

SIGNIFICANT DEVELOPMENTS
IN THE FUELS AND POWER INDUSTRIES OF THE USSR
IN 1960



June 1961

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SIGNIFICANT DEVELOPMENTS
IN THE FUELS AND POWER INDUSTRIES OF THE USSR
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Summary and Conclusions

Production of primary energy in the USSR in 1960 is estimated to have been about 733 million tons of standard fuel, about 7.7 percent more than in 1959.* The share of oil and natural gas in the total production of primary energy increased from 33.4 percent in 1959 to 36.3 percent in 1960, and the share of solid fuels declined from 63.4 to 60.1 percent.

All goals for production of energy were achieved with the exception of those for coal and natural gas. Although the USSR produced 45.3 billion cubic meters (cu m) of natural gas, an increase of approximately 10 billion cu m above 1959, the plan was underfulfilled by 6.2 billion cu m. Production of coal was 513 million tons, approximately 2 million tons below the plan, although the reduction probably was deliberate and reflected the continued existence of a surplus of anthracite fines. The 1961 plan for producing 512 million tons of coal reflects a continuation of this downward trend, and, insofar as is known, 1961 is the first time that the announced goal has been below the level of achievement (513 million tons) of the preceding year. Production of crude oil in 1960 reached 148 million tons, 4 million tons above the goal; and a total estimated at 294 billion kilowatt-hours (kwh) of electric power was generated -- an increase of 29 billion kwh above 1959 and 3 billion kwh above the plan. The contribution of less important sources of primary energy -- peat, shale, fuelwood, hydroelectric power, and nuclear electric power -- showed relatively little change (in either percentage or absolute terms) in the over-all output of energy. (The estimated production of all types of primary energy in the USSR in 1958-60 and 1965 is given in Table 1,** and the accompanying chart*** shows graphically how the shares of oil and gas in the total production of primary energy have been increasing and will continue to increase at the expense of coal.)

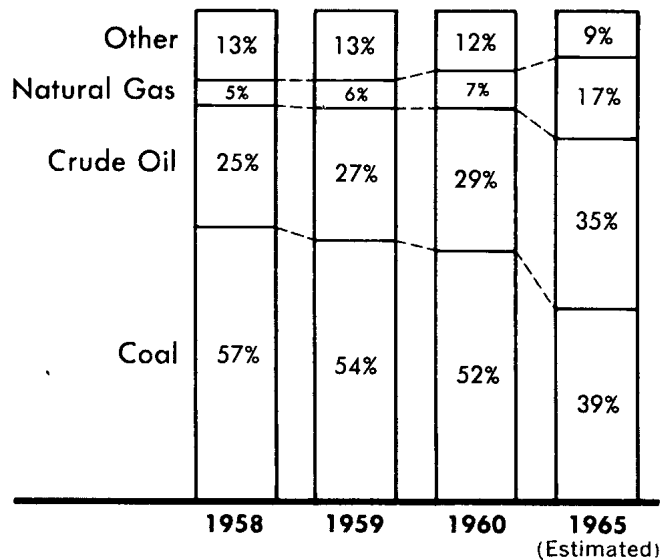
Probably the most important feature of the performance of the Soviet fuels and power industries was the increasing availability of

* Standard fuel has a calorific value of 7,000 kilocalories per kilogram. Tonnages are given in metric tons throughout this report.

** Table 1 follows on p. 3.

*** Following on p. 2.

**PERCENTAGE DISTRIBUTION OF PRODUCTION OF PRIMARY ENERGY
IN THE USSR, 1958-60 AND 1965**



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oil in excess of the amount required for domestic consumption. In 1960 the USSR sold 19 million tons of oil to the Free World, about 4 million tons more than in 1959. Three countries, Cuba, India, and Guinea, imported Soviet oil for the first time.

The willingness of the USSR to accept soft currencies and commodities in exchange for oil advanced its competitive position considerably. Significantly, many of the trade agreements concluded or being negotiated with countries of the Free World for the export of Soviet oil provide for reciprocal imports of industrial equipment including pipe, which is urgently needed to complete the Soviet construction program for petroleum and natural gas pipelines.

Other important developments in the Soviet fuels and power industries in 1960 included an increase of 23 percent in oil pipeline transport, which reached 51 billion ton-kilometers; the first significant improvement in labor productivity in the coal industry in 8 years; a decline in the average cost of production of coal compared with the preceding year; and significant progress in automation and mechanization of the coal industry, including the successful, but limited, employment of underground hydraulic mining.

Table 1
 Estimated Production of Primary Energy in the USSR
 by Source of Energy ^{a/}
 1958-60 and 1965

Source of Energy	1958		1959		1960 ^{b/}		1965	
	Million Metric Tons of Standard Fuel ^{c/}	Percent of Total	Million Metric Tons of Standard Fuel ^{c/}	Percent of Total	Million Metric Tons of Standard Fuel ^{c/}	Percent of Total	Million Metric Tons of Standard Fuel ^{c/}	Percent of Total
Coal	362.1	56.7	370.0	54.3	384.8	52.4	420.0 ^{d/}	38.8
Crude oil	161.9	25.3	185.3	27.2	211.6	28.9	379.0 ^{e/}	35.0
Natural gas	33.9	5.3	42.5	6.2	54.5	7.4	180.0	16.6
Peat	21.1	3.3	23.0	3.4	19.1 ^{f/}	2.6	25.7	2.4
Shale	4.5	0.7	4.7	0.7	5.0 ^{g/}	0.7	6.0	0.6
Fuelwood	32.9	5.2	33.9	5.0	32.0 ^{g/}	4.4	28.6	2.6
Hydroelectric power	22.3	3.5	21.8	3.2	26.4	3.6	39.5	3.7
Nuclear electric power	Negl.	Negl.	Negl.	Negl.	Negl.	Negl.	3.0	0.3
Total	<u>638.7</u>	<u>100.0</u>	<u>681.2</u>	<u>100.0</u>	<u>733.4</u>	<u>100.0</u>	<u>1,081.8</u>	<u>100.0</u>

a. Unless otherwise indicated, data are from source 1/. (For serially numbered source references, see the Appendix.)

b. Computed on the basis of production data for 1960.

c. The term standard fuel refers to a measure adopted by Soviet authorities for the purpose of comparing fuels on the basis of their calorific values. Standard fuel has been assigned a calorific value of 7,000 kilocalories per kilogram.

d. Computed on the basis of an estimated production of 560 million metric tons in 1965. The plan is 606 million to 612 million metric tons.

e. Computed on the basis of an estimated production of 265 million metric tons in 1965.

f. Production data estimated on the basis of data in source 2/.

g. Estimated.

Many of the problems in the Soviet fuels and power industries in 1960 were a continuation of those that existed in 1959. Underfulfillment of the production goal for natural gas by 6.2 billion cu m continued to be primarily the result of inadequacies in storage, gas-consuming equipment, city distributing systems, and a shortage of compressor equipment for major pipelines.

Although primary refining capacity in 1960 was sufficient to handle the 130 million tons of crude oil charged to refining, the total secondary refining capacity continued to be inadequate. Production of diesel fuels, for example, reportedly were in short supply, although there were significant increases in capacity in the thermal conversion, catalytic cracking, and catalytic hydrotreating processes. It is probable that considerably more improvement in the construction and installation of secondary capacity than was evident in 1960 will be required if the refining capacities planned for 1965 are to be achieved.

In 1960, fulfillment of a reduced plan for the installation of 5.7 million kilowatts of new generating capacity reflected the lowest annual rate of increase in capacity during the postwar years. As in the previous 2 years, the installation of new generating capacity in the USSR was inadequate to maintain reserve capacity at the desired level, and the hours of utilization had to be increased.

I. Crude Oil and Natural GasA. Production1. Crude Oil

Production of crude oil in the USSR in 1960 reportedly exceeded the plan goal by 2.8 percent, reaching 148 million tons, an increase of about 14 percent above production in 1959. ^{3/} Continuation of this rate of increase would result in production of 288 million tons by 1965, well in excess of the goal under the Seven Year Plan (1959-65) of 240 million tons. The plan for 1961, however, calls for only a 10.8-percent increase. It is currently estimated that production in 1965 may be about 265 million tons, a level that can be achieved by an average annual increase slightly in excess of 12 percent. (The estimated production of crude oil in the USSR in 1955 and 1958-60 and that planned for 1961 and 1965 are given in Table 2.)

Table 2

Estimated Production of Crude Oil in the USSR ^{a/}
1955, 1958-60, and Plans for 1961 and 1965

Million Metric Tons	
<u>Year</u>	<u>Amount</u>
1955	70.8
1958	113.2
1959	129.6
1960 ^{b/}	148.0
1961 Plan ^{c/}	164.0
1965 Plan	240.0
1965 ^{d/}	265.0

a. Unless otherwise indicated, data are from source ^{4/}.

b. ^{5/}

c. ^{6/}

d. Estimated.

Probably at least 70 percent of the Soviet production of crude oil in 1960 was provided by the Urals-Volga oilfields. Slightly more than 12 percent, or 18.1 million tons, was produced in Azerbaydzhan SSR. Little significant growth in output of crude oil was obtained in the other principal producing areas of Kazakhstan, the Central Asian Republics, and the Ukrainian SSR.

The use of water flooding to maintain formation pressure resulted in the extraction of 45 million additional tons of crude oil, an 89-percent increase above the amount recovered by this method in 1959. At present, deposits that are included in the water flooding program account for 63 percent of the national production of crude oil, and it is claimed that up to 70 percent of the oil in place is being recovered.

2. Natural Gas

Production of natural gas in the USSR in 1960 amounted to 45.3 billion cubic meters (cu m), an 88-percent fulfillment of the planned 51.5 billion cu m. 7/ In 1959 the plan was fulfilled by only 90.6 percent.

Underfulfillment of the plans for extraction of natural gas appear to be more related to shortcomings in supporting activities than to difficulties in production. It is probable that the continuing underfulfillment of plans is due mainly to inadequate storage facilities, insufficient gas consuming equipment, limited city distribution systems, and lack of compressing equipment for pipelines. Planned additions to reserves have consistently been exceeded, and proved reserves as of 1 January 1960 were estimated at about 1.7 trillion cu m. 8/ (The estimated production of natural gas in the USSR in 1955 and 1958-60 and that planned for 1961 and 1965 are given in Table 3.*)

B. Drilling

Exploratory and developmental drilling for crude oil and natural gas in 1960 fell below the level in 1959. This decline resulted primarily from a rather sharp underfulfillment of the exploratory drilling program, although the amount of exploratory drilling exceeded that of developmental drilling for the second consecutive year. The relatively poor performance in exploratory drilling served to depress to an unknown degree the increments in the proved reserves of crude oil and natural gas. Nevertheless, in the RSFSR alone, it was reported that 15 new oil deposits were discovered in 1960, including the discovery of the first commercial crude oil deposit in Siberia.

* Table 3 follows on p. 7.

Table 3

Estimated Production of Natural Gas in the USSR
1955, 1958-60, and Plans for 1961 and 1965

Billion Cubic Meters	
<u>Year</u>	<u>Amount</u>
1955 <u>a/</u>	9.0
1958 <u>a/</u>	28.1
1959 <u>a/</u>	35.5
1960 <u>b/</u>	45.3
1961 Plan <u>c/</u>	61.4
1965 Plan <u>a/</u>	148.0

a. 9/
b. 10/
c. 11/

(The amount of exploratory and developmental drilling for crude oil and natural gas in the USSR in 1959-60 and that planned for 1961 are given in Table 4.)

Table 4

Exploratory and Developmental Drilling
for Crude Oil and Natural Gas in the USSR
1959-60 and Plan for 1961

<u>Type of Drilling</u>	<u>1960</u>				<u>1961 Plan (Thousand Meters)</u>
	<u>1959 (Thousand Meters)</u>	<u>Plan (Thousand Meters)</u>	<u>Actual (Thousand Meters)</u>	<u>Percent of Plan</u>	
Exploratory	4,094	4,608	4,000	87	5,100
Develop- mental	3,649	3,748	3,700	99	3,900
Total	<u>7,743</u>	<u>8,356</u>	<u>7,700</u>	92	<u>9,000</u>

C. Refining of Crude Oil

In 1960 the USSR is believed to have had a yield of 119.6 million tons of refined products, an increase of 11.7 percent above 1959. Because of a shortage of secondary refining capacity, the practice of maximizing output of residual products, especially fuel oil, at the expense of gasoline, kerosine, and light diesel fuel was continued in 1960. 12/ Production of a high percentage of residuals is to continue throughout the Seven Year Plan. (The estimated yields of principal petroleum products in the USSR for 1958-60 and the yield planned for 1965 are given in Table 5.*) The yield of gasoline, kerosine, and light diesel fuel declined from 52.4 percent in 1959 to 50.8 percent in 1960, and, concomitantly, the yield of residuals increased from 31.9 to 33.3 percent.

The total primary refining capacity in the USSR amounted to 157.3 million tons in 1960, 19.9 million tons, or 14.5 percent, above that in 1959.** This rate of growth is well above the average annual rate of about 10 percent necessary to reach the goal for 1965, estimated to be 252 million tons. Of the increase in capacity for refining of roughly 20 million tons, about 15 million tons, or about 75 percent, are estimated to have been installed at existing refineries, including 12 million tons at the following six refineries:

<u>Location of Refinery</u>	<u>Million Tons of Capacity</u>		
	<u>1959</u>	<u>Installed in 1960</u>	<u>1960</u>
Batumi	2.4	1.2	3.6
Fergana	2.6	2.4	5.0
Groznyy	10.2	2.1	12.3
Omsk	14.5	1.5	16.0
Perm'	2.6	2.4	5.0
Stalingrad	2.6	2.4	5.0

The remaining 5 million tons of the increment in capacity for refining in 1960 is assumed to be accounted for by the commissioning of new refineries at Angarsk (4-million-ton capacity)*** and Ryazan' (1-million-ton capacity).*** 13/

* Table 5 follows on p. 9.

** For a list of refineries in the USSR with their estimated capacities for 1959 and 1960, see Table 6, which follows on p. 10.

*** Represents only the capacity available for efficient use in 1960.

Table 5

Estimated Production of Petroleum Products in the USSR, by Type of Product
1958-60 and 1965

Product	1958		1959		1960		1965	
	Million Metric Tons	Percent of Total	Million Metric Tons	Percent of Total	Million Metric Tons	Percent of Total	Million Metric Tons	Percent of Total
Gasoline	21.5	20.7	23.4	20.1	25.4	19.5	35.4	16.5
Kerosine	13.2	12.7	14.6	12.5	16.0	12.3	24.0	11.2
Light diesel fuel	21.5	20.6	23.0	19.8	24.7	19.0	31.8	14.9
Total light products	<u>56.2</u>	<u>54.0</u>	<u>61.0</u>	<u>52.4</u>	<u>66.1</u>	<u>50.8</u>	<u>91.2</u>	<u>42.6</u>
Heavy diesel fuels	3.2	3.1	4.0	3.4	4.8	3.7	11.2	5.2
Total distillation	<u>59.4</u>	<u>57.1</u>	<u>65.0</u>	<u>55.8</u>	<u>70.9</u>	<u>54.5</u>	<u>102.4</u>	<u>47.8</u>
Lubricants	4.6	4.4	5.0	4.3	5.4	4.2	7.9	3.7
Residuals and others <u>a/</u>	31.7	30.5	37.1	31.9	43.3	33.3	86.7	40.5
Total output of petroleum products	<u>95.7</u>	<u>92.0</u>	<u>107.1</u>	<u>92.0</u>	<u>119.6</u>	<u>92.0</u>	<u>197.0</u>	<u>92.0</u>
Gas and loss	8.3	8.0	9.3	8.0	10.4	8.0	17.0	8.0
Grand total	<u>104.0</u>	<u>100.0</u>	<u>116.4</u>	<u>100.0</u>	<u>130.0</u>	<u>100.0</u>	<u>214.0</u>	<u>100.0</u>

a. Residual fuel oil, road oils, asphalts, bitumen, and bituminous tar.

Table 6

Estimated Refining Capacities in the USSR
by Refining Area
1959-60

<u>Location of Refinery</u>	<u>Million Metric Tons</u>	
	<u>Capacity</u>	
	<u>1959</u>	<u>1960</u>
Baku	20.6	21.0
Kuybyshev	17.5	18.0
Ufa	17.5	18.0
Omsk	14.5	16.0
Groznyy	10.2	12.3
Syzran'	7.0	7.0
Krasnovodsk	6.7	6.7
Ishimbay/Salavat	6.3	7.0
Gur'yev	4.9	4.9
Gor'kiy	3.2	3.6
Saratov	3.2	3.6
Tuapse	3.1	3.1
Moscow	2.7	2.7
Fergana	2.6	5.0
Perm'	2.6	5.0
Stalingrad	2.6	5.0
Batumi	2.4	3.6
Orsk	1.8	1.8
Vannovskaya	1.8	1.8
Krasnodar	1.2	1.2
Angarsk	0	4.0
Ryazan'	0	1.0
Other	5.0	5.0
Total	<u>137.4</u>	<u>157.3</u>

Although Soviet publications indicate that notable gains were achieved in 1960 in secondary refining, especially in thermal conversion, catalytic cracking, and catalytic hydrotreating processes, the total secondary refining capacity probably is still below the level desired, particularly for production of diesel fuels that were reported to be in short supply. It is not known at what sites the increments in secondary refining capacity occurred. (The estimated

increments in refining capacity in the USSR for 1960, by type of process, are shown in Table 7.)

Table 7

Estimated Increments in Refining Capacity in the USSR
by Type of Process
1960

Type of Process	Refining Capacity (Million Metric Tons)		Increase in 1960	
	1959	1960	Million Metric Tons	Percent
Primary distillation	137.4	157.3	19.9	14.5
Secondary process				
Thermal conversion	27.5	31.5	4.0	14.5
Catalytic cracking	16.3	22.0	5.7	35.0
Catalytic reforming	2.9	5.4	2.5	86.2
Catalytic hydrotreating	5.9	12.4	6.5	110.2
Lubricant processing	6.2	7.0	0.8	12.9

D. Consumption of Petroleum Products and Natural Gas

1. Petroleum Products

(The estimated balance of supply and demand for petroleum products in the USSR in 1960 is shown in Table 8.*) Of the slightly more than 103 million tons of petroleum products available for domestic consumption, a total estimated at about 90 million tons was consumed by the civil sector of the economy, and about 13 million tons remained for consumption by the military sector and by civil aviation. Compared with 1959, military consumption declined 10 percent, and civil consumption increased about 13 percent. Changes in the organization and equipment of the military forces will continue to reduce the POL requirements of this sector of the Soviet economy. Significant increases in the extent of civil air activities will be insufficient to offset the decline in military demand. The industrial sector of the Soviet economy

* Table 8 follows on p. 12.

continued to dominate the civil consumption of petroleum products, as shown below:

	<u>Million Tons</u>	<u>Percent of Total</u>
Industry	46	51
Transport	17	19
Agriculture	20	22
Communal and household	7	8
Total	<u>90</u>	<u>100</u>

Table 8

Estimated Balance of Supply and Demand
for Petroleum Products in the USSR
1960

<u>Million Metric Tons</u>	
	<u>Amount</u>
Supply	
Production	119.6
Imports	3.0
Total	<u>122.6</u>
Demand	
Military	13.0 a/
Civil	90.0
Exports	15.0
Losses and increments in storage	4.6 b/
Total	<u>122.6</u>

a. Including consumption by civil aviation.

b. Estimated at about 3 to 4 percent of the total supply.

The continued emphasis on dieselization in transport and agriculture in the USSR helps to explain criticisms by the Soviet press regarding the inadequate supply of diesel fuel and an oversupply of gasoline. The Soviet regime alleviated this condition somewhat by using low-quality straight-run gasoline in light diesel fuel blends, 14/ a practice that had an added advantage of improving diesel fuel for use in frigid weather by lowering its initial freezing point. 15/

2. Natural Gas

The share of Soviet industry in the total consumption of natural gas was estimated to be about 85 percent in 1960 and is expected to be more than 90 percent in 1965. In 1960 the major industrial consumer of natural gas was the electric power industry, which utilized about 50 percent of the total natural gas consumed in the industrial sector. This share is expected to decline, however, to about 25 percent of the total by 1965. Reportedly, considerable progress was made during 1959-60 in increasing the use of natural gas in the metallurgical industry of the USSR. The share of the metallurgical industry in the total consumption of natural gas is expected to increase from less than 5 percent of the total in 1960 to about 20 percent in 1965.*

E. Oil Pipelines

A significant advance in the USSR in 1960 was achieved in the transport of oil by pipeline, which increased to 51 billion ton-kilometers in 1960, a growth of 23 percent compared with 1959.

The USSR fulfilled the annual construction plan for trunk oil pipelines for the first time since 1950. However, the plan was so modest -- about 2,000 kilometers (km) -- that the achievement was not particularly significant, at least in terms of the increment to the total availability of pipelines. 17/ Availability of pipelines at the end of 1960 amounted to 18,700 km. Significantly the construction plan for pipelines for 1961 calls for 2,800 km, a 40-percent increase above the construction in 1960. Apparently this increase is to be made at the expense of the construction of gas pipelines because there is a 15-percent reduction in the construction program for gas pipelines for 1961. (The estimated construction of oil pipelines in the USSR and their availability for 1955-60 and as planned for 1961 and 1965 are given in Table 9.**)

* Data based on information contained in studies listed in source 16/.

** Table 9 follows on p. 14.

Table 9

Estimated Construction and Availability of Oil Pipelines
in the USSR ^{a/}
1955-60 and Plans for 1961 and 1965

<u>Year</u>	<u>End-of-Year Availability</u>	<u>Annual Construction ^{b/}</u>
1955	10.4	N.A.
1956	11.6	1.2
1957	13.2	1.6
1958	14.4	1.2
1959	16.7	2.3
1960 ^{c/}	18.7	2.0
1961 Plan ^{c/}	21.5	2.8
1965 Plan ^{c/}	45.1	8.1

a. Unless otherwise indicated, data are from source 18/.

b. Derived from end-of-year availability data.

c. 19/

The major achievement in the construction of pipelines in the USSR in 1960 was the completion of that part of the proposed Tuymazy-Irkutsk crude oil pipeline between Sokur and Klukvennaya, a distance of 771 km, that will permit the completion of this system probably late in 1961 or early in 1962. Other major installations completed in 1960 were as follows:

<u>Origin</u>	<u>Terminus</u>	<u>Length (Kilometers)</u>
Ishimbay*	Orsk	300
Gor'kiy**	Ryazan'	415
Penza***	Michurinsk	342
Novosibirsk [†]	Krasnoyarsk	375 to 400

* For the supplying of Urals-Volga crude oil to the Orsk refinery.

** For the supplying of Urals-Volga crude oil to the Ryazan' refinery.

*** A part of the planned Kuybyshev-Bryansk products pipeline.

† A part of the planned Omsk-Chita products pipeline.

Initial construction on the proposed Soviet-European Satellite crude oil pipeline was not begun until early 1961, probably reflecting a lack of steel pipe. During 1960, negotiations were continued with firms of the Free World for purchases of steel pipe to close the apparent gap between requirements and indigenous output, and a contract was concluded with the Italian State Corporation for Oil and Natural Gas (ENI) that called for the delivery of 240,000 tons of steel pipe during 1961-64. 20/ Early in 1961, additional contracts providing for imports of pipe into the USSR were reported to have been concluded with a firm in Sweden for 135,000 tons and with a firm in the UK for 150,000 tons. Negotiations are reported to be in progress with Japan that would provide for Soviet imports of as much as 250,000 tons of large-diameter pipe.

F. Natural Gas Pipelines

The construction program for natural gas transmission pipelines in the USSR for 1960 exceeded the plan by about 12 percent. The plan called for laying 3,660 km of pipeline, 21/ and a total of 4,101 km was installed. 22/ The length of the transmission gas pipeline system in the USSR at the beginning of 1961 was approximately 21,000 km. Significantly the plan for 1961 is only 3,400 km, 17 percent below the gas pipeline installations in 1960. 23/ Many Soviet gas pipelines have operated at only 35 to 70 percent of planned capacity. 24/ The major difficulty is the failure of the USSR to achieve the planned construction of compressor stations. Attempts to import and/or produce compressors apparently have not eliminated the bottlenecks. Other problems have been the lag in construction of adequate storage facilities and in development of city distribution systems.

A major accomplishment in the installation of gas transmission pipelines in 1960 was the installation of more than 1,200 km of 40-inch pipeline. The major part of the 40-inch, 1,000-km line from Krasnodarskiy Kray to Serpukhov, which is expected to be completed early in 1961, and all of the 240-km branch line from Shebelinka to Ostrogozhsk was completed. 25/ Other significant transmission gas pipelines installed in 1960 include the 665-km, 32-inch pipeline from Dashava to Minsk 26/; the 652-km, 32-inch pipeline from Saratov to Gor'kiy 27/; and the 570-km, 28-inch pipeline from Dzharkak to Bukhara to Samarkand to Tashkent. 28/

II. Solid Fuels (Coal)*

Production of coal in the USSR reached 513 million tons in 1960 -- about a 2-million-ton underfulfillment of the 1960 plan, which called for a 1.7-percent increase above output in 1959 of 506.6 million tons. As there is no evidence of a shortage of coal in the USSR and as all preliminary reports show that coal targets were exceeded, the original annual plan for 1960 must have been deliberately reduced.** Perhaps the revision reflects an acceleration of the program under the Seven Year Plan for virtually eliminating production of high-cost, low-quality energy coal in the Moscow Basin and reducing output of surplus unprocessed anthracite coal dust in the Donets Basin.

A problem of surplus low-quality, high-cost energy coal has plagued the Soviet coal industry for the past few years. Early in 1960, because of this surplus, electric power stations in the Ukraine that had been converted to use low-cost natural gas were reconverted to coal. Significantly, production of energy coal declined from 405.7 million tons in 1959 to 403 million tons in 1960.

One of the most important tasks of the Soviet coal industry in 1960 was the continued output of adequate quantities of coking coal. Output of coking coal reached 110 million tons, exceeding the preliminary annual plan for 1960 by about 2 million tons. 30/ The share of coking coal as a percent of the total production of coal increased to 21.4 percent in 1960 compared with only 19.9 percent in 1959. (The estimated production of coal and coking coal in the USSR in 1959-60 and that planned for 1961 and 1965 are given in Table 10.***) Even though the total production of coal is scheduled to be reduced below that of the previous year for the first time in 1961, production of coking coal is expected to increase 5.5 million tons to 115.5 million tons.

In 1960 the USSR made considerable progress in the mechanization and automation of coal mines. A great deal of equipment, including pumps, ventilators, and conveyors, was converted to completely automatic, semiautomatic, or remote control. The coal industry of the USSR now leads the world in the use of mechanical coal mining equipment. Reports indicate that during 1960 several new models of combines

* Except for coal, the data on solid fuels in this report are limited to Table 1, p. 3, above.

** The original Seven Year Plan goal of 606 million to 612 million tons of coal in 1965 probably also has been reduced. Production of coal in 1959 and 1960 and the plan for production of coal in 1961 (511.7 million tons) are not adequate to meet the goal for 1965. It is estimated that production of coal in 1965 probably will be about 560 million tons. 29/

*** Table 10 follows on p. 17.

were introduced with good results. The USSR also is replacing scraper conveyors and locomotives with belt conveyors in order to improve coal haulage in the mines.

Table 10

Estimated Production of Coal and Coking Coal in the USSR a/
1959-60 and Plans for 1961 and 1965

Year	Coal (Million Metric Tons)	Coking Coal	
		Million Metric Tons	Percent of Total Coal
1959	506.6	100.8	19.9
1960 <u>b/</u>	513.0	110.0	21.4
1961 Plan	511.7	115.5 <u>c/</u>	22.6
1965 Plan	560.0 <u>d/</u>	153.0	27.3

a. Unless otherwise indicated, data are from source 31/.

b. 32/

c. Based on data contained in source 33/.

d. Estimated. The official plan called for 606 million to 612 million metric tons.

These advances in the automation and mechanization of the Soviet coal industry in 1960 have resulted in the first significant improvement in labor productivity in 8 years, labor productivity in the mines having increased about 6 percent compared with 1959. Because of the increase in labor productivity, it is believed that the average cost of production of coal decreased during 1960 compared with 1959. For example, in the Ukraine, where one-third of the total Soviet coal is produced, costs of production of coal decreased 2.65 rubles per ton, from 108.8 rubles in 1959 to 106.15 rubles in 1960.* 34/

* Ruble values throughout this report are in current rubles (pre-1961 exchange rate) and may be converted to US dollars at a rate of exchange of 4 rubles to US \$1. This rate does not necessarily reflect the value of the ruble in terms of dollars.

A significant technical achievement by the Soviet coal industry in 1960 was the successful employment of the hydraulic method of mining, whereby water under pressure is used as a cutting force to extract coal as well as to transport it to the surface. In 1960 the hydraulic method was employed to some extent in the Donets Basin in 15 mines with a total capacity of only 2 million tons. However, a new Donets mine came into operation which has an estimated eventual production of about 3 million tons annually and which is designed to produce coal exclusively by the hydraulic method. By 1965, production of coal by this method is planned to reach 41.6 million tons, and labor productivity is expected to be from two to three times greater with the hydraulic method than with conventional mining methods.

III. Electric Power

Production of electric power in the USSR in 1960 is estimated at about 294 billion kilowatt-hours (kwh), an increase of 29 billion kwh above that in 1959 and 3 billion kwh above the plan. (The estimated production of electric power in the USSR in 1959-60 and that planned for 1961 and 1965 are shown in Table 11.)

Table 11

Estimated Production of Electric Power
by Thermal Electric and Hydroelectric Powerplants in the USSR
1959-60 and Plans for 1961 and 1965

<u>Type of Powerplant</u>	<u>Million Kilowatt-Hours</u>			
	<u>1959 a/</u>	<u>1960 b/</u>	<u>1961 Plan c/</u>	<u>1965 Plan d/</u>
Thermal electric	217,482	236,000	N.A.	420,000
Hydroelectric	47,630	58,000	N.A.	100,000
Total	<u>265,112</u>	<u>294,000</u>	<u>327,000</u>	<u>520,000</u>

a. 35/

b. Production of electric power in the USSR in 1960 was reported to have been 292 billion kwh. 36/ The figure was preliminary, however, and on the basis of past adjustments of such figures it is estimated that it will be adjusted to a final production figure of almost 294 billion kwh. The figure for hydroelectric production assumes an annual utilization of hydroelectric capacity close to the historic average.

c. 37/

d. The total figure is the upper limit of the Plan range for 1965. 38/ The figure for hydroelectric production is a rounded figure from an average of several Soviet statements.

The final 1960 plan for the installation of 5.7 million kilowatts (kw) of new electric power generating capacity is estimated to have been fulfilled. ^{39/} The original plan of 6 million kw, however, was underfulfilled by 300,000 kw, and the actual installation reflected an annual rate of increase in new capacity of only 9.7 percent, the lowest annual percentage increase during the postwar years. In 1960, as in the previous 2 years, the installation of new capacity for generating electric power was inadequate to maintain reserve capacity at the desired level. Only the more intensive use of installed capacity enabled the USSR to exceed the 1960 plan for generating electric power. It is estimated that the average annual hours of operation increased from 4,775 hours in 1959 to 4,840 hours in 1960. (The estimated capacity of electric powerplants in the USSR in 1959-60 and as planned for 1965 is given in Table 12.)

Table 12

Estimated Capacity of Electric Powerplants in the USSR
1959-60 and Plan for 1965

Type of Powerplant	Thousand Kilowatts		
	1959 ^{a/}	1960 ^{b/}	1965 Plan ^{c/}
Thermal electric	46,557	50,190	92,000
Hydroelectric	12,710	14,810	22,000
Total	<u>59,267</u>	<u>65,000</u>	<u>114,000</u>

a. ^{40/}

b. The total is as reported. ^{41/} Hydroelectric is based on reported additions to specific plants; thermal electric is a remainder.

c. Derived by adding the planned new capacity to be installed during 1959-65 ^{42/} to the capacity at the end of 1958. ^{43/}

The construction of 27,900 km of new high-tension lines by the end of 1960, as scheduled under the Seven Year Plan, is believed to have been fulfilled. ^{44/} The plan for 1961 calls for the completion of 29,280 km of new transmission lines. ^{45/}

IV. Trade

A. Crude Oil and Petroleum Products

Soviet exports of crude oil and petroleum products to the Free World have increased annually since 1955. In 1960, at a time when the consumption of oil by the Free World increased less than 10 percent and when world oil supplies were in excess of demand, Soviet net exports of oil to the Free World increased 4.4 million tons, or about 32 percent, reaching 18 million tons. Of this amount, it is estimated that 9 million tons were crude oil and that 9 million tons were petroleum products. Soviet oil was exported to at least 28 countries of the Free World, including 3 countries -- India, Cuba, and Guinea -- that imported Soviet oil for the first time.

Economic considerations may be secondary to political considerations in Soviet sales of oil to underdeveloped countries, but the main objective of the USSR in selling oil to industrialized countries probably is to pay for the imports of needed industrial equipment. Significant to the Soviet success in selling oil is a willingness to accept payment in soft currencies and in commodities. Many of the agreements to export Soviet oil to the Free World provide for the reciprocal import of pipe that is urgently needed to complete the Soviet construction program for pipelines. In 1960 the Italian State Corporation for Oil and Natural Gas (ENI) agreed to import 12 million tons of Soviet crude oil over a 4-year period, to be paid for principally by Soviet imports of pipeline material, including 240,000 tons of steel pipe. ^{46/} The USSR also hopes to conclude a long-term agreement with Japan to supply oil in exchange for 250,000 tons of pipe.

In 1960 the total Soviet net exports of crude oil and petroleum products increased by 6 million tons, to 26 million tons. Net exports to other countries of the Sino-Soviet Bloc increased by 1.6 million tons, or about 25 percent. (The estimated Soviet trade in crude oil and petroleum products with the Free World and with the Sino-Soviet Bloc in 1955-60 is given in Table 13.*)

B. Coal

In 1960, Soviet net trade in coal and coke amounted to only about 7.5 million tons. In comparison with 1959, Soviet exports of both coal and coke declined by about a half million tons. Imports were less than a half million tons. (The estimated Soviet trade in coal and coke with the Free World and the Sino-Soviet Bloc in 1955 and 1958-60 is given in Table 14.**)

* Table 13 follows on p. 21.

** Table 14 follows on p. 22.

Soviet exports of coal to the Free World, although relatively small, have increased annually since 1955. Trade negotiations with Japan late in 1960 reflect further Soviet efforts to increase the future exports of coal to the Free World. Japan agreed informally to double imports of coal from the Kuznetsk Basin during 1961-63. The estimated average prices for Soviet coal delivered to Japan (about \$15 per ton) are \$3 to \$4 lower than comparable prices for US coal (\$18 to \$19 per ton). ^{47/} The US, which currently supplies 80 to 90 percent of Japanese imports of coal, probably will face more serious competition from the USSR in the future.

Table 13

Estimated Trade in Crude Oil and Petroleum Products
by the USSR, by Destination ^{a/}
1955-60

	Million Metric Tons					
Destination	<u>1955</u>	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>1960</u>
With the Free World						
Imports ^{b/}	0.5	1.4	1.3	1.0	1.0	1
Exports	3.1	4.6	7.9 ^{c/}	9.6 ^{c/}	14.6 ^{c/}	19
Net ^{d/}	<u>2.6</u>	<u>3.2</u>	<u>6.6</u>	<u>8.6</u>	<u>13.6</u>	<u>18</u>
With the Sino-Soviet Bloc						
Imports	3.8	3.9	3.0	2.9	4.4	3
Exports	2.1	4.1	5.8	8.5	10.8	11
Net ^{d/}	<u>-1.7</u>	<u>0.2</u>	<u>2.7</u>	<u>5.6</u>	<u>6.4</u>	<u>8</u>
Net total trade	<u>0.9</u>	<u>3.4</u>	<u>9.4</u>	<u>14.2</u>	<u>20.0</u>	<u>26</u>

a. ^{48/}. Except for 1960, which was estimated on the basis of preliminary reports.

b. Austrian reparations.

c. Residual.

d. Net imports are designated by the use of a minus sign.

Table 14

Estimated Trade in Coal and Coke by the USSR
by Destination a/
1955 and 1958-60

Destination	Million Metric Tons							
	1955		1958		1959		1960	
	Coal	Coke	Coal	Coke	Coal	Coke	Coal <u>b/</u>	Coke <u>c/</u>
With the Free World								
Exports	1.8	0.2	3.6	0.4	4.2	0.4	4.5	0.4
Imports	0	0	0	0	0	0	0	0
Net	<u>1.8</u>	<u>0.2</u>	<u>3.6</u>	<u>0.4</u>	<u>4.2</u>	<u>0.4</u>	<u>4.5</u>	<u>0.4</u>
With the Sino-Soviet Bloc								
Exports	0.2	1.0	2.8	1.3	2.7	1.4	1.9	1.0
Imports	6.6	0	0.3	0	0.3	0	0.3	0
Net <u>d/</u>	<u>-6.3</u>	<u>1.0</u>	<u>2.6</u>	<u>1.3</u>	<u>2.4</u>	<u>1.4</u>	<u>1.6</u>	<u>1.0</u>
Net total trade	<u>-4.3</u>	<u>1.2</u>	<u>6.1</u>	<u>1.7</u>	<u>6.6</u>	<u>1.8</u>	<u>6.1</u>	<u>1.4</u>

a. Basic studies used in the construction of this table are those listed in source 49/. Official Soviet data include Polish coal and coke that are reexported but never enter the USSR. These amounts are excluded from these data.

b. 50/

c. 51/

d. Derived from unrounded data. Net imports are designated by the use of a minus sign.

APPENDIX

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