as well as another model of 0.75-cubic-meter bucket capacity, are used mainly for loading coal.

During the last few years the USSR has built some large power shovels and draglines, including a 14-cubic-meter dragline, which it is planned to use extensively. It had a capacity to handle 4 million cubic meters annually. 159/ An article of January 1952 states that a 14-cubic-meter dragline had been built and a 15-cubic-meter shovel (tracked) was under construction. It also mentions that the excavators built by the Barrikady, the Voronezh, and the Kovrov works were of poor quality. 160/ The Voronezh Plant imeni Komintern produces the model E-1003 shovel with a bucket capacity of 1 cubic meter, and the Kovrov Excavator Plant produces the model E-505 with a bucket capacity of 0.5 cubic meter.

It is probable that only a few large excavators had been installed at the mines by the end of 1952. It was reported that in 1951 the Vakhrushevugol' Trust (Bogoslovsk) put into operation the first strip-mine excavator on caterpillar treads, which has a bucket capacity of 15 cubic meters (probably a Model EGL-15), and 2 walking draglines with a capacity of 10 cubic meters each (probably Model ESh-10/75). 161/

Soviet intentions to use a considerable number of the larger machines (with a bucket capacity of 10 cubic meters and over) are evidenced by the statement that, for the Ministry of the Coal Industry as a whole, the nontransport method will be used 5.3 times as much in 1955 as it is at present, accounting for 30 percent of the total removal of rock and coal in strip mining. The Raychikhinsk, Cheremkhovo, and other deposits can be worked entirely by the nontransport method, by using power shovels with a bucket capacity of 10 to 15 cubic meters and draglines with a capacity of 10 to 18 cubic meters. 162/ It was reported in January 1952 that the volume of overburden removal with draglines increased almost 3 times in the past 5 years. 163/

Table 38 shows the average yearly productivity of excavators engaged in removal work at various strip-mine fields as reported for a recent year (probably 1949). 164/

Table 38

Average Annual Productivity of Excavators in Removing Overburden in Strip Mines in the USSR 1949

Cubic Meters per Cubic Meter of Bucket Capacity

Trust	Location	Productivity
Korkinugol'	Korkino	194,500
Vakhrushevugol'	Bogoslovsk	229,500
Volchanskugol'	Volchanka	173,000
Karagandauglerazrez	Karaganda	222,000
Uzbekugol'	Angren	111,500
Kirovugol'	Cheremkhovo	202,000
Raychikhugol'	Raychikhinsk	163,000

The performance of individual machines varies within wide margins. The SE-3 excavator handled as much as 125,000 cubic meters per month at Bogoslovsk, but the maximum at Angren was only 50,000 cubic meters. [redacted] the changeover to 50X1 a cycle work schedule had increased the average daily productivity of excavators at Bogoslovsk to between 4,600 and 5,800 cubic meters in 1951, or from 82 to 97 percent. 165/ The assumption is that these figures are with reference to rated capacity.

Excavators have not been exploited at full capacity, mainly because of severe weather at certain periods of the year and the difficulties of transport in the pits. Table 39* indicates the amount of idleness on the part of excavators in removing overburden. 166/

Figures have also been reported for the idle time in actual mining operations, which probably refers to coal loading. 167/ These are shown in Table 40.**

* Table 39 follows on p. 140.
** Table 40 follows on p. 140.

Table 39

Idle Time of Excavators in Removing Overburden in Strip Mines in the USSR

Trust	Location	Idle Time: Percent of Calendar Time	Idle Time: Percent of Working Time
Korkinugol'	Korkino	16.5	21.3
Vakhrushevugol'	Bogoslovsk	20.9	28.8
Volchanskugol'	Volchanka	30.3	42.0
Karagandauglerazrez	Karaganda	21.8	28.0
Kirovugol'	Cheremkhovo	25.2	37.7
Raychikhugol'	Raychikhinsk	38.8	55.2

Table 40

Idle Time of Excavators in Loading Coal in Strip Mines in the USSR

Trust	Location	Coefficient of Exploitation of Machine Time	Idle Time: Percent of Calendar Time	Idle Time: Percent of Working Time
Korkinugol'	Korkino	75.5	16.1	21.3
Vakhrushevugol'	Bogoslovsk	71.6	26.3	46.7
Volchanskugol'	Volchanka	75.0	39.5	52.7
Karagandauglerazrez	Karaganda	74.3	20.0	27.0
Raychikhugol'	Raychikhinsk	44.0	38.0	85.0

Tables 41* and 42** show the models and capacities of various draglines and power shovels in serial production or under development for use in the Soviet coal industry. 168/

* Table 41 follows on p. 141.
** Table 42 follows on p. 141.

Table 41

Capacities of Soviet Models of Draglines

Model	Bucket Capacity (cu m)	Maximum Digging Depth (m)	Weight (ton)	Travel
E-1003	1.0	9.5 and 12.2	43	Caterpillar
ESh-1	3.4	37.6	169.2	Walking
ESh-10/75	22.0	N.A.	N.A.	Walking
ESh-10/75	18.0	N.A.	N.A.	Walking
ESh-10/75	14.0	45	1,050.0	Walking
ESh-10/75	10.0	50	N.A.	Walking

Table 42

Capacities of Soviet Models of Power Shovels

Model	Bucket Capacity (cu m)	Average Productivity (cu m per hour)	Power Source	Engine Capacity
E-505	0.5	60-75	Diesel KDM-46 Motor	80 hp
E-502	0.5	50-60	Diesel KDM-46 Motor	80 hp
OM-201	0.5	60-70	Diesel KDM-46 Motor	80 hp
E-751	0.75	60-75	Electric AM-114-8 Motor	55 kw
E-1003	1.0	100-130	Electric Motor	80 kw
SE-3	3.0	200-250	Multi-electric Motored	250 kw
EGL-15	10.0	N.A.	Multi-electric Motored	1,700 kva
EGL-15	15.0	N.A.	Multi-electric Motored	1,700 kva
EGL-15	25.0	N.A.	Multi-electric Motored	1,700 kva

Plants producing excavators for the Soviet coal industry are listed in Table 43.* 169/

* Table 43 follows on p. 142.

Table 43

Soviet Plants Producing Excavator Machinery

Plant	Model of Excavator
Kovrov Excavator Plant	E-505
Tashkent Excavator Plant	E-502
Molotov Plant imeni Molotov	OM-201
Kostroma Rabochiy Plant	E-751
Voronezh Excavator Plant imeni Komintern	E-1003
Uralmash Plant imeni Ordzhonikidze	SE-3
Novo Kramatorsk Plant imeni I.V. Stalin	EGL-15
Karpinskiy Machine Building Plant a/	ESh-1

a. This plant developed the dragline, but no single plant of the Main Administration for Coal Machinery Building was equipped to handle such a machine; so it was manufactured through the cooperation of the administration's various plants. 170/

A Soviet article of May 1950 states that in comparison with 1940 the production of excavators had risen 10 times; of bulldozers, 22 times; of motor tippers, 26 times; and of dump cars, 5 times. 171/ It is evident from this report that quantities available for the coal industry had increased substantially.

In 1943 the Russians started to produce coal only by hydraulic mining, whereby water under high pressure is used to wash away the sediments overlying a coal seam. The amount of overburden removed by this method has been relatively small, as shown by the following figures, which give cubic meters of overburden removed in Soviet strip mines during the years indicated: 1943, 470,000 cubic meters; 1944, 873,000 cubic meters; 1945, 1,393,000 cubic meters; 1946, 1,800,000 cubic meters; and 1947, 2,750,000 cubic meters. 172/

As far as is known, this method has been used in the Chelyabinsk Basin in Krasnosel'skiy pit and at Korkino, and it was used at Bogoslovsk and Raychikhinsk in 1948. It is evident that climate tends to limit the number of working days that hydraulic equipment can operate. At Korkino, these operations worked from 70 to 207 days per year and averaged 139 days per year. Bogoslovsk, which is much farther north, used the equipment from 50 to 190 days per year and averaged 120 days per year. 173/ The Krasnosel'skiy pit, located in the southern part of Chelyabinsk Oblast, was using hydraulic mining in conjunction with bulldozers in 1950. 174/

In 1951, only 13 percent of the entire amount of overburden did not have to be transported. 175/ In other words, shovels and draglines piled about 13 percent of the total rock lifted, and the balance of 87 percent, or about 59 million cubic meters, had to be transported from the working area by railroad cars or by conveyors.

The transport of this volume of rock requires a great number of cars and locomotives. It was estimated that the installation of 1 shovel with a bucket capacity of 15 cubic meters and 1 dragline with a capacity of 10 cubic meters at Bogoslovsk, which together would handle 4 million cubic meters of overburden annually, could eliminate the use of 13 Series E (electric locomotives), 160 40-ton dump cars, 21 kilometers of railroad track, and 383 workers. (This installation apparently was made.) At Karaganda, one 15-cubic-meter power shovel was expected to eliminate the use of 4 smaller excavators with a capacity of 3.8 cubic meters each, 26 locomotives, and 154 dump cars. 176/ These figures give an indication of some changes that will occur as larger power shovels and draglines are brought into use at various operations.

Steam traction has caused considerable delays in operations during bad weather. A changeover to electric traction at the Bogoslovsk and Korkino deposits, started in 1948 and completed in 1951, reportedly permits work to be carried on under any climatic conditions. Excavators had been idle 40 percent of the time because of poor functioning of steam locomotives in those pits. The electric locomotives now in use at the Urals pits all have a weight of 80 tons on the driving wheels. In 1955, electric transport will be used for 66 percent of the total amount of coal and rock removed by the transport method in Soviet strip mining. This amount includes 34 percent of the total coal removed. 177/ [redacted] 50X1
electric haulage amounted to only 16 percent of total haulage and also that the use of SE-3 power shovels had resulted in a reduction of 25 percent in strip-mine railroad operations in 1951. 178/ The railroad cars now in use are automatic dump cars and have capacities of

40 to 50 tons as compared with the manually operated 20- to 30-ton cars in operation until recent years.

There is very little use of dump trucks at the strip mines, but belt conveyors are used extensively for transporting coal and rock.

Conveyor lines exceed 15 kilometers in strip mines of the Korkinugol' Trust and extend for 10 kilometers and 6 kilometers, respectively, in mines of the Vakhrushevugol' and Volchanskugol' Trusts. At Korkino there were at the No. 1 mine 68 conveyors with a total length of 4,000 meters. The Khramtsovskiy mine at Cheremkhovo has been using belt conveyors since 1935. 179/

The RT-60 belt conveyor has been widely used. It has a speed of 1.5 meters per second, and the belt is 900 millimeters wide. Other belt conveyors include the KRU-250, the KRU-300, the KLZ-300, and the KRP-300. These machines have capacities of 250 to 300 tons per hour. 180/

Table 44* shows the method of transport used, the maximum depth of the coal pit, and the relative cost of removing 1 ton of coal in percent in Soviet strip mining. 181/

4. Coal Preparation.

a. Before World War II.

Soviet data show that of the 29 coal-cleaning plants operating in the USSR at the beginning of the Third Five Year Plan (1938-42), 10 had been built before 1916. Six of these were located at coke-chemical plants in the Ukraine, and the others were located at Donbas mines. The largest had an hourly capacity of 130 tons, and the total capacity of all 10 plants was between 750 and 800 tons hourly.

There was evidently no construction of plants between 1915 and 1925. In 1925 a small installation of the jigging type with a capacity of 25 tons per hour was built. In 1928 the USSR built a 200-ton-per-hour plant of the jigging type. By 1938, 17 others were installed, ranging up to 400 tons per hour capacity. The total capacity of all the cleaning plants in 1938 was about 4,500 tons per hour.

* Table 44 follows on p. 145.

Table 44

Transport Method, Maximum Depth of Pits, and Relative Cost of Mining Coal at Various Pits in Strip Mines in the USSR
July 1951

Trust and Pit	Method of Transport	Maximum Depth of Pit	Cost of Mining per Ton of Coal a/ (Percent)
Korkinugol'	Belt Conveyor	180	154
Vakhrushevugol'	Belt Conveyor	110	276
Volchanskugol'	Belt Conveyor	80	173
Khramtsovskiy Pit	Belt Conveyor	30	296
Karagandauglerazrez	Standard-Gauge Railroad	40	125
Raychikhugol' Trust	Standard-Gauge Railroad	30	148
Angren Pit	Standard-Gauge Railroad	45	100

a. The cost at the Angren pit is taken as 100.

Of the 29 plants installed by 1938, one was located at Gubakha, in the Kizel Basin; another was at Karaganda; and a third was built at Tkvarcheli, in Georgian SSR. These 3 plants had a total hourly capacity of 580 tons. The rest of the capacity apparently was installed in the Donbas region. 182/

The only other information for the period before World War II is [redacted] that there were only 32 cleaning plants in operation by the end of the period. 183/ 50X1

The old plants for preparation of coal near the coke ovens were provided with picking tables (canvas belts) or with circular sorting tables. They also used fixed sieve jigs having only one compartment. Screening was done with shaking screens (the Baum system) and with revolving screens. For those coking coals which contained relatively small amounts of ash, it was the practice to use either canvas belts from which the rock was picked or circular sorting tables. Likewise, a simple plant of this kind was used at tipples of many mines which furnished fuel for the railroads. 184/

The only available data with regard to operating results at cleaning plants pertain to the period before 1936, and at that time all experience was based on operation of the plants in the Donbas. Nine plants, with a total capacity of 2,000 tons of raw coal per hour using the wet method of cleaning, gave the results shown in Table 45.* 185/

At the washing plants the dust was ordinarily added to the washed coals. The addition of dust lowered the quality of the coke somewhat but increased the yield and reduced the moisture content. After being mixed with the dust, the washed coals averaged from 7 to 8.5 percent ash and from 7.7 to 11.5 percent moisture. The consumption of water per ton of raw coal treated varied from 80 to 130 gallons. Electric energy consumption ranged from 3.6 to 5.5 kwh per ton of raw coal.

The results obtained at 2 pneumatic cleaning plants in the Donbas, which treated a total of 280 tons per hour, are shown in Table 46.** 186/

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* Table 45 follows on p. 147.
** Table 46 follows on p. 147.

Table 45

Operating Results of Soviet Coal-Washing Plants in the Donbas Prior to 1936

Percent

Product	Yield of Raw Coal	Ash	Sulfur	Moisture
Raw Coal	100.0	11.5-14.5	2.5-3.2	3.0-3.5
Washed Coal	62.0-77.0	5.5- 7.5	2.0-2.5	8.5-13.0
Middlings	3.0-8.0	20.0-27.0	N.A.	N.A.
Sludge	1.3-4.2	10.5-20.0	2.5-3.7	N.A.
Dust	10.0-20.0	10.0-12.0	N.A.	N.A.
Refuse	8.0-13.5	61.0-70.0	N.A.	N.A.

Table 46

Operating Results of Soviet Pneumatic Cleaning Plants in the Donbas Prior to 1936

Percent

Product	Yield of Raw Coal	Ash	Sulfur
Raw Coal	100.0	22.4	N.A.
Cleaned Coal	46.0-54.0	9.0-12.5	N.A.
Middlings	15.0-18.5	19.0-24.0	N.A.
Dust	10.0-15.0	12.0-18.0	N.A.
Refuse	18.0-20.0	62.0	N.A.

The dust at these plants was added to the middlings because the quality of the coke would be lowered by adding the dust to the clean coal. The consumption of electric energy was higher at these plants than at those using the wet method of cleaning and ranged from 5 to 8 kwh per ton of coal treated.

The washed coals from the cleaning plants were sent to the coke ovens, although the sizes between 12 and 30 millimeters were partially used as blacksmith coal. Middlings and sludge went to local electric stations and were used for domestic fuel, but some of the less fine sludges, with low ash content, were added to the coals used at the coke ovens. Also, some dust was added to coal sent to coke ovens. The coal cleaned at the pneumatic cleaning plants, being higher in ash and sulfur content, was utilized principally by the railroads and only partially for coke production. The mixture of the middlings and dust from the pneumatic cleaning plants went to the boilers of the electric stations.

The old cleaning plants built before World War I were situated at the mines near which the coke plants were located, but there was during the 1930's a tendency to construct centralized cleaning plants. These were designed to produce one or more kinds of prepared coal which would make these plants independent of the life of any one mine. Furthermore, it appeared desirable to apply both wet and dry methods at the central plants and to use the wet method in the individual plants near the mines, since this latter process, all conditions being equal, gave the better results. 187/

Table 47* presents information about the various coal preparation plants in the USSR prior to 1938. 188/

b. World War II and Postwar.

The German invasion of the Donbas in 1941 resulted in great destruction of the mines, and it is probable that most of the cleaning plants had to be rebuilt when the war was over. The only plants known to have been constructed during the war were two of the pneumatic type which were installed in the Kuzbas in 1942-43. 189/

A Soviet article of December 1947 stated that all new shafts which were put into commission must have cleaning and screening plants, according to the Fourth Five Year Plan (1946-50). This branch of mine construction was so backward, however, that even very much reduced plans of coal sorting were not fulfilled. During the first half of 1947, only 17.1 percent of the total coal produced by Ministry mines in the western regions was sorted, as compared with 40 percent in 1940. The figure for the Ministry mines in the eastern regions was about 9 percent in the first half of 1947 as against 26 percent in 1940. The proportion of coal sorted in the various basins in the first half of 1947 was as follows: the Donbas, 19.7 percent; the Chelyabinsk,

* Table 47 follows on p. 149.

Table 47

Coal-Cleaning Plants in Operation in the USSR at the Beginning of the Third Five Year Plan (1938-42)

Plant	Built (Year)	Productivity (Tons per Hour)	Type of Installation
Staro-Makeyevskaya, Coke-Chemical Plant	1895	60	Jigging
Olkhovskaya, Coke-Chemical Plant	1896	40-60	Jigging
Kadiyevskaya, Coke-Chemical Plant	1896	130	Jigging
Schcherbinovskaya, Tsentralnaya Mine	1901	60	Jigging
Khashonkovskaya, Coke-Chemical Plant	1901	100	Jigging
Yunkomovskaya, Kun Rom Mine	1910	100	Jigging
Gorlovskaya, Mine No. 1	1910	30	Jigging
Nikitovskaya Komsomolets Mine	1912	75-100	Jigging
Ordzhonidevskaya, Coke-Chemical Plant	1914	100	Jigging
Buyanskay, Coke-Chemical Plant	1915	60	Jigging
Novo-Nikitovskaya, Coke-Chemical Plant	1925	25	Jigging
Novo-Gorlovskaya, Mine No. 8a	1928	200	Jigging
Alchevskaya, Coke-Chemical Plant	1929	200-285	Jigging
Dnepropetrovskaya, Coke-Chemical Plant	1928-32	250	Jigging
Kamenskaya, Coke-Chemical Plant	1930-32	280	Jigging
Krivorozhskaya, Mine No. 1 - 1-bis	1930	60	Rheolaveur
Postnikovskaya Postnikovo Station (Anthracite)	1930	60	Rheolaveur

Table 47

Coal-Cleaning Plants in Operation in the USSR
at the Beginning of the Third Five Year Plan (1938-42)
(Continued)

Plant	Built (Year)	Productivity (Tons per Hour)	Type of Installation
Pnevmatichiskaya, Mine No. 113	1933	80	Pneumatic Tables
Stalinskaya, Coke-Chemical Plant	1933	100	Jigging
Novouzlovskaya, Rumyantsevo Mine	1933	200	Pneumatic Tables
Novo-Makeyevskaya, Coke-Chemical Plant	1935	300	Jigging
Novo-Ordzhonikidzevskaya, Coke-Chemical Plant	1935	350	Jigging and Flotation
Kalmiyskaya TsOF	1935	400	Jigging and Rheolaveur
Chumakovskaya TsOF	1934	400	Jigging and Rheolaveur
Kiselyevskaya, Mine imeni Kiseleva (Anthracite)	1936	100	Rheolaveur
Irminskaya	1936	40	Rheolaveur
Karagandinskaya TsOF, Karaganda Basin	1936	125	Rheolaveur and Jigging Machines
Gubakhinskaya, Kizel Basin in the Urals	1936	330	Jigging
Tkvarchelskaya, Tkvarcheli in Georgian SSR	1937	125	Jigging

20 percent; and the Moscow Basin, 8.6 percent. The proportion of coal sorted in the Moscow Basin was only one-quarter of what it had been in 1940, when it was 34.5 percent. 190/

On the assumption that Ministry mines accounted for 90 percent of total production in 1940, the maximum quantities of sorted coal would have been approximately 38.4 million tons in the western regions and 13,850,000 tons in the eastern regions, or a total of about 52,250,000 tons. This figure would represent, apparently, the coal that was run over picking tables and screened and is much greater than the amount that was mechanically cleaned. If the percentages given for the first half of 1947 are applied to the annual output for that year, the tonnages of sorted coal for the year 1947 did not exceed 15 million tons in the western regions and 8.5 million tons in the eastern regions. The actual figure for 1947 was probably about 22 million tons, or nearly 12 percent of the total production.

The amount of coal that was mechanically cleaned in 1947 is not known. It is believed that about 11 million tons of coal would have been cleaned for the purpose of making coke in the Donbas. The capacity of the Donbas cleaning plants was 9.8 million tons in 1932 and between 27.5 and 30 million tons in 1940.

[redacted] the construction of 50X1
enrichment (cleaning) and briquette works had been widely developed in the postwar years and that the output of enriched (cleaned) and sorted coal had risen considerably. In 1949 the volume of prepared coal exceeded the prewar level by 118 percent* and, for coking coal, by 167 percent. If, before the war, 19.4 percent of the coal for coking was subjected to enrichment, in 1949, about 40 percent of the total yield of it was enriched. In the Fifth Five Year Plan (1951-55) the amount of cleaned coal must be increased by at least six times in comparison with 1948. All power-engineering coal with an ash content exceeding 7 percent is to be mechanically enriched. In connection with this, the quantity of working cleaning plants is in the near future to be increased by over four times compared with 1948. 191/ The foregoing statement was made by the Minister of the Coal Industry, A.F. Zasyad'ko.

A Soviet article of November 1950 mentions that the gross production of coal-cleaning plants already amounted to more than 11 percent of the total gross production of the Ministry and was 2.9 times as great as in the prewar period. 192/ [redacted] 50X1
2.6 times as much run-of-mine coal was processed in 1950 50X1
as in 1940 and that there were almost 4 times as many coal-cleaning plants in operation in August 1951 as before the war, as well as

* It is not known whether this figure is inclusive of coking coal or not.

twice as many screening installations. There was still much to be done in the field of coal cleaning. New methods of coal cleaning should be introduced more rapidly to insure a steady improvement in the quality of the coals, particularly those types used for coking. 193/

The statement that production of coal-cleaning plants already amounted to more than 11 percent would indicate that as much as 26.5 million tons were mechanically cleaned at mines under the Ministry of the Coal Industry in 1950. It is not known how much run-of-mine coal was processed in 1940, but it has been estimated that the tonnage of coal sorted was at the most 52,520,000 tons, which furnishes an estimate of about 136 million tons for the quantity processed in 1950. Neither estimate, however, can be regarded as particularly reliable.

Zasyad'ko mentioned in 1948 that concentration plants in the western regions would process 49 percent of all the black coal (bituminous) and anthracite extracted in 1950. 194/ This means that the Plan called for cleaning possibly 50 million tons in the western regions in 1950. The Plan for 1950, as established at the inception of the Fourth Five Year Plan, called for 100 concentration plants in the USSR with a capacity of 67.3 million tons. The statement that there were almost 4 times as many coal-cleaning plants in August 1951 as before the war indicates that there must have been less than 128 in 1951, since there were 32 in 1940. It is still not certain that the Plan for 1950 was met as to number of cleaning plants or to the volume of coal that was to have been cleaned.

The USSR always has had a great shortage of cleaning facilities, with the result that the coals generally have a very high ash content. In 1932, 45 to 50 percent of the coal produced in the Donbas was dust and was not cleaned at all. The plants at that time processed only coal 25 millimeters in size or larger. Furthermore, the ash content of coke averaged 11.45 percent and is known to have increased between 1935 and 1939, as a result of the working of dirtier coal seams in the Donbas.

[redacted] on the subject of 50X1
coal preparation is that the ash content of coking coals shipped during the Fourth Five Year Plan (1946-50) from cleaning plants of the Ministry of the Coal Industry was reduced in the Donbas from 9.7 to 8 percent, in the Karaganda Basin from 11.2 to 10.9 percent, and in the Kuzbas from 8.5 to 8 percent. It was claimed that 40 percent

of the coking coal was mechanically cleaned in 1950 and 50 percent in 1952. All coking coal in the Kuzbassugol' Combine is now mechanically cleaned, whereas no cleaning plants existed there before 1940. In 1950, 2.5 million tons of refuse were removed at coal-cleaning plants. If this cleaning had not been done, about 2,000 more railroad trains would have been required to ship the coal. 195/

Of particular significance is [redacted] that 50X1
the ash content of coal shipped to the Ministry of Power had been reduced from 17.1 percent in 1945 to 15.9 percent in 1950. In the same period, the coal shipped to the Ministry of Transportation was reduced in ash content from 24.21 percent to 23.05 percent, 196/ and thus fewer locomotives and less railroad equipment were used. 197/

5. Underground Gasification. 198/

The underground gasification of coal is the process of conversion of the organic matter of coal deposits into a combustible gas without removing the coal from the deposit. The coal is burned and gasified with the aid of air, of a mixture of air and steam, of air enriched with oxygen, or of a mixture of oxygen and steam. The process takes place under pressure approximating that of the atmosphere. The theoretical calorific value of the gas is about 2,800 Cal per cubic meter. In practice, it runs about 1,350 Cal per cubic meter if oxygen is used and about 890 Cal per cubic meter if air is used.

The idea of underground coal gasification was first proposed by the famous Russian scientist D.I. Mendeleyev in 1888. In 1912, William Ramsey, an Englishman, became an advocate of the idea. At the end of the Russian Revolution, the possibilities of such underground gasification began to be considered. In 1931, on the basis of directives given by the Supreme Soviet of the USSR, a commission for problems of underground gasification was set up under Glavugol'. In 1932 the construction of the first experimental station was begun in Lisichansk in the Donbas. In 1933 an underground gas generator was built in the Moscow Basin. An All-Union Podzemgas (Underground Gasification) Bureau also was created in 1933 to coordinate all the work connected with underground coal gasification and to direct the work of existing experimental stations. In 1936 the work passed from the experimental stage to application on a semitechnical scale. In that year, Podzemgas already employed 1,500 workers, including 150 specialists.

The first experiments with underground gasification used the shaft method, which involved sinking shafts to the coal bed and driving a connecting tunnel so that there could be an inflow of air, oxygen, steam, or a combination of these through an inlet shaft to faciliate gasification. The combustible gases were drawn off through another shaft. Several variations of this method were tried, of which the flow method proved to be successful.

Experiments with the flow method commenced at Gorlovka in 1935, and the method was used on an industrial scale in 1938. From the time when cheaply produced oxygen began to be used, intensive studies were made with an oxygen-enriched blast. The most satisfactory results were obtained with a blast containing 27 to 30 percent oxygen. Over an 18-month period of continuous production at Gorlovka, a total of 9 million cubic meters of gas was produced, of which 7 million had a calorific value of 1,080 Cal per cubic meter. When a blast composed of oxygen-enriched air and steam was applied, the gas had a calorific value of 2,620 Cal. Part of the gas produced at Gorlovka went to a neighboring factory. Gorlovka installation succeeded, in part, because the coal bed had a pitch of 75 to 80 degrees, which permitted the ashes to fall away from the burning area and permitted free combustion and flow of gas. In the flow method the coal is burned out asymmetrically, and it is therefore necessary to change the direction of the blast periodically.

Another method, known as the drill method, was introduced at Lisichansk in the Donbas. It proved successful there as well as in application in the Kuzbas and the Moscow Basin. The use of this method necessitates the construction of two parallel tunnels running lengthwise along the coal bed and serving to introduce the blast and to receive the gas. The tunnels are connected at right angles with a large number of parallel drilled openings, each 10 centimeters in diameter. These openings, cut across the entire width of the strip lying between the two tunnels, are drilled from the surface at 5-meter distances from each other and are equipped with valves at the entrances with iron braces at the exits. Remote-control equipment is installed to open the entrance valves and to electrically ignite the coal in the openings. This method is particularly advantageous for horizontal deposits or for deposits with only a slight dip, especially where the roof is porous. Because of the necessity for considerable preparatory work, this method was recommended for use only where other methods had failed.

In an attempt to eliminate the necessity for underground preparatory work, there was devised the so-called filter method. This

method is applicable, under certain conditions, where the coal is sufficiently permeable by gas, as in the Moscow Basin lignite deposits. The method is based on the phenomenon that, when heated, the lignite shrinks and forms cracks which permit the passage of gas. The method consists of drilling from the earth's surface a number of openings arranged in some regular pattern, as, for example, in concentric rings spaced 18 to 37 meters apart. The lignite on the bottom of the drilled opening is ignited either electrically or by throwing down glowing charcoal. Burning is maintained by supplying air or oxygen through a centrally placed pipe. The Moscow Basin underground gasification station apparently was put into operation in 1938, although [redacted] 50X1
[redacted] the first station in the Moscow Basin on an industrial 50X1
scale, the Krotov Plant, started operating in November 1941.

In the initial attempts at underground gasification, only a small fraction of the coal was converted to gas, since the roof collapsed after only partial burning out of the coal seam. As a result, the air escaped from the reaction area, and the gas produced would then mix with the air. In later attempts, because of better developed blowing techniques, the oxidation of the gas by unreacted air was limited. When the flow method is applied to level deposits, such as those in the Moscow Basin and Kuzbas, coal losses result unless the operation is carried out so that stray air currents under the blast and cave-ins are avoided. By using underground gasification, as much as 80 to 90 percent of the coal may be utilized, while in mining only 60 to 70 percent of the coal is exploited.

It seems there were at least two gasification plants in European USSR in 1941, of which one was at Gorlovka in the Donbas and the other was the Krotov plant in the Moscow Basin. Two other stations were under construction in the early part of 1941, one at Lisichansk and the other was probably at Kurakova. All of these plants in European USSR are understood to have been badly damaged during the war. Another installation was located in the vicinity of Leninsk-Kuznetskiy in the Kuzbas.

At the present time, the Gorlovka plant and a large installation at Shchekino in the Moscow Basin are operating. Postwar reports have mentioned the Lisichansk installation, but it is not certain that it is operating. A few references have been made to "Podzemgas" in the Kuzbas, so it is assumed that a plant is operating there.

It would appear that underground gasification offers successful possibilities under carefully selected conditions, but the limited information on the subject in postwar years leads to the conclusion that the USSR has not undertaken any extensive expansion in the field. Some new installations are probably contemplated and possibly may be under construction, but at the present time underground gasification figures only to a negligible extent in the energy balance. One reason for the slow development is the cost of an oxygen-producing unit, which is given as 70 percent of the total cost. The production costs of gas produced by means of an oxygen-enriched blast are given as three times the production costs of gas obtained with an air blast. The Russians apparently regard an oxygen-enriched blast as a practical necessity.

F. Labor Productivity, Labor Force, and Wages.

1. Labor Productivity.

The overfulfillment of the Fourth Five Year Plan of coal extraction was a result of the mechanization of production, the growth of the size of the labor force, and the raising of labor productivity. It has been reported, however, that labor productivity for workers engaged in extraction in 1950 had not yet reached the pre-World War II level. In Rostovugol' Combine of the Donbas, productivity per worker in extraction was only 90.8 percent of the prewar level. At Karaganda, workers in extraction were producing at only 89.2 percent of the prewar level, although at a rate 130.0 percent higher than in 1945. 199/ [redacted] labor productivity in the Artemugol' Combine was still 21 percent below the prewar level in 1950 and 12 percent below for the Stalinugol' Combine. 200/ Thus, the 3 most important combines in the Donbas showed 9 to 21 percent lower labor productivity in 1950 than before World War II, and there were other major producing areas, such as the Karaganda underground mines, where labor productivity was still lower. 50X1

Lower productivity in the Donbas is explained in part by a statement that the proportion of coal extracted in small mines was greater than before the war, since the large mines had to be reconstructed. 201/ These small mines were far less mechanized and had lower labor productivity than the large mines. [redacted] labor productivity in most of the Donbas mines was still below the prewar level. 202/ 50X1 50X1

In some areas, labor productivity in 1949 exceeded the prewar level, as, for example, the Moscow Basin, where the Moskvaugol' and Tulaugol' combines showed comparative increases of 10 percent and 5.6 percent, respectively, as compared with prewar productivity. 203/ [redacted] many mines of the Prokop'yevskugol' Trust, an important producer in the Kuzbas, had achieved their prewar labor productivity level in 1949. 50X1

Given the fact that labor productivity in the coal industry was still below the prewar level in 1950, even though reported gains over the preceding years had been claimed in productivity during the years of the Fourth Five Year Plan, it is evident that labor productivity was at a low level in 1945. Labor productivity was especially low in the western regions. The 1950 Plan called for an increase of 69 percent in labor productivity in the western regions as compared with 1945. 204/

Before the war, labor productivity in the new coal basins of the eastern regions was from 40 to 83 percent higher than the average for the Soviet coal industry and from 1.5 to 2 times greater than in the Donbas. Higher productivity of labor in the eastern regions accounts mostly for the lower production cost of coal in those regions. In 1940 the average cost of production for coal in the eastern regions was from 29 to 42 percent lower than the average cost of production for coal in the USSR, and still lower than the average cost of production in the Donbas. 205/

In the postwar period the difference in the level of labor productivity between the new and the old coal fields of the USSR became even more pronounced. The production cost of the Donbas coal is considerably higher than that of the eastern regions, in spite of the fact that in 1940 the Council of Ministers USSR, taking into account the severe weather conditions in the Urals, Siberia, and the Far East, increased by 20 percent the wages of workers and engineering technical personnel engaged in the coal, ore, petroleum, and metallurgical industries and in construction, loading and unloading work in those regions. 206/

One factor influencing the difference in labor productivity and production cost between the old and new coal fields is the technological factor. Most of the eastern coal fields were started during the Soviet period and are being exploited with up-to-date machinery, while in the Donbas the application of modern machinery was limited by the character of the mines inherited from the prerevolutionary period. 207/ It is difficult to convert some of the old Donbas mines to new methods and the use of new machinery, although newly constructed mines in the Donbas are as modern as the best in the east.

Another factor influencing labor productivity and production cost in coal mining is the way in which coal seams occur in the various regions. In most of the eastern coal fields the coal seams are close to the surface, are much thicker than in the Donbas, and may be strip mined in some places, which permits much greater productivity than deep mining. Furthermore, the Donbas fields are characterized by steeply pitching seams, the mining of which requires greater expenditure of labor. 208/ The more favorable natural mining conditions in the eastern fields constitute the main basic reason for their much higher labor productivity.

Labor productivity in the principal coal basins about 1949 is shown by percentage in relation to the Donbas, which is taken as 100 percent in Table 48. 209/

Table 48

Relative Labor Productivity in Principal Coal Basins in the USSR

Basin	Labor Productivity (Percent)
Donets	100.0
Kuznetsk	120.0
Karaganda	111.4
Cheremkhovo	180.0
Kizel	114.3

In arriving at the above figures, the thickness of the seams in the eastern coal deposits has not been taken fully into account. Recent experiments have shown that it is possible to mine thick seams without shields. Under these conditions, labor productivity should be even higher than is indicated in Table 48. 210/

In 1939 the average productivity of all wage earners in coal mining was 25.3 tons monthly, and it averaged only 29.4 tons for the workers who are assumed to be on actual exploitation work. The average for the latter is reported to have been 30.5 tons in 1940, so that the average productivity for all wage earners in the same year, including surface workers, must have been about 26 tons per month per worker, or 312 tons for the year. The statement that labor productivity in 1950 was still below the prewar level leads to the assumption that it was somewhere around 300 tons per worker in 1950. Actually, it may have been higher, for the Donbas, with its low average productivity, contributed only about 36 percent of the tonnage in 1950, whereas it accounted for about 57 percent in 1940.

In 1951 the productivity of coal-mine labor is reported to have exceeded the prewar level. This accomplishment was made possible by the use of the highly productive coal combines. 211/ Another source states that labor productivity increased 7.6 percent in 1951 as compared with the previous year. On the basis of an assumed average annual output of 300 tons per worker in 1950, therefore, the increase would result in an estimate of 323 tons in 1951.

The limited amount of data available on the subject of productivity would necessitate further study to arrive at figures which would reflect more accurately the current situation. The increased proportion furnished by the eastern fields -- nearly 50 percent of the production -- and the high productivity at strip mines, where output is around 100 tons monthly, or 3 to 5 times greater than in underground mining, 212/ would seem to more than offset the lower productivity in the Donbas.

2. Labor Force.

The last published Soviet figures on employment in coal mining gave a figure of 437,500 for employment as of 1 January 1936. This figure represented the number of wage earners, including apprentices, who were engaged in coal mining and doubtless excluded some workers in auxiliary industrial plants which were closely associated with coal mines.

Figures on average monthly productivity of wage earners during the years 1937-40 have permitted reasonably good estimates of employment for those years. It is estimated there were about 532,000 wage earners in coal mining in 1940. This figure is based on the assumption that the average monthly productivity of all wage earners was 26 tons, or 312 tons for the year.

As previously indicated, it is not certain what productivity has been in recent years. Productivity for the USSR, however, was below the 1940 level in 1950 and for the Donbas was still below in 1951. Therefore, the assumption is that labor productivity for all wage earners in coal mining was only 300 tons in 1950, which results in an employment figure of about 875,000. It is believed that this estimate is well within a range of error of 10 percent. In addition to these employees, there would also be a considerable number of salaried workers, as well as auxiliary workers, such as those employed on mine construction, which would raise the total to more than a million.

Table 49 furnishes data on labor productivity and the number of wage earners in coal mining.

Table 49

Estimated Number of Wage Earners in Coal Mining in the USSR
Selected Years, 1913-51

	Coal Production		Production per Worker		
Year	Thousand Tons	Annual Increase (Percent)	Tons	Annual Increase (Percent)	Estimated Number of Workers a/*
1913	29,117	N.A.	148.3 b/	N.A.	196,400 213/
1928	35,510	10.0	140.1 b/	N.A.	253,500 213/
1932	64,690	14.0	156.3 b/	N.A.	413,900 213/
1934	94,160	23.4	222.7 b/	N.A.	422,800 213/
1936	126,400	16.1	288.9 b/	N.A.	437,500 213/ c/
1937	127,968	1.2	285.6 d/	1.1	448,100 e/
1938	132,888	3.8	288.0 d/	0.8	461,400 e/
1939	145,700	9.6	303.6 d/	5.4	479,900 e/
1940	166,000	13.9	312.0 f/	2.8	532,050 e/
1947	183,900	12.0	221.0 g/	N.A.	832,100 e/
1948	209,650	14.0	250.0 g/	13.0 214/	838,600 e/
1949	236,100	12.6	272.0 g/	8.7 215/	868,000 e/

* Footnotes for Table 49 follows on p. 161.

Table 49

Estimated Number of Wage Earners in Coal Mining in the USSR
Selected Years, 1913-51
(Continued)

	Coal Production		Production per Worker		
Year	Thousand Tons	Annual Increase (Percent)	Tons	Annual Increase (Percent)	Estimated Number of Workers a/
1950	262,000	11.0	300.0 g/	10.2 216/	873,350 e/
1951	282,400	7.8	323.0 g/	7.6 217/	874,300 e/

a. Wage earners, including apprentices in prewar years. Estimates for postwar years are based on data which are believed to be exclusive of prisoners of war, but this is not definitely known. All figures are exclusive of salaried personnel. It is believed that the number of workers does not include those employed in certain auxiliary enterprises, such as machine-building plants for the coal industry and building-construction workers.
b. Calculated on basis of reported production and number of wage earners, including apprentices.
c. As of 1 January 1936.
d. Based on average monthly production of 23.8 tons in 1937, of 24.0 tons in 1938, and of 25.3 tons in 1939. 218/
e. Estimates based on production and annual output per worker.
f. It is assumed that the average monthly output of all wage earners was 26 tons in 1940. One report stated that labor efficiency had increased from 12.5 tons in 1913 to 30.5 tons in 1940. 219/ The figure of 30.5 tons must represent the average monthly output of those wage earners doing exploitation work.
g. Figures are based on the statement that labor productivity in 1950 was still below prewar level and on reported increases in labor productivity. It is assumed that the average productivity of all wage earners was 25 tons monthly in 1950, which is believed to be within 5 percent of the actual figure.

It is possible to estimate with greater precision the number of wage earners employed at strip mines. In 1950 there must have been close to 22,400 wage earners at strip mines as compared with about 8,000 in 1940. Table 50 shows average annual labor productivity and estimated number of workers at strip mines, based on data available for past years.

Table 50

Labor Productivity and Estimated Number of Wage Earners at Strip Mines in the USSR
1940, 1945, 1949, 1950, 1955 Plan

Year	Strip-Mine Production (Tons)	Annual Productivity per Worker (Tons)	Estimated Number of Workers
1940	6,308,700	787.2 a/	8,013
1945	17,385,000	1,042.8 a/	16,670
1949	22,821,000	1,080.0 b/	21,130
1950	28,000,000	1,248.0 c/	22,435
1955 Plan		1,920.0 d/	

a. Reported average monthly productivity of 65.6 tons in 1940 and 86.9 tons in 1945. 220/
b. Reported average monthly productivity of 90 tons. 221/
c. Increased 20 percent in comparison with 1945. 222/
d. The 1955 Plan calls for output per worker of 160 tons per month. 223/

3. Wages.

Coal miners receive the highest earnings in the Soviet national economy, according to a Soviet press statement of August 1952. The monthly average earnings of a miner amounted to 1,673 rubles in 1946 and had increased to 2,274 rubles by the first quarter of 1949. 224/ [redacted] the average earnings of the miner increased 7 percent during 1949 and that during the first 8 months of 1950 wages were 5.9 percent higher than during the same period in 1949. 225/ Thus, it is probable that average monthly earnings in 1950 were approximately 2,500 rubles. Stakhanovite workers have been reported to earn over 7,000 rubles monthly in the mines. Earnings vary considerably, depending upon the 50X1 job and individual productivity. High bonuses are paid for exceeding the norms, which tend to be established on the basis of production attained by the best worker.

The number of workers who were paid on the basis of piecework in percent of the total mine labor force had shown an increase in prewar years as follows: 1932, 43.5 percent; 1935, 63.7 percent; 1939, 75.1 percent; 226/ and 1940, 76 percent. The number of such workers declined during the war and was only 66 percent of the total mine labor in early 1948. The drop was caused mainly by the fact that electricians, pipe fitters, machine operators, and other workmen had been transferred in many mines to the system of payment for working time. This system of payment had deprived them of the incentive to do more work in the course of the working day and to raise their efficiency. 227/

A bonus system is in effect, based upon years of service in the mines. The scale is as follows: for more than 1 year's work, 10 percent of the annual salary; for 3 to 5 years, 15 percent; for 5 to 10 years, 20 percent; for 10 to 15 years, 25 percent; and for more than 15 years of work, 30 percent. 228/

It is known that in the Moscow Basin, coal mines are worked 24 hours per day and 358 days per year. This practice is assumed to be standard throughout the industry. Miners work an 8-hour day, 6 days per week. They frequently work the seventh day as well.

[redacted] labor turnover was 50X1
a very serious problem in the coal industry, although it was not so bad as it was during the prewar period. 229/

III. Coke.

A. General.

In 1913, Russia mined 29.1 million tons of coal, of which probably about 6 million tons were required to produce 4.44 million tons of coke. 230/ There were a number of small coke plants in the Ukraine and one in Siberia, mostly owned by French and Belgian capital. The average annual capacity of these plants ranged from 100,000 to 200,000 tons.

From 1928 until 1940 the Soviet government spent considerable amounts of money and energy on the development of the country's coke and coke by-products industry. Foreign equipment, designs, and engineering skills were imported on a large scale, and the industry progressed rapidly in size and in efficiency. One of the most important advancements was the installation of large modern coke ovens of the by-product type.

In 1941 and 1942, approximately 75 percent of the productive capacity of the coke industry was lost. The German and Soviet armies destroyed almost completely that portion of the coke industry located in the southwestern section of the USSR. The Soviet official press estimated that 4,470 coking ovens, with a total capacity of 19 million tons per year, were destroyed partially or completely by the invaders. Since 1944, great effort has gone into reconstruction, the prospecting for new coking coal deposits, and the building of new coking plants. The latter two projects are part of a program to shift a larger portion of the industry eastward into the Urals and Siberia. According to the 1950 Plan, at least 50 percent of the 1950 goal of 30 million tons of coke was to have been produced by the new industrial centers in the east.

The redistribution of the coke industry eastward was undertaken principally to provide for the better exploitation of the mineral resources of the eastern regions, but also because of the vulnerability of the southern regions in time of war.

Despite progress in the industry, there remain several basic handicaps. Some steel centers are located at a distance from satisfactory coking coal supplies. Supplying these centers involves long and costly freight hauls, ranging up to 1,200 miles in the east. 231/ All of the Soviet coals used for coking purposes, with the exception of those from the Kuzbas and from a few mines in other areas, have a high ash and sulfur content. Therefore, most of the coals must be cleaned, but this does not generally reduce impurities enough to furnish high-quality coke. All cokes made with Donbas and Kizel Basin coals are high in sulfur. Moreover, it is necessary to blend all coals used for coking in order to increase supplies by utilizing coals with little caking power. The supply of coals with good coking properties has been limited, and it is to be expected that the proportion of such coals used in blending will decrease and more gas coals will have to be used.

B. Supply.*

According to the 1950 estimate, coking production fell short, by about 5 million tons, of meeting the planned goals of 30 million tons. Some of the apparent reasons why production was deficient are given as follows: (1) heavy devastation of southern regions during the war and slow progress in reconstruction, (2) poor quality of the coal, (3) inadequacy of coal preparation facilities, (4) shortage of spare or replacement parts, (5) inefficient and incomplete utilization of existing equipment, and (6) large amount of reconstruction work carried out unsatisfactorily.

Production data for 1937-51 in Table 51** represent the sum of the estimated production at individual producing plants supplying metallurgical-grade or other high-temperature coke. It is probable that this method would underestimate the total production of coke in the USSR. The degree of underestimation may be gauged by comparison of 17,565,000 tons estimated for 1937 with the total output of 19.8 million tons for the same year, as published in the Third Five Year Plan (1938-42).

In 1949 there were at least 31 coke plants in the USSR, and 5 additional plants were under construction. From the point of view of design, capacity, and size, most of the Soviet plants compare favorably with those of the US. The eastward movement of heavy industry and integration of coke plants with metallurgical plants have made considerable progress. It is estimated that approximately half of the total coke output in 1950 came from plants in the Urals and eastern regions. The southern region (Donbas), however, was still producing at only about 70 percent of prewar output. 232/ In 1940, approximately 75 percent of the output came from integrated plants.

C. Consumption.

According to the Plan for 1950, ferrous metallurgy was assigned 70 percent, or 21 million tons, of the planned total gross output of coke, which was 30 million tons. The balance, 9 million tons, was intended for nonferrous metallurgy, for the manufacture of producer and water gas, and for making chemicals. Of the 21 million tons assigned

* See Appendix K for capacity, production, and other data for 1950-51.
** Table 51 follows on p. 166.

Table 51

Production of High-Temperature Coke in the USSR
1928-51

Thousand Tons

Year	Production
1928	3,200 a/
1929	N.A.
1930	6,205.1 b/
1931	6,755.6 b/
1932	8,421.4 b/
1933	10,225.4 b/
1934	14,213.0 b/
1935	16,752.0 b/
1936	N.A.
1937	17,565 c/
1938	20,000 c/
1939	N.A.
1940	21,900 c/
1941	N.A.
1942	6,085 d/
1943	9,700 e/
1944	11,000 e/
1945	12,500 e/
1946	14,000 e/
1947	15,300 e/
1948	18,000 e/
1949	20,200 e/
1950	25,380 e/
1951	29,200 f/

a. 233/
b. 234/
c. 235/
d. 236/
e. 237/
f. 238/

to ferrous metallurgy, 20 million tons were to be consumed by blast-furnace operation and 1 million tons by cupolas in foundry smelting.

Based on the foregoing equation and on a planned target for pig iron of 19.5 million tons, consumption of coke per ton of pig iron in 1950 is computed at 1.02 tons. The actual figure is probably somewhat higher because the quality of coke has not come up to expectations. One source reports an average figure of 1.2 tons of coke per ton of pig iron, 239/ compared with the US average ratio of 0.95 ton of coke per ton of pig iron. 240/ If 1.2 tons may be taken as an average figure, coke consumption in the production of 19.5 million tons if iron in 1950 was 23.4 million tons, or 77.7 percent of the total planned output of coke, instead of the 70 percent originally assigned to ferrous metallurgy. If the foundry industry received its planned share of 1 million tons, a balance of 5.6 million tons, rather than the planned 9 million tons, was left for consumption by other industries and for export. It is possible that as much as 500,000 tons were exported to Satellite countries.

Table 52* shows the estimated consumption 241/ of coke in 1951.

D. Quality.

According to US standards, good-quality blast-furnace coke should contain less than 1.3 percent sulfur and less than 12 percent ash. It is believed that a large portion of the coke produced in the USSR does not meet these requirements. Moreover, there are reasons to believe that considerable coke made in Soviet plants is not so good from the point of view of hardness and density as is desirable.

The blending of coals of different characteristics and analyses is done to improve the quality of the coke and to utilize coals that will not coke satisfactorily by themselves. There has been a trend toward greater use of Class G coals, and also Class T coals are now being used. A Soviet article of June 1952 stated that in the past 5 years plants for coke by-products in the southern part of the USSR (the Donbas) had achieved great success in extending supplies of coal suitable for coking. To this end the composition of coal charged into coke ovens had been radically changed. In 1933 the charges contained an average of 0.1 percent of Class G coals; in 1940, 7.5 percent; and in 1951, 15.1 percent. During 1951, Class T coals was introduced into the

* Table 52 follows on p. 168.

Table 52

Estimated Consumption of Coke in the USSR
1951

Consumer Group	Thousand Tons	Percent
Ferrous Metallurgy	21,000	72.5
Nonferrous Metallurgy	300	1.0
Chemical Industry	700	2.4
Domestic and Steam Raising	6,500	22.4
Export	500	1.7
Total	29,000	100.0

charge in the Novo-Makeyevka, Smolyaninovskiy, Mushketovskiy, Kramatorsk, and Khanzhenkovskiy coke plants. Large quantities of coal, moreover, which were considered to be satisfactory for coking were not being sent to coal-cleaning plants, since they were difficult to clean. 242/ The fact that the metallurgical industry has been opposed to increasing the proportion of Class G coal in the blend is an indication that production of weaker coke in the Donbas has been a consequence of efforts to expand the supply of suitable coking coal.

Despite the high ash and sulfur content of Kizel Basin coals, it is claimed that they are valuable in admixture with other coals to produce a stronger coke. They also furnish a high yield of gas and chemical by-products. Experiments conducted in the Magnitogorsk Metallurgical Combine have indicated that up to 50 percent of Kizel Basin coal may be combined with other coals containing less ash and sulfur to make a satisfactory blast-furnace charge.

Coke is produced at the Gubakha Plant in the Urals from a blend of 80 to 85 percent Kizel Basin coals and 15 to 20 percent Kuzbas coals. A Soviet report of December 1952 mentions that run-of-mine coal from the Kizel Basin contains 21.5 percent ash, 5.8 percent sulfur, and 0.007 to 0.012 percent phosphorous. The quality is improved, however, by removing considerable impurities at the cleaning plants. The coke is used largely in the smelting of copper and nickel in the Urals. The ash content of the coke going to the copper plants is 16 to 17 percent.

The coke consumption for smelting copper at these plants ranges from 2.8 to 5.6 percent of the weight of the charge. 243/

Kuzbas coals, when coked alone, are reported to make only fair coke of brittle quality. They are also somewhat high in phosphorous and, unless blended with coal having little or no phosphorous content, furnish a coke that is not suitable for smelting pig iron to be used in making Bessemer steel.

Coke made from straight Vorkuta coal is generally too weak and requires addition of lower volatile coal from other fields of the Pechora Basin. Experiments in blending Donbas and Kuzbas coals with Pechora Basin coals have indicated an improvement in the quality of the coke.

Although all the evidence seems to indicate that Soviet coke, in general, is not of very good quality, the fact remains that it is used in blast furnaces of maximum dimensions and provides satisfactory pig iron.

Table 53* shows a comparative analysis of coke produced from various coals in the USSR.

E. Labor.

The general quality of the labor force has been poor according to US standards. There is still a shortage of technical personnel and skilled workers. This condition, however, has improved considerably in comparison with prewar years. Women workers comprise approximately 20 percent of the total during peacetime and 47 percent during the war. Prisoners of war are employed only to do manual work such as cleaning yards and hauling waste.

IV. Peat.

A. General.

Peat is semicarbonized vegetable matter formed by partial decomposition in water of various plants, especially certain mosses. As it comes from the bog, it contains more than 85 percent water, but when

* Table 53 follows on p. 170.

Table 53

Analyses of Coke Produced from Various Coals (Beneficiated) in the USSR

Percent

Source of Coking Coals	Moisture a/*	Ash b/	Sulfur b/	Volatile Matter b/	Fixed Carbon b/
Donbas Coals c/					
	7.6	14.6	2.3	.72	82.4
	9.0	12.5	1.9	1.30	84.2
	4.45	11.2	1.8	.92	86.1
	2.2	10.5	1.5	.60	87.4
	4.5	9.7	1.5	.99	87.8
	5.0	9.5	1.3	1.90	87.3
Kuzbas Coals					
Kemerovo Deposit Coals c/	5.0	12.4	.45	1.90	85.27
Mixture of Prokop'yevsk and Osinniki Coals c/	3.6	13.6	.53	1.28	84.61
Mixture of Prokop'yevsk and Leninsk-Kuznetski Coals c/	3.7	13.5	.55	1.17	84.76
Karaganda Basin Coals c/	2.0	15.6	1.09	1.27	82.04
Mixture of Kuzbas and Karaganda Coals c/	3.7	13.4	.57	1.05	85.03

* Footnotes for Table 53 follow on p. 171

Table 53

Analyses of Coke Produced from Various Coals (Beneficiated) in the USSR
(Continued)

Percent

Source of Coking Coals	Moisture a/	Ash b/	Sulfur b/	Volatile Matter b/	Fixed Carbon b/
Mixture of Kuzbas and Kizel Coals c/	4.6	16.1	1.42	.92	81.56
Mixture of Karaganda and Kizel Coals c/	4.3	16.1	1.65	1.45	80.82
Pechora Coal d/		11.0-13.0	0.5-1.1		

a. Probably "as received" basis.
b. Apparently "dry" basis.
c. 244/
d. 245/

dried, it can be used as fuel. Extensive deposits of peat are found in many parts of the world, but exploitation has been extensive only in the USSR and Ireland, since in most areas peat fuel cannot be produced economically enough to compete with coal, oil, and natural gas. The calorific value of peat is low, its production requires large amounts of seasonal labor, it does not store well, it is difficult to transport, and it is less suitable than coal, oil, and natural gas for most uses. Despite these disadvantages, the production of peat in the USSR is a substantial industry. Peat represented about 6 percent of the total primary energy consumed by the Soviet economy in 1940, and production was planned for the same percentage in 1950. 246/

The peat industry has been particularly developed in regions deficient in higher grade fuels, such as the Moscow industrial area, Leningrad Oblast, and the Belorussian SSR. The following figures give the proportion of peat in total consumption of all fuels in these areas in 1938: Ivanovo Oblast, 34.5 percent; Moscow Oblast, 19.2 percent; Leningrad Oblast, 12.6 percent; and the Belorussian SSR, 41 percent. 247/ The percentages in most areas are believed to have increased since 1938, in view of Soviet stress on the use of local fuels.

Soviet policy has been to distribute the responsibility for peat production among the major consumers. The relative importance, in percentage of total production, of the various producers is approximately as follows: Ministry of Electric Power Plants, 41 percent; Ministry of Light Industry, 14 percent; Ministry of the Food Industry, 6 percent; Ministry of the Construction Materials Industry, 3 percent; various republic ministries of local fuel industry, 17 percent; industrial cooperatives, 9 percent; and other producers, 10 percent. This breakdown is based on that shown in the 1941 Plan. No later data are available, except for the Ministry of Electric Power Plants, for which the percentage remains the same. In its role of largest producer, the Ministry of Electric Power Plants takes the lead in research, introduction of mechanization, and other developments in technology. The administrative unit which is responsible for peat production in this ministry is the Main Administration of the Peat Industry.

B. Production.

1. Before World War II.

The production of peat in Russia dates from before the Revolution. At that time peat had little importance outside the central industrial area. In 1913 a total of 1,688,000 tons was produced, of which 1,070,500 tons were produced in Moscow Oblast alone. The basic consumer was the textile industry, which used 62.7 percent of all peat produced. Power stations used only 3.6 percent, and other minor consumers used from 0.2 to 6.4 percent each. 248/

With the advent of the Soviet regime, new stress was placed on the peat industry. This was partially due to Lenin's strong interest in peat as a fuel for electric power generation in areas where industry was largely dependent on fuel shipped by rail from afar. Development of peat production for other uses has been part of the general Soviet policy of striving for regional self-sufficiency in fuel.

Following extensive capital investment in the industry, peat production under the Communists increased from a low of 1,093,000 tons in 1918 to 13,653,000 tons in 1932. 249/ This increase was accompanied by a change in the geographical breakdown of production. Such regions as Leningrad Oblast, the Urals, and the Belorussian and Ukrainian republics became important producers. Simultaneously the pattern of industrial consumption also changed. The power plants gradually overtook the textile industry in consumption of peat, until, in 1932, 52 percent of peat output went to power plants. 250/

Production increases in this period were to a large extent a result of the mechanization of the industry. The hydropeat method, approved by Lenin in 1920, and later the milled peat method were actively promoted by the central government. By 1932 these methods comprised, respectively, 18.3 percent and 25.4 percent of production. 251/ The industry continued to grow until 1940, when production of 32 million tons was reached.

Further development was prevented by the war. Even if war had not intervened, however, it is doubtful if the Third Five Year Plan goal of 49 million tons in 1942 would have been achieved.

2. World War II and Postwar.

Production dropped sharply during the war, as a large portion of the industry was in the invaded area. This included the Leningrad and Kalinin oblasts and the Belorussian and Ukrainian republics.

Labor shortages and other difficulties hampered operations in other producing regions. Output in 1942 was reported at only 14,844,000 tons. From then on, the industry gradually recovered.

In 1945, the year the USSR emerged from the war, the peat industry produced 22,607,000 tons, or about 71 percent of production in 1940, the last prewar year. The Fourth Five Year Plan (1946-50) envisaged an increase to 44,300,000 tons in 1950 and stressed the need for further mechanization to achieve this goal. Some efforts toward organizing year-round production were contemplated. Actual progress did not prove to be so great as planned, however, and 1950 production is estimated at only 35,700,000 tons. Soviet production of peat for the years 1913-40, 1942-49, and 1950-51, and that given by the Plans for the years 1941, 1950, and 1955, is shown in Table 54.*

Future plans for the industry appear to be for a steady, but unspectacular, increase in output. Under the Fifth Five Year Plan (1951-55), 1955 production is to increase 27 percent over 1950. This seems reasonable in the light of the 32-percent increase attained during the period of 1946-50.

3. Producing Areas.**

Information on the current geographic distribution of peat production is scant. The best available indicator is the 1941 Plan, which gives a rather detailed breakdown. On the basis of the data in the 1941 Plan, more than half of all peat production is in Economic Region VII (Central European USSR). It was planned to produce 57 percent of the total peat production in this area in 1941. Other producing areas, in order of importance, are Economic Regions Ia (Northwest), 12 percent; IIb (Belorussia), 10 percent; III (Ukraine and Moldavia), 10 percent; VIII (Urals), 6 percent; VI (Volga),

* Table 54 follows on p. 175.
** See Appendix L for a detailed breakdown of the 1941 Plan for peat production.

Table 54

Peat Production in the USSR
1913-40, 1942-49, and 1950-51
and Planned Production for 1941, 1950, and 1955

Tons

Year	Production	Year	Production
1913	1,688,000 a/	1934	17,160,000 a/
1914	1,903,300 a/	1935	18,486,000 a/
1915	1,674,600 a/	1936	22,386,000 a/
1916	1,619,000 a/	1937	25,000,000 a/
1917	1,356,300 a/	1938	26,271,000 a/
1918	1,093,000 a/	1939	28,720,000 a/
1919	1,225,200 a/	1940	32,000,000 b/
1920	1,390,000 a/	1941 Plan	39,615,000 a/
1921	2,018,000 a/	1942	14,844,000 a/
1922	2,158,000 a/	1943	22,000,000 c/
1923	2,427,200 a/	1944	23,000,000 d/
1924	2,857,600 a/	1945	22,607,000 a/
1925	2,718,200 a/	1946	27,000,000 e/
1926	3,554,100 a/	1947	31,200,000 f/
1927	4,910,700 a/	1948	33,600,000 g/
1928	5,319,900 a/	1949	36,300,000 g/
1929	5,489,600 a/	1950 Plan	44,300,000 a/
1930	6,501,400 a/	1950	35,700,000 h/
1931	10,850,500 a/	1951	41,600,000 g/
1932	13,653,000 a/	1952	39,200,000 g/
1933	12,900,000 a/	1955	45,300,000 i/

a. Tonnage figures from Soviet sources are as follows: 1913-32 252/; 1933-36 253/; 1937 and 1939 254/; 1938, 1942, and 1945 255/; 1941 Plan 256/; and 1950 Plan 257/.
b. The Five Year Plan goal of 44.3 million tons was stated to be 39 percent above the prewar level. 258/
c. Excavation of peat reported as 50 percent more than in 1942. 259/
d. Read from a rough graph in which points representing 1942 and 1945 figures had the exact tonnage marked in numerals above them. 260/

Table 54

Peat Production in the USSR
1913-40, 1942-49, and 1950-51
and Planned Production for 1941, 1950, and 1955
(Continued)

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e. Production given as 83 percent of prewar. 261/
f. Production given as 23 times prerevolutionary production. Prerevolutionary production is taken to refer to 1917 production. 262/
g. Derived from Ministry of Electric Power Plants production figures. The Ministry of Electric Power Plants production was calculated to be as follows: 1946, 11,398,000 tons; 1947, 12,480,000 tons; 1948, 13,760,000 tons; 1949, 14,890,000 tons; 1950, 14,510,000 tons; 1951, 17,050,000 tons; and 1952, 15,920,000 tons. The figure for 1946 production is from a Soviet source 263/ and represents peat prepared and collected by the Ministry of Electric Power Plants in 1946. The 1947-50 tonnage figures are computed from Soviet percentage figures 264/ comparing peat excavation in those years with excavation in 1946. The percentage figures were as follows: 1946, 100 percent; 1947, 109.5 percent; 1948, 120.7 percent; 1949, 130.6 percent; and 1950, 127.3 percent. With regard to the 1951 figure, [redacted] 50X1 the Ministry of Electric Power Plants mined 17.5 percent more peat 50X1 in 1951 than in 1950. 265/ Output in 1952 was stated to be 9.7 percent over 1950. 266/ Production of 11,398,000 tons by the Ministry of Electric Power Plants in 1946 is calculated to be 42 percent of total Soviet production of 27,000,000 tons, while production of 12,480,000 tons by the Ministry of Electric Power Plants in 1947 is calculated to be 40 percent of total production of 31,200,000 tons in that year, and production of 14,510,000 tons by the Ministry of Electric Power Plants in 1950 is calculated to be 41 percent of total 1950 production of 35,700,000. Thus production by the Ministry of Electric Power Plants averages 41 percent of total production in 1946, 1947, and 1950, according to these calculations. Consequently, total 1948, 1949, 1951, and 1952 production figures have been calculated by taking production of the Ministry of Electric Power Plants in these years also to be 41 percent of total production.
h. [redacted] 1950 peat production was 58 percent 50X1 greater than 1945 production.
i. The Fifth Five Year Plan goal for 1955 is 27 percent over 1950. 268/

3 percent; and IIa (Baltic), 2 percent. Most of the remaining 1 percent was planned for Regions X (Kazakhstan and Central Asia) and IX (West Siberia).

C. Consumption.

The geographical patterns for production and consumption are virtually the same, since peat must be consumed close to the place of production. The average haul of peat is 20 kilometers or less. 269/ Hence the geographical breakdown shown for production can also be used for consumption.

Moreover, it appears that for the most part the producers are also the consumers. The Ministry of Electric Power Plants is by far the largest consumer of peat. Thermal electric plants are estimated to consume 40 to 50 percent of all peat produced in the USSR. One source states that regional power plants in the Moscow, Gor'kiy, Kaluga, Ivanovo, Vologda, and Leningrad provinces consumed about 50 percent of all peat produced. 270/ On the other hand, the 1941 Plan [redacted] show the Ministry of Electric Power Plants as producing only 41 to 42 percent of the total. As much as 70 percent of all lump peat produced is consumed in power generation. 271/ In the total fuel of all kinds consumed in the production of electric power, peat accounts for about 23 percent. 272/ 50X1

The second largest consumer of peat is the textile industry. Assuming the industry's consumption of peat to be equal to its production of peat, the textile industry consumes about 11 percent of total Soviet peat output. This is the proportion planned to be produced in 1941 by the Peoples' Commissariat of the Textile Industry, as outlined in the 1941 Plan. [redacted] peat represented 46 percent of the total fuel consumed by the textile industry at that time (presumably 1946). Figures for the same period for the textile industries of the Ivanovo Oblast, the Vladmiri Oblast, and the Moscow Oblast were 62 percent, 75 percent, and 52 percent, respectively. 273/ 50X1 50X1

Other industries in which peat has been used include the paper, silicate, sugar, and metallurgical industries. Peat is also used as fuel in homes.

Agriculture consumes a significant amount of peat. In 1940, Soviet agriculture used 3 million tons as fuel, 8 million tons as soil conditioner, and about 200,000 tons as litter for livestock. 274/

D. Technology.

Peat as found in swamps or bogs has a moisture content of 88 to 92 percent. The process of turning peat into a fuel requires excavating it and drying it until its moisture content is reduced to 30 percent at the maximum. The relative importance of the different peat-excavating methods used in the USSR at the present time is given in Table 55. 275/

Table 55

Peat Output in the USSR by Methods of Production
1946, 1950 Plan

		Percent
Method of Production	1946	1950 Plan
Hydraulic (Hydropeat)	27.0	20.8
Hydroelevator	2.0	1.6
Elevator	20.4	17.0
Scraper and Dredge-Elevator	2.7	11.7
Dredge	2.6	7.5
Hand-Cut	25.8	12.6
Milled	19.5	28.8
Total	100.0	100.0

It is noted that the share of scraper, dredge-elevator, dredge, and milled peat was planned to be increased by 1950 at the expense of hydropeat, hydroelevator, elevator, and hand-cut peat. A discussion of the various production methods suggests some reasons for this.

Peat fuel is made in two forms. One is in bricks of a standard size and is called lump peat. The other is in pulverized or fine form and is called milled peat. Of the 7 production methods shown in Table 55, only 1, called the milling method, produces milled peat. The other six methods produce lump peat.

1. Hand-Cut.

The oldest and most primitive method of excavating peat is to cut it from the deposit with the aid of a special spade, which forms standard-size bricks ready for drying.

2. Elevator.

In the elevator method, laborers working with spades load lumps of peat of various sizes into an "elevator," which transports the peat to the place where it is to be processed and shaped into bricks. The processing and shaping is done mechanically in a device called a macerator. The macerator is a steel drum equipped with steel spirals on which fixed knives cut and pulp the peat. The pulped peat is then squeezed through a die in the macerator and cut automatically into blocks. Although the elevator system is more efficient than hand cutting, it still takes a large amount of manual labor. The elevator system was used in prerevolutionary years and is the oldest form of mechanization in the industry.

3. Hydraulic.

The original hydraulic method was patented by a Russian engineer, P.E. Klasson, in 1917. The essence of the hydraulic method is reduction of the peat to a pulp by playing upon it streams of water under pressure. This pulp is sucked from the deposit by means of pumps, passed through a grinder, and sent to a storage tank. The liquid is then pumped out of the tank onto a field, where the excess water drains off into the soil. When the peat pulp reaches a plastic state, it is cut into lumps, which are stacked for further drying by sun and wind. This method requires a minimum of manpower in excavation. Separation of stumps from the peat is easier in this method than in others. With the addition of pipelines to transport the wet pulp to drying fields near the consumers, there may also be a transportation advantage. In some cases, pipeline transport of the peat in liquid form is cheaper than rail transport of finished peat. On the other hand, the addition of water to the peat makes for a much longer drying period. The added time required for drying is an important consideration, since drying is one of the industry's main problems. This method also requires more extensive drying fields.

4. Milled.

The milling method of producing peat was first employed in the USSR about 1928. It consists of the following three stages: (a) milling by breaking the surface layer of the deposit into peat crumbs, (b) drying the peat crumbs on the surface of the deposit, and (c) gathering the dried peat crumbs into piles.

Because of the greater drying surface of the peat crumbs as compared with peat in lump form, the milling process has a much shorter drying period than other processes. Drying is speeded by making ripples in the milled peat with a special attachment and periodically turning the crumbs over with rakes. When the peat is milled fine, the drying period is reduced to 6 to 8 hours and the whole production cycle to a day. This makes production of milled peat much less dependent on weather than other methods.

Another advantage of the milling method is that the gathering of milled peat lends itself better to mechanization than does the gathering of lump peat. A disadvantage of the milling method is that it can be used only on bogs that are largely free of stumps. Also, milled peat absorbs more moisture in storage than lump peat.

In judging the efficiency of the milling method as compared with others, it is of interest to note that a recent Soviet source states that milling is the most productive method of producing peat in the USSR. 276/ That this method is currently favored is also suggested by the fact that the proportion of milled peat in total production was planned to be increased from 19.5 percent in 1946 to 28.8 percent in 1950, as shown in Table 54.* Actually, the proportion proved to be 23.2 percent in 1950. 277/

5. Dredge.

In the dredge method a rotating chain of scoops scrapes the peat from the side of the pit. The peat is fed onto a conveyor, which carries it to the macerator for processing. Transportation to the drying field and spreading for drying may be done in 1 of 2 ways. In the first method the peat bricks formed by the macerator die are transported by conveyors to the drying field and are spread manually by workers. With this method the dredge cannot work at capacity because the subsequent processes are too slow. In the second method the peat pulp, processed but unformed, is fed into a spreading machine on

* P. 175, above.

caterpillar treads, which then transports it to the drying field. There the molding mechanism emits the peat in four thick ribbons, which are cut into bricks by spades fastened to a wheel behind the spreading machine. Dredge peat is said to be superior in quality to both hydropeat and milled peat.

E. Reserves.

According to Soviet calculations, total peat deposits in the USSR amounted to 24,700,000 acres at the beginning of 1947. Reserves were claimed to be equivalent to 150 billion tons of "standard fuel," or over 70 percent of the peat deposits of the world. 278/

The latest available data on the geographical distribution of peat reserves are given in Table 56.* 279/

F. Future of the Industry.

The future of the peat industry in the USSR depends largely on improvements in drying methods. The present system of natural drying in open fields restricts production largely to the summer months. This results in a need for large numbers of seasonal workers. In 1946 there were 320,000 of them. 280/ Further mechanization will help somewhat to solve the labor problem by reducing the number of employees required.

Although some artificial drying has been done, there is no indication in Soviet publications of plans for use of artificial drying on a large scale in the immediate future, which suggests that such drying is still uneconomical. The very modest goal of a 27-percent increase in peat output in 1955 over 1950 is probably the best indicator of Soviet opinion on prospects for the industry.

V. Fuel Briquettes.

A. General.

In order to increase the Soviet fuel supply for industrial and household use, every means is being tried to make otherwise waste or inefficient products usable. Bituminous coal fines, brown coal, and peat can become satisfactory fuels after subjection to the briquette process. Although the briquetting process is not new in the USSR, increased emphasis has been placed on this method of utilizing waste fuel since World War II.

* Table 56 follows on p. 182.

Table 56

Peat Reserves in the USSR
1 July 1937

	Million Tons
Northern Oblast (Archangel, Komi, Vologda, Karelia)	30,835
Leningrad Oblast	3,118
Smolensk Oblast	620
Kalinin Oblast	1,840
Moscow Oblast	600
Mordva ASSR, Kuybyshev Oblast	70
Yaroslavl' and Ivanovo Oblasts	1,472
Gor'kiy Oblast, Chuvash ASSR, and Mari ASSR	828
Kirov Oblast	1,000
Tatar ASSR	50
Saratov Oblast	7
Voronezh Oblast	61
Kursk Oblast	90
Bashkir ASSR	139
Omsk Oblast	39,375
Sverdlovsk Oblast	3,600
Chelyabinsk Oblast	650
Novosibirsk Oblast	1,500
Krasnoyarsk Kray	4,357
Irkutsk and Chita Oblasts	37,500
Ukrainian SSR	2,637
Belorussian SSR	2,670
Total	133,019

The process of briquetting involves several stages during which the raw fuel, if not already in fines, is ground and pressed into briquettes. Bituminous coal fines must be mixed with a binder before being pressed. Briquettes may be of various shapes and weights -- brick shaped, pillow shaped, and ovoid. Peat briquettes generally are brick shaped.

B. Production.

High production goals for both coal and peat briquettes in the Fourth Five Year Plan (1946-50) demonstrate the importance attributed to this segment of the solid fuel industry. Actual coal briquette production was to be 7.4 million tons by 1950, with a potential production of 10 million tons. 281/ It is believed that this figure was not attained, since even in 1945 there were no competent technicians in the field, no briquette machine industry existed, and the tars required in the manufacture of bituminous coal briquettes were not in production. 282/ As late as 1948 the "unsolved technical problems" of the industry were public knowledge. The planned production of 1.2 million tons of peat briquettes in 1950 was not achieved. The biggest plant at Orekhovo produced only half of its quota. Another model plant, the Tootsi Peat Briquette Plant in Estonia, although completing its quota, produced only a fraction of the goal and received great acclaim for even this accomplishment. In all probability only 50 percent, or 600,000 tons, was achieved.

C. Consumption and Distribution.

There is scant available information on the consumption and distribution of fuel briquettes in the USSR. It is presumed that the pattern is similar to that of East Europe, where briquettes are used as a substitute for lump coal wherever possible. It has been reported that peat briquettes are also used in the USSR as household fuel, 283/ for the generation of gas, 284/ and in the textile industry. 285/ According to the Fourth Five Year Plan, peat briquettes were to constitute 56 to 66 percent of the solid fuels consumed by the textile industry in 1950. 286/ It has been reported that the Nevskiy Chemical Works, Leningrad, is using brown coal briquettes imported from East Germany, 287/ and it is possible this plant also uses briquettes produced in the Moscow Basin.

D. Plants.

1. Coal Briquette Plants.

Coal briquette plants have been in operation in the USSR since 1870. The two largest and most modern plants were built between 1927 and 1939 -- the Mospino Plant in the Donbas and the Aleksandriya Plant in the Ukraine. According to the Fourth Five Year Plan, 26 new coal briquette installations were to be constructed by 1950. Information collected up to the date of writing indicates that there are 17 hard coal and 14 brown coal briquette plants either in operation or under construction. Tables 57* and 58** show the distribution of coal briquette installations and the source of raw coal used. The date of information is included in parentheses.

2. Peat Briquette Plants.

Before World War II there were only 2 peat briquette plants in the USSR: Orekhovskiy Plant in Moscow Oblast, with a planned capacity of 180,000 tons a year and an average production of 60,000 tons a year; and the Tootsi Plant in Estonia, with a planned capacity of 50,000 tons a year and an average production of 32,000 tons a year. Both of these plants went into operation in 1938.

In order to achieve the production goal of 1.2 million tons by 1950, the construction of new plants was planned in the Belorussian SSR, the Ukraine, Estonia, and Latvia. Eight new plants were to be constructed in Belorussia alone, with a total capacity of 130,000 tons per year. Some criticism has been made in the Soviet press of the failure to complete the required installations and of the continued installation of plants too small to be efficient and economical. The Tootsi Plant in Estonia is still considered the best plant in operation.

Table 59*** shows the extent and regional development of the peat briquette industry according to available information.

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* Table 57 follows on p. 185.
** Table 58 follows on p. 186.
*** Table 59 follows on p. 187.

Table 57

Bituminous Coal Briquette Plants in the USSR 288/

Source of Coal	Location and Installation	Comment
Donbas	Briquette Plant, Izvarino, Rostov Oblast	Under construction (September 1949).
	Irminskaya Briquette Plant, Irmino	No additional information.
	Dzerzhinskaya Briquette Plant, Dzerzhinsk	Under construction (1935).
	Krivorozhskaya Briquette Plant, Krivorozhskiy	Under construction (1935).
	Nikitovskaya Briquette Plant, Nikitovskiy	Under construction (1935).
	Novo-Uzlovskaya Briquette Plant	No additional information.
	Yunkomovskaya Briquette Plant	No additional information.
	Novo-Golubovskaya Briquette Plant	To start operation October 1947 (1935).
	Urakhovskaya Briquette Plant	To start operation in the near future (September 1949).
	Mandrykinskaya Briquette Plant	Planned production, 300,000 tons.
	Mospinskaya Briquette Plant, Mospino	Reconstructed; planned production, 1.2 to 1.5 million tons.
	Briansk Coal Mine and Briquette Plant, Briansk, Voroshilovgrad Oblast	Construction started 1948; to start operations 1950.
	Briquette Plant, Stalino	Under construction (1945).
Urals	Briquette Plant, Midnogorsk, Chkalov Oblast	Expansion intended; no progress made (1946).
Kuzbas	Briquette Plant, Kemerovo	No additional information.
	Briquette Plant, Prokop'yevsk, Kemerovo Oblast	Under construction (1945-47).
Spitzbergen	Arkhangel'sk Hydrolysis Plant, Archangel	Operation started (May 1949).

Table 58

Brown Coal Briquette Plants in the USSR 289/

Source of Coal	Location and Installation	Comment
Ukraine	Aleksandrivkiy Briquette Plant, Aleksandriya	Reconstructed and expanded after World War II; planned capacity, 1.5 million tons.
	Baydakovskaya Briquette Plant	Under construction (1945).
	Semenovka-Golovkovskaya Briquette Plant	Under construction (1950).
	Yurkovskaya Briquette Plant	Under construction (1950).
	Lignite Briquette Plant, Simferopol, Crimea Oblast	No additional information.
Urals	Yermolayevskaya Briquette Plant, Bashkiria	Under construction (1950).
	Briquette Plant, Volchanka, Sverdlovsk Oblast	Under construction (1947-49).
Moscow Basin	Briquette Plant, Bronnitsy Station, Moscow Oblast	To be assembled during 1949-50 (1949).
	Briquette Plant, Yepifan	Under construction (1947-48).
Central Asia	Briquette Plant, Fergana Oblast	Production in 1950, 10,000 tons; planned production, 15,000 tons.
	Briquette Plant, Angren, Uzbek SSR	Under construction (1950); to operate in 1952.
Far East	Briquette Plant, Raychikhinsk	No additional information.
	Briquette Plant, Artemgres, Primorskiy Kray	Under construction (June 1949).
Karaganda	Briquette Plant, Novi-Gorod (Suburb of Karaganda)	Under construction (1947-49).

Table 59

Peat Briquette Plants in the USSR 290/

Region	Location and Installation	Comment
Ia (RSFSR)	Boksitogorsk Peat Dehydrating Works, Boksitogorsk, Leningrad Oblast	Operation started in 1949.
	Farnovskiy Peat Briquette Plant, Leningrad Oblast	Under construction; equipment to be imported from Sweden (1947).
	Peat Briquette Plant, Yanino, Leningrad Oblast	Built during period 1946-August 1949.
IIa (Estonia)	Briquette Plant, Lavasaari	Briquettes shipped to Moscow, Leningrad, and Tallinn.
	Peat Briquette Plant, Oru	To be constructed under the Five Year Plan; production, 50,000 tons per year.
	Briquette Plant, Poravere	No additional information.
	Tootsi Peat Briquette Plant, Pyannu	Production in 1950, 55,000 tons; profit in 1950, 3.5 million rubles.
IIa (Latvia)	Balozhi Peat Briquette Plant, Balozhi	Operation at capacity started in 1949.
IIa (Lithuania)	Baltoyi Voke Briquette Plant, Baltoyi Voke, Vil'nyus Uyezd	Operation started in November 1949; called "first peat briquette plant in Lithuania."
	Peat Briquette Plant, Shaulyay	Under construction (1946).
IIb (Belorussia)	Peat Briquette Plant, near Belokorovichi Station, Zhitomir Oblast	Under construction; to be completed in 1948; production of 50,000 tons per year, mainly for household use.
	Peat Briquette Plant, Smolevichi, Minsk Oblast	To be completed by 1950 under Five Year Plan (doubtful) (1949).
	Vertselishki Briquette Plant	Construction planned (1949).
	Peat Briquette Plant, Zhitkovichskiy Rayon, Polesskaya Oblast	Under construction (1949).

Table 59

Peat Briquette Plants in the USSR 290/
(Continued)

Region	Location and Installation	Comment
V (Armenian SSR)	Peat Briquette Plant, Kalinino	Under construction (1949).
VI (Tatar ASSR)	Peat Briquette Plant, near Kazan	No additional information.
VII (RSFSR)	Dulevskiy Peat Briquette Plant, Moscow Oblast	Construction completed (1949); production, 10,000 tons per year.
	Orudyevskiy Peat Briquette Plant, Moscow Oblast	Operation started in 1946; production for household use.
	Peat Briquette Plant, Dmitrov, Moscow Oblast	Planned production in 1946, 10,000 tons; actual production in 1946, 6,000 tons.
	Peat Briquette Plant, Orekhovo, Moscow Oblast	Operation started in 1938; prewar output, 60,000 tons per year.
VIII (RSFSR)	Peat Briquette Plant, Berezovskiy, Sverdlovsk Oblast	Being equipped for production (1946).

VI. Fuelwood.

A. General.

Fuelwood production should be regarded as originating from two distinctly different sources. One is the fuelwood derived from large-scale logging operations, which are carried on primarily for industrial wood or lumber by the various ministries. Statistics on fuelwood from this source are compiled by subtraction of the industrial wood from the total wood felled and handled by the ministries. Such a subtotal, obtained by difference, is suspect in that part of it may not be consumed as fuel but may be wasted, with no attempt at utilization. Despite this probability of overstatement, the data on fuelwood from commercial-scale operations represent the only official -- and hence relatively firm -- statistics available on production. These statistics provide a reasonably satisfactory base from which to estimate the amount of fuelwood produced from the second source of supply.

The second source of fuelwood is from small self-contained and purely local lumbering operations, such as those attached to kolkhozes and small settlements, and also from individual efforts of the population to obtain fuelwood. Since there are no data available on production from this source, estimates must be made, and it is assumed for purposes of this report that this local production is equal to the planned production from commercial operations.

The data on fuelwood do not include the wood used to produce charcoal. Such wood is more properly classed as industrial or chemical wood.

Fuelwood has always been an important source of energy in the USSR. Production of coal and other fuels has increased, however, and the relative importance of fuelwood has declined. In 1940, fuelwood production from planned commercial operations was stated to be 120 million cubic meters. 291/ In the Fourth Five Year Plan (1946-50), planned production of fuelwood was to be only 90 million cubic meters, approximately a 25-percent reduction from this source.

Fuelwood production from planned or commercial operations is controlled by about 14 different ministries. The Ministry of Timber Industry, however, controls nearly half of the planned output of round wood, or timber. Consequently, it controls about half of the planned fuelwood production. There are very few centralized controls on the production of fuelwood by the small local groups.

B. Supply.

The planned large-scale logging operations are concentrated in the Karelo-Finnish SSR and in the upper Volga and Ural areas of the RSFSR. Other concentrations are in the far eastern region of Siberia. Local production of fuelwood would be greatest in the heavily populated western part of the USSR.

It is noted from Table 60* that annual fuelwood production followed an irregular but slightly downward trend from 1920 through 1936. This trend was interrupted by a rising trend through

* Table 60 follows on p. 190.

Table 60

Annual Fuelwood Production in the USSR a/
1913, 1920-51

Million Cubic Meters

Year	Production	Year	Production
1913	180	1935	196
1920	233	1936	191
1921	234	1937	208
1922	234	1938	212
1923	201	1939	227
1924	185	1940	240
1925	215	1941	220
1926	214	1942	200
1927	221	1943	200
1928	211	1944	200
1929	201	1945	200
1930	202	1946	190
1931	212	1947	180
1932	205	1948	175
1933	197	1949	175
1934	205	1950	180
		1951	182

a. Within the following territorial limits: 1913, Russian Empire; 1920-38, present de facto boundaries, including the Baltic Republics and territory taken from Finland, Poland, and Germany but excluding territory taken from Rumania, Czechoslovakia, and Japan during World War II; 1939-51, present de facto boundaries. Data are estimates of total production, including planned and local gathering. The measure is a cubic meter of solid wood content and is not a stacked measure.

1940, after which the irregular downward trend appears to have been resumed. The high annual production for the period was in 1940, and the low in 1948-49. The 1951 output of 182 million cubic meters was only slightly above the low point of 175 million cubic meters in 1949.

During the war years 1941-45, fuelwood became more important owing to the loss of the Donbas and to transport difficulties. In 1940, fuelwood represented 51 percent of the total planned harvest of wood, whereas in the war years 292/ two-thirds of the planned harvest was fuelwood. Greater activity in local gathering of wood, however, probably contributed a greater proportion to the relatively high total production in the war period.

C. Consumption.

The Soviet desire to reduce consumption of fuelwood is caused in part by the difficulties arising from its transportation and in part by the fact that it is an uneconomical fuel, except for purely local use. One-third of the wood logged, however, still is used for fuel. Fuelwood per unit of heat obtained is 6 times more expensive than coal, 2 times more expensive than peat, and 3 to 4 times more expensive than gas. On this basis of cost alone, Soviet authorities are continuing to replace fuelwood as far as possible by other fuels. Such replacements will take place in large industrial centers, particularly in the west, where long distances are involved in transporting fuel supplies. For example, supplying Moscow with gas from Saratov is said to have replaced about 3 million cubic meters of fuelwood. 293/ The scale of replacement of wood by coal in Moscow can be judged by the conversion of more than 58,000 furnaces and stoves from wood to coal during 1949. In Leningrad, annual consumption of fuelwood was reduced from 5 million to 2 million cubic meters by the completion of the Kokhtla-Yarve-Leningrad shale-gas pipeline at the end of 1948. It has been reported that the plan was to reduce the amount of fuelwood used in centralized heating systems throughout the country from 13.9 percent in 1940 to 9.7 percent in 1950. 294/

In local areas deficient in mineral fuels, however, use of fuelwood is being expanded. The Fourth Five Year Plan (1946-50) specified increased use of wood-fired gas generators and steam engines in logging operations. The Plan also required the conversion to wood fuel of not less than 70 percent of the tractors used for hauling wood. Seventy plants in 1940 were under construction for the production of wood chips for automobile gas generators. 295/ It has been estimated that about 100,000 wood-burning cars and trucks were in operation in the USSR in 1942.

Information on general consumption of fuelwood is virtually nonexistant. [redacted] wood-burning gas generators consume nearly 5 million meters of fuelwood. This statement probably relates to the middle 1940's. [redacted] Georgia, a poorly forested area, probably will require about 2.5 million cubic meters of fuelwood in the course of the Fourth Five Year Plan.

D. Reserves.

The USSR has larger resources of timber than any other country. Its forest reserves represent more than one-third of the world total reserves. Forests occupy a total of more than 1.1 billion hectares. Of this area, more than 700 million hectares are said to be continuous forests, with a useful store of 40 billion to 45 billion cubic meters of wood. Yearly natural growth is roughly estimated to be 700 million to 800 million cubic meters.

Much of this timber, however, is inaccessible at present. More than 70 percent of the forests are east of the Urals, where only one-fifth of the Soviet population dwells, and less than 30 percent are in European USSR, which has 80 percent of the population. This distribution, coupled with inadequate transportation facilities, has resulted in overcutting in some of the easily accessible and densely populated western areas.

VII. Charcoal.

Significant quantities of charcoal are produced in the USSR, primarily for use in the production of high-quality pig iron. In the past, most of the charcoal production came from either charcoal kilns or antiquated wood-carbonization plants. Since the start of the Five Year Plans, however, several large, modern wood-carbonization plants have been built and put in operation. The USSR currently is devoting more attention to wood-chemical plants, of which many would produce charcoal as a by-product. Immediately before World War II, the wood-carbonization industry was centered largely in the Urals, and more specificially in the Chelyabinsk and Sverdlovsk oblasts. A smaller production was in northern European USSR in the Archangel and Vologda oblasts. In addition, there were scattered plants in the Ukrainian and Belorussian republics and in the Moscow, Kineshna, and Gor'kiy oblasts. 297/ Despite the growth of the wood-carbonization industry, it is believed that a sizable part of the charcoal used to make pig iron comes from primitive stills operated with little or no recovery of distillation products other than the charcoal.

Information on production is scattered and very incomplete. It has been reported that the Sverdlovsk and Chelyabinsk oblasts alone produced more than 1 million tons of charcoal annually during the 1930's. Of the total 1934 output of the Urals area, 1,272,000 tons of charcoal were consumed in the production of pig iron. This tonnage was [redacted] approximately five-sixths of the total output of charcoal in the USSR during that year. 298/ [redacted] charcoal production in the Urals area during the late 1930's was in the neighborhood of 4 million cubic meters per year. 299/ This production would require approximately 10 million cubic meters of wood. [redacted] steel plants during 1938-39 were using from 3 million to 3.5 million cubic meters of charcoal. 300/ The Third Five Year Plan (1938-42) called for a production of pig iron which would require 1.5 million tons of charcoal in 1942. [redacted] the established input was 4.5 to 5 cubic meters of charcoal per ton of pig iron. The actual consumption, however, was never under 6 to 7 cubic meters per ton of pig iron during the prewar years. During World War II the input was as high as 7 to 8 cubic meters. Despite improvements since the war, the input still is 6 to 7 cubic meters per ton of pig iron.

50X1
50X1
50X1
50X1
50X1

Based upon an extremely rough estimate of production of charcoal pig iron, it is further estimated that about 5,850,000 cubic meters of charcoal were consumed in 1951 in iron metallurgy. This charcoal would have required roughly 14.5 million cubic meters of wood.

VIII. Oil Shale.

Oil shales are sedimentary rocks containing sufficient quantities of carbonaceous material to make it economically feasible to use them as solid fuels or as sources of shale gas or oil.

A. General.

Deposits of oil shales have been known and exploited in varying degrees at widely separated localities in the USSR. The most extensively developed deposits are in the Estonian SSR and the Leningrad and Kuybyshev oblasts of the RSFSR. More information is available on the Estonian deposits, which have been exploited in greater degree than any of the others. The deposits in Leningrad Oblast doubtless are similar to those in Estonia, as both are the same stratigraphic horizon.

In Estonia the deposits are known as kukersite. They are a fossiliferous, calcareous oil shale of light, yellowish-brown color. They occur in beds from 2 to 30 inches thick, alternated with Ordovician limestone beds of somewhat similar thickness and comprise a single workable complex series containing usually 6 shale beds. The strike is roughly east-west, virtually parallel to the Gulf of Finland, along which the beds outcrop. The beds have a slight dip of approximately 12 minutes toward the south, thin gradually to the east, and are only 1 inch thick at Tallinn. To the west the beds thin more gradually and are still of workable thickness in Leningrad Oblast near Veymarn and also to the south. It has been estimated that commercially workable beds underlie an area of about 120 by 30 kilometers in Estonia. 301/

In places the shale is much harder than coal, although softer than the neighboring limestones. After mining, the shale decrepitates slowly on exposure to weather. The oil substance is present in the shale as minute, solid, dry spheroids of amber color. The shales in Estonia and the Leningrad Oblast are among the richest in the world. They have an average organic volatile content of 41 percent, carbon content of 10 percent, and ash content of 49 percent. The carbon dioxide content of the minerals is included with the ash. 302/

The first steps toward utilization of the oil shales in the Baltic area were taken by the Russians during World War I, when Petrograd (Leningrad) suffered a fuel shortage. Based upon surveys and experiments during 1914-18, the Russians planned to establish an oil shale mine of 150,000 tons per year at Kokhtla in Estonia. The shale was to be shipped to the gas plant in Petrograd and used as a substitute for coal. Until the occupation of Estonia by the Germans in 1917 the Russians had mined only 820 tons. 303/

The Russians persisted in their efforts to develop local fuels for Leningrad. They discovered and developed on a small scale (25,000 tons per year) the oil shale deposits near Veymarn in the Kingisepp district of Leningrad Oblast. Also, during 1930-35, they developed oil shale mines in the Gdov district, near the Estonian border at Slantsy. Gasification experiments were continued but did not advance beyond large-scale pilot tests. In 1937 the USSR started construction of a shale oil refinery in the Gdov district, but this was stopped by the German occupation in 1941.

Estonia, as an independent state, following World War I, developed an oil shale industry rapidly and made it the most important branch of its industry. In the late 1930's, it was one of the leading shale industries in the world. In 1939 the USSR occupied Estonia and, in 1940, nationalized the industry. This change had no effect on oil shale production except that the USSR initiated more ambitious plans. When the Germans invaded Estonia and the Leningrad Oblast in 1941, the retreating Soviet forces disabled the oil shale plants and mines. Extensive plans for rehabilitation and reorganization of the industry were made by the Germans. These plans were only partly fulfilled when Soviet forces reoccupied Estonia in September 1944, just before the German-built plants were ready to operate. The retreating Germans very effectively destroyed the mines and plants. Ambitious postwar Soviet plans for rehabilitation of old and construction of new oil shale operations have been only partly fulfilled in the Baltic area.

Outside the Baltic area the Soviet oil shale industry has been developed principally in the Kuybyshev and Saratov oblasts. Output was small until 1931, when the USSR initiated its first plan for development of a shale industry and the technology of utilization of the shale. Although progress was made until World War II, it was not so substantial as that in Estonia.

Since the end of the war the oil shale industry in the RSFSR has been administered by the All-Union Ministry of the Coal Industry. Until about 1951 the industry in Estonia was directed by the Estonian Ministries for Oil Shale Industry and for Rehabilitation of the Oil Shale Industry. In 1951 the greater part of the mines and plants, especially in the territory east of Kokhtla-Jarve, was taken from Estonian direction and placed under control of the Ministry of the Coal Industry in Moscow. The mines in the western half of the Estonian fields remained under control of the Council of Ministers, Estonia SSR. 304/

B. Supply.

Although the Estonian oil shale deposits had been known and investigated more than a century ago, their commercial utilization was not attempted until World War I. In the RSFSR the deposits in the Leningrad Oblast and the central Volga area were developed shortly after World War I. The rate of development increased rapidly during the 1930's, and annual production reached a pre-World War II peak of 2,726,000 tons in 1940, as indicated in Table 61.*

* Table 61 follows on p. 196.

Table 61

Production of Oil Shale in the USSR
1920, 1925, 1928-51

Thousand Tons

Year	Estonian SSR	RSFSR	Total
1920	48.7 a/	29.8 j/	78.5
1925	288.1 a/	11.1 j/	299.2
1928	446.0 a/	9.4 j/	455.4
1929	517.6 a/	19.7 j/	537.3
1930	498.0 a/	28.8 j/	526.8
1931	499.4 a/	145.2 j/	644.6
1932	492.6 a/	318.2 k/	810.8
1933	487.0 b/	201.6 k/	688.6
1934	589.0 c/	206.4 k/	795.4
1935	604.3 c/	417.0 k/	1,021.3
1936	766.4 c/	470.0 f/	1,236.4
1937	1,136.3 c/	520.0 l/	1,656.3
1938	1,474.2 c/	550.0 m/	2,024.2
1939	1,666.9 c/	585.0 m/	2,251.9
1940	1,995.0 d/	731.0 n/	2,726.0
1941 Plan	2,700.0 d/	1,200.0	3,900.0
1941	1,800.0 e/	380.0 f/	2,180.0
1942	500.0 f/	470.0 f/	970.0
1943	1,300.0 d/	560.0 f/	1,860.0
1944	2,000,0 d/	650,0 f/	2,650.0
1945	1,260.0 g/	730.0 o/	1,990.0
1946	2,000.0 h/	1,400.0 o/	3,400.0
1947	2,500.0 f/	1,870.0 o/	4,370.0
1948	3,000.0 f/	1,970.0 f/	4,970.0
1949	3,210.0 f/	2,120.0 f/	5,330.0
1950 Plan	8,410.0	1,590.0 p/	10,000.0 q/
1950	3,600.0 i/	2,320.0 f/	5,920.0
1951	3,950.0 f/	2,500.0 f/	6,450.0

a. 305/
b. 306/
c. 307/
d. 308/
e. 309/

Table 61

Production of Oil Shale in the USSR
1920, 1925, 1928-51
(Continued)

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f. CIA Estimates.
g. 310/
h. 311/
i. 312/
j. 313/
k. 314/
l. 315/
m. 316/
n. 317/
o. 318/
p. Difference between reported totals for USSR and the Estonian SSR.
q. 319/

During World War II, in 1941 and 1944, the oil shale mines and plants in Estonia and the Leningrad Oblast were seriously damaged. The mines in the Volga area suffered no damage, since the area remained under Soviet control. Following the war the upward trend in exploitation was resumed, and in 1951 the annual output was estimated to be 6,450,000 tons. The industry in the Estonian SSR produced 61 percent of the total, and the remainder came from mines of the RSFSR, principally in the Leningrad and Saratov oblasts.

In Estonia, oil shale is obtained from both underground mines and open pits. Before World War II, most of the shale came from underground mines. In the reconstruction by the Soviet government, however, several new, large open pits have been opened on the Ahtme - Johvi railroad and one to the east of Kokhtla. Consequently, the proportion of open-pit shale currently would be much larger than before the war. The Fourth Five Year Plan (1946-50) called for the construction of 11 new pits in the area between Kokhtla and Ahtme. 320/

Before World War II, mining operations in Estonian mines were crude. Drilling, loading, and face or room haulage were done manually. It was not until 1938 that forced ventilation was used for the first time. During the German occupation, major steps in mine mechanization were taken. Under Soviet control the major mines were electrified, and mechanization was stressed. Drilling, cutting, and loading machines and heavy electric locomotives were brought in rapidly. In 1950, two-thirds of the total shale output was mined by heavy cutting machines. A radical change during 1949-50 was the conversion from the room-and-pillar method to the twin-drift method of extraction. In 1951 the shale mines were instructed by the Ministry of the Coal Industry to convert to the cycle work schedule. 321/

In the Leningrad Oblast, practically all phases of shale mining reportedly have been mechanized, from cutting the shale to loading it into railroad cars on the surface. 322/ In the postwar period, underground operations in the Gdov (Slantsy) area have been rehabilitated and enlarged, and construction has been started on new mines. In the past there was small-scale mining of oil shale near Veymarn, about 75 kilometers northwest of the Gdov deposit at Slantsy. Although there is no information available on the current status of these operations, it is believed that the Veymarn area is inactive insofar as oil shale mining is concerned.

Specific, current production data for the Leningrad Oblast are not available. In 1934 the new Gdov mine produced 57,172 tons. This was the only large mine in the area at the time. In December 1934, nearly 10,000 tons were mined -- an annual rate of 120,000 tons. 323/ The construction of some large shafts was started in the Gdov deposits in 1934, and one of these started operation in 1939. 324/ In 1941 it was planned to mine 610,000 tons in the Leningrad Oblast.

Only fragmentary information is available on postwar activity on oil shale deposits in other parts of the USSR. According to the 1941 Plan, 540,000 tons of oil shale were to be mined in the southeast part of the RSFSR, presumably in Kuybyshev and Saratov oblasts and possibly in Chuvash ASSR and Chkalov Oblast. It also was planned to mine 50,000 tons in the "Center," presumably south of Moscow at Buzuluk. In 1934 the Kashpir mine in Kuybyshev Oblast and the Savelev mine in the Saratov Oblast mined 107,727 tons and 41,529 tons, respectively. Peak monthly production of the Kashpir mine in 1934 was slightly more than 13,000 tons, and peak monthly production of the Savelev mine was nearly 6,000 tons. 325/ The Kashpir and Savelev mines were reported to be active at the close of 1947, and new mines were reported to be under construction in the Kuybyshev Oblast. Other active shale mines in 1947 were said to be the Ul'yanovskiy mine. 12 kilometers from Ul'yanovsk in Kuybyshev Oblast; a mine 11 kilometers from Ozinki in Saratov Oblast; and a mine 90 kilometers south of Buzuluk in Andreyevskiy Rayon, Chkalov Oblast. 326/

No information is available on the current status of the oil shale mines at Buinsk in Chuvash ASSR and at Kinderlyk in the East Kazakh Oblast of the Kazakh SSR. 327/

C. Consumption and Distribution.

Oil shale has three primary uses in the USSR: as a solid fuel, as raw material for production of shale gas, and as raw material for production of shale oil. The first commercial interest in Estonian oil shales was the unsuccessful attempt by the Russians during World War I to use the shales as raw material for gas manufacture in Leningrad. The first shale oil plant was built in 1924. From this it is evident that by far the largest part of the oil shale mined during the 1920's was used as solid fuel. By 1934 the use of oil shale as solid fuel represented 59 percent of total Estonian production. By 1939 it was only 42 percent of the total shale mined. 328/ Destruction of the shale oil plants during World War II reversed this trend, as the mines could be rehabilitated faster than the refineries. In all probability, most of the oil shale mined during the immediate postwar years was used as solid fuel. However, the restoration of old refineries, the completion of new ones, and the establishment of a shale gas industry undoubtedly have renewed a downward trend in use as solid fuel. No information is available as to the current proportion of total mine output that is used for solid fuel.

Run-of-mine oil shale in Estonia is crushed and screened in three size groups, each of which is used as solid fuel. The average characteristics of the three grades are shown in Table 62.*

The largest and intermediate size groups also are in demand for manufacture of shale oil and shale gas. The fine size can be used in only one of the various gas or oil refining processes. It is also the most difficult to use as a solid fuel. Despite efforts to develop uses for this fine grade, stocks have accumulated and were estimated to be about 800,000 tons on 1 January 1950. 329/ The fine size has been used principally in thermal electric power plants, in the cement plant at Kunda as both fuel and raw material, to supply heat needed in the gas and oil refining processes, and in other Estonian industries equipped to use such material. The intermediate and large sizes are used as solid fuels for industrial and household purposes.

During the last years of Estonia's independence, electric power stations used 350,000 tons, and other consumers used

* Table 62 follows on p. 200.

Table 62

Characteristics of Oil Shale Mined in the Estonian SSR

Size (mm)	Moisture (Percent)	Ash (Percent)	Heat Value (Cal per kg)
100-40	11-20	50	3,500
40-10	12-25	55	3,100
10 and Less	15-30	60	2,500
Unsized	15-25	55	2,900

550,000 tons of oil shale as solid fuel. The railroad consumption would represent a large part of the latter figure. The shale at present is used both as fuel and raw material in cement plants at Leningrad, at Kunda in the Estonian SSR, and at Riga and Broceni in the Latvian SSR. Its use also was planned in a new cement plant in the Lithuanian SSR. 330/

A newly developed use has been the partial substitution of oil shale for foundry coke. A foundry shop at Tallinn in the Estonian SSR found that the shale could replace from 30 to 35 percent of the normal coke requirements and at the same time eliminate the need for limestone as a flux. A Latvian foundry has found that shale could replace almost 22 percent of its daily coke requirements. 331/

No direct information is available on the use of oil shale as solid fuel near other producing districts in the USSR outside the Baltic area. It is believed that most of the production is used as solid fuel because there is knowledge of only a few refineries in these districts. One of the refineries is at Ul'yanovsk, another is at Ostashkovo, and there possibly may be a third near Kashpir. 332/

D. Reserves.

There are extensive reserves of oil shale in the USSR. The largest and richest are those in the Estonian SSR, for which the commercially workable reserves have been estimated at 4 billion to 6 billion tons. 333/ In 1932, reserves were reported to total

7,177 million tons within the boundaries of the USSR at that time, as shown in Table 63.

Table 63

Oil Shale Reserves in the USSR 334/
1932

Area	Amount (Million Tons)	Heat Value (Cal per kg)
Lower Volga	2,573	1,000-3,675
Middle Volga	1,511	1,000-3,600
Nizhne Gorod	1,274	1,000-3,380
Bashkir	132	1,498-1,898
Leningrad	1,687	2,300-5,400
Total	7,177	

[redacted] listed oil shale reserves as 800 million tons in Gor'kiy Oblast, 2 billion tons in Kirov Oblast, 5 billion tons in Kuybyshev Oblast, 4 billion tons in Saratov Oblast, 400 million tons in Chuvash ASSR, and 70 million tons in Tatar ASSR. 336/ 50X1

IX. Intentions, Capabilities, and Vulnerabilities.

A. Intentions.

Soviet objectives during the Fifth Five Year Plan (1951-55) are to increase coal production by 43 percent, to 375 million tons, and to increase peat production by 27 percent, to about 45.3 million tons. Coke-oven capacity is to be enlarged 80 percent, to about 60 million tons. Also, there is to be considerable expansion in output of coal briquettes and oil shale.

While intentions with respect to fuelwood are not known, it is possible that its use may decline. According to the Fourth Five Year Plan (1946-50) there was to be a reduction in output of fuelwood because transportation was such a problem. It is much cheaper to use coal, especially if wood has to be transported long distances.

The current Five Year Plan does not refer to charcoal, but the previous Plan called for expansion of wood-chemical production, in which charcoal is a by-product. The objectives were not attained, and it is believed that intentions are to continue expansion.

The planned increases in production of solid fuels appear to be in accord with the trend of growth for industry in general and cannot be considered as indications of warlike intentions. Expansion in the coal industry in particular, however, does contribute a great deal to the military potential, since it is a basic raw material in ferrous metallurgy, power generation, and transportation.

B. Capabilities.

During the last 3 years of the Fourth Five Year Plan, coal production showed an average annual increase of 26 million tons, but in 1951 the increase amounted to only 21 million tons over 1950. According to figures furnished by Malenkov in October 1952 the annual increase in 1952 would be only 15 million tons. The reason for the greater increases in the 1948-50 period was mainly the rehabilitation of the Donbas, where mines were already developed and where it was necessary only to drain them and install equipment. The restoration of the Donbas to full capacity, completed in 1950, was reflected in a slower rate of output growth in 1951 and 1952.

A planned increase of 113 million tons by 1955 as compared with 1950 requires an average increment of 22.6 million tons annually. Prospects appear favorable for attaining the objective. New strip mines at the brown coal deposits in the Ukraine and the Urals can provide a significant boost in output, and the level of labor productivity should rise as a result of the use of more combines in underground mines.

The possibilities of expanding coke-oven capacity 80 percent in the 1951-55 period appear unfavorable, if past accomplishments are any criterion. Also, it is very doubtful that sufficient coking coal would be available by 1955 for the planned coke-oven capacity, which would be nearly 60 million tons.

Peat production should reach the 1955 target of 45.3 million tons, which is only 1 million tons more than the 1950 goal.

All evidence indicates that briquette production under the Fourth Five Year Plan fell far short of the 1950 Plan figure of 7.4 million tons. The completion of plants now under construction, however, will result in sizable expansion of output. Capabilities for supplying enough briquetting equipment are believed to be improving.

Production of fuelwood could be increased somewhat above recent levels if the Soviet government desired an increase, but it is probable that the production of fuelwood will be permitted to decline as other fuels become more plentiful.

The growth in output of charcoal in the Urals will depend on construction of new wood-chemical plants. Some expansion is to be expected, but it is not possible to forecast the rate at which the expansion will take place.

Oil shale is easily mined, but requirements for shale depend upon building facilities for liquification and gasification. Several new gas plants were under construction in 1950 and probably have been completed. It is believed that the USSR is in position to carry out a moderate expansion in gas-producing facilities.

C. Vulnerabilities.

The USSR is capable of satisfying all essential requirements for solid fuels from indigenous production. From a military point of view, the solid fuels industries have relatively little direct vulnerability.

Coal mines are numerous and widely dispersed and therefore offer poor targets for bombing, but there are obvious possibilities for sabotage. In deep, gassy, and dusty mines that employ many forced laborers, disastrous mine explosions could easily be initiated providing that opportunities were favorable.

Since coal mines are dependent, for the most part, on central power stations for electricity, it is obvious that coal production can be affected by destroying power stations. The effect on coal production as the result of destruction of coal-mining machinery plants would not be immediate, and it might not be important unless several of the more important plants were included. There are numerous repair plants capable of making many kinds of machine parts.

Another point of indirect vulnerability is in the transport system, especially between the Kuzbas and the Urals area, where coal traffic is very heavy. Without coking coal or coke the Urals area would become immeasurably weakened.

Many coke plants are located at the steel mills, which are also among the important industrial targets for bombing.

APPENDIX A

FOURTH FIVE YEAR PLAN (1946-50)

The Fourth Five Year Plan had the following objectives for the coal industry:

1. Increase coal output to 250 million tons in 1950, or 51 percent over the prewar level.

2. Produce 88 million tons of coal in the Donbas in 1950 and exceed the prewar level of output.

3. Increase the output of coking coal to 57.7 million tons from the Donbas, Kuzbas, Karaganda, Kizel, Pechora, Tkvarcheli, and Tkibuli mines.

4. Open new coal fields in the Bureya Basin in Khabarovsk Kray, at Ekibastuz in Kazakh SSR, at Knyurgas in Bashkir ASSR, and at Uzgen in Kirgiz SSR. Also, extract coal from local fields in all regions of the country where deposits could be developed to the utmost with a view to substituting local fuel for outside supplies.

5. Rehabilitate 182 large pits in the Donbas with a total capacity of 67.7 million tons.

6. Construct the following new mines*:

7. Increase the number of machines used in the coal industry 3 or 4 times the prewar number.

8. Build 13 new machinery plants for the coal industry and reconstruct 16 plants producing mine machinery.

9. Utilize extensively metal and ferroconcrete proppings in place of wooden proppings.

* Number, capacity, and regional location of the projected new mines are shown in tabular form at the end of this Appendix.

10. Improve the quality of coal by concentration, by screening, and by briquetting by the following means: establish large-scale, technically up-to-date mechanized plants; construct 271 concentration plants, with a total capacity of 175 million tons annually; rehabilitate 6 plants, with a total capacity of 9 million tons; and construct 26 coal briquetting plants, with an annual capacity of 10 million tons.

11. Mechanically concentrate in 1950 a total of 150 million tons of coal; comprising 53 million tons of coking coal, including all coking coal with an ash content exceeding 7 percent; and 97 million tons of coal for electric power plants, including all such coal exceeding 10 percent ash.

12. Bring the production of briquettes up to 7,400,000 tons in 1950.

13. Install concentration and screening equipment at all new pits.

14. Build a large plant for manufacturing coal-preparation equipment in the Donbas and another in the Kuzbas.

15. Survey 765 sites with a view to starting new mines and strip mines with a total annual output of 361 million tons of coal, including 131 sites in the Urals, 135 in the Moscow field, 660 in the Karaganda field, 60 in the Kuzbas, and 140 in the Donbas.

16. In the RSFSR, produce 141.9 million tons in 1950 and survey 488 sites suitable for sinking mines with a projected annual capacity of 221 million tons.

17. In the Ukrainian SSR, produce 86.1 million tons in 1950, put into operation during the period 1946-50 coal mines with an aggregate capacity of 77.5 million tons in the Stalino and Voroshilovgrad regions, extend exploitation of the coal fields in the regions west of the Dneiper and in the western Ukraine, and produce 6 million tons of brown coal in these areas in 1950. Production of the Ukraine, exclusive of the lignite, was planned to be 81.1 million tons.

18. In Uzbek SSR, produce 1.13 million tons in 1950.

19. In Kazakh SSR, produce 16.4 million tons in 1950; in addition to 17 mines at Karaganda, open 4 mines with an annual capacity of 270,000 tons in the Aktuybinsk field and an open-cut working with a capacity of 600,000 tons in the Ekibastuz field; and open coal mines under the jurisdiction of the Kazakh SSR with a capacity of 400,000 tons.

20. In the Georgian SSR, produce 2.4 million tons in 1950.

21. In Kirgiz SSR, produce 1.6 million tons in 1950, put into operation mines with a capacity of 825,000 tons, put into operation mines under the jurisdiction of the SSR with a capacity of 125,000 tons, and prepare sites during the Five Year Plan with a capacity of 5.5 million tons.

22. In Tadzhik SSR, produce 440,000 tons in 1950, build mines with an annual capacity of 100,000 tons, and build a railroad to the Ziddy coal field.

23. In Turkmen SSR, produce 60,000 tons in 1950.

The new mines referred to under 6, above, are grouped as follows:

Coal Basin	Number of New Mines to be Constructed	Production Capacity (Tons)
Donets	60	14,100,000
Moscow	66	18,800,000
Kuznetsk	30	18,000,000
Karaganda	17	6,500,000
Pechora	29	7,700,000
Urals	49	19,000,000
East Siberia	10	5,000,000
Far East	8	1,250,000
Central Asia	9	3,200,000
Western Ukraine	13	9,700,000
Caucasus	10	3,200,000
Others	N.A.	8,850,000
Total		115,300,000

APPENDIX B

ADMINISTRATIVE ORGANIZATION OF THE COAL INDUSTRY IN THE USSR 337/

The Ministry of the Coal Industry (Ministerstvo Ugol'noy Promyshlennosti) consists of a central apparatus and a series of Main Administrations. The central apparatus consists of sections and subsections. The Main Administrations of the Ministry are organizationally equivalent to sections, except that each has its own balance sheet. The Main Administrations and their functions are as follows:

1. Glavuglerazvedka (Main Administration of Coal Prospecting).

   Locating and surveying of untapped coal deposits.

2. Glavshakhtoproyekt (Main Administration of Mine Designing).

   Planning of new mines, through special project offices (such as in Leningrad and Khar'kov).

3. Glavuglemash (Main Administration of Coal Machine Building).

   Direction of all factories producing coal-mining machines, equipment, and accessories.

4. Giprouglemash (State Planning, Designing, and Experimental Institute for Coal Mine Machinery Building).

   Designing and testing of new equipment.

5. Orguglemash (Institute for the Improvement and Modernization of Coal Mining Machinery Concerns).

6. Glavuglesnab (Main Administration of Material and Technical Supply).

   Organization and direction of the flow of supplies to all enterprises within the Ministry's jurisdiction, through local "supply bases" or depots.

7. Glavurs (Main Administration of Workers' Supply).

Centralized supply of all workers and employees of coal industry enterprises with food rations and consumer goods.

8. Glavuglesbyt (Main Administration of Coal Marketing).

Centralized marketing of coal. All coal produced throughout the country is placed at the disposal of this Administration, which distributes it among consumers according to the provisions of the State Planning Commission's fuel program.

9. Glavprofob (Main Administration of Professional Education).

Training of skilled workers and filling of cadre requirements.

10. Glavugleobogashcheniye (Main Administration of Coal Cleaning and Briquetting).

Designing of coal-cleaning and briquetting plants.

11. Glavtransupr (Main Administration of Transport).

Direction of the transport of coal.

12. Glavslanets (Main Administration of the Shale Industry).

Direction of the oil shale mines.

Ministry officials in combines, trusts, and mines occupy the following positions:

1. Combines.

   a. Entire managing staff
   b. Section chiefs
   c. Subsection chiefs
   d. Miscellaneous officials assigned to combine level (supervision, inspectors, etc.)

2. Trusts.

   a. Manager
   b. Deputy Manager
   c. Chief Engineer
   d. Chief Geologist
   e. Chief Accountant

3. Mines.

   a. Mine Chief
   b. Chief Engineer

Combine officials occupy the following positions in trusts and mines:

1. Trusts.

   a. Section chiefs
   b. Production section and shop chiefs
   c. Chief Surveyor
   d. Senior Engineer
   e. Senior Technical and Security Engineer
   f. Miscellaneous combine officials

2. Mines.

   a. Chief Mechanic
   b. Chief Surveyor
   c. Chief Engineer
   d. All sector chiefs

Trust officials occupy the following positions in mines:

1. All engineers and technicians
2. Production section and shop chiefs
3. Foremen and mechanics

The structure of a trust is given as follows:

1. Administration.

   a. Manager
   b. Deputy Manager
   c. Chief Engineer

2. Direction.

   a. Inspector
   b. Special engineers
   c. Legal Consultant

3. Sections.

   a. Technical

      (1) Chief Geologist
      (2) Senior Engineer
      (3) Chief Surveyor
      (4) Technical and Security Engineer

   b. Chief Mechanic
   c. Capital Repair
   d. Labor and Wages
   e. Planning and Statistics
   f. Accounting and Finance
   g. Personnel and Cadre
   h. Administrative-Economic
   i. Special

4. Production Sections and Independent Shops. (separate balance sheet)

   a. Worker Supply Section

Running of canteens and messes at mines and workers' settlements; also collective farms and gardens for miners.

   b. Material-Technical Base

Procurement and central warehouses of machines, instruments, parts and accessories, lumber, personnel equipment, fuel, and explosives.

c. Project Section

Drawing up of plans and estimates for new mining projects and for capital repairs on mines already in operation.

d. Railroad Section

Exploitation of railways and rolling stock. Twenty-four-hour dispatcher service daily; regulating of incoming rail traffic, loading of coal at mines, and outgoing shipments.

e. Motor Pool ("Auto Base")
f. Central Mechanical Workshops
(150 to 200 skilled workers)

Second and sometimes first echelon maintenance of mine equipment.

Manufacture of small spare parts and accessories not available in trust warehouses.

Provision of separate brigades to check the mines for defective equipment.

g. Construction Office

Carrying out of supplementary construction work on mine buildings and shops.

h. Militarized Guard

All mines, shops, and warehouses under the trust are guarded by special detachments organized in military fashion under a commanding officer, who is Militarized Guard Commander and has his staff officers at the trust.

i. Fire Guard (Central Fire Depot)

Posting of guards at mines, shops, and warehouses.

j. Rescue Station

Accident prevention measures and first aid; provision of a rescue squad at each mine.

In addition to the above, the following control offices of the Ministry exist on trust level without being administratively responsible to the trust:

1. Mine Supervision.
2. Technical and Security Inspection.
3. Fuel Quality Inspection.
4. Sanitary Inspection.

For every 1 or 2 trusts there is a rayon office of the Glavuglesbyt.

Every trust has a rayon trade-union committee, to which the following percentages of each workers' paycheck are turned over: 0.5 percent for maintenance of mine trade-union committees and 1.0 percent for cultural work.

The mine is a purely productive enterprise (corresponding to a shop or department of a large factory). It is entirely dependent on the trusts and has no direct contact with any other administrative or economic organization.

The organizational structure of a mine is given as follows:

1. <u>Administration</u>.

   a. Mine Chief
   b. Deputy Chief and assistants
   c. Chief Engineer
   d. Deputy Chief Engineer and assistants
   e. ORS Director

2. <u>Mine Apparatus Sections</u>.

   a. Records and Accounts
   b. Tariff and Norm
   c. Planning
   d. Survey
   e. Cadre (Personnel)
   f. Statistics
   g. General Office
   h. Special Worker

3. Economic Sections.

   a. Communal Billeting Section

      (1) Construction Engineer
      (2) Repair workers and foremen
      (3) Apartment commandants
      (4) Service personnel

   b. Horse Stables
   c. Garage
      (automobiles for Mine Chief and Chief Engineer)
   d. Storehouse (machinery, tools, etc.)
   e. Lumber Depot (for building lumber)

4. Production.

   a. Underground

Work in the pits is divided into sectors. A sector is the basic coal-producing unit. The officials in each sector are:

      (1) Sector Chief and assistants
      (2) Mechanic
      (3) Shift technicians
      (4) Foremen (1 foreman to every 30-40 workers)
      (5) Monteur

   b. Surface
   c. Mechanic Workshops
      (24 hours a day for first echelon maintenance)
   d. Coal Stockpiles

5. Auxiliary Installations.

   a. Nursery for daytime care of workers' children
   b. Training courses for wives and other workers

Contributions for maintenance of above are drawn from miners' pay on basis of monthly estimate. These expenditures are included in the planned figure for production costs of fuel.

c. Club and Theater

Controlled by the trade-union. Financed from the rayon trade-union committee fund, which in turn comes from the miners' pay checks.

d. School

Elementary and/or secondary school for children of miners and employees.

e. Aid Station

At larger mines, hospital.

Schools are financed by the Ministry of Education (at the Republic level); aid stations and hospitals, by the Ministry of Health.

APPENDIX C

LIST OF COAL COMBINES AND TRUSTS IN THE USSR

1. Western Regions.

a. Donbas.

Artemugol' Combine	Number of Mines Recorded
Dzerzhinskugol' Trust	15
Gorlovskugol' Trust	16
Kalininugol' Trust	8
Krasnoarmeyskugol' Trust	22
Ordzhonikidzeugol' Trust	5
Total	66

Donbassantratsit Combine	
Bokovantratsit Trust	24
Frunzeugol' Trust (Liquidated in 1950)	10
Krasnoluchugol' Trust	34
Total	68

Rostovugol' Combine	
Bogurayevugol' Trust	11
Gukovugol' Trust	10
Gundorovugol' Trust	3
Nesvetayantratsit Trust	12
Shakhtantratsit Trust	25
Total	61

1. Western Regions (Continued).

a. Donbas (Continued).

Stalinugol' Combine	Number of Mines Recorded
Budennovugol' Trust	22
Chistyakovantratsit Trust	35
Krasnogvardeyskugol' Trust	5
Kuybyshevugol' Trust	8
Makeyevugol' Trust	38
Rutchenkovugol' Trust	12
Snezhnyanantratsit Trust	12
Sovetskugol' Trust	20
Stalinugol' Trust	45
Zuyevantratsit Trust	11
Total	208
Voroshilovgradugol' Combine	
Bryanskugol' Trust	19
Kadiyevugol' Trust	12
Kirovugol' Trust	15
Krasnodonugol' Trust	18
Lisichanskugol' Trust	25
Lutuginugol' Trust	6
Pervomayskugol' Trust	20
Sverdlovugol' Trust	16
Voroshilovugol' Trust	19
Total	150
Grand Total	553

The above list does not include all the mines in the Donbas, but it probably does include nearly all the large ones and many smaller mines. The number of mines that produce more than 100,000 tons annually exceeds 350. Before World War II there were about 2,000 small mines with production up to 100,000 tons annually, but the vast majority produced 10,000 tons or less. The total number of mines at present is believed to be at least 1,500 and may exceed 2,000.

A study of mine locations and output of different mining districts has not been made. Information has been received on numerous other mines that have not been included in the foregoing list because it was not known to which trust each belonged. A careful check, however, of Soviet literature on the coal industry would permit a reasonably accurate count of all mines in each trust. There are many other mines which are not administered by the Ministry of the Coal Industry.

It is possible that the Yenakiyevugol' Trust and Belokalitvin-ugol' Trust are no longer in existence, and their mines have been consolidated in other trusts. The Frunzeugol' Trust was liquidated in the summer of 1950.

There are a number of mine administrations which have been reported subsidiary to a trust. It is believed that in most cases these operate one or more small mines, possibly in localities separated from the major mines of a trust.

b. Moscow Basin.

Moskvougol' Combine	Number of Mines Recorded
Donskoyugol' Trust	17
Krasnoarmeyskugol' Trust	12
Molotovugol' Trust	4
Oktyabr'ugol' Trust	9
Shcherbakovugol' Trust	4
Stalinogorskugol' Trust	17
Total	63
Tulaugol' Combine	
Bolokhovugol' Trust	12
Cherapitugol' Trust	
Kalininugol' Trust	5
Krasnogvardeyskugol' Trust	1
Shchekinugol' Trust	8
Skuratovugol' Trust	7

b. Moscow Basin (Continued).

Tulaugol' Combine (Continued)	Number of Mines Recorded
Smorodinskugol' Trust	2
Tovarkovugol' Trust	8
Yepifan'ugol' Trust	2
Total	45
Grand Total	108

The average production of the mines in the Moscow Basin was 233,000 tons in 1947 and is probably higher now. The actual number of mines at the present time is probably between 150 and 175.

c. Leningrad Area.

Leningradugol' Combine	Number of Mines Recorded
Gdovskugol' Trust	0
Novgorodugol' Trust	16

The mines belonging to the Leningradugol' Combine are located in the northwestern part of the Moscow Basin, but their production is not included with that of the Moscow Basin proper. Soviet production data for the Moscow Basin pertain to the mines of the Moskvo-ugol' and Tulaugol' combines.

Prisoner-of-war reports mention 7 mines at Borovichi, but a Soviet periodical 338/ mentions that in May 1945 two new coal deposits were being developed. There were 13 mines in operation at the Komarovo deposit, and there were 3 mines under construction and 3 more to be started in 1945 at the Ust'-Brynkinsk deposit. [redacted] 50X1
16 mines were built at the Komarovo deposit 50X1
(Borovichi) during World War II. 339/ It is not probable that the Borovichi area has more than 20 relatively small mines at the present time.

In an effort to develop local resources for industry in the Leningrad area, several mines were being started in 1948 at the

Nelidovo coal deposits, situated about 250 miles from Leningrad. These, as well as a few mines at Selizharovo, may belong to the Gdovskugol' Trust, but there is no information.

d. Georgian SSR.

Gruzugol' Combine	Number of Mines Recorded
Tkvarchelugol' Trust	7
Tkibulugol' Trust	7
Akhaltsikhe Mine Administration	3
Total	17

It is believed that these are all the mines controlled by the Gruzugol' Combine. The Akhaltsikhe Mine Administration may have four mines.

e. Pechora Basin.

The Vorkutaugol' Combine in the Pechora Basin is estimated to have 48 mines. Administration was under the jurisdiction of the NKVD for a long time. At present it may be under the jurisdiction of the MVD, or it may be under the Ministry of the Coal Industry. Vorkuta is the main mining center, but other reported production is at Inta (started 1942), Ukhta, Kazhim, Abez', and the Khalmer-yu deposit, north of Vorkuta. [redacted] there were 18 mines operating in 3 deposits of the Pechora Basin in March 1946, and in 1950 there were to be 48 shafts exploiting 8 deposits. The Fourth Five Year Plan provided for construction of mines with a total capacity of 7.7 million tons, and information seems to indicate that the construction plan was accomplished. 50X1

f. Spitzbergen.

It is believed that the two mines on Spitzbergen belong to the Arktikugol' Trust -- one operating mine at Grumantbyen and another at Barentsburg.

g. Ukraine (excluding the Donbas).

Ukrainugol' Combine	Number of Mines Recorded
L'vovugol' Trust (L'vov Oblast)	5
(?) Trust (Kirovgrad Oblast)	1
(?) Trust (Krivoy Rog Basin)	5
(?) Trust (Ternopol' Oblast)	1
Total	12

The Ukrainugol' Combine was organized after 1945 to assume control of the mines producing brown coal in the western Ukraine. The mines recorded are probably much less than the actual number. References have been made to the development of coal deposits in Dnepropetrovsk, Kiev, Stanislav, Voronezh, and Zhitomir oblasts in addition to those shown in the above list. Four deposits, in particular, have been mentioned: Aleksandriya, Semenovka-Golovkovsk, Yughovka, and Veselo. The Aleksandriya Basin in Kirovgrad Oblast is probably the most important at the present time.

A number of trusts have been referred to, but it is not known where they are located, except that they are in the Ukraine. These include the Pervomayskiy, Partizanskiy, Rughugov, Shirovalskiy, and Chervonoarmeyskiy Trusts.

h. Crimea.

There was minor production at the beginning of the war, and it is believed that 1 or 2 mines are still producing, but there has been no information.

i. Volga Region.

There are, apparently, a few deposits of low-grade coal in Saratov and Stalingrad oblasts and in Tatar ASSR (Turki-Tarkimen deposit, 24 kilometers east of Kazan), but there is no information except mention of a few mines in the Volga region. It is assumed that production is unimportant.

j. Caucasus (excluding Gruzugol' Combine).

Deposits and coal mines have been mentioned in the Cherkessk area, Krasnodar Kray, Mukachevskiy Okrug, Irshavskiy Okrug, and Khustskiy Okrug. Also, there is low-grade coal in Armenia. Mines are producing in the Cherkessk area. There is no information about the other areas. All mines are administered locally.

2. Eastern Regions.

a. Urals.

Chelyabinskugol'	Number of Mines Recorded
Chelyabugol' Trust	15
Kalachevugol' Trust	0
Kopeyskugol' Trust	30
Korkinugol' Trust	20
Yemanzhelinugol' Trust	6
Total	71
Molotovugol' Combine	
Andreyevugol' Trust	0
Gremyachinskoye Mine Administration	6
Kizelugol' Trust	24
Kospashugol' Trust	6
Stalinugol' Trust	22
Total	58
Sverdlovskugol' Combine	
Vakhrushevugol' Trust	4
Volchanskugol' Trust	3
Yegorshinugol' Trust	6
Total	13
Grand Total	142

2. Eastern Regions (Continued).

a. Urals (Continued).

Other Producing Areas	Number of Mines Recorded
Bulanash	6-12
Chusovoy	1
Dombarovskiy	2
Sverdlovsk	7
Bashkir ASSR	
Babayevo Deposit	1 (Being Constructed, 1950)
Davlekanovo	
Krasnyy-Klyuch	5 (Being Opened, 1947)
Kuyurgazinskiy Deposit	1 (Being Constructed, 1950)
Maichny	1 (Being Constructed, 1950)
Rayevskiy (formerly Al'sheyevskiy)	1 (Probable)
Ufa	1
Chkalov Oblast	
Iletskaya, Zashchita Deposit (77 km S of Chkalov)	1
Udmurt ASSR	
Alnashi Deposit (200 km NW of Ufa)	1

Information on the coal mines of the Urals is very inadequate. There is another trust, Nespashugol', which cannot be placed. It is not definitely known that mines are operating at Chusovoy, nor the importance of some of the other areas. The vicinity of Sverdlovsk may have a considerable number of mines, but the Russians do not refer much to it. Neither do they refer to Bulanash and some other scattered districts.

b. Karaganda Basin.

Karagandaugol' Combine	Number of Mines Estimated
Kirovugol' Trust Leninugol' Trust Molotovugol' Trust Stalinugol' Trust Karagandauglerazrezy Trust	65-75 (Operating)

c. Kazakh SSR (excluding Karaganda and Lenger).

With the exception of the Karaganda and Lenger mines, those in other parts of Kazakh SSR are not known to be under jurisdiction of a combine or trust. It is believed that the mines operating in each of these particular areas are few in number and not particularly important.

	Number of Mines Recorded
Aktyubinsk Oblast	
Berchogur	1
Kozesheise Mine (20 km NW of Aktyubinsk) Shaft No. 6	1
Baykonur Deposit	1
Bogombay (Akmolinsk Oblast)	2 (1947)
Dzhezkazgan Deposit	0
Dzholonbed	2-4
Ekibastuz	1 (Probable)
Kaynamin Deposit	0 (Being Opened, 1949)
Kilitomashat (South Kazakhstan)	7-9 (1948)
Mangyshlak (near Taushik)	0
Pavlodar Area (New Mine)	1 (New Mine, August 1949)
Ust'-Kamenogorsk	1

d. Central Asia.

Sredazugol' Combine	Number of Mines Recorded
South Kazakhstan	
Lengerugol' Trust	7
Lenger Deposit (7)	
Kirgiz SSR	
Kirgizugol' Trust	17
Kyzyl-Kiya Deposit (6)	
Kok-Yangak Deposit (4)	
Sulyukta Deposit (6)	
Tashkumyr Deposit (1)	
Tadzhik SSR	
Tadzhikugol' Trust	4
Shurab Deposit (4)	
Uzbek SSR	
Uzbekugol' Trust	7
Angren Deposit (7)	
Total	35

Other Producing Areas

There are other mines in Central Asia, all of which probably belong to the Ministry of Local Industry for the respective republics. The Soviet press has mentioned the following:

d. Central Asia (Continued).

Other Producing Areas (Continued)	Number of Mines Recorded
Tadzhik SSR	
Isfara Mine Administration	1
Ziddinskaya Mine Administration	1
Turkmen SSR	
Kugitang Tau Mine (Karalyukskiy Rayon)	1
Kirgiz SSR	
Mine E of Lake Issyk-Kul	
Dzhergalan	1
Uzgen	1

e. Kuzbas.

Kemerovugol' Combine	
Anzherougol' Trust	13
Belovugol' Trust	7
Kemerovugol' Trust	5
Leninugol' Trust	11
Total	36
Kuzbassugol' Combine	
Kaganovichugol' Trust	7
Kuybyshevugol' Trust	4
Kuznetskugol' Trust	4
Molotovugol' Trust	6
Prokop'yevskugol' Trust	15
Stalinugol' Trust	10
Total	46
Grand Total	82

There are probably more than 100 mines in the Kuzbas, and the actual number could be determined by careful check of all available information.

f. Novosibirsk Oblast, Omsk Oblast, and Altay Kray (West Siberia).

The Ministry for Local Industry in Novosibirsk Oblast controls the production of mines which were reported operating at the Zav'yalov deposit, located several kilometers from the Toguchin station on the railroad line leading to the Kuzbas, and at the Listvyan deposit in the Gorlov Basin, near the Yevsino Station on the railroad line to Barnaul.

Coal is reportedly mined in Omsk Oblast, but there is no other information.

[redacted] in Altay Kray there is a shaft 5 km W of the railway station at Rubtsovsk ($51^{\circ}31'$ N - $81^{\circ}14'$ E) and another located 4 km E of the station. 340/ 50X1

g. East Siberia.

Krasnoyarskugol' Combine	Number of Mines Recorded
Kanskugol' Trust	5 (at Zaozernyy)
Khakassugol' Trust	17 (at least 10 Operating)
Total	22

The mines at Chernogorsk in the Minusinsk Basin belong to the Khakassugol' Trust, and those in the Kansk Basin at Zaozernyy and Rybinskoye are controlled by the Kanskugol' Trust. The number of mines at Rybinskoye are not known.

[redacted] three mines near Krasnoyarsk -- the Novyy, Komsomol', and Kirov mines. 341/ It is not known if these mines are controlled by Kanskugol'. 50X1

g. East Siberia (Continued).

Vostsibugol' Combine	Number of Mines Recorded
Cheremkhovugol' Trust	12 (Minimum)
Kirovugol' Trust	2
Zabaykalugol' Trust	
Buryat Mongol ASSR	
Bayugol'	2
Gorodok Area	1
Novo-Selenginsk Area	1
Tarbagatay	1
Zagustay	3
Chita Oblast	
Bukachacha	4
Chernovskiye Kopi and Kadala	5-11
Khadabulak	1
Khara Nor	1
Kholbon	3 or More
Molodoy	1
Nelchinsk	1
Novo Pavlovka	1 or More
Sherlovaya Gora	1

The mines of the Kirovugol' and Cheremkovugol' trusts are located at Cheremkhovo, those of the Kirovugol' Trust being strip mines. It is possible that there are other mines in the Irkutsk Basin, but there is no available information.

It is not certain that all of the mines included in the above localities in Buryat Mongol ASSR and Chita Oblast are controlled by Zabaykalugol' Trust. Some may be under local administration.

Other Producing Areas

Coal mines have been reported at Noril'sk and Khatanga in Taymyr National Okrug and near Sangar and Kangalasskiye Kopi, along the Lena River, and near Zyryanka, along the Kolyma River, in Yakut ASSR, but there is almost no information about these mines. Production, however, is believed to be relatively small except at Norilsk, and it is doubtful if the number of mines at all these places exceeds 10 or 12.

h. Far East.

Khabarovskugol' Combine	Number of Mines Estimated
Raychikugol' Trust	16-21
Urgol' Mine Administration	5
Total	21-26

It is believed that there are between 10 and 15 strip mines in the Raychikhinsk - Arochka area and 6 underground mines in the vicinity of Kivda which belong to the Raychikugol' Trust. The mines at Chagdamyn in the Bureya Basin may be known by another name than the Urgol' Mine Administration.

Khabarovskugol' Combine may have other scattered mines under its jurisdiction, but the number, in any case, is small and production is unimportant. Mines were reported in the localities of Khabarovsk, Khungari, and Nikolayevsk during World War II, and it is probable that there are mines now operating in these areas. Besides these, there have been [redacted] others operating in Khabarovsk Kray, near El'gen, and at Khassouin, about 60 km N of Magadan. 50X1

Primorskugol' Combine	Number of Mines Recorded
Artemugol' Trust	13
Suchanugol' Trust	12
Lipovetskoye Mine Administration	4
Voroshilovskoye Mine Administration	3
Tavrichanka Mine Administration	4
Total	36

Sakahlinugol' Combine	
Aleksandrovskugol' Trust	3
Kholmskugol' Trust	9
Makarovugol' Trust	9
Uglegorskugol' Trust	7
Total	28

The Aleksandrovskugol' Trust controls the coal mines in north Sakhalin, which are located near Mgachi, Due, and Oktyabr'skiy.

The other three trusts control the mines in south Sakhalin. The number of mines in operation exceeds the 25 shown above, but several could not be designated by trusts. In 1945, when the Russians forced the Japanese out, there were 45 mines in south Sakhalin, of which 16 were exhausted or abandoned, 2 were under construction, 14 were idle, and 3 had been destroyed. The remaining 10 had a total capacity of 1.4 million tons annually. 342/

Other Producing Areas.

Small coal production has been reported at Tilichiki and Ugol'naya in Kamchatka and in the Anadyr' area of Chukhotskiy Peninsula. These mines are not under the control of the Ministry of the Coal Industry.

APPENDIX D

ESTIMATED 1950 COAL PRODUCTION IN THE USSR BY KIND AND BY AREA

Table 64

Thousand Tons

	Anthracite a/*	Bituminous Coal b/	Lignite and Brown Coal	Total Coal Production
Western Regions				
Donbas	34,000	61,000		95,000
Moscow Basin			29,600	29,600
Georgian SSR		1,600	175	1,775
Pechora Basin		10,850		10,850
Spitzbergen		185 c/		185
Western Ukraine			2,400	2,400
Caucasus (excluding Georgian SSR) d/		250		250
Crimea		40		40
Leningrad Area e/			750	750
Volga Area f/			50	50
Total Western Regions	34,000	73,925	32,975	140,900
Eastern Regions				
Urals Area g/				
Kizel Basin		12,000		12,000
Chusovaya Area		200		200
Volchanka			6,500	6,500
Karpinsk (Bogoslovsk)			2,000	2,000

* Footnotes for Table 64 follow on p. 237.

Table 64
(Continued)

Thousand Tons

	Anthracite a/	Bituminous Coal b/	Lignite and Brown Coal	Total Coal Production
Eastern Regions (Continued)				
Urals Area g/ (Continued)				
Chelyabinsk Basin			11,500	11,500
Yegorshino	600			600
Poltavka - Bredy	350			350
Dombarovka	150			150
Sverdlovsk, Artemovskiy, Bulanash		750		750
Bashkir ASSR		50	200	250
Chkalov Oblast			150	150
Udmurt ASSR			50	50
Total Urals Area	1,100	13,000	20,400	34,500
Karaganda Basin		13,500	2,500	16,000
Kazakh SSR (excluding Karaganda) h/		1,000	500	1,500
Central Asia		475	3,800	4,275
Kuzbas i/	2,625	34,000		36,625
East Siberian Area				
Taymyr National Okrug				
Noril'sk j/		400		400
Khatanga k/		20		20
Khakas Autonomous Oblast				
Minusinsk Basin l/		2,150		2,150

Table 64
(Continued)

Thousand Tons

	Anthracite a/	Bituminous Coal b/	Lignite and Brown Coal	Total Coal Production
Eastern Regions (Continued)				
East Siberian Area (Continued)				
Tuva Autonomous Oblast		5		5
Krasnoyarsk Kray				
Kansk Basin m/			1,000	1,000
Irkutsk Oblast				
Cheremkhovo n/		7,000		7,000
Other o/		150		150
Buryat Mongol ASSR p/		250	250	500
Chita Oblast				
Bukachacha q/		1,100		1,100
Chernovskiye Kopi r/			1,200	1,200
Other s/			450	450
Yakut ASSR t/				
Kangalasskiye Kopi			100	100
Sangar			100	100
Zyryanka		75		75
Total East Siberian Area		11,150	3,100	14,250

Table 64
(Continued)

Thousand Tons

	Anthracite a/	Bituminous Coal b/	Lignite and Brown Coal	Total Coal Production
Eastern Regions (Continued)				
Far Eastern Area u/				
Khabarovsk Kray and Amur Oblast v/				
Bureya Basin		400		400
Kivda			300	300
Raychikhinsk - Arochka			4,000	4,000
Tilichiki		75		75
Ugol'naya		50		50
Other w/			150	150
Primorskiy Kray				
Suchan	75	1,325		1,400
Artem			2,500	2,500
Podgorodnenka		175		175
Tavrichanka			200	200
Voroshilov		175		175
Lipovetsk			225	225
Ugol'naya and Ugl'ovaya			200	200
Kraskino			25	25
Other			125	125
Sakhalin Island				
North Sakhalin		500		500
South Sakhalin		2,500		2,500

Table 64
(Continued)

Thousand Tons

	Anthracite a/	Bituminous Coal b/	Lignite and Brown Coal	Total Coal Production
Eastern Regions (Continued)				
Far Eastern Area (Continued)				
Total Far Eastern Area	75	5,200	7,725	13,000
Other Eastern Areas w/		750	200	950
Total Eastern Regions	3,800	79,075	38,225	121,100
Total USSR	37,800	153,000	71,200	262,000
Percent of Total	14.43	58.40	27.17	100.00

a. Includes semianthracite.
b. Includes subbituminous coal.
c. Export figure.
d. Small mines were opened in Mukachevskiy and Khustskiy okrugs in recent years. Also there have been mines operating in the Cherkessk area since before the war.
e. Mines are at Borovichi, Selizharovo, and possibly elsewhere.
f. Mines have been reported in Saratov and Stalingrad oblasts and Tatar ASSR.
g. The estimate for the Kizel Basin is believed to be very close to actual, and estimates for Volchanka and Karpinsk are based on good information for the 1947-48 period. The information for most of the other areas is very inadequate, and estimates are arbitrary.
h. The 1950 Plan established a goal of 1.75 million tons, but it is believed that it was not reached, partly because of slow progress at Ekibastuz. It is impossible to break down the production by producing areas for lack of adequate information. Lenger in south Kazakhstan is believed to have furnished in the magnitude of 500,000 tons.

Table 64
(Continued)

i. The breakdown by kinds of coal is arbitrary. It is believed that there is some production of semianthracite.

j. There are no production data available, although [redacted] two strip mines with steam shovels. [redacted] a number of drift mines. 50X1 50X1

k. Small-scale output started after the war.

l. There are at least 10 mines in operation, and output is believed to be more than double the prewar level.

m. There are a number of shaft mines and at least one strip mine. Output at the latter could be considerable. [redacted] 50X1 50X1

n. [redacted] Cheremkhovo for the 1946-49 period, but it is somewhat difficult to reconcile conflicting data. The estimate, however, is believed to be within 0.5 million tons, or 7 percent, of actual production. 50X1

o. There are probably a few mines located in the Irkutsk Basin other than at Cheremkhovo, and the estimate may be low.

p. Mines are located at Baingol, Tarbagatai, Novoselenginsk area, Gorodok area, and Zagustay. Estimates are based on inadequate data.

q. Estimated at about 3,000 tons daily from 4 mines.

r. [redacted] some mines at Kadala, but there was sufficient evidence in most cases that they were the same mines that were mentioned near Chernovskiye Kopi. [redacted] 11 mines in the area. This is possible, but the number in operation may be no more than 5 or 6. 50X1 50X1

s. Mines have been reported at Khadabulak, Khara Nor, Kholbon, Molodoy, Nerchinsk, Novo Pavlovka, and Sherlovaya Gora.

t. Estimates for Yakut ASSR are arbitrary. They are higher than output reported for the prewar years.

u. A good basis for estimates has been furnished for the following locations: Kivda, Raychickhinsk - Arochka, Suchan, and Artem. [redacted] output was several million tons on Sakhalin Island with 20 mines in operation. 50X1 50X1

v. Mines in the Bureya Basin, at Kivda, at Raychikhinsk, and at Arochka belong to the Khabarovskugol' Combine. These mines are in Amur Oblast, which was separated from Khabarovsk Kray in 1948. Tilichiki and Ugol'naya are located on Kamchatka.

w. Novosibirsk Oblast and any unallocated tonnage in the eastern regions.

APPENDIX E

ESTIMATED COAL PRODUCTION IN THE USSR BY MAJOR AREAS
1913, 1938-52

Table 65

Thousand Tons

Region	Area	1913	1938	1939	1940	1941 Plan	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950 Plan	1950	1951	1952
	Western Regions																		
III & IV	Donbas	25,288	80,733	85,300	94,400 a/	105,212 b/	63,500	1,000	4,200	22,400	36,540	47,500	56,530	68,400	82,000	88,000	95,000	103,000	107,000
VII	Moscow Basin	300	7,416	8,100	9,950	12,530	11,000	9,500	14,400	17,900	19,000	19,600	21,500	23,885	26,900	24,000	29,600	31,700	33,600
Ib	Pechora Basin	0	200	350	375	300 c/	440	1,015	2,260	3,265	4,160	5,000	6,645	7,800	9,365	11,250 d/	10,850	11,800	12,850
V	Georgian SSR	70	429	550	620	920	772	600	700	750	800	837	1,022	1,245	1,430	2,400	1,775	2,060	2,250
Ia	Spitzbergen	0	400	340	300	400 e/	150	0	0	0	0	0	0	70	105	N.A.	185	150	150
III	Western Ukraine	0				f/										6,000			
	Other or Unallocated	0	1,181	1,160	1,155	378 g/	438	385	440	485	1,900	2,463	2,803	3,100	3,360	N.A.	3,490	3,890	5,350
	Total Western Regions	25,658	90,359	95,800	106,800	119,740	76,300	12,500	22,000	44,800	62,400	75,400	88,500	104,500	123,100	131,650	140,900	152,600	161,200
	Eastern Regions																		
VIII	Urals	1,217	8,062	10,100	11,840	15,275	13,600	16,400	21,300	23,680	25,450	15,400	27,000	30,250	32,500	30,750 h/	34,500	36,900	40,000
Xa	Karaganda	0	4,100	5,300	6,300	7,500	7,000	7,200	9,300	10,460	11,275	11,000	12,320	13,475	14,550	14,650 h/	16,000	17,300	18,900
Xa	Kazakh SSR (excluding Karaganda)	90	327	400	500	923	600	650	750	1,000	950	1,000	1,100	1,300	1,400	1,750	1,500	1,550	1,750
Xb	Central Asia	158	1,100	1,400	1,920	2,409	1,750	1,550	1,950	2,000	1,550	1,730	2,150	2,940	3,550	3,230 i/	4,275	4,885	5,650
IX	Kuzbas	774	17,338	19,000	21,140	23,400 j/	21,000	21,000	25,000	27,200	28,950	27,965 k/	29,080	30,825	33,600	35,500 h/	36,625	39,500	42,000
XI	East Siberia l/	823	6,850	7,900	9,400	10,913	9,800	10,000	10,000	10,500	10,000	10,600	11,200	13,400	13,900	12,700 m/	14,250	15,000	16,300
XII	Far East l/	373	4,752	5,325	6,600	8,973	7,000	7,200	7,200	7,600	8,100	10,400-	11,800	12,100	12,600	10,850 h/	13,000	13,700	14,500
	Other or Unallocated n/	24	0	475	1,500	1,645 o/	450	500	500	760	625	705	750	910	900		950	965	1,000
	Total Eastern Regions	3,459	42,529	49,900	59,200	71,038	61,200	64,500	76,000	83,200	86,900	88,800	95,400 p/	105,150	113,000	109,430	121,100	129,800	140,100
	Unallocated															8,950 q/			
	Total USSR	29,117	132,888	145,700	166,000 r/	190,778	137,500	77,000	98,000	128,000	149,300	164,200	183,900	209,650 s/	236,100	250,030	262,000 t/	282,400 u/	301,300 u/

Table 65
(Continued)

a. Frequently reported figure is 85,500,000 tons, but this is believed to be production of the Ministry of the Coal Industry only. Actual output was about 57 percent of the Soviet total.
b. Includes minor production in the western Ukraine. The quota for the mines in the Donbas under the Ministry of the Coal Industry was 95 million tons.
c. Figure for Komi ASSR; higher production estimated for 1939 and 1940 furnished most satisfactory basis for computing production in later years.
d. Estimated on basis of information in 1947 that output was to exceed the current production at Karaganda.
e. Plan for Artikugol'; assumed to be for mines on Spitzbergen.
f. Included with the Donbas.
g. Includes Leningrad Oblast (50,000 tons), Tatar ASSR (3,000 tons), Krasnodar Kray (8,000 tons), Ordzhonikidze Kray (231,000 tons), Dagestan ASSR (14,000 tons), Kabardino-Balkan ASSR (25,000 tons), Crimean ASSR (35,000 tons), and Armenian ASSR (12,000 tons).
h. Calculated from planned percentage increases over 1940.
i. Original plan included Kirgiz SSR (1,600,000 tons), Uzbek SSR (1,130,000 tons), Tadzhik SSR (440,000 tons), and Turkmen SSR (60,000 tons). Quota for Kirgiz SSR was reported later to be 2,200,000 tons.
j. Ministry of the Coal Industry only. The total for Novosibirsk Oblast was 5,045,000 tons. It is possible that all of this may have been for the Kuzbas.
k. Reported figure.
l. Figures given for East Siberia and the Far East are based on relatively few Soviet statistics as compared with other areas, but the estimates are believed to be within a range of accuracy of 10 percent.
m. Planned increase of 35 percent over 1940.
n. Residual figures. It is believed that there is some scattered production, such as that of the mines near Novosibirsk, whose production is probably not included in reported regional statistics. The estimates for East Siberia and the Far East are intended to include all production in those regions, but there is probably some production from mines under local administration that is not taken into account.
o. Possibly some to be produced in the Kuzbas. In Novosibirsk Oblast, industrial cooperatives were to produce 1,156,000 tons; and the Ministry of Local Industry and the Ministry of Local Fuel Industry, 275,000 tons.
p. Increased 60 percent over 1940 [redacted] but the estimated total for the western regions is 61 percent. 50X1
q. It is believed that the major part of this tonnage was planned for production in the Donbas at mines not under control of the Ministry of the Coal Industry.
r. [redacted] what was probably the actual figure -- 165,926,000 tons. 50X1
s. Reported as 126.3 percent of 1940.
t. It has been reported that production was 57 percent higher than 1940, equivalent to 260,600,000 tons. The estimate is based on an increase of 11 percent over the previous years.
u. The estimate for 1951 is based on the reported increase of 7.8 percent in comparison with 1950, but Malenkov mentioned 285 million tons of coal during a speech in 1952. He also mentioned that coal production would be 300 million tons in 1952. The estimate for 1952 is based on the reported increase of 6.7 percent as compared with 1951.

APPENDIX F

ESTIMATED COAL PRODUCTION IN THE USSR BY MAJOR AREAS IN PERCENT
1913, 1938-52

Table 66

Percent

Region	Area	1913	1938	1939	1940	1941 Plan	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950 Plan	1950	1951	1952
	Western Regions																		
III & IV	Donbas	86.85	60.76	58.55	56.87	55.15	46.18	1.30	4.29	17.50	24.47	28.93	30.74	32.64	34.73	35.19	36.26	36.48	35.52
VII	Moscow Basin	1.03	5.58	5.56	5.99	6.57	8.00	12.34	14.69	13.98	12.72	11.94	11.69	11.39	11.39	19.60	11.30	11.22	11.15
Ib	Pechora Basin	0	0.15	0.24	0.23	0.16	0.32	1.32	2.31	2.55	2.79	3.04	3.61	3.72	3.97	4.50	4.14	4.18	4.26
V	Georgian SSR	0.24	0.32	0.38	0.37	0.48	0.56	0.78	0.71	0.59	0.54	0.51	0.55	0.59	0.61	0.96	0.68	0.73	0.75
Ia	Spitzbergen	0	0.30	0.23	0.18	0.21	0.11	0	0	0	0	0	0	0.03	0.04	N.A.	0.07	0.05	0.05
III	Western Ukraine	0														2.40			
	Other or Unallocated	0	0.89	0.79	0.70	0.19	0.32	0.50	0.45	0.38	1.27	1.50	1.53	1.47	1.40	N.A.	1.33	1.38	1.77
	Total Western Regions	88.12	68.00	65.75	64.34	62.76	55.49	16.23	22.45	35.00	41.79	45.92	48.12	49.84	52.14	52.65	53.78	54.04	53.50
	Eastern Regions																		
VIII	Urals	4.19	6.07	6.93	7.13	8.01	9.89	21.30	21.74	18.50	17.06	15.47	14.68	14.41	13.77	12.30	13.17	13.06	13.28
Xa	Karaganda	0	3.08	3.64	3.80	3.93	5.09	9.35	9.49	8.17	7.55	6.70	6.70	6.43	6.16	5.86	6.10	6.13	6.27
Xa	Kazakh SSR (Excluding Karaganda)	0.30	0.25	0.27	0.30	0.48	0.44	0.84	0.76	0.78	0.64	0.61	0.60	0.62	0.59	0.70	0.57	0.55	0.58
Xb	Central Asia	0.54	0.83	0.96	1.16	1.26	1.27	2.01	1.99	1.56	1.03	1.05	1.17	1.40	1.50	1.29	1.63	1.73	1.88
IX	Kuzbas	2.66	13.04	13.04	12.73	12.28	15.27	27.27	25.51	21.26	19.39	17.03	15.81	14.70	14.24	14.20	13.98	13.99	13.94
XI	East Siberia	2.83	5.15	5.42	5.66	5.72	7.13	13.00	10.20	8.20	6.70	6.46	6.09	6.39	5.88	5.08	5.44	5.31	5.41
XII	Far East	1.28	3.58	3.66	3.98	4.70	5.09	9.35	7.35	5.94	5.43	6.33	6.42	5.77	5.33	4.34	4.97	4.85	4.81
	Other or Unallocated	0.08		0.33	0.90	0.86	0.33	0.65	0.51	0.59	0.43	0.43	0.41	0.44	0.39		0.36	0.34	0.33
	Total Eastern Regions	11.88	32.00	34.25	35.66	37.24	44.51	83.77	77.55	65.00	58.21	54.08	51.88	50.16	47.86	43.77	46.22	45.96	46.50
	Unallocated															3.58 a/			
	Total USSR	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

a. Largely Donbas production by various ministries, cooperatives, and directorates.

APPENDIX G

TOTAL AND REGIONAL COAL PRODUCTION IN THE USSR

Table 67

Soviet Coal Production
1913, 1921-52

Year	Tons	Year	Tons
1913	29,117,000 a/	1938	132,888,000 c/
1921-22	11,324,000 a/	1939	145,700,000 c/
1922-23	12,700,000 a/	1940	166,000,000 d/
1923-24	16,328,000 a/	1941 Plan	190,778,000 e/ f/
1924-25	16,520,000 a/	1941	137,500,000 g/
1925-26	25,770,000 a/	1942	77,000,000 g/
1926-27	32,275,000 a/	1943	98,000,000 h/
1927-28	35,510,000 a/	1944	128,000,000 i/
1928-29	40,067,000 a/	1945	149,300,000 j/
1929-30	47,780,000 a/	1946	164,200,000 j/
1931	56,752,000 a/	1947	183,900,000 j/
1932	66,690,000 a/ b/	1948	209,650,000 j/
1933	76,333,000 a/ b/	1949	236,100,000 k/
1934	94,160,000 a/ b/	1950 Plan	250,030,000 l/
1935	108,900,000 c/	1950	262,000,000 m/
1936	126,400,000 c/	1951	282,400,000 n/
1937	127,968,000 c/	1952	301,300,000 o/

a. 343/
b. Includes 26,000 tons mined at Spitzbergen in 1932, 128,100 tons in 1933, and 220,000 tons in 1934.
c. 344/
d. [redacted] 50X1
[redacted] probably the actual production: 165,926,000. 345/ 50X1
e. 346/
f. Narkomugol' was to produce 171,160,000 tons, and the balance was to come from mines operated by various commissariats, directorates, and cooperatives.

Table 67

Soviet Coal Production
1913, 1921-52
(Continued)

The Commissariat of the Interior (NKVD) controlled some important producing fields.
g. Total of estimates by areas. See footnote h.
h. The mining of coal increased by 23 percent between 1942 and 1943. 347/ The estimate of 98 million tons in 1943 represents an increase of 27.2 percent over 1942. The discrepancy arises from lack of good data about certain areas, particularly the Donbas, which is credited with only 1 million tons production in 1942.
i. The increase in coal production in 1944 as compared with 1943 was 30.6 percent, of which 18.6 percent is accounted for by the Donbas. 348/ Also reported as an increase of 30.4 percent over 1943. 349/
j. Production in 1948 was 26.3 percent higher than 1940 and 14 percent above 1947. 350/ Coal production increased as follows: 1946, 10 percent; 1947, 12 percent; and 1948, 14 percent. 351/
k. It was reported on 28 December 1949 that output increased 12.5 percent 352/, but [redacted] the national economy received 12.6 percent more coal than in 1948. 353/ 50X1
l. Announced in the Plan.
m. Increased 11 percent in 1950 as compared with 1949. 354/ The Soviet coal output was 57 percent higher in 1950 than before the war. 355/ Minister of Coal A. Zasyad'ko announced on 11 December 1950 that his Ministry would overfulfill the Plan by 14 million tons of coal before the end of the year. 356/ By the end of the Fifth Five Year Plan (1951-55) the production of coal was to have increased by 43 percent as compared with 1950. 357/ An increase of 57 percent compared with 1940 is equivalent to 260.6 million tons, which is the estimate published [redacted] Others furnish the figure of 264 million, 50X1 basing it on the statement that output was or would be 14 million tons over the 1950 Plan. However, this was for the Ministry of the Coal Industry only and, apparently, should not be added to the total 1950 Plan of 250 million. Of significance is the fact that an increase of 11 percent over 1949 estimate is equal to 262 million tons of coal, and a planned increase of 43 percent over this estimate equals 374.64 million in 1955. It is believed that the 1955 goal is probably 375 million tons of coal or very close thereto.

Table 67

Soviet Coal Production
1913, 1921-52
(Continued)

n. According to Zasyad'ko, output increased 7.8 percent in 1951. 358/

o. In 1952, output increased 6.7 percent. 359/ It was announced on 10 November 1952 that the Ten Month Plan was fulfilled by 101 percent and the country would receive 15 percent more coal than in 1950. 360/ [redacted] production would be 300 million tons. The estimate may be as much as 1.6 million tons in excess of actual. 50X1

Table 68

Soviet Coal Production in the Donbas
Selected Years, 1910-1952

Year	Tons	Percent of Total Soviet Production
1910	16,688,200 a/*	N.A.
1913	25,288,100 a/	86.55
1916	28,690,300 a/	83.67
1920	5,536,600 a/	65.1
1921-22	7,187,000 b/	63.47
1927-28	27,330,000 b/	76.96

* Footnotes for Table 68 follow on p. 246.

Table 68

Soviet Coal Production in the Donbas
Selected Years, 1910-1952
(Continued)

Year	Tons	Percent of Total Soviet Production
1929-30	36,541,000 b/	76.48
1931	40,936,000 b/	72.13
1932	45,044,000 b/	67.54
1933	51,060,000 b/	66.84
1934	61,496,000 b/	65.31
1935	69,500,000 c/	63.82
1936	78,600,000 c/	62.18
1937	77,542,000 c/	60.87
1938	80,733,000 c/	60.76
1939	85,300,000 c/	58.55
1940	94,400,000 d/	56.87
1941 Plan	105,212,000 e/	55.15
1941	63,500,000 f/	46.18
1942	1,000,000 f/	1.30
1943	4,200,000 f/	4.29
1944	22,400,000 g/	17.50
1945	36,540,000 h/	24.47
1946	47,500,000 h/	28.93
1947	56,530,000 h/	30.74
1948	68,400,000 h/	32.64
1949	82,000,000 i/	34.73
1950 Plan	88,000,000 j/	35.19
1950	95,000,000 k/	36.26
1951	103,000,000 l/	36.48
1952	107,000,000 m/	35.52

a. 361/
b. 362/
c. 363/
d. Production is generally reported as 85,500,000 tons and [redacted] 85,551,000 tons. 364/ It seems certain, however, that this was the output of mines under Narkomugol' and does not include about 9 million tons of other production. 50X1

Table 68

Soviet Coal Production in the Donbas
Selected Years, 1810-1952
(Continued)

[redacted] in 1940, 63 percent of the total output of 166 million tons came from the Donbas and the Moscow Basin, and [redacted] the Donbas produced 57 percent of the total. A Soviet transportation report mentions 94.4 million tons. 50X1 50X1
e. Includes minor production in areas of the Ukraine outside of the Donbas. Narkomugol' was to produce 95 million in the Donbas. 367/
f. Estimates. 368/
g. The increase in coal production in 1944 as compared with 1943 was 30.6 percent, of which 18.6 percent is accounted for by the Donbas. 369/ [redacted] estimated 20.7 million tons, but the foregoing data indicate output was probably more. 50X1
h. In 1948 the Donbas produced 80 percent of the prewar production level. 371/ In 1948 the Donbas increased coal output 21 percent. 372/ The 1947 output was 19 percent greater than 1946. 373/ The yearly output of coal in the Donbas in 1946 was 29.6 percent higher than 1945. 374/ If 1948 output is computed at 80 percent of the estimated output in 1940, or 94.4 million tons, the indicated output would be 75.5 million tons. This figure appears too high with respect to later production and with respect to other areas. Consequently, the figures given in the table for all years following 1944 are predicated on the production for Narkomugol' only in 1940, or 85.5 million tons. It is possible that such estimates may exclude some production from mines not operated by the Narkomugol', at least for the years before 1950.
i. In 1949, coal production in the Ukraine was 119 percent of 1948. 375/ This basis would include all the brown coal production in the Ukraine and exclude that part of the Donbas in Rostov Oblast. The estimated increase for the Donbas is about 20 percent and may be more than actual.
j. Plan figure, which was probably for the Ministry of the Coal Industry only.
k. The estimate represents an increase of about 16 percent over 1949. Production was reported to be in excess of Plan and higher than 1940, but it is possible that all comparisons have been made with figures assumed to be for the Ministry of the Coal Industry. Actual production for all mines may have been more than the estimate. The 1950 Plan

Table 68

Soviet Coal Production in the Donbas
Selected Years, 1810-1952
(Continued)

showed an undistributed balance of almost 9 million tons, a major portion of which is believed to have been planned for mines not controlled by the Ministry of the Coal Industry in the Donbas. It is believed that the total for all mines in the Donbas was close to the 1940 estimate of 94.4 million. It is quite possible that mines independent of the Ministry of the Coal Industry may not provide as much coal as before the war. On the basis of calculations for production of other fields, it would seem that 1950 output was between 94 and 97 million tons.

l. Production in Voroshilovgrad Oblast increased 8.3 percent over 1950. 376/ Stalino Oblast exceeded 1950 output by 10.4 percent. 377/ Rostovugol' Combine increased coal output 6.5 percent above 1950 level. 378/ The estimated figure represents an increase of 8.4 percent over 1950.

m. Zasyad'ko stated on 12 October 1952 that the Donbas had bettered its prewar output by almost 24 percent. 379/ The Stalin and Artem combines overfulfilled the 1952 Plan, but various mines and trusts failed. 380/ The Rostov Combine did not fulfill the 1952 Plan. 381/ The estimate represents an increase of 3.9 percent over the 1951 estimate, and it is believed that it is within 2 million tons of actual.

Table 69

Soviet Coal Production in the Moscow Basin
Selected Years, 1913-52

Year	Tons	Percent of Total Soviet Production
1913	300,000 a/*	1.03
1921-22	623,000 a/	5.50

* Footnotes for Table 69 follow on p. 249.

Table 69

Soviet Coal Production in the Moscow Basin
Selected Years, 1913-52
(Continued)

Year	Tons	Percent of Total Soviet Production
1927-28	1,135,000 a/	3.20
1929-30	1,697,000 a/	3.55
1931	2,131,000 a/	3.76
1932	2,613,000 a/	3.92
1933	3,833,000 a/	5.02
1934	4,619,000 a/	4.91
1935	5,700,000 b/	5.23
1936	7,100,000 b/	5.61
1937	7,506,000 b/	5.89
1938	7,416,000 b/	5.58
1939	8,100,000 b/	5.56
1940	9,950,000 c/	5.99
1941 Plan	12,530,000 d/	6.57
1941	11,000,000 e/	8.00
1942	9,500,000 f/	12.34
1943	14,400,000 f/	14.69
1944	17,900,000 g/	13.98
1945	19,000,000 h/	12.72
1946	19,600,000 h/	11.94
1947	21,500,000 h/	11.69
1948	23,885,000 i/	11.39
1949	26,900,000 j/	11.39
1950 Plan	24,000,000 k/	9.60
1950	29,600,000 l/	11.30
1951	31,700,000 m/	11.22
1952	33,600,000 n/	11.15

a. 382/
b. 383/
c. 384/
d. Only 12,300,000 tons to be produced by mines controlled by Narkomugol'. 385/
e. Maximum, since the Germans occupied the Moscow Basin in

Table 69

Soviet Coal Production in the Moscow Basin
Selected Years, 1913-52
(Continued)

November 1941, and output ceased completely in December. 386/

f. In January 1942, soon after the liberation of the region, the extraction of coal amounted to only 590 tons daily, but in May 1942 it rose to 22,000 tons daily, and in October 1942 it reached the prewar level of 35,000 tons daily. In 1943 the extraction of coal in the region surpassed the 1940 level by 45 percent. 387/ The output in September 1942 exceeded the prewar level. 388/ In December 1942 the basin was divided into two combines. At this time output was 35,650 tons daily. 389/

g. Increased 80 percent as compared with 1940. 390/

h. Very few data are available on the Moscow Basin for this period, but production is believed to have increased each year, and the estimates appear to be in accord with the over-all pattern of increase for the country and individual regions. Output in 1948 is well established and was about 11 percent over 1947.

i. In 1948 the Moscow Basin produced 240 percent of the prewar production level. 391/ The Fourth Five Year Plan had been fulfilled in 3 years, and 885,000 tons over and above the planned amount had been delivered in 1948. 392/

j. The Moskvougol' Combine was reported to have produced 12,310,000 tons in 1948, so that output of the Tulaugol' Combine was evidently 11,575,000 tons. The latter pledged an increase of 8 percent over 1948, 393/ which would be equivalent to 12,500,000 tons. The original quota may have called for an increase of only 5 percent over 1948, but an additional pledge of 350,000 tons was made and subsequently increased to 630,000 tons for the Tulaugol' Combine, which was probably realized, as the Plan for the first 11 months was exceeded by 580,000 tons. 394/ The miners of the Moskvougol' Combine pledged an increase of 400,000 tons over the original quota for 1949, which was probably 10 percent over 1948. Therefore, the target must have been 14 million tons or very close thereto. During the first 11 months of 1949 the average daily output increased by 14.8 percent 395/ and was 677,000 tons above Plan. 396/ An increase of 14 percent was reported for Moscow Oblast for the year, 397/ indicating that output was about 14 million tons. The production of the Moscow Basin is estimated at 26.9 million tons for 1949 and is equivalent to slightly more than 12 percent over 1948.

Table 69

Soviet Coal Production in the Moscow Basin
Selected Years, 1913-52
(Continued)

k. The 1950 output goal for the Moscow Basin was 241.2 percent of 1940 production. 398/
l. Production in 1950 was three times output in 1940. 399/
m. Miners of the Moscow Basin delivered about 200,000 tons of fuel above the Plan in 1951. 400/ Tulaugol' completed the Nine Month Plan 2 days ahead of schedule. Output of the combine had increased 7.6 percent in comparison with 1950. 401/ The estimate represents an increase of slightly more than 7 percent over 1950.
n. Zasyad'ko stated on 12 October 1952 that the Moscow Basin mined almost 3-1/2 times more coal than before the war. 402/ The coal output of the Tulaugol' Combine was 100.1 percent of 1952 Plan. 403/ The Moscow Oblast increased coal output 6 percent over 1951. 404/ The estimate represents an increase of 6 percent over the estimate for 1951. If it is assumed that production in 1952 was 3.4 times the 1940 level, the figure would be 33,800,000 tons.

Table 70

Soviet Coal Production in the Pechora Basin
1931-52

Year	Tons	Percent of Total Soviet Production
Before 1931	None	0
1931	6,000 a/*	0.01
1932	9,000 a/	0.01
1933	33,000 a/	0.04
1934	61,000 a/	0.06
1935	N.A.	N.A.

* Footnotes for Table 70 follow on p. 252.

Table 70

Soviet Coal Production in the Pechora Basin
1931-52
(Continued)

Year	Tons	Percent of Total Soviet Production
1936	N.A.	N.A.
1937	N.A.	N.A.
1938	200,000 b/	0.15
1939	350,000 c/	0.24
1940	375,000 d/	0.23
1941 Plan	300,000 e/	0.16
1941	440,000 f/	0.32
1942	1,015,000 f/	1.32
1943	2,260,000 f/	2.31
1944	3,265,000 f/	2.55
1945	4,160,000 f/	2.79
1946	5,000,000 f/	3.04
1947	6,645,000 g/	3.61
1948	7,800,000 h/	3.72
1949	9,365,000 i/	3.97
1950 Plan	11,250,000 j/	4.50
1950	10,850,000 k/	4.14
1951	11,800,000 k/	4.18
1952	12,850,000 l/	4.26

a. 405/
b. Estimated.
c. Information of October 1939 states that the main working shaft is at Vorkuta itself, where 300,000 tons are being produced annually. A second shaft is being sunk for 750,000 tons and will be in operation in 1942. Next year (1940), 3 new shafts of over 300,000 to 350,000 tons per year each will be started and are also to be completed in 1942. 406/ Coal production in 1942 increased 292 percent compared with 1939. 407/ It is assumed that there was some production other than at Vorkuta.
d. The output figure for 1940 is not known and, if available,

Table 70

Soviet Coal Production in the Pechora Basin
1931-52
(Continued)

would permit reasonably accurate estimates for all later years. It is believed that the estimate of 375,000 tons furnishes a good base for projection, despite the fact that the 1941 Plan for the Komi ASSR was only 300,000 tons.

e. Plan for Komi ASSR.

f. Significant data for the 1941-46 period are as follows: (1) If coal production in the Pechora Basin for 1940 is taken as 100 percent, the following scale will express increases: 1941, 118 percent; 1942, 271 percent; 1943, 603 percent; 1944, 871 percent; 1945, 1,110 percent; and 1946, 20 percent increase as compared with 1945. According to a Soviet source published in 1946, Vorkutaugol' had 12 shafts in operation. 408/ (2) First train entered Vorkuta on 28 December 1941. During the war years (June 1941-August 1945) "tens of mines" were constructed. Also, during the war years, the capacity of the mines increased by 8 times, and production of coal increased by almost 9 times. It was reported that in 1945 the Vorkutaugol' Combine was loading in a month considerably more than in all of 1939 (monthly output at the end of 1945 could be much higher). 409/ (3) In October 1944 it was reported that the 10-year-old Vorkuta Coal Combine was producing 9 times as much as in 1940. 410/ (4) Pechora on 20 March 1946 was reported to be in fifth place among the coal basins of the country in the volume of output. Coal was mined in industrial quantities at the Vorkuta, Intinskiy, and Edzhit-Kyrtinskiy deposits, where 18 mines were operating. 411/ (5) [redacted] 50X1
the Vorkutaugol' Combine was supplying 10,000 to 11,000 tons per day. 412/ Vorkuta probably produced 3,750,000 tons or more in 1946. There was other production, evidently, which could raise the total to 5 million tons, but this figure appears to be the maximum.

g. Coal production in the Pechora Basin increased by 33 percent in 1947 over 1946, and the annual plan was fulfilled. The Vorkutaugol' Combine, according to a source published in January 1948, promised to increase production by 18 percent in 1948 and by 20 percent in 1949. 413/ The Vorkutaugol' Combine increased output 32.5 percent in 1947. 414/

h. The 1948 Plan for coal output was fulfilled on 19 December, and for coal loading on 24 December. Over a period of 11 months in 1948, coal

Table 70

Soviet Coal Production in the Pechora Basin
1931-52
(Continued)

extraction at Vorkutaugol' increased 17.5 percent compared with a like period in 1947, and 26.1 percent more coal was loaded on the railroads. 415/ A Soviet technician made the following statement on 19 January 1949: "In 1940, I took part in the plan for development of Vorkuta according to which in 1948 there should have been produced 25 million tons of coal -- actually, today, 20,000 tons daily -- the war slowed it down." 416/ The last statement indicates that output was at an annual rate of 7.2 million tons in January 1949.

i. Assumed increase of 20 percent over 1948. A prisoner of war interviewed in August 1949 reported that annual production at Vorkuta was 10 million tons. 417/ This figure appears too high for 1949.

j. The goal for 1950 cannot be definitely determined. [redacted] 50X1
[redacted] in 1950 the Pechora Basin will yield more than the 50X1
Karaganda Basin at the present time (April 1946). 418/ [redacted] 50X1
[redacted] under the Fourth Five Year Plan, out- 50X1
put at Pechora was to be tripled as compared with 1945. 419/ The Fourth Five Year Plan called for new mines to be constructed at Pechora with a capacity of 7.7 million tons. Karaganda produced 11.3 million tons in 1945 and about 11 million in 1946, so that the goal was probably within this range. An estimate of 11,250,000 tons appears to show a proper balance in the Plan for the entire country and for the western regions.

k. Assumed that Plan estimate was not fulfilled and may possibly be too low, although the estimated increase over 1949 is nearly 16 percent.

l. The Pechora Basin exceeded its 1951 annual coal production Plan by several hundred thousand tons and increased labor productivity 8 percent. The workers of the basin pledged to exceed the 1952 production Plan by 300,000 tons and to raise labor productivity 8 percent. 420/ The estimates for 1951 and 1952 represent increases of about 9 percent over the preceding year.

Table 71

Soviet Coal Production in the Georgian SSR
Selected Years, 1913-52

Year	Tons	Percent of Total Soviet Production
1913	70,000 a/*	0.24
1921-22	26,000 a/	0.22
1927-28	85,000 a/	0.24
1929-30	97,000 a/	0.20
1931	144,000 a/	0.25
1932	205,300 a/	0.31
1933	185,500 a/	0.24
1934	234,000 a/	0.25
1935	200,000 b/	0.18
1936	300,000 b/	0.24
1937	400,000 b/	0.31
1938	429,000 b/	0.32
1939	550,000 c/	0.38
1940	620,000 d/	0.37
1941 Plan	920,000 e/	0.48
1941	772,500 f/	0.56
1942	600,000 g/	0.78
1943	700,000 g/	0.71
1944	750,000 g/	0.59
1945	800,000 g/	0.54
1946	837,000 h/	0.51
1947	1,022,000 i/	0.55
1948	1,245,000 j/	0.59
1949	1,430,000 k/	0.61
1950 Plan	2,400,000 l/	0.96
1950	1,775,000 m/	0.68
1951	2,060,000 n/	0.73
1952	2,250,000 o/	0.75

* Footnotes for Table 71 follow on p. 256.

Table 71

Soviet Coal Production in the Georgian SSR
Selected Years, 1913-52
(Continued)

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a. All production from Tkibuli coal field. The Tkvarcheli deposit was opened in 1935. 421/
b. [redacted] these figures for the Transcaucasus. 422/ 50X1
c. Estimate.
d. The 1950 Plan was 2,400,000 tons, or 388.3 percent of 1940, which would indicate only 618,500 tons. 423/
e. According to the Plan the mines at Tkvarcheli and Tkibuli were scheduled to produce 400,000 tons and 500,000 tons, respectively. An additional 20,000 tons was to have been produced by the Commissariat for Local Industry. 424/
f. 425/
g. Estimates are maximum and are based on the following information:

Between the beginning of 1942 and May 1943, Tkvarcheli fulfilled only one monthly Plan, that for April 1943. The daily production of coal in 1943 was to have amounted to 1,150 tons, while the yearly Plan called for a production of 385,000 tons. In May, output decreased again because of a shortage of explosives. Tkibuli, which produced 22,135 tons of coal in April, was supposed to mine 9,774 tons in the first 10 days of May, but, because of the shortage of explosives, only 4,222 tons were produced. During the same period, only 4,869 tons (49 percent) of the planned coal could be shipped. The shortage of explosives in the mines was caused by transportation difficulties. The supply of explosives in Tkibuli was exhausted on 11 April 1943. The army had to use its trucks to get explosives to the mines. Also, the supply of mine timber was inadequate due to transport difficulties.

Total shipments made by Tkibulugol' during the first quarter of 1944 amounted to 75,200 tons, of which 73,000 tons were shipped by rail.

Total shipments made by Tkvarchelugol' during the first quarter of 1944 amounted to 54,000 tons, of which 21,000 tons were shipped by railroad and 33,000 tons by its own transportation pool.

The February 1944 production of Tkvarcheli amounted to 17,582 tons, while Tkibuli mined 21,000 tons. The monthly plan for Tkvarcheli was set at 24,700 tons in September 1944. 426/

h. 427/

Table 71

Soviet Coal Production in the Georgian SSR
Selected Years, 1913-52
(Continued)

i. The 1947 production is estimated as 78 percent of the 1948 production. 428/

j. In 1948 the coal output of the Georgian SSR was 201.1 percent of 1940. In regard to Gruzugol' Combine, the Plan was fulfilled only 89 percent, and mine capacity was utilized only 51.3 percent. 429/

k. Coal production in Georgia was 94 percent of plan and 115 percent of 1948. 430/ In 1949 the Georgian coal industry mined 20 times more coal than in 1913. 431/

l. Announced in the Fourth Five Year Plan. Also, 1950 Plan called for 388.3 percent of 1940. 432/

m. The Georgian coal output was 286.8 percent as high in 1950 as in 1940. The production of coal in Georgia was 20 percent greater than in 1949. 433/

n. In the first half of 1951, 64 percent more coal was mined than in all of 1940 and 29 percent more than in the first half of 1950. 434/ Coal production during 1951 in the Georgian SSR was 105 percent of Plan and 116 percent of 1950. 435/ The 1951 output of the Gruzugol' Combine was 116.2 percent of 1950. 436/ In 1951 the Georgian coal output was 233 percent higher than in 1940 and 58 percent higher than in 1948. The coal output Plan was fulfilled 94.6 percent in 1949, 101 percent in 1950, 105.1 percent in 1951, and 100.8 percent during the first 6 months of 1952. 437/

The Tkvarchelugol' Trust fulfilled the 1951 Plan for coal output 115.6 percent, which represents an increase of 26 percent over 1950. Production of this trust in 1951 was 4.3 times the prewar level, 3.4 times that of 1945, and 2.4 times that of 1947. 438/

o. The average daily output for the Gruzugol' Combine during the first 8 months of 1952 was more than 1.4 percent above Plan and 8 percent higher than in the same period of 1951. 439/ The fulfillment of the annual Plan in the Georgian SSR was 102 percent in 1952. 440/ The Tkvarchelugol' Trust fulfilled the 1952 Plan on 4 December 1952. 441/ The Tkibulugol' Trust and Akhaltsikhe Mine Administration failed to fulfill 1952 Plans. Nineteen of 39 coal mining sectors of the Gruzugol' Combine failed to fulfill the 1952 Plan. 442/ It was announced on 31 August 1952 that the Gruzugol' Combine had pledged completion of the Plan ahead of schedule, delivery of 40,000 tons of above-Plan coal, and an increase in labor productivity of 8.6 percent above 1950. 443/ The estimate for 1952 represents an increase of about 9 percent over 1951.

Table 72

Soviet Coal Production in Spitzbergen a/
1932-52

Year	Tons	Percent of Total Soviet Production
Before 1932	None	0
1932	26,000 b/	0.04
1933	128,100 b/	0.17
1934	220,000 b/	0.23
1935	275,000 c/	0.25
1936	400,000 c/	0.32
1937	400,000 c/	0.31
1938	400,000 c/	0.30
1939	340,000 c/	0.23
1940	300,000 c/	0.18
1941 Plan	400,000 d/	0.21
1941	150,000 c/	0.11
1942-47	0	0
1948	70,000 e/	0.03
1949	105,000 f/	0.04
1950 Plan	N.A.	N.A.
1950	185,000 g/	0.07
1951	150,000 h/	0.05
1952	150,000 h/	0.05

a. Records show that Spitzbergen production was not included in the total production figures during the years 1932-34, and the policy may never have been changed. This coal has been included in the totals in this report, and, if this is contrary to Soviet custom, it is of little consequence because the quantities are small.
b. 444/
c. Estimates, [redacted] 50X1
50X1
d. Plan for Arktikugol', which is assumed to be the controlling trust for Spitzbergen.
e. 445/
f. 446/

Table 72

Soviet Coal Production in Spitzbergen
1932-52
(Continued)

g. Shipments during 1950 amounted to 115,643 tons from the Grumant mine and 71,010 tons from the Barentsburgh mine. 447/
h. Estimate.

Table 73

Soviet Coal Production in Other Western Regions a/*
1931-52

Year	Tons	Percent of Total Soviet Production
Before 1931	0	
1931	38,200 b/	0.07
1932	88,500 b/	0.13
1933	122,600 b/	0.16
1934	200,000 b/	0.21
1935-37	N.A.	
1938	1,181,000 c/	0.89
1939	1,160,000 c/	0.80
1940	1,155,000 c/	0.70
1941 Plan	d/	
1941	438,000 e/	0.32
1942	385,000 e/	0.50
1943	440,000 e/	0.45
1944	485,000 e/	0.38
1945	1,900,000 f/	1.27
1946	2,463,000 f/	1.50
1947	2,803,000 f/	1.53
1948	3,100,000 f/	1.47
1949	3,300,000 f/	1.40
1950 Plan	g/	
1950	3,490,000 h/	1.33
1951	3,890,000 i/	1.38
1952	5,350,000 j/	1.77

* Footnotes for Table 73 follow on p. 260.

Table 73

Soviet Coal Production in Other Western Regions
1931-52
(Continued)

a. Includes the brown coal and lignite mines of the western Ukraine; the lignite mines at Borovichi and Selizharovo in the northwest section of the Greater Moscow Basin; mines in the Caucasus, excluding those in the Georgian SSR; a few mines in the Crimea; and probably a few in Saratov and Stalingrad oblasts and Tatar ASSR in the Volga region.

b. Production was distributed as follows: the Ukrainian SSR produced in 1931, 38,200 tons; in 1932, 80,600 tons; in 1933, 103,600 tons; and in 1934, 200,000 tons. Borovichi produced in 1932, 5,400 tons; and in 1933, 17,000 tons. Crimea produced in 1932, 2,500 tons; and in 1933, 2,000 tons. 448/

c. Residual figures after estimating production for all producing areas in the western regions and deducting estimates of production for the Georgian SSR, Spitzbergen, the Donbas, and the Moscow and Pechora basins. The western regions accounted for a little more than 64 percent of the total Soviet production in 1940.

d. The 1941 Plan called for production other than Ukrainian mines as follows: Leningrad Oblast, 50,000 tons; Tatar ASSR, 3,000 tons; Krasnodar Kray, 8,000 tons; Ordzhonikidze Kray, 235,000 tons; Dagestan ASSR, 14,000 tons; Kabardino Balkar ASSR, 25,000 tons; Crimea ASSR, 35,000 tons and Armenia ASSR, 12,000 tons. Also, 162,000 tons were the quota for Moldavia. The figure given for the Ukraine included the mines of the Donbas, and the quota for the brown coal mines cannot be determined.

e. Estimates. There was production during these years in the Caucasus and in the Lyubotinsk and Borovichi areas near Leningrad, but the quantities are not known. Undoubtedly, there was little, if any, production at the brown coal mines in the Ukraine.

f. Residual figures in estimates for the western regions are possibly high. Production, however, in all the areas was probably expanding. Five new deposits were to be developed during the Fourth Five Year Plan in Kiev and Kirovograd oblasts on the right bank of the Dnieper. Many other mines were to begin operations in various localities of the western Ukraine. 449/ Several large open-cut mines were to be developed, including the Semenovsko-Golobovskiy, with a planned output of 10,000 tons daily. 450/ The Russians admitted that slow progress was being made, and it seems fairly certain that output never came up to plan.

Table 73

Soviet Coal Production in Other Western Regions
1931-52
(Continued)

g. The 1950 Plan for the Ukrainian brown coal mines was 6 million tons, but no figures are available for other areas.
h. It is believed that output of coal in the western Ukraine was considerably less than planned. The estimate is a residual figure in the total of estimated production for the western regions.
i. It is believed that brown coal production in 1951 in the western Ukraine was considerably less than planned for 1950.
j. The Ukrainugol' Combine pledged to complete the 1952 Plan by 21 December 1952 and to deliver 85,000 tons of above-Plan coal. The removal of overburden in construction of pits was to be completed by 7 November, and the plan for construction and installation work by 21 December. The Semenovskiy Mine and the briquetting plant were to be placed in operation in the fourth quarter of 1952. 451/ The production of brown coal from open-cut mines increased many times as compared with last year. 452/ If it is assumed that 85,000 tons represented the total production of brown coal in the Ukraine during the last 10 days of 1952, and further that 8,500 tons was the average daily production for the year, it is evident that total production of brown coal by the Ukrainugol' Combine would not have exceeded 3 million tons in 1952. Data are not adequate to furnish a more adequate estimate for 1952 or for any year since before World War II. All estimates for recent years may be much higher than actual production.

Table 74

Soviet Coal Production in the Urals
Selected Years, 1913-52

Year	Tons	Percent of Total Soviet Production
1913	1,217,000 a/	4.19
1921-22	1,024,000 a/	9.04
1927-28	1,989,000 a/	5.60
1929-30	2,338,600 a/	4.89
1931	2,891,200 a/	4.47
1932	3,164,900 a/	4.75
1933	4,199,000 a/	5.50
1934	5,508,000 a/	5.85
1935	6,500,000 b/	5.97
1936	7,800,000 b/	6.17
1937	8,081,000 b/	6.34
1938	8,062,000 b/	6.07
1939	10,100,000 b/	6.93
1940	11,840,000 c/	7.13
1941 Plan	15,275,000 d/	8.01
1941	13,600,000 e/	9.89
1942	16,400,000 f/	21.30
1943	21,300,000 f/	21.74
1944	23,680,000 g/	18.50
1945	25,450,000 h/	17.06
1946	25,400,000 i/	15.47
1947	27,000,000 j/	14.68
1948	30,250,000 k/	14.41
1949	32,500,000 l/	13.77
1950 Plan	30,750,000	12.30
1950	34,500,000 m/	13.17
1951	36,900,000 n/	13.06
1952	40,000,000 o/	13.28

a. 453/
b. 454/
c. 455/
d. Plan for Narkomugol' was 15,000,000 tons. 456/

Table 74

Soviet Coal Production in the Urals
Selected Years, 1913-52
(Continued)

e. Increase of about 15 percent over 1940. 457/
f. 458/
g. Doubled in comparison with 1940.
h. In 1945, output in the Urals was 215 percent of 1940 level. 459/
i. Statements appeared in the Soviet press that coal production in some areas, including the Urals, was slightly lower than the previous year. 460/
j. By the end of October 1947, Kizel had exceeded 1946 production for the same period by 213,000 tons, and Chelyabinsk was expected to surpass the 1947 goal by 213,000 tons during the fourth quarter. 461/ Kizel was obligated to increase output by the end of 1947 by 12 percent over the first half of the year. It is assumed that output for the Urals increased more than 6 percent in 1947.
k. The Urals produced 12 percent more coal in 1948 than in 1947. 462/ In July 1948 the Kizel coal region reached the level of production planned for 1950. 463/
l. For the last 4 months of 1949, the Urals pledged to produce 335,000 tons above Plan. 464/ By November 1949, Sverdlovskugol' Combine was producing more coal than planned for 1950. 465/ Although there was no mention that the Urals exceeded the 1950 Plan in 1949, there is sufficient indication that it was the Chelyabinsk Basin which produced 334,000 tons in excess of the 1948 schedule and had undertaken to reach in 1949 the level of output planned for 1950 and produce 200,000 tons above Plan. 466/
m. The 1950 output was almost three times the 1940 output. 467/ Three times the 1940 level is equivalent to 35.5 million tons. The estimate of 34.5 million may be a little less than actual, although 2.9 times of the 1940 level is equivalent to 34.3 million tons.
n. Assumed increase of 7 percent over 1950.
o. The Kizelugol', Stalinugol', and Kospashugol' trusts were pledged to fulfill the 1952 Plan ahead of schedule and to deliver 80,000 tons of above-Plan coal. The Chelyabinskugol' Combine was pledged to deliver 50,000 tons of coal over the 1952 Plan and to raise labor productivity a total of 8.3 percent. The Sverdlovskugol' Combine was pledged to deliver 85,000 tons of coal over the 1952 Plan and to increase labor productivity 14 percent. 468/ The assumed increase in production as compared with 1951 is 8.4 percent. It is believed that new strip mines

Table 74

Soviet Coal Production in the Urals
Selected Years, 1913-52
(Continued)

in Bashkir ASSR contributed considerable coal, but production in the Sverdlovskugol' Combine probably increased at a much lower rate than the increase in labor productivity.

Table 75

Soviet Coal Production in the Karaganda Basin
Selected Years, 1913-52

Year	Tons a/*	Percent of Total Soviet Production
1913	0 b/	0
1921-22	0 b/	0
1927-28	0 b/	0
1929-30	11,900 b/	0.03
1931	278,300 b/	0.49
1932	721,900 b/	1.08
1933	1,132,700 b/	1.48
1934	1,831,000 b/	1.94
1935	2,356,038 c/	2.16
1936	3,500,000 c/	2.77
1937	3,940,000 d/	3.09
1938	4,100,000 d/ e/	3.08
1939	5,300,000 d/	3.64
1940	6,300,000 f/	3.80
1941 Plan	7,500,000 g/	3.93
1941	7,000,000 h/	5.09
1942	7,200,000 h/	9.35
1943	9,300,000 i/	9.49
1944	10,460,000 j/	8.17

* Footnotes for Table 75 follow on p. 265.

Table 75

Soviet Coal Production in the Karaganda Basin
Selected Years, 1913-52
(Continued)

Year	Tons a/	Percent of Total Soviet Production
1945	11,275,000 k/	7.55
1946	11,000,000 l/	6.70
1947	12,320,000 m/	6.70
1948	13,475,000 n/	6.43
1949	14,550,000 o/	6.16
1950 Plan	14,650,000 p/	5.86
1950	16,000,000 q/	6.10
1951	17,300,000 r/	6.13
1952	18,900,000 s/	6.27

a. First production in 1856.
b. 469/
c. 470/
d. 471/
e. Production was 4,427,000 tons in Kazakhstan, 472/ and it is estimated that 327,000 tons were produced by other fields.
f. 473/
g. Narkomugol'. 474/
h. Figures are lower than previous estimates for the respective years 1941 and 1942 by 1.2 and 1.3 million tons. Voznesenskiy stated that the amount of coal mined in Central Asia and Kazakhstan was only 9.4 million tons in 1942 and 12 million tons in 1943. 475/ Allowing 2.2 million tons for Central Asia and other output in Kazakhstan leaves 7.2 million tons for Karaganda. Production in 1941 was probably somewhat less.
i. Output of coal in Kazakhstan in 1943 was 3,256,000 tons above 1940. 476/ This figure indicates that total was about 10,050,000 tons, of which 750,000 tons is allocated to other fields in Kazakhstan.
j. Karaganda produced 66 percent more coal in 1944 than in 1940. 477/

Table 75

Soviet Coal Production in the Karaganda Basin
Selected Years, 1913-52
(Continued)

k. Output was 179 percent of 1940 output. 478/

l. A Soviet newspaper reported that production decreased slightly in 1946. Actual production may have been somewhat more than the estimate.

m. Karaganda increased output 12 percent over 1946. 479/ Karaganda miners exceeded the 1947 Plan by 258,000 tons. 480/ An increase of 12 percent over estimated 1946 output is equivalent to 12,320,000 tons. Assuming that the Plan called for an increase of 10 percent over 1946 and was exceeded by 258,000 tons, the output would have been 12,358,000 tons. The actual goal for 1947 may have been 12 million.

n. Production of coal in Kazakh SSR increased 9.4 percent in comparison with 1947. Average daily carloadings of coal on the Karaganda Railroad were 105.2 percent in comparison with 1947. 481/ A Soviet newspaper 482/ mentions that Karaganda fulfilled the Plan for the year and had undertaken to produce 447,000 tons in excess of the Plan before the end of the year. The goal for 1948 was probably very close to 13 million tons. The increase of 9.4 percent reported for Kazakh SSR would be just about the increase for Karaganda, which accounts for more than 80 percent of output in Kazakhstan.

o. On 2 June 1949 it was announced that the Karagandaugol' Combine had reached the level planned for 1950. 483/ The level planned for 1950 was exceeded in August. 484/ Kazakh SSR reported that coal output in 1949 was 101 percent of Plan and 108 percent compared with 1948. 485/ There was never any mention that the 1950 total output target was reached or exceeded in 1949, but 1949 total output probably was not far short of the 1950 target, assuming that 1949 total output represented an increase of 8 percent over 1948 total output. The pledged increase for 1949 was 9 percent over 1948. 486/

p. Original 1950 Plan. Karaganda was scheduled to furnish 5.85 percent of the total output in 1950. 487/ Output at Karaganda in 1950 is to be 232.4 percent of 1940. 488/

q. Karaganda pledged to increase output 17 percent as compared with 1948. 489/ This pledge was apparently given in the early part of 1949. One source states that output in 1950 had increased to more than 2.5 times output in 1940. 490/ [redacted] the Karagandaugol' Combine completed the Fourth Five Year Plan 2-1/2 months ahead of schedule. 491/ The last statement may imply that the total quantity for the Fourth Five Year Plan was fulfilled by the time stated. Output in 1950 was in excess of 15,750,000. 50X1

Table 75

Soviet Coal Production in the Karaganda Basin
Selected Years, 1913-52
(Continued)

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r. Karaganda pledged to increase daily average output 13 percent above 1950 and increase labor productivity 14 percent. 492/ Coal production in Kazakh SSR during 1951 was 108 percent of 1950 output. 493/ In 1951, Karaganda completed the annual Plan ahead of schedule and extracted more than 200 trainloads of power and coking coal above the Plan. Labor productivity was 12 percent higher than in 1950. 494/ Since Karaganda accounts for the preponderant tonnage in Kazakh SSR, the estimate is based on an increase of 8 percent and data in footnote o. It was reported in January 1952 that not one of the trusts of the Karagandaugol' Combine had reached prewar labor productivity.

s. Karaganda pledged completion of the 1952 Plan ahead of schedule, delivery of 215,000 tons of above-Plan coal, and an increase in labor productivity of 7 percent over 1951. 495/ The Karagandaugol' Combine fulfilled the 1952 Plan on 26 December 1952. The Karagandauglerazrez (open-cast mines) and Kirov trusts were ahead of schedule. 496/ Two trusts of the Karagandaugol' Combine -- almost half of the mines and sections -- and more than 20 percent of the workers were failing to fulfill the Plan and the norms in September 1952. 497/ [redacted] 50X1
[redacted] coal output in Kazakh SSR increased 9.4 percent between 50X1
the Fifth and Sixth Kazakh Party Congresses. 498/ Zasyad'ko stated on 12 October 1952 that three times more coal was mined at Karaganda than before the war. 499/ Three times 1940 output is equivalent to 18,900,000 tons; also 9.4 percent over 1951.

Table 76

Soviet Coal Production in Kazakh SSR (excluding Karaganda) a/*
Selected Years, 1913-52

Year	Tons	Percent of Total Soviet Production
1913	90,000 b/	0.31
1921-22	58,000 b/	0.51

* Footnotes for Table 76 follow on p. 268.

Table 76

Soviet Coal Production in Kazakh SSR (excluding Karaganda) a/
Selected Years, 1913-52

Year	Tons	Percent of Total Soviet Production
1927-28	37,400 b/	0.11
1929-30	79,200 b/	0.35
1931	98,400 b/	0.17
1932	99,800 b/	0.15
1933	95,600 b/	0.13
1934	89,000 b/	0.09
1935-37	N.A.	N.A.
1938	327,000	0.12
1939	400,000	0.27
1940	500,000	0.30
1941 Plan	923,000	0.48
1941	600,000	0.43
1942	650,000	0.84
1943	750,000	0.76
1944	1,000,000	0.78
1945	950,000	0.63
1946	1,000,000	0.61
1947	1,100,000	0.60
1948	1,300,000	0.62
1949	1,400,000	.59
1950 Plan	1,750,000	0.70
1950	1,500,000	.57
1951	1,550,000	.55
1952	1,750,000	0.58

a. The Ministry of the Coal Industry has under its administration the Karaganda Mines (Karagandaugol' Combine) and the Lenger Mines (Sredazugol' Combine), but these are believed to be all. The balance of the mines are probably under local administration. Production in recent years has been reported at Lenger, at Sas-Tyube and Kilitomashat in South Kazakhstan, at Dzholonbed and Bogombay in Akmolinsk Oblast, and at Ust'Kamenogorsk in East Kazakhstan. In addition, there is current

Table 76

Soviet Coal Production in Kazakh SSR (excluding Karaganda) a/
Selected Years, 1913-52
(Continued)

production at Dzhezkazgan, Ekibas-tuz, and Kaynamin, in the Aktyubinsk and Omsk oblasts, and in the Pavlodar area. The Fourth Five Year Plan called for opening 4 new mines in the Aktyubinsk field with an annual capacity of 270,000 tons, a strip mine at Ekibas-tuz with an annual capacity of 600,000 tons, and various mines under the Kazakh SSR's jurisdiction with an annual capacity of 400,000 tons. The Ekibas-tuz mine was being developed in 1949, but progress was reported slow. It is doubtful if the mine had much output, if any, in 1950. It is probable that Lenger is producing around 500,000 tons a year and is the major producing area. All figures in the table for the 1938-52 period, with the exception of the 1941 and 1950 Plan figures, are estimates which are based to some extent on increases reported for Kazakh SSR. (See footnotes to Table 74.) The estimates for recent years may be as much as 500,000 tons more than actual production.
b. 500/

Table 77

Soviet Coal Production in Central Asia
Selected Years, 1913-52

Tons

Year	Kirgiz SSR a/*	Uzbek SSR b/	Tadzhik SSR c/	Turkmen SSR d/	Total e/
1913					158,000 f/
1921-22					104,000 f/
1927-28					234,000 f/
1929-30					387,000 f/
1931					666,100 f/
1932					745,200 f/

* Footnotes for Table 77 follow on p. 270.

Table 77

Soviet Coal Production in Central Asia
Selected Years, 1913-52
(Continued)

Tons

Year	Kirgiz SSR a/	Uzbek SSR b/	Tadzhik SSR c/	Turkmen SSR d/	Total e/
1933					814,600 f/
1934					1,012,000 f/
1935					1,000,000 g/
1936					965,000 g/
1937					910,000 g/
1938					1,100,000 g/
1939					1,400,000 g/
1940	1,703,000		205,000	12,000	1,920,000
1941 Plan	2,036,000	10,000	343,000	20,000	2,409,000
1941	1,530,000	10,000	200,000	10,000	1,750,000
1942	1,331,000	51,000	160,000	8,000	1,550,000
1943	1,708,000	60,000	170,000	12,000	1,950,000
1944	1,730,000	80,000	175,000	15,000	2,000,000
1945	1,271,000	104,000	160,000	15,000	1,550,000
1946	1,325,000	187,000	200,000	18,000	1,730,000
1947	1,565,000	305,000	260,000	20,000	2,150,000
1948	1,860,000	758,000	300,000	22,000	2,940,000
1949	1,990,000	1,160,000	375,000	25,000	3,550,000
1950 Plan	1,600,000	1,130,000	440,000	60,000	3,230,000
1950	2,130,000	1,675,000	448,000	22,000	4,275,000
1951	2,350,000	2,050,000	460,000	25,000	4,885,000
1952	2,720,000	2,400,000	500,000	30,000	5,650,000

a. The Kirgizugol' Trust controls mines operating at four deposits -- Kyzyl-Kiya, Kok-Yangak, Sulyukta, and Tashkumyr. Production of these mines is under the Ministry of the Coal Industry. So far as is known, there is little, if any, production elsewhere. [redacted] 50X1
[redacted] the prewar output of all 4 deposits was about 1 million tons. 501/ 50X1
[redacted] the 1940 output of the Kirgiz SSR was 50X1
1,383,000 tons. 502/ The production of Central Asia in 1940 was reported to be 1,920,000 tons, which, after deducting probable output in other Republics, leaves a balance of about 1.7 million tons for Kirgiz SSR. [redacted] the 1950 Plan called for out- 50X1

Table 77

Soviet Coal Production in Central Asia
Selected Years, 1913-52
(Continued)

put to reach 1.6 million tons 503/ and [redacted] 2.2 million tons. 504/ The last figure may be a revised Plan. In 1950, production was 25 percent above the 1940 level, 505/ which is equivalent to 1,730,000 tons based on the lower level or 2,130,000 tons at the higher level. Also, 1950 output was almost 70 percent more than 1945. 506/ During the first and third quarters of 1950, output was 104 percent and 107 percent, respectively, of the same periods in 1949. 507/ In August 1950 it was reported that the Kyzyl-Kiya and Kok-Yangak mines completed the Fourth Five Year Plan, 508/ and in August 1949 it was reported that the same mines had achieved the 1950 production rate. 509/ The 1949 Plan was fulfilled 99 percent, and output was 107 percent of 1948. In 1948 the Plan was fulfilled 99.4 percent, and output increased 19 percent over 1947. 510/ The major center of production is at Kyzyl-Kiya, for which the following data are available: 1946, 5 percent over 1945; 1947, 20 percent over 1946; 1949, 19.2 percent over 1940 and almost 1-1/2 times 1946. According to preliminary figures, coal output in 1951 rose by over 10 percent. 511/ [redacted] the Central Asiatic coal industry furnishes the following estimates of production in 1948 512/: Kyzyl-Kiya, a maximum of 2,000 to 2,100 tons daily; Kok-Yangak, 1,200 to 1,300 tons daily; Tashkumyr, 600 to 650 tons daily; and Sulyukta, 1,800 tons daily. These estimates give a range of 5,600 to 5,850 tons daily for the mines of the Kirgiz Trust, or between 1.8 and 1.9 million tons in 1948. Such figures tend to support the opinion that output in Kirgiz SSR in 1940 was about 1.7 million tons, and this base has been used for projection.

50X1

50X1

50X1

b. The mines at Angren, which are under the administration of the Angrenugol' Trust of the Sredazugol' Combine, are the only ones known to be producing in Uzbek SSR. In October 1940, Sredazugol' was ordered to sink at once 2 mines for exploratory purposes with a view to producing 100,000 tons annually. 513/ The first mine began to yield coal in 1941 (the Plan called for 10,000 tons) and started to expand in 1943. In 1944, 2 more mines were started, and in 1945 the strip mine was started, but the latter did not yield coal until 1948. 514/ Output in Uzbek SSR was 104,000 tons in 1945. 515/ Relative changes in output have been reported as follows: in 1946 a 79.5-percent increase over 1945 516/; in 1947 a 62.1-percent increase over 1946 517/; in 1948 a 150-percent increase during the year at Angren, 518/ and

Table 77

Soviet Coal Production in Central Asia
Selected Years, 1913-52
(Continued)

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output rose 2.5 times as against 1947 519/; in 1949, 94 percent of the Plan and 153 percent of 1948 520/; in 1950 an increase of 9 times as against 1946 521/; in 1951 a 79-percent increase of the Plan 522/; during the first quarter, output was only 60 percent of the Plan and 78 percent of the first quarter of 1950, and was only 81 percent and 83 percent, respectively, of the second and third quarter of the Plan. 523/

c. The Shurab mines, of which there were two operating in 1946, belong to the Tadzhikugol' Trust, a subsidiary of the Sredazugol' Combine. In addition, there are the Isfara Mine Administration and Ziddinskaya Mine Administration (Ziddy), both of which are under control of the Ministry for Local Industry. It is probable that there are no more than two mines operated to supply local needs and that output is very small. The Tadzhikugol' Trust was pledged to reach by 6 November 1949 the output level fixed for 1950 and to exceed the 1949 Plan by 10 percent. 524/ [redacted] the Shurab mines were producing 50X1
700 to 800 tons daily in 1948. 525/ It was reported that coal output in Tadzhik SSR during 1950 reached 102 percent of the Fourth Five Year Plan quota and exceeded the prewar level 2.2 times. 526/ In August 1950 it was reported that Tadzhikugol' had completed the Fourth Five Year Plan, 527/ [redacted] there 50X1
were serious defects in the operations of the Tadzhikugol' Trust and in the mine of the local industry. [redacted] only one 50X1
mine. The Tadzhikugol' Trust had failed for a long time to complete the state Plan for coal output. The new equipment arriving at the Shurab mines was being poorly utilized. 528/ It would appear that the original 1950 quota was exceeded slightly, but super quotas had been imposed which were not met. Available statistics on Plan fulfillment and comparison with the same quarter a year earlier are as follows for Tadzhik SSR:

Table 77

Soviet Coal Production in Central Asia
Selected Years, 1913-52
(Continued)

Period	Percent of Plan Fulfillment	In Percent Of Past Year
1950 (First Quarter)	74	85
1950 (Second Quarter)	97	115
1950 (Third Quarter)	85	94
1951 (Third Quarter)	71	

The foregoing would indicate that 1949 output was about as high as 1950 but was probably somewhat less. It was reported that 1949 production was 109 percent of plan and 127 percent of 1948. Isfara Mine fulfilled the 1949 Plan. 529/ The Tadzhikugol' Trust fulfilled only 90 percent of the 1948 Plan but produced 12 percent more than 1947. 530/

d. The Kugitang Tau mine in Turkmen SSR is administered locally and is evidently the only mine in operation. The 1950 Plan was fulfilled 37 percent, and output was 95 percent of 1949 level. 531/ The 1950 Plan was only 60,000 tons, so 1949 output would have been about 25,000 tons and probably was the peak for that area. Statistics for 1951 are as follows:

Period	Percent of Plan Fulfillment	In Percent of Same Quarter 1950
1951 (First Quarter)	71	49
1951 (Second Quarter)	102	
1951 (Third Quarter)	100.8	

e. Production for the 1941-52 period totals the estimates made for each republic. [redacted] the total production of Kazakh SSR and Central Asia amounted to 12 million tons in 1943. 532/ The estimate for Central Asia is 1,950,000 tons. The 1950 Plan called for production of Central Asia to increase 70.8 percent as compared with 1940. 533/ The original 1950 Plan was 3,230,000 tons. It was reported that output of the Sredazugol' Combine in 1948 was 157.8 percent of 1940 and had increased 37 percent over 1947. Promises were

50X1

Table 77

Soviet Coal Production in Central Asia
Selected Years, 1913-52
(Continued)

made to exceed the 1949 planned output by 100,000 tons, a 24.8 percent increase over 1948. 534/ It was reported on 24 December 1952 that the output of coal by the Sredazugol' Combine was 15.9 percent higher during the first 11 months of 1952 than in the corresponding period of 1951. 535/ The Sredazugol' Combine includes Lenger in south Kazakhstan. It was reported that the Sredazugol' Combine fulfilled the 1952 Plan 5-1/2 days ahead of schedule. The Uzbekugol' Trust and the Sulyukta-ugol' Trust fulfilled the Plan ahead of schedule. 536/

f. 537/.
g. 538/.

Table 78

Soviet Coal Production in the Kuzbas
Selected Years, 1913-52

Year	Tons	Percent of Total Soviet Production
1913	774,000 a/*	2.66
1921-22	885,000 a/	7.82
1927-28	2,618,000 a/	7.37
1929-30	3,610,500 a/	7.56
1931	5,459,400 a/	9.62
1932	7,255,200 a/	10.88
1933	9,159,700 a/	12.00
1934	11,495,000 a/	12.21
1935	13,900,000 b/	12.76
1936	16,800,000 b/	13.29
1937	17,813,000 b/	13.98
1938	17,338,000 b/	13.04

* Footnotes for Table 78 follow on p. 275.

Table 78

Soviet Coal Production in the Kuzbas
Selected Years, 1913-52
(Continued)

Year	Tons	Percent of Total Soviet Production
1939	19,000,000 c/	13.04
1940	21,140,000 d/	12.73
1941 Plan	23,400,000 e/	12.28
1941	21,000,000 f/	15.27
1942	21,000,000 f/	27.27
1943	25,000,000 g/	25.51
1944	27,200,000 h/	21.26
1945	28,950,000 i/	19.39
1946	27,965,000 j/	17.03
1947	29,080,000 k/	15.81
1948	30,825,000 l/	14.70
1949	33,600,000 m/	14.24
1950 Plan	35,500,000 n/	14.20
1950	36,625,000 o/	13.98
1951	39,500,000 p/	13.99
1952	42,000,000 q/	13.94

a. 539/
b. 540/
c. This figure represents a compromise between estimates. [redacted] 17,047,000 tons, and [redacted] 21,000,000 tons. [redacted] was 3 million tons too high in 1940. Since 1940 production is fairly definite and previous estimates were based on a sizable increase in that year compared with 1939, the conclusion must be that 1939 output was 2 million tons, if not more, below 1940. 50X1 50X1 50X1
d. 543/
e. Narkomugol' only. The total for Novosibirsk Oblast was 25,045,000 tons. 544/
f. [redacted] coal output was not 50X1

Table 78

Soviet Coal Production in the Kuzbas
Selected Years, 1913-52
(Continued)

increased during the war but in 1942 remained at the same level as 1940. The problems of increasing coking coal output were very acute. It was announced 546/ in April 1942 that the Kuzbas fulfilled the 1941 Plan, but this has the aspect of propaganda.
g. In 1943 the Kuzbas produced 4 million tons more than in 1942. 547/
h. Output was 2,212,000 tons more than in 1943. 548/
i. The Kuzbas promised to produce 1.8 million tons more coal in 1945 than in 1944. 549/ In 1945, output was 137 percent of 1940. 550/
j. Reported in the press. 551/ The 1946 Plan was fulfilled by only 96.4 percent, 552/ indicating that the goal was 29 million and no increase was planned over 1945 output.
k. The Plan for 1947 provided for the production of 30,700,000 tons. 553/ In 1947, output increased 815,000 tons at Kuzbassugol' Combine and 300,000 tons at Kemerovugol' Combine as compared with 1946. 554/
l. Miners of the Kuzbas produced 580,000 tons of coal above the Plan in 1948. Coal output was 106 percent of 1947. 555/
m. Output was 109 percent of 1948. 556/
n. In 1950 the Kuzbas was to produce 168.9 percent of prewar output. 557/ Also, 14.2 percent of the total. 558/
o. Output was 109 percent of 1949. 559/
p. Estimated increase of about 8 percent over 1950.
q. The Kuzbassugol' Combine was pledged to deliver 150,000 tons over the Plan and increase labor productivity 6 percent as compared with 1951. The Kemerovugol' Combine pledged to deliver 75,000 tons of coal over the Plan and increase labor productivity 7 percent. 560/ Zasyad'ko stated on 12 October 1952 that the Kuzbas was mining two times more coal than before the war. 561/ It is probable that Kuzbas production in 1952 was somewhat less than 42.3 million tons, or twice the 1940 level. The estimate represents an increase of 6.3 percent, which is about the same as the planned average increase in labor productivity for the entire basin, based on the relative output in the 2 combines.

Table 79

Soviet Coal Production in East Siberia
Selected Years, 1913-52

Year	Tons a/	Percent of Total Soviet Production
1913	823,000 b/	2.83
1921-22	724,000 b/	6.39
1927-28	884,000 b/	2.49
1929-30	1,277,800 b/	2.67
1931	1,905,600 b/	3.36
1932	2,167,500 b/	3.25
1933	2,519,000 b/	3.30
1934	3,540,000 b/	3.76
1935	4,105,000 c/	3.77
1936	5,538,000 c/	4.38
1937	5,765,000 c/	4.53
1938	6,850,000 c/	5.15
1939	7,900,000 c/	5.42
1940	9,400,000	5.66
1941 Plan	10,913,000	5.72
1941	9,800,000 d/	7.13
1942	10,000,000 d/	13.00
1943	10,000,000 d/	10.20
1944	10,500,000	8.20
1945	10,000,000 e/	6.70
1946	10,600,000 e/	6.46
1947	11,200,000 f/	6.09
1948	13,400,000 f/	6.39
1949	13,900,000 g/	5.88
1950 Plan	12,700,000 h/	5.08
1950	14,250,000 i/	5.44
1951	15,000,000 i/	5.31
1952	16,300,000 j/	5.41

a. In East Siberia there are five major producing basins or fields: Minusinsk, Kansk, Cheremkhomo, Bukachacha, and Chernovskiye Kopi. These, as well as a number of other mining areas, are subsidiary to the

Table 79

Soviet Coal Production in East Siberia
Selected Years, 1913-52
(Continued)

Ministry of the Coal Industry. In addition, there are many relatively small mines scattered over a vast area, including Taymyr National Okrug and the Yakut ASSR, which have been controlled by the NKVD or other administrations. Few statistics have been published since 1934, but some information concerning output in the major fields since the war has served as a basis for estimates, which are believed to be accurate within 10 percent.

b. 562/

[redacted] 50X1

d. Transportation, labor, and machinery difficulties retarded development.

e. It is probable that output dropped during 1945 and efficiency was very low. There were many Japanese brought into East Siberia in 1945 and 1946, which increased production in the latter year.

f. The Vostsibugol' Combine, which includes Cheremkhovo, produced more than a half million tons in excess of the 1948 target and 1,351,000 tons in excess of the 1947 output. In the fourth quarter, production exceeded the level planned for 1950. In 1948 the Krasnoyarsk Combine produced 1,887,000 tons of coal over the Plan. Compared with 1947, output increased by 20 percent. 564/ The increase in production in the Krasnoyarsk Combine was between 500,000 and 550,000 tons in 1948, so that the total increase for the mines of the Ministry of the Coal Industry was not more than 1.9 million tons. This, added to an estimated increase of 300,000 tons in scattered production, gives an increase of 2.2 million in 1948. Thus, 1948 production exceeds the estimated Plan goal for 1950 by about 700,000 tons. It is the opinion that output expanded much more rapidly in the Kansk Basin than had been anticipated. The Vostsibugol' Combine achieved in 1948 the extraction level established for 1950, but this could mean the average daily rate and not the 1950 annual quota. The Zabaykalugol' Trust, with mines in Buryat Mongol ASSR and Chita Oblast, exceeded the 1950 level in 1948 and fulfilled the 1948 Plan on 9 December 1948, exceeding 1947 production by 16.2 percent. 565/

g. The Khakassugol' Trust in Minusinsk Basin completed the Fourth Five Year Plan in 3 years and 8 months, doubling average production

Table 79

Soviet Coal Production in East Siberia
Selected Years, 1913-52
(Continued)

in comparison with the prewar (1940) period. 566/ Many Japanese were taken out of the mines in late 1948 and 1949, which had some effect on production in 1949. The increase over 1948 is estimated at 500,000 tons, or about 4 percent.

h. Mines under the Ministry of the Coal Industry were to produce 107 million tons in 1950, and the figure of 12.7 million tons represents a residual estimate for East Siberia.

i. Estimates based on trends in coal production and labor productivity in the USSR. Considerable new mine machinery was sent to Cheremkhovo and probably some of the other mines. Expansion of production, however, was limited to some extent by low efficiency of the personnel in these areas, who are largely convicts and inexperienced youth.

j. The Krasnoyarskugol' Combine was pledged to complete the 1952 Plan ahead of schedule, to deliver 35,000 tons of coal more than the Plan, and to raise labor productivity a total of 12.1 percent above 1951. The Vostsibugol' Combine was pledged to complete the 1952 Plan ahead of schedule, to deliver 33,000 tons of coal above the Plan, and to increase labor productivity a total of 7.6 percent above 1951. 567/ It is estimated that coal production in East Siberia increased about 8.7 percent in 1952 as compared with 1951.

Table 80

Soviet Coal Production in the Far East a/*
Selected Years, 1913-52

Year	Tons b/	Percent of Total Soviet Production
1913	373,000 c/	1.28
1921-22	664,000 c/	5.58

* Footnotes for Table 80 follow on p. 280.

Table 80

Soviet Coal Production in the Far East a/
Selected Years, 1913-52
(Continued)

Year	Tons b/	Percent of Total Soviet Production
1927-28	1,072,700 c/	3.02
1929-30	1,598,100 c/	3.35
1931	2,011,800 c/	3.54
1932	2,260,300 c/	3.39
1933	2,678,600 c/	3.51
1934	3,390,000 c/	3.60
1935	4,281,000 d/	3.93
1936	4,695,000 d/	3.71
1937	4,723,000 d/	3.71
1938	4,752,000 d/	3.58
1939	5,325,000 d/	3.66
1940	6,600,000 e/	3.98
1941 Plan	8,973,000 f/	4.70
1941	7,000,000 g/	5.09
1942	7,200,000 g/	9.35
1943	7,200,000 g/	7.35
1944	7,600,000 h/	5.94
1945	8,100,000 i/	5.43
1946	10,400,000 j/	6.33
1947	11,800,000 k/	6.42
1948	12,100,000 l/	5.77
1949	12,600,000 m/	5.33
1950 Plan	10,850,000 n/	4.34
1950	13,000,000 o/	4.97
1951	13,700,000 p/	4.85
1952	14,500,000 q/	4.81

a. The Ministry of the Coal Industry has under its jurisdiction the Khabarovskugol', Primorskugol', and Sakhalinugol' combines. The mines at Raychikhinsk, Kivda, and Chagdamyn (Bureya Basin) are controlled by

Table 80

Soviet Coal Production in the Far East a/
Selected Years, 1913-52
(Continued)

Khabarovskugol'; those in north Sakhalin and south Sakhalin, by Sakhalinugol'; and the principal mines under Primorskugol' are at Suchan and Artem. The mines on south Sakhalin were taken over by the Russians in 1945 and had supplied the Japanese with as much as 6 million tons annually during World War II. Only 11 out of 45 mines, however, were being operated by the Russians in the last half of 1945, and these had an annual capacity of 1.4 million tons. In addition to the foregoing coal mining areas, there is scattered production at small mines, a few of which are probably controlled by the Ministry of the Coal Industry.

b. All figures are estimates with the exception of those for the 1913-34 period, 1940, and 1941 Plan.

c. 568/

[redacted] 50X1

e. 570/

f. 571/

g. Soviet data for these years are not available, but it is believed that there was some increase in production in 1941 and 1942 and none in 1943. The mines in the Bureya Basin were closed in 1941, at which time there was no railroad to them. Raychikhinsk did not have any significant expansion until quantities of strip equipment were obtained at the end of the war. The mines in north Sakhalin produced only about 250,000 tons in 1944, 572/ which was less than before the war. It is possible that the estimates may be high.

h. Coal production in Primorskiy Kray was 400,000 tons higher than in 1943. 573/ It is assumed that there was no increase at the Kivda and Raychikhinsk mines in Khabarovsk Kray.

i. The increase for 1945 results from mines acquired in south Sakhalin. It is possible that these mines contributed more than 500,000 tons to the USSR in 1945, but the amount is not known. Some decline may have occurred in other areas as the Russians furnish no data about coal output in the Far East in 1945, except that it was possible to work only eight of the mines in south Sakhalin when the Japanese left.

j. The Khabarovskugol' Combine increased production in 1946 by 15.6

Table 80

Soviet Coal Production in the Far East a/
Selected Years, 1913-52
(Continued)

percent over the prewar level. 574/ Assuming that the Khabarovskugol' Combine mined 3 million tons in 1940, its indicated production in 1946 would be about 3.45 million tons or at the most 3.6 million tons. The Bureya Basin was contributing 300 tons daily in May 1946. 575/ The 1946 Plan was overfulfilled by 440,000 tons. 576/ It is assumed that south Sakhalin contributed at least 1.4 million tons.

k. Khabarovsk Kray produced 25 percent more coal than in 1940 and 8.4 percent more than in 1946. 577/ In 1947 the Khabarovskugol' Combine increased output by 10.1 percent over 1946. 578/ During 1947, 11 pits were rehabilitated and put into operation in south Sakhalin. 579/ During the first 8 months of 1947 the Plan was exceeded by 50,000 tons, and the target at the year's end was 80,000 tons over the year's Plan. 580/ The estimate for 1947 represents an increase of about 13.5 percent over 1946 and may be as much as 1 million tons too high. It is assumed, however, that south Sakhalin contributed in excess of 2 million tons, and there was a sizable increase in Primorskiy Kray because of the employment of large numbers of Japanese.

l. Maritime Territory (Primorskiy Kray) fulfilled the annual Plan. Artem mines met the Fourth Five Year Plan quota in 3 years. 581/ Primorskugol' production in 1948 was 107.3 percent of 1947. 582/ According to a published Soviet source, output of coal at Raychikhinsk had been trebled in the last few years. The Novo Raychikhinsk deposit was to be put into operation in 1948 and was expected to yield hundreds of thousands of tons annually. The Kivda mines had received new equipment. It was stated to be no longer necessary to bring coal from the Kuzbas. 583/ In March 1948 there were more than 20 coal mines in operation in Sakhalin, which yielded several million tons of coal annually. In 1947 alone, Sakhalin gave the country more coal than was obtained from the island in the 70 years preceding the Revolution. It has earned the title of the "Stokehole of the Soviet Far East." 584/ The increase of 300,000 tons over 1947 may be too small and would result from overestimating production in 1947. Lack of good information about south Sakhalin, however, is a factor that complicates the difficulties of arriving at a reasonably accurate determination of production in the Far East.

m. The Primorskugol' Combine pledged to exceed the 1950 level of coal

Table 80

Soviet Coal Production in the Far East a/
Selected Years, 1913-52
(Continued)

mining by 2 percent and mine 150,000 tons above Plan, including 110,000 tons by Miners Day on 28 August 1949. 585/ During the first 9 months the production of the Primorskugol' Combine was 10.5 percent above the corresponding period of the last year. 586/ On the eve of Miners Day the Khabarovskugol' Combine achieved the output planned for 1950 and pledged to obtain 135,000 tons above Plan in the remaining 4 months of the year. 587/ Miners of the Aleksandrovskugol' Trust (north Sakhalin mines) are successfully meeting their obligations to fulfill the Fourth Five Year Plan in 4 years. 588/

n. The Plan called for production in the Far East to reach 164.6 percent of the prewar level. 589/ It is believed that the original target for 1950 did not include south Sakhalin.

o. In 1950 the Sakhalinugol' Combine mined more than 40,000 tons of coal above Plan. 590/ During 1950 the Primorskugol' Combine mined more than 150,000 tons of coal above Plan. 591/ the foregoing 50X1 information did not furnish 1950 statistics for the Khabarovskugol' Combine, and it is not likely that these mines fared too well. It is believed that 400,000 tons would represent the maximum increase in the region as compared with 1949.

p. Khabarovskugol' pledged to deliver 150,000 tons above Plan in 1951 and increase labor productivity 7 percent. Primorskugol' pledged to mine 90,000 tons of coal above Plan and increase labor productivity 5 percent. The Sakhalinugol' Combine pledged to mine 25,000 tons of coal above Plan and raise labor productivity 11.5 percent in 1951. These pledges were made in May 1951. 592/

q. The Khabarovskugol' Combine pledged completion of the 1952 Plan ahead of schedule, delivery of 70,000 tons of above-Plan coal, and an increase in labor productivity of 9.6 percent above 1951. The Primorskugol' Combine pledged completion of the 1952 Plan ahead of schedule, delivery of 30,000 tons of coal over the Plan, and an increase of 5 percent in labor productivity as compared with 1951. 593/ The estimated production in 1952 represents an increase of 5.8 percent over the estimate for 1951. It is believed that the estimates for 1950, 1951, and 1952 are within 500,000 tons of actual, but figures for the 1945-49 period may have a larger range of error.

APPENDIX H

COAL PRODUCTION TRENDS IN THE USSR BY MAJOR AREAS, SHOWING PERCENTAGE OF CHANGE FROM PRECEDING YEAR
1939-52

Table 81

Region	Area	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952
	Western Regions														
III & IV	Donbas	+ 5.7	+ 10.7	- 32.7	- 84.3	+ 320.0	+ 433.0	+ 63.1	+ 30.0	+ 19.0	+ 21.0	+ 19.9	+ 15.9	+ 8.4	+ 3.9
VII	Moscow Basin	+ 9.2	+ 22.9	+ 10.5	- 13.4	+ 51.6	+ 24.3	+ 6.1	+ 3.2	+ 9.7	+ 11.1	+ 12.6	+ 10.0	+ 7.1	+ 6.0
Ib	Pechora Basin	+ 75.0	+ 7.8	+ 17.9	+ 129.3	+ 122.5	+ 44.4	+ 27.4	+ 20.0	+ 33.0	+ 17.5	+ 20.0	+ 15.8	+ 8.8	+ 9.0
V	Georgian SSR	+ 28.2	+ 12.7	+ 23.6	- 22.3	+ 16.7	+ 7.1	+ 6.7	+ 4.6	+ 22.1	+ 21.8	+ 14.9	+ 24.1	+ 16.1	+ 9.2
Ia	Spitzbergen	- 15.0	- 11.8	- 50.0	a/	a/	a/	a/	a/	a/	b/	+ 50.0	+ 23.8	+ 15.4	
III	Western Ukraine	- 1.8	- 0.4	- 62.1	- 12.1	+ 14.3	+ 10.0	+ 291.7	+ 29.6	+ 13.8	+ 10.6	+ 6.5	+ 5.8	+ 11.5	+ 37.5
	Total Western Regions	+ 6.0	+ 11.1	- 28.6	- 83.6	+ 76.0	+ 103.6	+ 39.3	+ 20.8	+ 17.4	+ 18.1	+ 17.8	+ 14.6	+ 8.3	+ 5.6
	Eastern Regions														
VIII	Urals	+ 25.2	+ 17.2	+ 14.9	+ 20.5	+ 29.9	+ 11.2	+ 7.5	- 0.2	+ 6.3	+ 12.0	+ 7.4	+ 6.1	+ 7.0	+ 8.4
Xa	Karaganda	+ 29.2	+ 18.9	+ 11.1	+ 2.9	+ 29.2	+ 12.4	+ 7.8	- 2.4	+ 12.0	+ 9.4	+ 8.0	+ 10.0	+ 8.1	+ 9.2
Xa	Kazakh SSR (excluding Karaganda)	+ 22.3	+ 25.0	+ 20.0	+ 8.3	+ 15.3	+ 33.3	- 5.0	+ 5.3	+ 10.0	+ 18.1	+ 7.7	+ 7.1	+ 3.3	+ 12.9
Xb	Central Asia	+ 27.3	+ 37.1	- 8.9	- 11.4	+ 25.8	+ 2.6	- 22.5	+ 11.6	+ 24.3	+ 36.7	+ 20.7	+ 20.6	+ 14.1	+ 15.7
IX	Kuzbas	+ 9.6	+ 11.3	- 0.7		+ 19.0	+ 8.8	+ 6.4	- 3.4	+ 4.0	+ 6.0	+ 9.0	+ 9.0	+ 7.8	+ 6.3
XI	East Siberia	+ 15.3	+ 19.0	- 4.3	+ 2.0		+ 5.0	- 4.8	+ 6.0	+ 5.7	+ 19.6	+ 3.7	+ 2.5	+ 5.3	+ 8.7
XII	Far East	+ 12.0	+ 23.9	+ 6.1	+ 2.9		+ 5.6	+ 6.6	+ 28.3	+ 13.5	+ 2.5	+ 4.1	+ 3.2	+ 5.4	+ 5.8
	Other				+ 11.1		+ 52.0	- 18.8	+ 12.8	+ 6.4	+ 12.1	- 1.1	+ 5.0	+ 2.1	+ 3.6
	Total Eastern Regions	+ 17.3	+ 18.6	+ 3.4	+ 5.4	+ 17.8	+ 9.5	+ 4.4	+ 2.2	+ 7.4	+ 10.2	+ 7.5	+ 7.1	+ 7.2	+ 7.9
	Total USSR	+ 9.6	+ 13.9	- 17.2	- 44.0	+ 27.3	+ 30.6	+ 16.6	+ 10.0	+ 12.0	+ 14.0	+ 12.6	+ 11.0	+ 7.8	+ 6.7

a. No production.
b. Started production.

APPENDIX I

COAL RESOURCES IN THE USSR ACCORDING TO THE REPORT OF THE SEVENTEENTH SESSION OF THE INTERNATIONAL GEOLOGICAL CONGRESS, 1937 594/

Table 82

Distribution and Depth of Soviet Coal Reserves
1937 Estimate

Million Tons

Area	Total Geological Reserves	Total Reserves a/* Actual	Total Reserves a/* Probable	Distribution of Reserves According to Depths: To a Depth of 600 m	Distribution of Reserves According to Depths: From 600 m to 1,200 m	Distribution of Reserves According to Depths: From 1,200 m to 1,800 m
European USSR						
RSFSR						
Pechora Coal-Bearing Region	36,500			30,500	6,000	
Moscow Basin: Western Limb	500	20	30	50		
Moscow Basin: Southern Limb	11,900	1,461	2,939	11,900		
Urals : Western Slope	4,777	546	927	2,634	1,093	1,050
Urals : Eastern Slope	2,872	768	600	2,872		
Caucasus : Northern Slope	4,068	36	3,277	4,068		

* Footnotes for Table 82 follow on p. 288.

Table 82

Distribution and Depth of Soviet Coal Reserves
1937 Estimate
(Continued)

Million Tons

Area	Total Geological Reserves	Total Reserves a/ Actual	Probable	Distribution of Reserves According to Depths To a Depth of 600 m	From 600 m to 1,200 m	From 1,200 m to 1,800 m
Ukrainian SSR						
Donbas as a Whole (including the Azov-Black Sea Area)	88,872 b/	24,971	31,440	30,000	33,000	25,872
Brown Coal of the Ukraine	518	446	72	518		
Transcaucasia						
(Georgian SSR, Armenian SSR)	357	182	127	341	16	
Total European USSR	150,364	28,430	39,412	83,333	40,109	26,922
Asiatic USSR						
RSFSR						
Kuzbas	450,658	26,421	29,290	218,725	154,635	77,298
Gorlovo Coal-Bearing Region	1,545		5	1,545		
Minusinsk Basin	20,612	5,089	9,561	13,218	5,911	1,493
Chulym-Yenisey Basin	43,000	1,600	8,000	43,000		
Kansk Basin	42,000	4,420	21,081	42,000		
Tungus Coal-Bearing Region	440,000	30,000	90,000	440,000		
Irkutsk Basin and Transbaikal Region	81,397 c/	23,284	34,950	81,359	38	

Table 82

Distribution and Depth of Soviet Coal Reserves
1937 Estimate
(Continued)

Million Tons

Area	Total Geological Reserves	Total Reserves a/ Actual	Total Reserves a/ Probable	Distribution of Reserves According to Depths: To a Depth of 600 m	From 600 m to 1,200 m	From 1,200 m to 1,800 m
RSFSR (Continued)						
Lena Coal-Bearing Region	203,160	3,882	19,592	203,160		
Bureya Basin	26,116	1,134	3,080	6,900	19,104	112
Other Regions of the Far East	9,906	549	1,300	7,162	2,744	
Northeastern Sector of the Soviet Arctic Region	102,860		1,200	102,860		
Kazakh SSR and Central Asia						
Karaganda Basin	52,696	4,932	31,034	6,210	18,790	27,696
Other Coal Regions of Kazakh SSR	10,102	1,152	1,822	9,432	670	
Kirghiz SSR	10,046	279	2,903	4,793	2,553	2,700
Turkmen SSR	3,538	10	962	3,538		
Tadzhik SSR	2,175	92	284	609	1,360	206
Uzbek SSR	4,186	25	111	576	1,810	1,800
Total Asiatic USSR	1,503,997	102,869	255,175	1,185,087	207,605	111,305
Total USSR	1,654,361	131,299	294,587	1,268,420	247,714	138,227

Table 82

Distribution and Depth of Soviet Coal Reserves
1937 Estimate
(Continued)

a. A discussion of the terms actual and probable as used in this table appears in D, 1, a, p. 47, above.
b. This figure, showing the reserves of the Donbas, includes 20,690 million tons representing the reserves of the Azov-Black Sea area.
c. A part of the Irkutsk Basin and some of the coal deposits of the Transbaikal region (with total reserves of about 7,560 million tons) belong to the Buryat Mongol ASSR.

Table 83

Distribution of Soviet Coal Reserves by Classes of Coal
1937 Estimate

Million Tons

Area	Categories of Reserves a/* A	B and C	D	Total
European USSR				
RSFSR				
Pechora Coal-Bearing Region		20,000	16,500	36,500
Moscow Basin: Western Limb			500	500
Moscow Basin: Southern Limb			11,900	11,900
Urals : Western Slope		4,777		4,777
Urals : Eastern Slope	631		2,241	2,872
Caucasus : Northern Slope	85	3,983		4,068
Ukrainian SSR				
Donbas as a Whole (including the Azov-Black Sea Area)	33,976	54,896		88,872 b/
Brown Coal of the Ukraine			518	518
Transcaucasia				
(Georgian SSR, Armenian SSR)		287	70	357
Total European USSR	34,692	83,943	31,729	150,364

* Footnotes for Table 83 follow on p. 293.

Table 83

Distribution of Soviet Coal Reserves by Classes of Coal
1937 Estimate
(Continued)

Million Tons

Area	Categories of Reserves a/ A	B and C	D	Total
Asiatic USSR				
RSFSR				
Kuzbas	54,000	396,658		450,658
Gorlovo Coal-Bearing Region	1,545			1,545
Minusinsk Basin		20,612		20,612
Chulym-Yenisey Basin			43,000	43,000
Kansk Basin		400	41,600	42,000
Tungus Coal-Bearing Region		440,000		440,000
Irkutsk Basin and Trans-baikal Region		79,129	2,268	81,397 c/
Lena Coal-Bearing Region		132,900	70,260	203,160
Bureya Basin		26,116		26,116
Other Regions of the Far East	489	6,967	2,450	9,906
Northeastern Sector of the Soviet Arctic Region		93,500	9,360	102,860
Kazakh SSR and Central Asia				
Karaganda Basin		54,418	1,278	52,696
Other Coal Regions of Kazakh SSR		7,139	2,962	10,102

Table 83

Distribution of Soviet Coal Reserves by Classes of Coal
1937 Estimate
(Continued)

Million Tons

Area	Categories of Reserves a/ A	B and C	D	Total
Kazakh SSR and Central Asia (Continued)				
Turkmen SSR		3,538		3,538
Kirghiz SSR		4,352	5,694	10,046
Tadzhik SSR		1,686	489	2,175
Uzbek SSR		4,184	2	4,186
Total Asiatic USSR	56,034	1,268,599	179,364	1,503,997
Total USSR	90,726	1,352,542	211,093	1,654,361

a. Classes of coal according to the classification adopted by the Seventeenth Session of the International Geological Congress. Class A includes anthracite and semianthracite; Class B, semibituminous (low volatile) and bituminous coals; Class C, cannel or boghead coals; and Class D, lignite and brown coals.
b. This figure, showing the reserves of the Donbas, includes 20,960 million tons representing the reserves of the Azov-Black Sea area.
c. A part of the Irkutsk Basin and some of the coal deposits of Transbaikal region (which have total reserves of about 7,560 million tons) belong to the Buryat Mongol ASSR.

APPENDIX J

ESTIMATED INVENTORIES AND PRODUCTION OF SOVIET UNDERGROUND MINING EQUIPMENT

Table 84

Estimated Inventory of Heavy and Light Coal-Cutting Machines in the USSR Selected Years, 1927-52

Units

Year (End of Year)	Heavy Cutting Machines	Light Cutting Machines	Total
1927-28 a/	549	268	817
1928-29 a/	761	393	1,154
1929-30 a/	1,007	409	1,416
1931 a/	1,278	322	1,600
1932 a/	1,473	339	1,812
1933 a/	1,679	294	1,973
1934 a/	1,754	327	2,081
1938	2,509 b/	341 c/	2,850
1939	2,925 d/	600 c/	3,525
1940	3,442 e/	608 c/	4,050
1941	850 f/	300 g/	1,150
1945	1,450 h/	300 h/	1,750 h/
1946	2,400 i/	300 j/	2,700
1947	3,425 i/	275 j/	3,700
1948	3,950 i/	250 j/	4,200
1949	4,350 i/	150 j/	4,500
1950	4,600 i/	100 j/	4,700
1951	4,800 i/	50 j/	4,850 k/
1952	5,092 i/	0 j/	5,092

a. 595/
b. Plan figure. 596/
c. According to calculations, light cutting machines accounted for the following coal output (in tons): 1932, 579,000; 1937, 628,000; 1940, 1,437,000; 1941, 537,000; 1945, 527,000; 1946, 587,000 (included with heavy cutters in later years). The

Table 84

Estimated Inventory of Heavy and Light
Coal-Cutting Machines in the USSR
Selected Years, 1927-52
(Continued)

number of machines must have increased considerably in 1939 on the basis of production and declined sharply with loss of the Donbas in 1941. The output of these machines was only about 2,000 tons annually in 1932. It is probable that some increase in productivity occurred from new models. This factor has been taken into account in the estimates for 1939 and 1940. It is believed that the park of machines in 1939 did not increase proportionately with production in that year as compared with 1938, but was actually much less. The 1941 Plan called for production of 500 light cutting machines, but probably less than half that number were produced because of the war.

d. Estimated. At the beginning of 1940 there were 2,150 heavy cutting machines in mines of the western regions. 597/

e. Figure is apparently based on Soviet data. 598/

f. Estimate. Before World War II the Donbas mines were using over 2,600 heavy cutting machines. 599/ It was claimed that 2,700 machines were lost because of the war. 600/ There were over 3,000 cutting machines in the Donbas in 1941. 601/ It is assumed that 2,600 were lost in the Donbas and 42 in the Moscow Basin, and the eastern regions had a net gain of 50 as compared with 1950.

g. Assumed that 300 were lost in the Donbas and the Moscow Basin.

h. Fourth Five Year Plan (1946-50) called for rebuilding 1,100. 602/ Twelve months after liberation, the Donbas mines had 442 coal cutters at their disposal. 603/ It is believed that there were around 1,100 old machines in addition to production of 650 (estimated) new machines in the cutting-machine park at the end of 1945.

i. Residual figures after deducting estimated quantities of light cutting machines.

j. Estimates. Data on percentage of output from light cutting machines end with 1946 and are combined with that produced by heavy cutting machines. It is the opinion that no light cutting machines have been built since the war, and it is possible that all were retired in 1952, if not before.

k. The industry had 20 percent more cutters than in 1940.

Table 85

Estimated Production, Imports, Exports, and Inventory of Coal-Cutting Machines in the USSR 1945-52

Units

Year	Inventory (1 January)	Production a/	Imports b/	Exports	Total	Retired c/	Inventory (31 December)
1945	1,100	650					1,750
1946	1,750	845	320		2,915	215	2,700
1947	2,700	1,400	105		4,205	505	3,700
1948	3,700	1,325			5,025	825	4,200
1949	4,200	1,405			5,605	1,105	4,500
1950	4,500	1,125		50 d/	5,575	875	4,700
1951	4,700	1,100		100 d/	5,700	850	4,850
1952	4,850	1,250		183 e/	5,917	825	5,092

a. From production table.
b. 604/
c. Estimates.
d. 605/
e. Estimate based on quantities indicated in Satellite plans.

Table 86

Estimated Production of Coal-Cutting Machines in the USSR by Plants and by Models
1945-52

Units

	Plant imeni Kirov Gorlovka			Plant No. 25 imeni Kirov Kopeysk				Voroshilov Arms Plant No. 4 Krasnoyarsk	
Year	GTK a/	MV-60 b/	Total	KMP-44 c/	KMP-1 d/	ShVD-48 e/	Total	VTU-1 f/	Total
1945	600 g/	0	600 g/	50 h/	0	0	50	0	650
1946	800 g/	0 i/	800 g/	0 j/	30 k/	0	30	15 l/	845
1947	991 g/	9 m/	1,000 g/	0	200 n/	0	200	200 o/	1,400
1948	700 p/	150 q/	850 g/	0	275 r/	0	275	200 o/	1,325
1949	600 s/	300 t/	900	0	400 u/	5 v/	405	100 w/	1,405
1950	300 s/	350 t/	650	0	475 x/	0 y/	475	0	1,125 z/
1951	200 aa/	400 t/	600	0	500 x/	N.A.	500	0	1,100
1952	300 bb/	450 t/	750	0	500 x/	N.A.	500	0	1,250

a. GTK longwall coal cutter. It was known as GTK-3 before the war. The GTK-3M was in production from 1945 through part of 1950. This machine was succeeded in 1950 by the GTK-35, which is now believed to be in production.
b. MV-60 longwall coal cutter. This is a heavy-duty machine which was introduced in 1947 and is still in production. It has also served as a basic component of the Donbas-1 and other combines.
c. KMP-44 longwall coal cutter. This machine may have been in production during the war. It was superseded in 1946 by the KMP-1.
d. KMP-1 longwall coal cutter. This machine is not quite as heavy as the MV-60. The KMP-1 has probably been the basis for the VPM-1 cutter-loader. The KMP-1 and GTK-3M machines were also component parts of the Makarov coal combine.
e. ShVD-48 shortwall coal cutter. It is the successor of the prewar ShVD-46 machine. Insofar as is known, it is still an experimental model.
f. VTU-1 universal coal cutter. This machine is a heavy-duty tractor-mounted cutter, designed especially for the cutting of preparatory passages.
g. Total production for the Gorlovka Plant for 1945-48 is estimated on the basis of the following information: Gorlovka produced its 2,000th cutting machine since the war according to a Soviet press statement of 7 August 1947. 606/ Gorlovka completed its 9,405th machine since the start of production in 1933 according to Soviet press information of 2 February 1948. 607/ It shipped its 10,000th cutter in November 1948. 608/ All 2,000 cutters were reasoned to be the postwar GTK-3M, except 9 MV-60 machines known to have been built in 1947. 609/
h. Estimated. The improved KMP-44 was being produced in 1945. 610/ The plant had not yet fully reconverted from war production in 1945.
i. There were 15 being built, 611/ but only 9 were in use in early 1948. 612/
j. Estimate none. It is believed that the plant was tooling up for production of the KMP-1.
k. The plant was tooling up for production of the KMP-1. 613/
l. The plant was preparing to manufacture parts for 15 heavy coal cutters. 614/
m. Three hundred were planned for 1947. 615/ After experimentation, mass production of revised models began in early 1948. 616/
n. Estimated total production of 250 machines, including 50 VPM-1 cutter-loaders.

Table 86

Estimated Production of Coal-Cutting Machines in the USSR by Plants and by Models
1945-52
(Continued)

o. Although a rate of 30 per month was indicated by a Japanese prisoner of war, production for 1947 and 1948 is conservatively estimated at 200 each year. 617/
p. A cutback in the production of the GTK-3M was assumed as a result of the shift to the production of the modernized heavy MV-60, which weighed 3,500 kg as against 2,000 kg for the GTK-3M.
q. Estimated. The first series shipment was not made until August 1948. It was then proposed to replace the GTK-3 machines. 618/
r. Estimated total production of 375 machines, including 100 VPM-1 cutter-loaders.
s. Estimated on the basis of a cutback in production of the outmoded GTK-3M. The 1950 estimate includes a small quantity of the new GTK-35 machines. 619/
t. Estimated. No official data are available on production. Demand is believed to be restricted by efforts to introduce the Donbas combine, which was built around the power unit of the MV-60. Since the 1947 Plan called for 300 MV-60 machines, at a time when production was just getting started, it is probable that at least as many as 300 would be produced per year once the plant had achieved full production. Difficulties were experienced with the machines in 1948 and 1949, which necessitated changes in motors, starters, and ratchets.
u. Prisoner-of-war reports furnish estimates ranging from 30 to 80 cutters per month, which must have included quantities of cutter-loaders. Production is estimated at 500 machines, including 100 cutter-loaders.
v. Estimated from a statement that in 1949, some experimental models of the ShVD-48 shortwall cutter were put out. 620/
w. Since this machine is too powerful for the work to be done, it is believed that it was discontinued in 1949 in the expectation that it would soon be replaced by the ShVD-48 or another model.
x. Estimates, excluding units for VPM-1 cutter-loaders.
y. Still in the experimental stage; will probably undergo extensive modifications. 621/
z. Before World War II (1940) the Soviet mining machinery plants put out over 1,000 cutting machines. The machine-building plants of the Ministry of the Coal Industry alone were to produce 11,000 cutting machines during the Fourth Five Year Plan. 622/
aa. Estimated from statement that the Gorlovak Plant was producing a large number of the new GTK-35 machines. 623/ Forty new GTK-35 cutters were to be ready by Miners Day, late in August. 624/
bb. Estimated. This machine, although light in weight for regular work, is useful in thin seams.

Table 87

Estimated Inventory of Coal Combines, Coal Planers, and Cutter-Loaders in the USSR a/
1945-51

Units

Year b/	Coal Combines c/	Coal Planers c/	Cutter-Loaders c/	Total
1945	5 d/	0	0	5
1946	9 e/	2	1	12
1947	16 f/	3	35	54
1948	75 g/	20	120	215
1949	175 h/	25	200	400
1950	300 h/	15	310	625
1951	460 i/	12	400	872

a. The inventories of machines are based mainly on estimated production of machines and output of coal from these machines, with discretionary allowances for heavy retirement, and supplemented by available Soviet statistics. The figures in the table necessarily include numerous machines that are idle or not installed.
b. End-of-year inventory.
c. See production tables.
d. Includes 1 Makarov built in 1944 and 4 of various types built in 1945. It is possible that there were a few prewar models in the mines, but it is doubtful if any of these were in operation.
e. Estimate based on report that 1950 inventory increased 32 times in 5 years since the war. 625/
f. Estimate [redacted] the number of combines increased elevenfold in 2 years preceding 1950. Statement of Minister of the Coal Industry Zasyad'ko, 10 February 1950. 626/ 50X1
g. Interpolated.
h. At the end of 1950 there were 300 combines in use in the USSR. 627/ During the first 6 months of 1950 the number of combines increased 38 percent. 628/ In 8 months of 1950 the number of combines increased 50 percent. 629/ The increase during 1950 was interpolated as 72 percent.
i. The production of combines is estimated at 240. About 50 of these were exported, and 30 old machines are assumed to have been retired.

Table 88

Estimated Production of Coal Combines in the USSR by Plants and by Models a/
1945-51

Units

	Plant imeni Kirov Gorlovka						Plant No. 25 imeni Kirov Kopeysk			Plant imeni Parkhomenko Karaganda	Voroshilov Omsk	Svet Shakhtera Khar'kov		
Year	Donbas b/	VOM-1 c/	UKMG-1	KKP-1	Other	Total	Makarov d/	Other	Total	Makarov d/	Makarov d/	UKT-1	Miscellaneous	Total
1945	0	1 630/	0	0	2 e/	3	0	0	0	1 f/	0	0	0	4
1946	0	1 g/	0	0	6 h/	7	0	0	0 i/	10 j/	0	0	0	17
1947	0	0 k/	0	0	2 l/	2	0	4 m/	4	15 n/	12 o/	0	0	33
1948	52 p/	1 q/	0	0	5 r/	58	3 s/	0 t/	3	10 u/	2 v/	0	0	73 w/
1949	100 x/	15 y/	0	0 z/	0 aa/	115 bb/	cc/	cc/	cc/	cc/	cc/	0	1 dd/	116 ee/
1950	150 ff/	5 gg/	0	0	3 hh/	158	ii/	22 jj/	22	kk/	kk/	5 ll/	0	185 mm/
1951	175 nn/	10 oo/	2 pp/	10 qq/	3 rr/	200	ss/	13 tt/	13 tt/	1 uu/	vv/	25 ww/	1 xx/	240
Total	477	33	2	10	21	543	3	39	42	37	14	30	2	668

a. Excluding cutter-loaders and coal planers which may be included in some Soviet references to combines.
b. Originally known as GUK-1; current model is Donbas-1.
c. Models VOM-1, VOM-2, and VOM-2M.
d. Models KM-4M, KM-5M, and KM-6M, which are, respectively, 2,200 mm, 1,379 mm, and 1,720 mm high.
e. Consists of 1 Abakumov, AMV-1, and 1 machine of unknown type, built by the engineers who later received credit for designing the Donbas combine. 631/
f. A mining machine designed by S.S. Makarov was placed in operation in Mine No. 31 of the Karaganda Basin in 1945. 632/
g. A second machine built. 633/
h. One VNAT 634/ and 5 Abakumov models. 635/
i. Plant retooling to build Makarov combine and VPM cutter-loader. 636/
j. Total number built in USSR in 1946. 637/ Believed to have been built at Karaganda, where they were designed.
k. Estimated. Experimenting with VOM-1 and still did not have heavy cutting machine MV-60 as base for combine; subsequently built VOM-2.

Table 88

Estimated Production of Coal Combines in the USSR by Plants and by Models a/
1945-51
(Continued)

l. Estimated production of VNAT. The five Abakumov, AMV-1, machines produced in 1946 were experimental and were never put into serial production. They laid the basis for the MBK-1, trial models of which were built in 1948. 638/

m. Estimated 2 VNATI and 2 UKA-1. These VNATI machines were built in 1947 and tested in the Andreyavugol' Trust in the Kizel Basin of the Urals. 639/ The first models of the UKA-1 were built and passed tests at the Anzherugol' Trust of the Kuzbas in 1947.

n. This is a maximum figure. Many of them may never have been installed in mines and may, instead, have been cannibalized for parts with which to repair other machines in the Karaganda mines.

o. These were assembled and tested in April 1947. 640/ They went into serial production [redacted] 641/ The plan called for 50X1
100 more by the end of 1947, but it is believed that they were never built, due to operational difficulties at the mines.

p. Two were completed by September 1948. 642/ Fifty more were completed in December as per plan. 643/ This combine was first introduced at the end of 1948 at Mine No. 3-bis, Chistyakovantratsit Trust in the Donbas. 644/

q. The new VOM-2 was under trial in the Moscow Basin. 645/

r. Estimated. All were experimental. These included 2 S-29 models, 646/ 2 MBK-1, and 1 ZAL-1. 647/

s. Estimated. Production began in summer 1948. 648/

t. No information; believed to be none.

u. Estimated.

v. Estimated. Modernized Makarov combines completed tests. 649/ These models were believed to be experimental.

w. In the middle of 1948, 20 combines were in use in the USSR. 650/ The number of coal combines increased 2.2 times in 1948. 651/

x. Estimated. Gorlovka was to deliver the second batch of Donbas combines on 1 April 1949. 652/ The Donbas was to get 100 combines in 1949. 653/ It is believed that probably 2 batches of 50 machines each were made in 1949. Series production did not begin until early 1950.

y. One hundred faces were to be equipped with VOM-1 combines in 1949. 654/ It is believed that all of these machines were intended for use in the Moscow
Basin, but [redacted]; so large a number was never produced. Evidently there was a changeover to the VOM-2, which 50X1
did not prove successful. This was followed by a modified VOM-2M. Development of the VOM-2 depended on development of the new MV-60 heavy-duty coal
cutter. A batch of VOM-2 machines was produced for the Moscow Basin, [redacted] probably in 1949. 655/ 50X1

z. An experimental model of this machine was produced in 1949 at the Malakhovskiy Plant. 656/ It is believed that Gorlovka did not begin production until later.

aa. No evidence of any production.

bb. The Donbas had three times as many combines in 1949 as in 1948. 657/

cc. Minor production, if any.

dd. An experimental model of the KKP-1 was built at the Malakhovskiy Plant. 658/

Table 88

Estimated Production of Coal Combines in the USSR by Plants and by Models a/
1945-51
(Continued)

ee. In the last 2 years the number of combines in the USSR increased elevenfold. 659/ This statement was made by Minister Zasyad'ko in February 1950 and is assumed to mean that the number of combines in use at the end of 1949 was 11 times greater than at the end of 1947. Many of the early machines were out of use by the end of 1949 and may have been scrapped.
ff. Estimates based on the over-all increase of about 75 in all types during 1950.
gg. Estimated. The Gorlovka Plant completed the first batch of the VOM-2M combines, the third and most recent modification of the VOM combine, in 1950. 660/
hh. Two trial models of the S-40 to be manufactured in the near future. 661/ An experimental model of the MBK-1 was built at Gorlovka. 662/
ii. Few, if any. The plant was probably developing the KMP-1 2-bar combine and the PK-2 entry driver.
jj. The first PK-2 was tried at the Kopeyskugol' Trust in February 1950. 663/ The PK-2M was first used in the Moscow Basin in June 1950. 664/ The Kopeysk Plant was ordered to build 10 KMP-1 2-bar combines in March and 10 in April 1950. 665/ It is estimated that 20 of these machines and 2 PK-2M combines were built in 1950.
kk. Probably none.
ll. The new UKT-1 was used effectively in Mine No. 19 of the Rutchenkovugol' Trust. 666/ Several were in operation in the Donbas Mines in the early part of 1951. The first machines were experimental models. Therefore, it is estimated that only 5 were built in 1950.
mm. At the end of 1950, 300 combines were in use. 667/ At the end of 6 months, 1950, the number of combines increased 38 percent. 668/ At the end of 8 months, 1950, the number of combines increased 50 percent. 669/
nn. It was planned to construct 48 combines in the entire USSR during the last 4 months of 1951. 670/ Work was being started on a lighter and simpler Donbas-1. 671/
oo. Estimated.
pp. An experimental model of the UKMG-1 was working in a mine of the Budennoyugol' Trust. 672/ Tests of the UKMG-1 were completed by the Gorlovka Plant and the Donets Coal Institute, and machines were to be shipped to the Stalin Combine Mines on 5 December 1951. 673/ It is probable that only 1 machine was shipped in 1951, since [redacted] the first group of 5 machines was completed.
qq. Estimated. The KKP-1 Combine was being tested at the mines of the Artemugol' Combine in the Donbas. 674/ [redacted] tests were made of the KKP-1. 675/ At the end of 1951 this machine was reported as being in use in many mines of the central Donbas. 676/ 50X1
rr. Estimated. Experimental models of the Gornyak machine, a combine for the mining of slanting seams 0.6 to 0.8 meter thick. 677/
ss. Probably none.
tt. In late 1950 the Kopeysk Plant received an order to build 10 more KMP-1 2-bar combines with culm remover. The plan for 1951 was to build enough of these machines to meet the demand of the Chelyabinskugol' Combine. 678/ Another new machine, made at Kopeysk, comprises an earth loosener, culm remover, and side controls to ensure straight running of the machine along the face. 679/ It is estimated that probably 2 of the complex PK-2M combines and 1 of the named machines, as well as at least 10 KMP-1 2-bar cutters were made. The plant prefers to concentrate on the KMP-1 longwall cutter and was forced to build the 2-bar machine.

Table 88

Estimated Production of Coal Combines in the USSR by Plants and by Models a/
1945-51
(Continued)

uu. A caterpillar hewing and loading machine, nicknamed by the miners "the underground tankette," capable of producing 13,000 tons of coal monthly, has been invented by S.S. Makarov. 680/

vv. Probably none.

ww. Estimated. The experimental plant of Giprouglemash put out the first model of the new UKT combine, designed to extract coal from seams 0.4 to 0.7 meter thick. These machines were said to have worked well in mines of the Rostovugol', Stalinugol', and Voroshilovgradugol' combines, where extraction of coal from thin seams increased on an average of 30 percent. 681/ In 1951 the plant was to send dozens of the UKT-1 to mines. 682/

xx. Estimated. One experimental heavy-duty combine, possibly produced at the Kiznets Mining Machine Plant at Stalinsk in the Kuzbas. [redacted] a new combine, designed by the Stazhevskiy brothers, cuts coal from the face and delivers it to a car. A heavy-duty model passed its tests in the Kuznetskugol' Trust. 683/ 50X1

Table 89

Estimated Production of Coal Planers in the USSR a/
1946-51

Units

Year	Models US-2	US-3	US-4	Total
Before 1946	0	0	0	0
1946	1 b/	1 b/	0	2
1947	0	1 c/	0	1
1948	0	35 d/	5 d/	40 d/
1949-51	0 e/	0 e/	0 e/	0 e/

a. Produced at the Voroshilovgrad Plant imeni Parkhomenko.
b. Estimates are an experimental model of each machine. Production, however, may have been delayed until 1947.
c. Two complex installations of the US-3 were exploited in 1947-48 in the No. 5 Mine of the Voroshilovgradugol' Trust and the No. 47 Mine of the Bryanskugol' Trust, both of which are located in the Donbas. 684/ According to a March 1948 article, trial was begun a few months ago in Voroshilovgradugol' Trust of coal planers. 685/ It is believed that no more than three coal planers had been produced before 1948.
d. The 1948 Plan called for 60 machines. Because of shortages of parts and trouble with heat treatment, actual production was 2 in the first quarter and 2 more by 20 May instead of the 6 planned. 686/ Sixty were planned for 1948. 687/ Forty were built in 1948 and then no more according to a prisoner-of-war report. 688/ Some US-4 models were built later in 1948. 689/ At the end of 1948, 13 were in use in the Donbas. 690/ Assumed production amounted to 40, consisting of 35 US-3 and 5 US-4 planers.
e. There has been no reference to production after 1948. It is probable that a few additional experimental models may have been built. Stalin prize winner I.I. Bazhenov reported in January 1950 that coal planers were being tested in the Donbas and had proved successful in getting soft coal in seams of average hardness where the thickness was up to 2 meters and the gradient was slight. One such unit, designed by L.V. Yegorov, was reported as being in experimental operation at this date in the Karaganda coal field.

Table 90

Estimated Production of Cutter-Loaders in the USSR a/
1946-52

Units

Year	Total (Model VPM-1)
Before 1946	0
1946	1 b/
1947	51 c/
1948	100 d/
1949	100 e/
1950	125 f/
1951	100 f/
1952	100 g/

a. Produced at Plant No. 25 imeni Kirov at Kopeysh.
b. One VPM-1 was built at Kopeysk; regular production was to begin at the end of 1946. 691/ The machine delivered in 1946 was probably an experimental model.
c. This estimate includes one BNU, which was being tested in 1948. Changes being made in the GTK-3M in 1948 probably indicate that this BNU was built in 1947. Tests of the BNU were canceled when it proved inferior to the VPM-1. 692/
d. Estimated.
e. Estimated. There were probably 37 in operation in the Donbas early in 1949. 693/
f. Estimated.
g. Estimated. Although little evidence was available as a basis for estimates in each year, it is believed that the character of the machine makes an estimate possible. These machines are an adaptation of the standard coal cutter KMP-1 to which plows have been added for loading coal into a conveyor. Estimates were made of the total production of KMP-1 cutters, and the estimated quantities of VPM-1 models have been deducted.

Table 91

Estimated Inventory of Working Loading Machines in the USSR
1940, 1947-51 a/

Units

Year	Rock Loaders b/	Coal Loaders c/	Total
1940	N.A.	N.A.	23 d/
1947	48 e/	66 e/	114 e/
1948	326	225	551 f/
1949	625	375	1,000 g/
1950	775	425	1,200 h/
1951	1,053 i/	543 i/	1,596 i/

a. End-of-year inventory.
b. Types in use, 1947-51: UMP-1 (electric), EMP-1 (electric), and PML-3, 4, and 5 (pneumatic).
c. Types in use, 1947-51; serial production of S-153 began in 1947, and 0-5 was produced later.
d. Estimate. In 1951 the available park of loading machines for development work increased 70 times over 1940. 694/
e. Based on 1951 estimates. i/
f. Assumed to be less than 600 machines at end of year. According to a press statement of 28 January 1949 there were 600 coal and rock loaders in operation.
g. According to a 10 February 1950 statement of Zasyad'ko, Minister of the Coal Industry, the number of rock and coal loaders increased 10 times in the past 2 years.
h. Interpolated figure. Over 1,000 rock and coal loaders in use at the end of 1950. 695/
i. Estimates. Coal loaded mechanically at almost 1,600 development faces. 696/ Beginning with 1947 the widespread introduction of loading machines was begun. The park of working loading machines increased by 14 times in the last 4 years. Those in most widespread use are the rock-loading machines, the quantity of which grew 21 times in the last 4 years; the number of coal-loading machines increased 8 times. At present, in the general park of machines, rock-loading machines constitute 66 percent and coal-loading machines, 34 percent of the total. 697/

Table 92

Estimated Production, Export, Retirement, and Inventory of Coal-Loading Machines in the USSR a/
1946-51

Units

Year	Production	Export	Retirement	Inventory
1946	0	0	0	0
1947	66 b/	0	0	66 c/
1948	175 d/	0	16	225 d/
1949	175 d/	0	25	375 d/
1950	125 d/	40 e/	35	425 d/
1951	210 d/	52 e/	40	543 f/

a. Production has consisted almost entirely of the S-153 model. The only other machine, apparently, has been the 0-5. Inventory is end-of-year inventory.
b. Series production of the S-153 began in 1947.
c. Based on 1951 estimate.
d. Interpolated.
e. Estimated. Czechoslovakia planned the installation of 60 coal loaders in 1952. 698/ Hungary imported 20 loaders from the USSR in 1951. 699/
f. [redacted] 50X1
coal was being mechanically loaded at about 1,600 working faces in 1951. In the general park of the rock- and coal-loading machines, coal loaders constituted 34 percent of the total (estimated at 1,596 machines). 700/ The number of coal loaders had increased eight times since 1947.

Table 93

Estimated Production, Retirement, and Inventory
of Rock-Loading Machines in the USSR
1947-51

Units

Year	Production a/	Export	Retirement	Inventory b/
1947	25	0		48 c/
1948	301	0	23 d/	326
1949	350	0	51 d/	625
1950	380	150 e/	80 d/	775
1951	540	170 e/	92 d/	1,053

a. Based on [redacted] particularly, growth in inventory. 50X1
b. End-of-year inventory, based on the following information: coal was machanically loaded at almost 1,600 working faces at the end of 1951. 701/ The park of working loading machines is said to have increased 14 times in the last 4 years. The most widespread increase was in rock loaders, the number of which grew 21 times in the last 4 years (end of 1951). At present, in the general park of machines, the rock loaders constitute 66 percent of the total and coal loaders, 34 percent. 702/ From these ratios the total was computed at 1,596 at the end of 1951, of which 1,054 are estimated to have been rock loaders.
c. Estimate includes 23 from 1940.
d. Arbitrary estimates.
e. Estimates. The Czechoslovak Plan for mechanizing coal mines called for the installation of 200 shovel loaders and 60 coal loaders in 1952. 703/ Hungary imported 20 loaders from the USSR in 1951. 704/

Table 94

Estimated Inventory of Rock-Loading Machines in the USSR by Types a/
1951 b/

Type	Units	Percent of Total
UMP-1	579	55
EPM-1	253	24
PML-5	221	21
Total	1,053	100

a. Based on statement that coal is loaded mechanically at almost 1,600 development faces (including S-153 coal loader) and on published percentages of rock loaders in the park. 705/
b. End-of-year inventory.

Table 95

Inventory of Underground Electric Coal Mine Locomotives in the USSR by Types, 1927-28, 1931-51

Units

Year a/*	Type: Trolley	Type: Battery	Total
1927-28	47 b/	12 b/ c/	59 b/
1931			150 b/ d/
1932	113 b/	170 b/	283 b/ e/
1934	121 b/ f/	308 b/ f/	429 b/ f/
1938	g/	g/	g/

* Footnotes for Table 95 follow on p. 311.

Table 95

Inventory of Underground Electric
Coal Mine Locomotives in the USSR
by Types, 1927-28, 1931-51
(Continued)

Units

Total a/	Trolley		Battery		Total	
1939	g/		g/		g/	
1940	846	h/	1,009	h/	1,855 h/	i/
1941					j/	
1945	1,497	h/	251	h/	1,748	h/
1946					2,348	k/
1947					3,048	k/
1948					3,750	k/
1949					4,640	l/
1950					6,040	m/
1951					7,400	n/

a. End-of-year inventory.
b. 706/
c. Also reported as 20. 707/
d. Entire mining industry.
e. Also reported as 272 battery locomotives. 708/
This figure is probably incorrect.
f. As of 15 September 1934.
g. The following data refer to electric locomotives in main line underground haulage on horizontal tracks. Although they refer to coal mines, the figures probably exclude locomotives used in secondary haulage work. 709/

Year	Trolley	Lilliput Trolley	Battery	Total
1938	540		502	1,042
1939	689	138	624	1,451
1940	753	235	672	1,660

h. 710/
i. Before the war the Donbas mines were using 1,300 electric locomotives. 711/

Table 95

Inventory of Underground Electric
Coal Mine Locomotives in the USSR
by Types, 1927-28, 1931-51
(Continued)

j. In 1941 the coal mines of the western regions had 1,100 electric locomotives. 712/
k. Estimates. 713/
l. There are 2.5 times as many mine locomotives as there were in 1940. 714/
m. Estimate. 715/
n. At the end of 1951 the coal-mining industry had almost four times the number of electric locomotives as in 1940. 716/ [redacted] 50X1
[redacted] 10- and 14-ton locomotives in January 1952 comprise about 25 percent of all operation locomotives. 50X1

Table 96

Estimated Production, Retirement, and Inventory
of Coal Mine Locomotives in the USSR
Selected Years, 1927-28, 1931-51

Units

Year	Production	Retirement	Inventory a/*
1927-28			59 b/
1931			150 c/
1932	87 d/		283 b/
1933	245 d/		N.A.
1934	161 d/		429 b/
1935	220 d/		N.A.
1936	169 d/		N.A.
1937-39	N.A.		N.A.
1940			1,855 c/
1941 Plan	200 e/		
1945	600		1,748 c/

* Footnotes for Table 96 follow on p. 313.

Table 96

Estimated Production, Retirement, and Inventory
of Coal Mine Locomotives in the USSR
Selected Years, 1927-28, 1931-51
(Continued)

Units

Year	Production	Retirement	Inventory a/
1946	700 f/	100 f/	2,348 f/
1947	900 f/	200 f/	3,048 f/
1948	901 f/	199 f/	3,750 f/
1949	1,190 f/	300 f/	4,640 g/
1950	1,700 f/	300 f/	6,040 f/
1951	1,700 f/	340 f/	7,400 h/

a. End-of-year inventory.
b. 717/
c. 718/
d. 719/
e. 720/
f. Estimates.
g. In 1949 the coal mine had 2.5 times as many underground locomotives as in 1940. 721/
h. At the end of 1951 the Soviet press announced that the coal-mining industry had almost four times as many electric locomotives as in 1940. 722/ Ten- and fourteen-ton locomotives now comprise 25 percent of all operating locomotives. 723/

APPENDIX K

SOVIET COKE PLANT DATA, 1951, 724/ AND COKE PRODUCTION, 1950 a/*

Table 97

Location	Installation Name	1951 Number of Ovens b/	1951 Oven Make c/	1951 Total Daily Carbonization Capacity (Tons)	1951 Annual d/ Coke Capacity Moist Basis (Tons)	1950 Coke Production (Tons)
Region III						
Zaporozh'ye	Metallurgical Combine, Zaporozhstal'	276	Becker	6,250	1,750,000	780,000
Zhdanov	Metallurgical Combine, Azovstal'	276	Becker	6,250	1,750,000	1,050,000
Gorlovka	Coke-Chemical Plant, (New)	233	Koppers	5,243	1,450,000	1,050,000
Dneprodzerzhinsk	Coke-Chemical Plant, Ordzhonikidze	215	Becker	5,000	1,400,000	600,000
Yenakiyevo	Iron and Steel Plant, Rikov	180	Becker	4,077	1,300,000	600,000
		160	Coppee			
Stalino	Coke-Chemical Plant, Rutchenkovo	142	Otto	3,148	1,100,000	1,050,000
		140	Coppee	893		
Makeyevka	Coke-Chemical Plant, No. 4 (New)	184	Koppers	3,938	1,100,000	1,200,000
Voroshilovsk	Metallurgical Plant, Voroshilov	168	Otto	3,852	1,100,000	1,050,000
Kadiyevka	Coke-Chemical Plant	160		3,600	1,100,000	1,050,000
Dnepropetrovsk	Coke-Chemical Plant, Kalinin	74	Becker	1,665	940,000	700,000
		80	Coppee	1,680		
Krivoy Rog	Metallurgical Plant, Krivoyrozhskiy, Stalin	138	Becker	3,126	880,000	500,000
Stalino	Coke-Chemical Plant, Smolyanka	190			640,000	450,000
Dneprodzerzhinsk	Coke-Chemical Plant, Kamen	94	Koppers a/ e/	2,115	600,000	500,000
Ok'khovka	Coke-Chemical Plant	150	Coppee	N.A.	500,000	f/
Makeyevka	Coke-Chemical Plant, No. 5 (Old)	242	Semet Solvay	N.A.	400,000	780,000
Stalino	Coke-Chemical Plant, Khanzhenkovo	250	N.A.	N.A.	400,000	N.A.
Kadiyevka	Coke-Chemical Plant, Bryanskiy	150	N.A.	N.A.	300,000	f/

* Footnotes for Table 97 follow on p. 317.

Table 97
(Continued)

Location	Installation Name	1951 Number of Ovens b/	1951 Oven Made c/	1951 Total Daily Carbonization Capacity (Tons)	1951 Annual d/ Coke Capacity Moist Basis (Tons)	1950 Coke Production (Tons)
Konstaninovka	Coke-Chemical Plant, Dubital, 17	40	N.A.	N.A.	300,000	300,000
Stalino	Iron and Steel Works, Stalin	47	Becker	1,058	300,000	N.A.
Stalino	Coke-Chemical Plant, Mushketovo	76	Coppee	N.A.	150,000	f/
Gorlovka	Coke-Chemical Plant, Nikitovka	80	Coppee	N.A.	150,000	f/
Kramatorsk	Iron and Steel Works, Kuybyshev	50	Collin	637	140,000	250,000
Almaznaya	Metallurgical Plant	60	N.A.	N.A.	120,000	f/
Region IV						
Kerch'	Iron and Steel Works, Volkov	110	Becker	2,558	720,000	N.A.
Region VIII						
Magnitorgorsk	Metallurgical Combine, Stalin	690	Becker a/	18,844	4,500,000	3,775,000
Nizhniy Tagil	Metallurgical Works, Novo Tagil	268	Koppers a/	6,890	2,000,000	2,000,000
Chelyabinsk	Steel Plant, Bakalstroy	276	Koppers a/	6,250	1,750,000	1,400,000
Orsk	Iron and Steel Plant, Novotroitsk Stalin	N.A.	N.A.	N.A.	500,000	475,000
Gubakha	Coke-Chemical Plant	204	Koppers a/	3,221	900,000	750,000
Region IX						
Stal'insk	Metallurgical Combine, Kuznetskiy/Stalin	330	Becker	8,768	2,500,000	2,600,000
Kemerovo	Coke-Chemical Plant, Stalin	220	Koppers a/	5,469	1,800,000	1,800,000
		150	Koppers a/			

Table 97
(Continued)

Location	Installation Name	1951				1950
		Number of Ovens b/	Oven Make c/	Total Daily Carbonization Capacity (Tons)	Annual d/ Coke Capacity Moist Basis (Tons)	Coke Production (Tons)
Region XI						
Noril'sk	Coke-Chemical Plant	N.A.	N.A.	N.A.	300,000	N.A.
Petrovsk	Metallurgical Plant, Stalin	2 batteries a/	N.A.	N.A.	235,000	200,000
Region XII						
Komsomol'sk	Steel Plant, Amurstal'	4 batteries a/	Koppers	N.A.	300,000	N.A.
Other						
Coke-Oven Gas Plants						
Moscow Gas Plant	Gas Plant (Region VII)	2 batteries a/	N.A.	N.A.	125,000	250,000
Leningrad	Gas Plant (Region Ia)	2 batteries a/	N.A.	N.A.	175,000	
All Other Gas Plants g/					200,000	N.A.
Total USSR					34,075,000	25,380,000 h/

a. Based on CIA estimates

50X1

b. 726/
c. The oven make represents prewar battery types when available; postwar types in reconstructed plants in the Ukraine are unknown.
d. Moisture content of coke is estimated at 3 percent, the maximum desirable in US practice, but analyses of Soviet cokes have often indicated higher moisture content. The capacity represents "normal capacity." Forced capacity in plants in the Ukraine may be 1.1 to 1.3 times normal capacity.
e. 727/
f. Production included in production of the Stalino Coke-Chemical Plant of Smolyanka.
g. Including a plant at Kiev.
h.. Estimated total coke production, including 220,000 tons from plants for which individual estimates have not been made.

APPENDIX L

PLANNED PEAT PRODUCTION IN THE USSR BY ECONOMIC REGIONS 1941

Table 98

Area	Planned Production (Tons)	Percent of Total
Region Ia	4,903,000	12.4
Leningrad Oblast	4,891,000	
Murmansk Oblast	12,000	
Region Ib	85,000	0.2
Vologda Oblast	85,000	
Region IIa	871,000	2.2
Lithuania	360,000	
Latvia	211,000	
Estonia	300,000	
Region IIb	4,084,000	10.3
Belorussian SSR	4,084,000	
Region III	3,844,000	9.7
Ukrainian SSR	3,844,000	
Region IV	7,000	a/*
Chechen-Ingush ASSR	7,000	
Region V	15,000	a/
Armenia	15,000	

* Footnotes for Table 98 follow on p. 321.

Table 98

(Continued)

Area	Planned Production (Tons)	Percent of Total
Region VI	621,500	1.6
Tatar ASSR	186,500	
Kuybyshev Oblast	399,000	
Saratov Oblast	23,000	
Stalingrad Oblast	13,000	
Region VII	22,496,700	56.8
Penza Oblast	448,000	
Kalinin Oblast	2,156,100	
Smolensk Oblast	1,063,700	
Yaroslav Oblast	2,053,000	
Ivanovo Oblast	3,483,400	
Moscow Oblast	6,730,400	
Tula Oblast	98,000	
Ryazan' Oblast	517,000	
Kursk Oblast	837,000	
Voronezh Oblast	223,400	
Tambov Oblast	485,700	
Gor'kiy Oblast	2,913,000	
Kirov Oblast	233,000	
Mari ASSR	1,000	
Chuvash ASSR	24,500	
Mordva ASSR	213,000	
Orel Oblast	1,016,500	
Region VIII	2,319,600	5.9
Molotov Oblast	30,500	
Sverdlovsk Oblast	1,649,000	
Chelyabinsk Oblast	235,000	
Chkalov Oblast	118,400	

Table 98
(Continued)

Area	Planned Production (Tons)	Percent of Total
Region VIII (Continued)		
Bashkir ASSR	200,700	
Udmurt ASSR	86,000	
Region IX	166,000	0.4
Altay Kray	17,000	
Omsk Oblast	94,000	
Novosibirsk Oblast	55,000	
Region Xa	130,000	0.3
Kazakh SSR	130,000	
Region Xb	70,200	0.2
Kirgiz SSR	70,200	
Region XI	2,000	a/
Total USSR	39,615,000	100.0

a. Less than 0.1 percent.

APPENDIX M

METHODOLOGY

This report is based mainly upon information furnished in Soviet publications. Most statistics have been cited as given by the sources, but certain statements are based on the interpretation of ambiguous information, and in a few cases statistics reflect a somewhat arbitrary use of sources. Estimates of production generally are explained in footnotes to the tables. The last year for which detailed figures are available for all producing areas is 1934, but 1941 and 1950 Plan data, as well as statistics of 1940 regional production, have served as satisfactory bases for projection. Only a few absolute figures have been reported, but there have been enough percentage figures to follow the trends in major regions.

Statistics have been published in the Soviet press concerning production in the Donbas. They have been reported in percentages and are related to 1940, a year in which the actual production is in some doubt. The frequently reported figure for Donbas production in 1940 is 85.5 million tons, but it is almost certain that this figure was only for mines of Narkomugol' and excluded production of various other commissariats and cooperatives. There was a balance of about 9.5 million tons in the western regions which must have come from the Donbas, since there were no other areas which could have accounted for such a large tonnage. One report furnishes a figure of 94.4 million tons for Donbas production in 1940, and 2 others provide a percentage figure of 57 percent of total Soviet production. The base figure becomes important when applying percentages in later years. It is believed that these percentages must be applied to the lower figure of 85.5 million in 1940 because use of the higher base results in unrealistic estimates in postwar years.

It will be noted in this report that total Soviet production is estimated at 282.4 million tons in 1951 and 301.3 million tons in 1952. In an address given in the early part of October 1952, Malenkov stated that coal production in 1951 was 285 million tons and would reach 300 million tons in 1952. These latter figures will undoubtedly be quoted frequently in the future, since the Soviet announcements rarely furnish absolute production figures.* It is possible, however, that Malenkov was using rounded figures. The estimate of 282.4 million tons is based on an increase of 7.8 percent [redacted] over 1950, whereas Malenkov's 50X1 figure represents an increase of slightly less than 9 percent.

An endeavor has been made throughout this report to furnish the basis used in making estimates, and most of the tables are footnoted to the extent of giving the most significant data. Occasional conflicts in statistics occur because of the fact that figures are rounded or do not pertain to identical time periods.

* A later announcement made by Malenkov on 9 August 1953 confirmed the figure of 300 million tons as total production of coal in 1952. 728/

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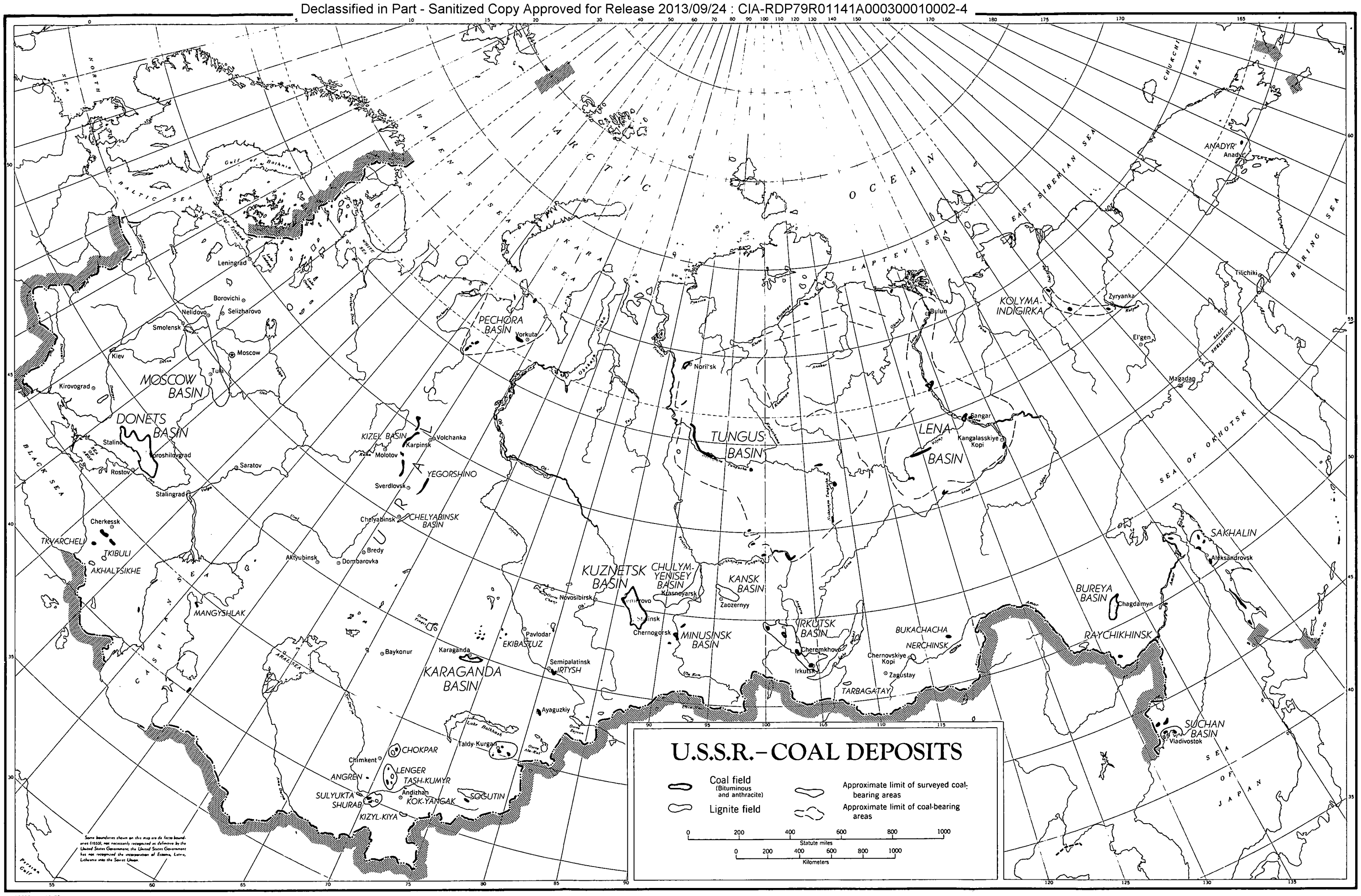
U.S.S.R.-COAL DEPOSITS
Coal field (Bituminous and anthracite)
Lignite field
Approximate limit of surveyed coal-bearing areas
Approximate limit of coal-bearing areas
Statute miles
0 200 400 600 800 1000
Kilometers
0 200 400 600 800 1000
ARCTIC OCEAN
BARENTS SEA
KARA SEA
LAPTEV SEA
EAST SIBERIAN SEA
BERING SEA
SEA OF OKHOTSK
SEA OF JAPAN
BLACK SEA
CASPIAN SEA
ARAL SEA
BALTIC SEA
Leningrad
Borovichi
Nelidovo
Selizharovo
Smolensk
Moscow
Tula
Kiev
Kirovograd
MOSCOW BASIN
DONETS BASIN
Stalino
Voroshilovgrad
Rostov
Saratov
Stalingrad
Cherkessk
TKVARCHELI
TKIBULI
AKHALTSIKHE
MANGYSHLAK
Aktyubinsk
Dombarovka
Bredy
PECHORA BASIN
Vorkuta
KIZEL BASIN
Karpinsk
Volchanka
Molotov
YEGORSHINO
Sverdlovsk
Chelyabinsk
CHELYABINSK BASIN
URAL
Baykonur
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Pavlodar
EKIBASTUZ
Semipalatinsk
IRTYSH
Ayaguzkiy
Taldy-Kurgan
CHOKPAR
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LENGER
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TASH-KUMYR
Andizhan
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Cheremkhovo
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