Directorate of
Intelligence

Soviet Energy Data Resource Handbook

A Reference Aid

SOV 90-10021
May 1990

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Intelligence

Soviet Energy Data Resource Handbook

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SOV 90-10021
May 1990

Contents

Tables

SOV 90-10021
May 1990

Table 1
USSR: Estimated Primary Energy Balance, 1985

Million tons standard fuel [a]

	Oil [b]	Natural Gas	Coal	Minor Fuels [c]	Primary Electricity			Total
					Hydro	Nuclear	Other	
Production	851.3	742.9	439.8	39.1	69.9	54.6	0.2	2,197.8
Other supply	2.6	1.7	3.2					7.5
Imports	20.6	2.8	7.4					30.8
Exports	243.6	79.7	19.5				9.4	352.2
Stock change [d]	1.9	3.4	−3.4					1.9
Consumption	629.0	664.3	434.3	39.1	69.9	54.6	−9.2	1,882.0
Conversion [e]	119.0	348.4	316.9	12.4				796.7
Nonenergy use	89.6	69.8	2.7					162.1
Losses	21.7	18.0	3.4	0.5				43.6
Direct fuel use	398.7	228.1	111.3	26.2				764.3
Industry	157.7	105.4	26.2	1.7				291.0
Construction	9.7	0.7	0.4	0.1				10.9
Transportation	156.3	58.0	1.2					215.5
Agriculture	43.7	2.2	3.0	1.1				50.0
Residential/ Municipal	24.7	59.7	77.3	22.0				183.7
Other	6.6	2.1	3.2	1.3				13.2

[a] One million tons standard fuel (*uslovnoye toplivo*) is equal to 1 million tons of high-quality hard coal (with an energy content of 7,000 kilocalories per kilogram), or about 5.1 million barrels of oil.
[b] Including gas condensate (natural gas liquids).
[c] Including peat, oil shale, and fuelwood.
[d] Negative sign indicates stock drawdown.
[e] Converted to other forms of energy (such as electricity and steam) or to other fuels (such as coal or peat briquettes).

SOV 90-10021
May 1990

Soviet Energy Data Resource Handbook

Overview

The USSR is the world's largest energy producer and ranks second in total energy consumption behind the United States. It has the largest oil reserves of any country outside the Middle East, leads the world in gas reserves, and contains enormous—albeit relatively low quality—coal resources. The USSR currently stands in third place after the United States and France in installed nuclear generating capacity, and only Canada and the United States produce more electricity than the USSR from hydropower plants. Natural gas is the leading source of energy for the domestic economy, followed closely by oil.

Energy exports are the principal source of foreign exchange earnings for the USSR. In 1988 Moscow received nearly $13 billion in hard currency for its exports of crude oil, petroleum products, natural gas, coal, and electricity. Revenues from energy sales to Western countries permit the acquisition of a wide variety of food, other materials, machinery, and technology, including some for the energy sector itself, such as large-diameter pipe to transport gas and equipment to increase oil recovery.

The 1990s will be a difficult period for the Soviet energy industries. Oil production is declining, growth in gas output has slowed, coal production—in terms of energy content—has been stagnant for years, and the nuclear power program has been retarded by growing antinuclear sentiment. Moreover, the costs of energy development are rising rapidly, and current Soviet technology and equipment are inadequate to exploit the more remote or hard-to-extract energy resources that have been found. Moscow is looking more to the West to help develop new energy-producing areas, but it has little excess cash to purchase equipment, technology, and expertise and is trying to interest Western firms in joint ventures on Soviet soil.

Figure 1
USSR: Trends in Energy Production, by Fuel, 1970-88

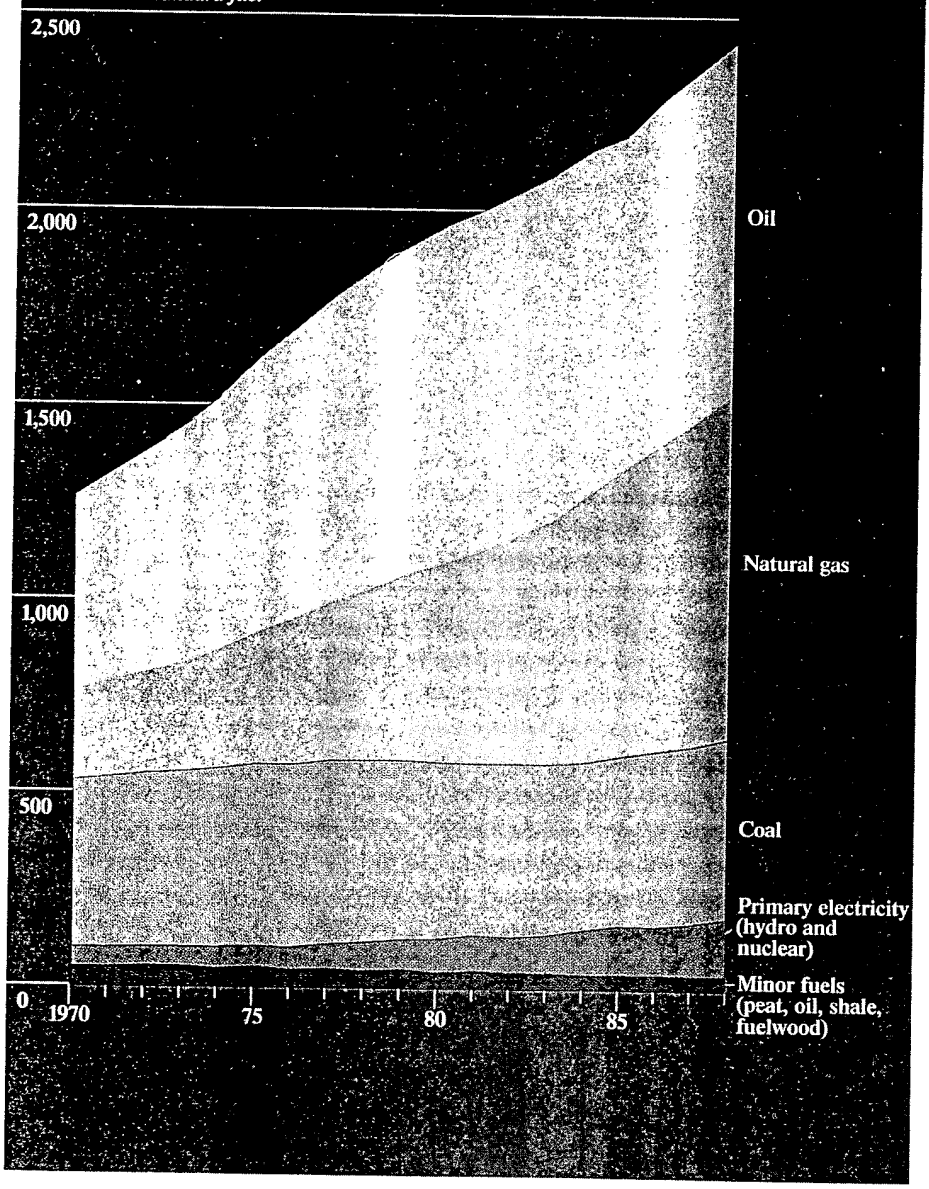

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Table 2
USSR: Total Energy Production

Million tons standard fuel [a]

	Total	Oil [b]	Natural Gas	Coal	Minor Fuels [c]	Primary Electricity [d]
1970	**1,268.8**	502.5	233.5	432.7	53.1	46.9
1971	**1,329.1**	537.3	250.6	441.6	52.9	46.7
1972	**1,388.2**	572.6	264.6	448.8	56.0	46.2
1973	**1,452.4**	613.5	282.4	454.6	55.2	46.7
1974	**1,532.2**	656.3	311.4	463.4	49.4	51.7
1975	**1,621.2**	701.9	342.9	471.8	54.7	49.9
1976	**1,698.6**	743.1	380.3	473.9	46.9	54.4
1977	**1,777.1**	780.5	410.0	475.9	50.0	60.7
1978	**1,846.3**	817.3	441.1	471.8	44.9	71.2
1979	**1,907.4**	837.4	481.8	463.6	49.6	75.0
1980	**1,960.2**	862.6	514.2	457.1	41.9	84.4
1981	**2,001.1**	870.6	549.9	444.2	47.2	89.2
1982	**2,049.1**	876.0	591.9	448.8	42.8	89.6
1983	**2,094.7**	881.4	633.2	442.5	42.2	95.4
1984	**2,157.8**	876.2	694.3	435.2	39.1	113.0
1985	**2,197.8**	851.3	742.9	439.8	39.1	124.7
1986	**2,289.0**	879.1	792.7	454.8	39.1	123.3
1987	**2,362.5**	892.6	840.1	459.7	37.7	132.4
1988	**2,432.4**	892.8	889.4	467.0	37.7	145.5

[a] One million tons standard fuel (*uslovnoye toplivo*) is equal to 1 million tons of high-quality hard coal (with an energy content of 7,000 kilocalories per kilogram), or about 5.1 million barrels of oil.
[b] Including gas condensate (natural gas liquids).
[c] Including peat, oil shale, and fuelwood.
[d] Including hydro, nuclear, and other non-fossil-fuel-based electricity.

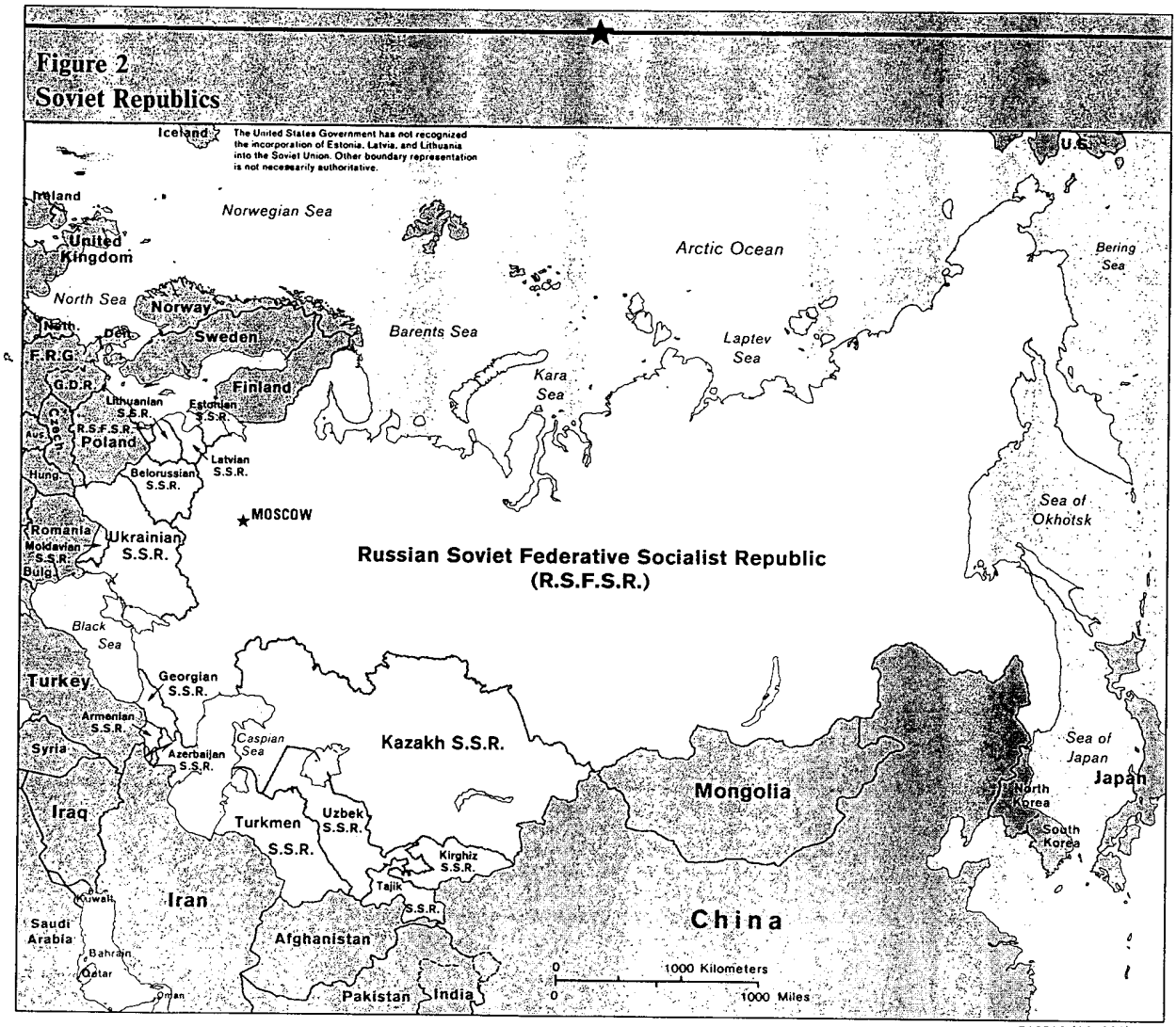
Figure 2
Soviet Republics
Iceland
The United States Government has not recognized the incorporation of Estonia, Latvia, and Lithuania into the Soviet Union. Other boundary representation is not necessarily authoritative.
U.S.
Ireland
Norwegian Sea
United Kingdom
Arctic Ocean
Bering Sea
North Sea
Norway
Barents Sea
Laptev Sea
Sweden
Finland
Kara Sea
Lithuanian S.S.R.
Estonian S.S.R.
Poland
Latvian S.S.R.
Belorussian S.S.R.
MOSCOW
Sea of Okhotsk
Romania
Ukrainian S.S.R.
Moldavian S.S.R.
Russian Soviet Federative Socialist Republic (R.S.F.S.R.)
Black Sea
Turkey
Georgian S.S.R.
Armenian S.S.R.
Syria
Caspian Sea
Azerbaijan S.S.R.
Kazakh S.S.R.
Sea of Japan
Japan
Mongolia
North Korea
Iraq
Turkmen S.S.R.
Uzbek S.S.R.
South Korea
Kirghiz S.S.R.
Tajik S.S.R.
Iran
Saudi Arabia
China
Afghanistan
Bahrain
Qatar
Pakistan
India
0 1000 Kilometers
0 1000 Miles
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Table 3
USSR: Regional Energy Production, 1987 [a]

	Oil [b] *(million b/d)*	Natural Gas *(billion cubic meters)*	Coal *(million tons)*	Electricity *(billion kilowatt-hours)*
Total	**12.48 (100)**	**727.4 (100)**	**760 (100)**	**1,665 (100)**
Russian SFSR	11.39 (91.3)	544.3 (74.8)	415 (54.6)	1,047 (62.9)
Ukrainian SSR	0.11 (0.9)	35.6 (4.9)	192 (25.3)	282 (16.9)
Belorussian SSR	0.04 (0.3)	0.3 (NEGL)		38 (2.3)
Uzbek SSR	0.05 (0.4)	39.8 (5.5)	5 (0.7)	55 (3.3)
Kazakh SSR	0.49 (3.9)	6.3 (0.9)	142 (18.7)	89 (5.3)
Georgian SSR	NEGL (NEGL)	0.1 (NEGL)	2 (0.2)	14 (0.8)
Azerbaijan SSR	0.28 (2.2)	12.5 (1.7)		23 (1.4)
Lithuanian SSR				23 (1.4)
Moldavian SSR				17 (1.0)
Latvian SSR				6 (0.4)
Kirghiz SSR	NEGL (NEGL)	0.1 (NEGL)	3 (0.4)	9 (0.5)
Tajik SSR	NEGL (NEGL)	0.3 (0.1)	1 (0.1)	16 (1.0)
Armenian SSR				15 (0.9)
Turkmen SSR	0.12 (1.0)	88.1 (12.1)		13 (0.8)
Estonian SSR				18 (1.1)

[a] Shares of total USSR production shown in parentheses.
[b] Including gas condensate (natural gas liquids).

Figure 3
USSR: Hard Currency Energy Export Earnings, by Source, 1970-88

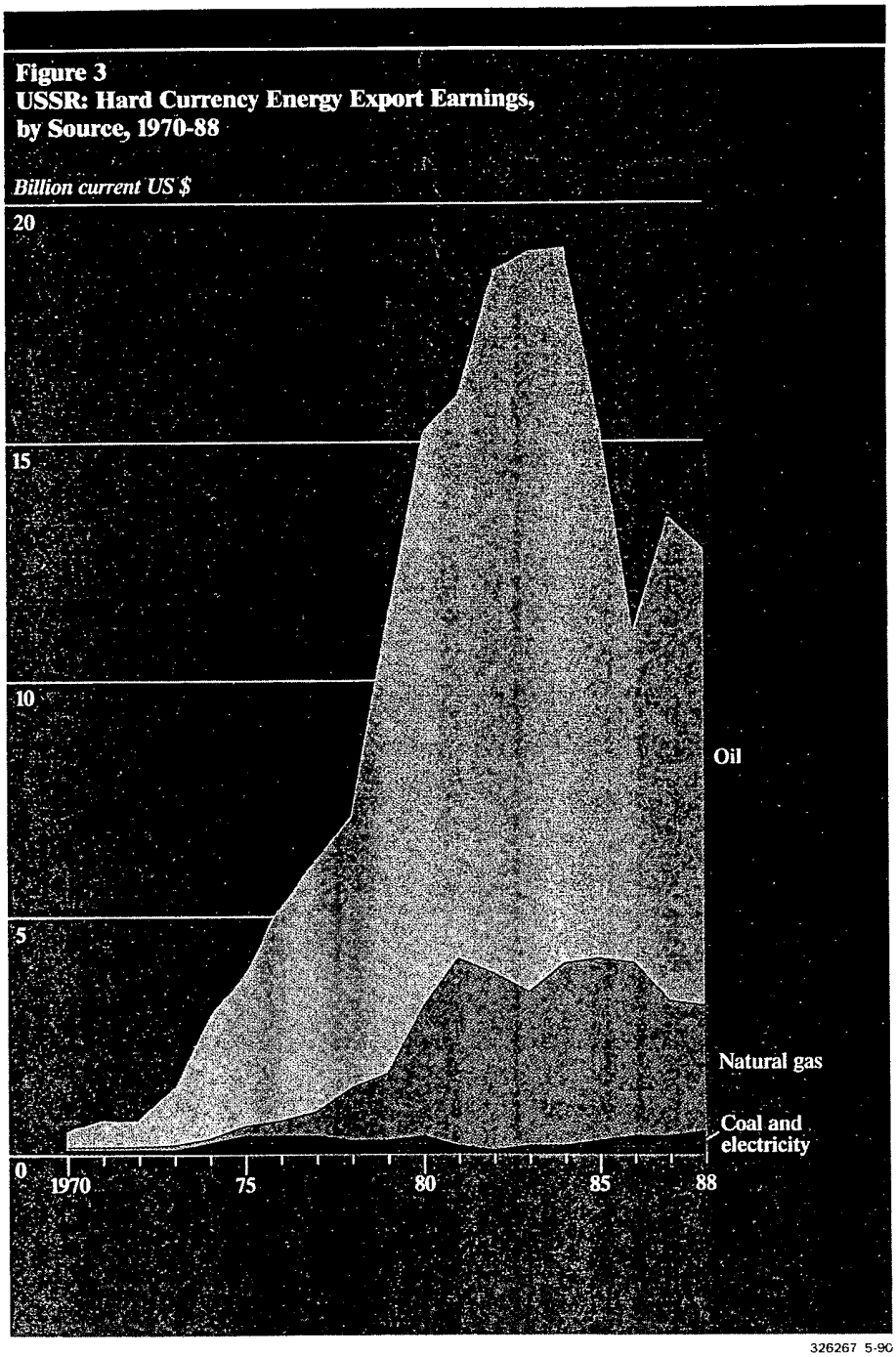
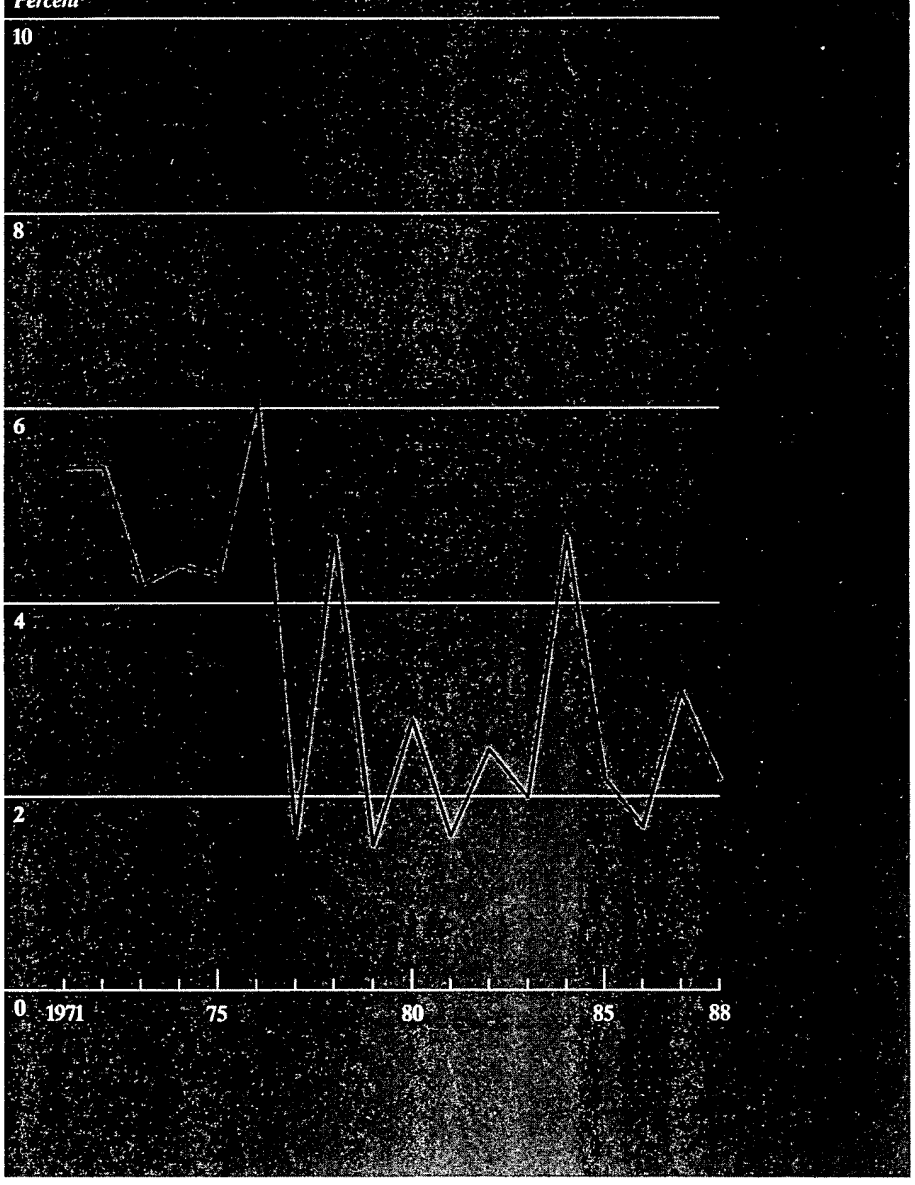


Table 4
USSR: Hard Currency Energy Export Earnings

Million current US $

	Total	Oil	Natural Gas	Coal	Electricity
1970	**479.8**	386.7	0.8	92.3	NEGL
1971	**713.2**	567.4	21.4	124.3	0.1
1972	**701.6**	556.2	24.3	120.4	0.7
1973	**1,416.4**	1,248.0	32.5	135.3	0.6
1974	**2,908.5**	2,562.4	94.6	251.0	0.5
1975	**3,780.3**	3,169.9	219.8	390.4	0.2
1976	**5,241.0**	4,513.6	358.3	368.6	0.5
1977	**6,219.9**	5,295.2	566.5	357.1	1.1
1978	**7,076.8**	5,710.2	1,072.1	293.0	1.5
1979	**11,301.6**	9,582.0	1,404.3	313.3	2.0
1980	**15,201.5**	12,123.7	2,710.2	365.8	1.8
1981	**16,034.6**	11,886.9	3,967.9	178.6	1.2
1982	**18,630.1**	14,823.8	3,672.8	132.9	0.6
1983	**18,970.7**	15,569.2	3,193.5	177.3	30.7
1984	**19,105.6**	15,111.3	3,753.9	209.4	31.0
1985	**15,591.2**	11,471.0	3,813.2	278.4	28.6
1986	**10,999.6**	6,962.8	3,638.4	354.6	43.8
1987	**13,478.3**	10,274.3	2,768.6	412.2	23.2
1988	**12,844.1**	9,767.8	2,621.4	440.0	14.9

Figure 4
USSR: Annual Growth of Total Energy Consumption, 1971-88



326268 5-90

Table 5
USSR: Total Energy Consumption

Million tons standard fuel [a]

	Total	Total Fuels Output [b]	Primary Electricity Output [c]	Imports	Exports	Stock Change [d]
1970	**1,110.5**	1,221.8	46.9	14.1	169.5	2.8
1971	**1,170.4**	1,282.4	46.7	23.4	180.5	1.6
1972	**1,233.6**	1,342.0	46.2	35.3	187.6	2.3
1973	**1,286.0**	1,405.7	46.7	44.1	205.7	4.8
1974	**1,342.0**	1,480.5	51.7	31.3	214.1	7.4
1975	**1,400.0**	1,571.3	49.9	36.5	242.7	15.0
1976	**1,485.8**	1,644.2	54.4	34.3	273.5	−26.4
1977	**1,509.5**	1,716.4	60.7	33.6	298.7	2.5
1978	**1,580.9**	1,775.1	71.2	35.0	306.3	−5.9
1979	**1,604.6**	1,832.4	75.0	26.3	314.5	14.6
1980	**1,649.6**	1,875.8	84.4	17.8	327.8	0.6
1981	**1,675.3**	1,911.9	89.2	16.5	323.7	18.6
1982	**1,717.2**	1,959.5	89.6	24.9	339.7	17.1
1983	**1,752.0**	1,999.3	95.4	29.6	360.4	11.9
1984	**1,834.2**	2,044.8	113.0	34.7	371.8	−13.5
1985	**1,874.5**	2,073.1	124.7	30.8	352.2	1.9
1986	**1,906.3**	2,165.7	123.3	34.9	396.0	21.6
1987	**1,964.5**	2,230.1	132.4	33.0	418.8	12.2
1988	**2,008.5**	2,286.9	145.5	42.7	446.5	20.1 [e]

[a] One million tons standard fuel (*uslovnoye toplivo*) is equal to 1 million tons of high-quality hard coal (with an energy content of 7,000 kilocalories per kilogram), or about 5.1 million barrels of oil.
[b] Including crude oil, natural gas, coal, gas condensate (natural gas liquids), peat, oil shale, and fuelwood.
[c] Including hydro, nuclear, and other non-fossil-fuel-based electricity.
[d] Negative sign indicates drawdown of total energy stocks.
[e] Estimated.

Energy Efficiency

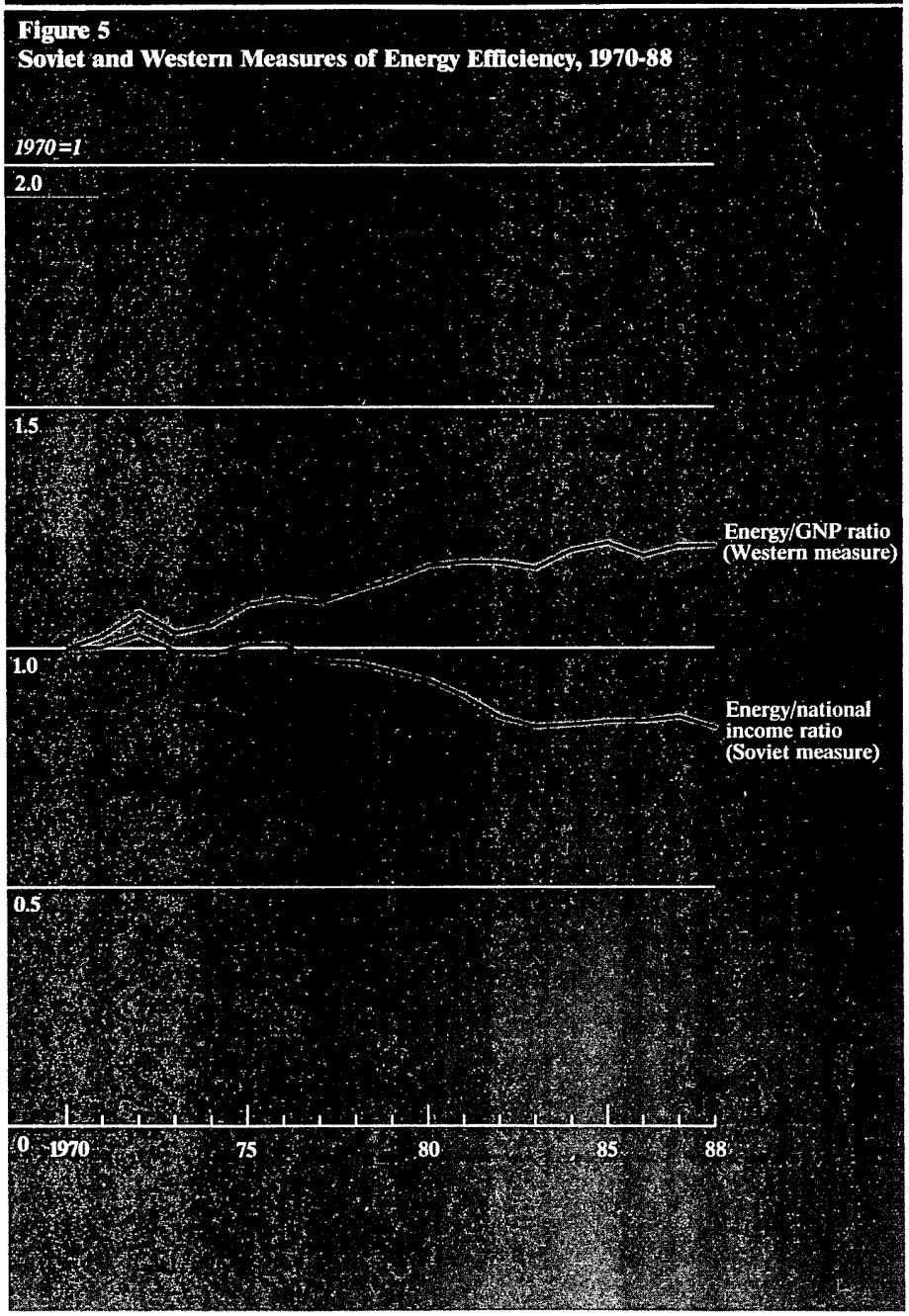
The USSR has long pursued a production-oriented energy policy to meet growing demand and has made few efforts to stretch available energy supplies through conservation. As a result of this inattention to conservation, Soviet energy use has progressively become more inefficient since the mid-1970s, as measured by the amount of energy consumed per unit of gross national product.[1] In contrast, most developed Western countries have been using less and less energy to produce a given amount of economic output.

The USSR is severely hampered in its ability to emulate the gains in energy efficiency that have characterized Western experience since the first big oil price shock in 1973-74. In part, its problems result from the harsher Soviet climate and the predominance in the economy of energy-intensive heavy industry. The principal reason for the USSR's poor record in energy conservation, however, is the Soviet pricing system, which, despite ongoing reforms, still undervalues energy resources, thereby encouraging wasteful energy use.

Improving Soviet energy efficiency will require the introduction of substantially higher prices that reflect changing demand for energy and increased extraction costs, along with radical changes in the economic incentive system to ensure conservation. More energy savings will also require a large quantity of energy monitoring and regulating equipment—obtained through the development of a new domestic industry and/or imports—as well as more investment to modernize the country's industrial base with more energy-efficient machinery.

[1] Soviet calculations of energy efficiency (usually expressed as a ratio of energy consumed per unit of national income produced) show an improvement over time, but Soviet measures of aggregate economic output are biased upward over time by disguised inflation. As a consequence, the growth of economic output per unit of energy input is overstated.

Figure 5
Soviet and Western Measures of Energy Efficiency, 1970-88



326269 5-90

Table 6
USSR: Trends in Overall Energy Efficiency

	Total Energy Consumption	Gross National Product (*billion 1982 rubles*) [a]	National Income (*billion rubles*) [b]	Energy/ GNP Ratio [c]	Energy/ NI Ratio [c]
1970	**1,110.5**	491.8	289.9	1.000	1.000
1971	**1,170.4**	505.3	305.0	1.026	1.002
1972	**1,233.6**	508.7	313.6	1.074	1.027
1973	**1,286.0**	552.1	337.8	1.031	0.994
1974	**1,342.0**	568.0	354.0	1.046	0.989
1975	**1,400.0**	569.5	363.3	1.089	1.006
1976	**1,485.8**	596.8	385.7	1.102	1.006
1977	**1,509.5**	610.7	405.6	1.094	0.971
1978	**1,580.9**	626.7	426.3	1.118	0.968
1979	**1,604.6**	623.4	440.6	1.140	0.951
1980	**1,649.6**	624.8	462.2	1.169	0.932
1981	**1,675.3**	630.3	486.7	1.177	0.899
1982	**1,717.2**	646.7	523.9	1.176	0.856
1983	**1,752.0**	667.1	548.3	1.164	0.834
1984	**1,834.2**	676.6	570.5	1.201	0.839
1985	**1,874.5**	682.6	578.5	1.216	0.846
1986	**1,906.3**	710.3	587.4	1.189	0.847
1987	**1,964.5**	719.5	599.6	1.209	0.855
1988	**2,008.5**	735.2	630.8	1.210	0.831

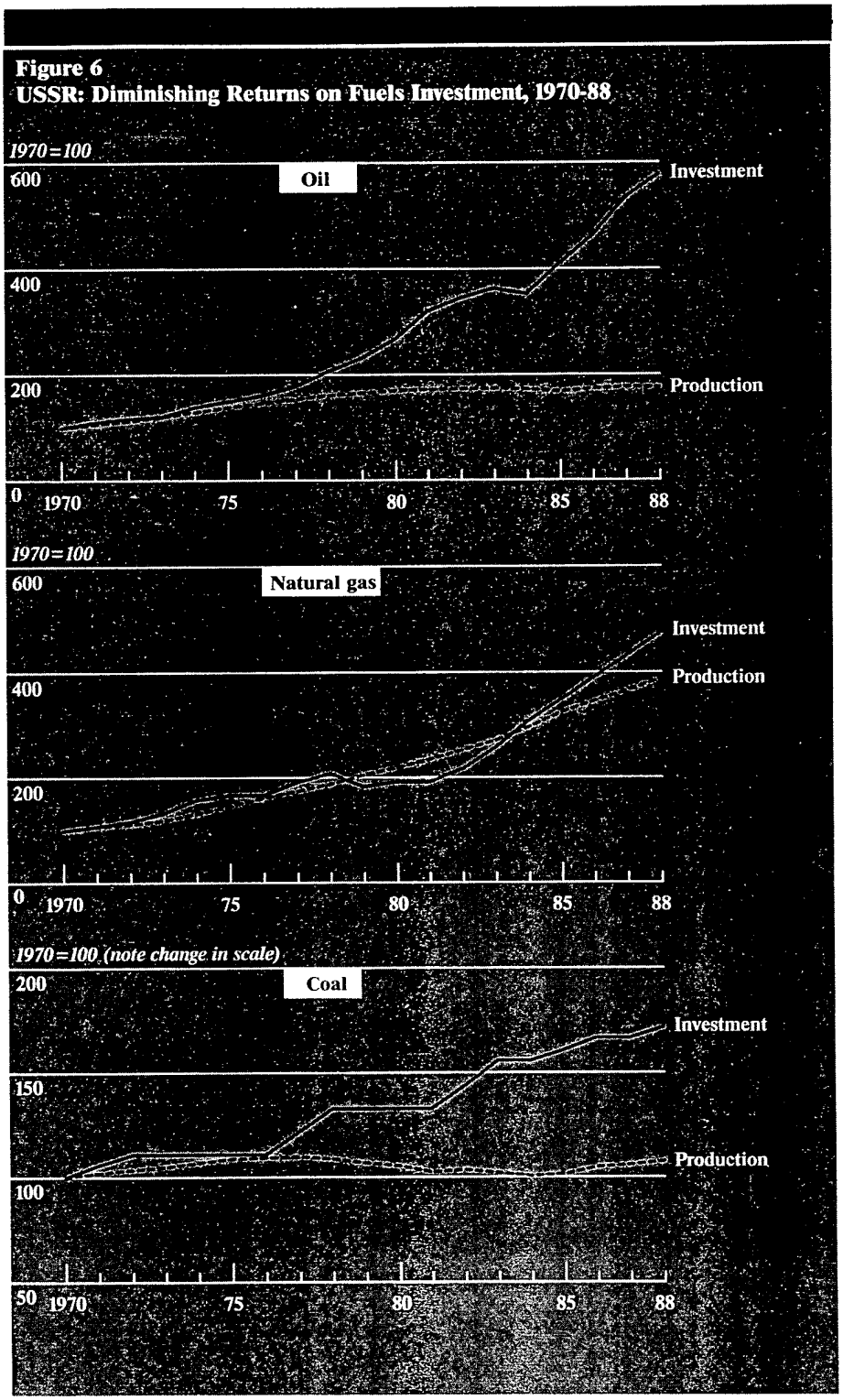
[a] CIA estimates. Official Soviet measures of aggregate economic growth are generally believed to have an upward bias because of increased double counting over time and disguised inflation.
[b] National income produced as reported in official Soviet statistics.
[c] Calculated as quotient of two indexes (1970 = 100).

Energy Investment

The costs of energy development have accelerated as the USSR's energy base has shifted eastward and northward, and operating conditions have become more difficult. In the last two decades, annual investment in the energy industries has doubled every 10 years. In 1988 capital spending for the energy industries took 15 percent of the USSR's total investment economywide and 40 percent of all industrial investment. Moreover, the distribution of energy investment among the various types of energy producers has shifted radically. In 1970, for example, the oil industry received 30 percent of total energy investment; by 1988 this share had grown to more than one-half. Not included in these costs are other massive expenditures not counted by the Soviets as investment in the energy sector. These include building and maintaining the vast natural gas pipeline network, modernizing oil refineries to produce more light petroleum products for industry and agriculture, and cleaning up mistakes of the past, such as the Chernobyl' accident and polluting coal-fired power plants.

The tremendous growth in investment, moreover, has brought declining returns. Between 1980 and 1988, combined yearly capital outlays for the oil, gas, and coal industries grew 105 percent. In the same period, the annual amount of energy supplied by these three fuels rose only 23 percent. The increased expenditures helped turn around a decline in oil production in the mid-1980s, but at the rate costs are rising, energy investment would need to double again by the end of this century just to sustain current output. The debate is intensifying in Moscow as to the wisdom of ever-increasing energy investment, and plans are under consideration to cut energy investment to free up more resources for the consumer.

Figure 6
USSR: Diminishing Returns on Fuels Investment, 1970-88



326270 5-90

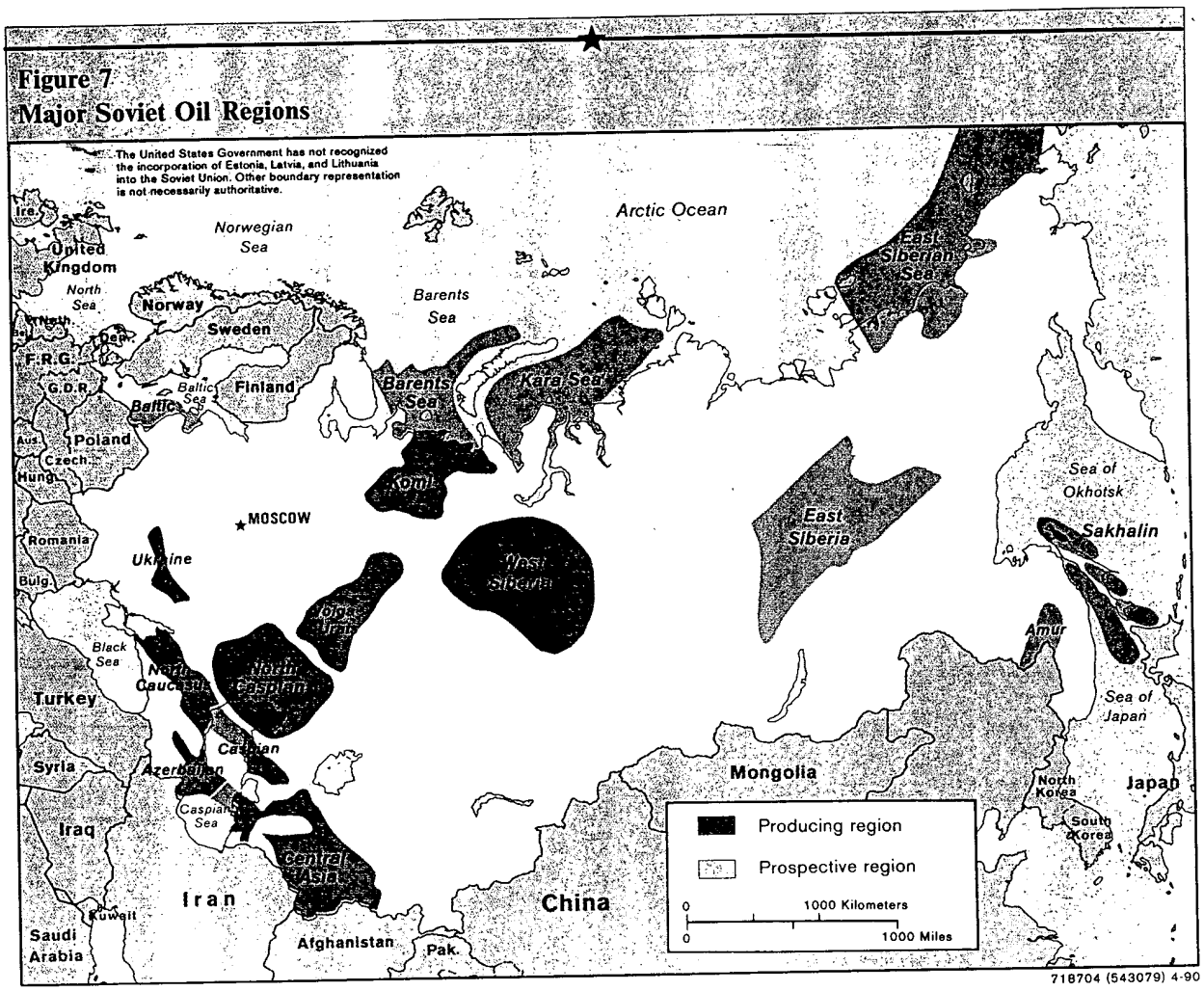
Table 7
USSR: Energy Investment

Billion 1984 rubles

	Total	Oil	Natural Gas	Coal	Electric Power	Other [a]
1970	**9.5**	2.8	1.2	1.8	3.6	0.1
1971	**10.3**	3.1	1.3	1.9	3.9	0.1
1972	**10.7**	3.3	1.4	2.0	3.9	0.1
1973	**11.2**	3.4	1.6	2.0	4.0	0.2
1974	**11.9**	3.9	1.9	2.0	3.9	0.2
1975	**12.7**	4.2	2.0	2.0	4.3	0.2
1976	**12.4**	4.5	2.0	2.0	3.8	0.1
1977	**13.8**	5.0	2.3	2.2	4.2	0.1
1978	**15.5**	5.8	2.5	2.4	4.6	0.2
1979	**16.4**	6.5	2.2	2.4	5.1	0.2
1980	**17.6**	7.5	2.3	2.4	5.2	0.2
1981	**19.1**	9.0	2.3	2.4	5.3	0.1
1982	**20.4**	9.7	2.6	2.6	5.4	0.1
1983	**21.7**	10.2	3.1	2.8	5.5	0.1
1984	**22.3**	9.9	3.7	2.8	5.8	0.1
1985	**25.4**	11.5	4.2	2.9	6.7	0.1
1986	**27.4**	13.0 [b]	4.7 [b]	3.0 [b]	6.7	0.1 [b]
1987	**30.1**	15.0 [b]	5.2 [b]	3.0 [b]	6.8	0.1 [b]
1988	**31.8**	16.2 [b]	5.7 [b]	3.1 [b]	6.8 [b]	0.1 [b]

[a] Including peat, oil shale, and fuelwood.
[b] Estimated.

Figure 7
Major Soviet Oil Regions

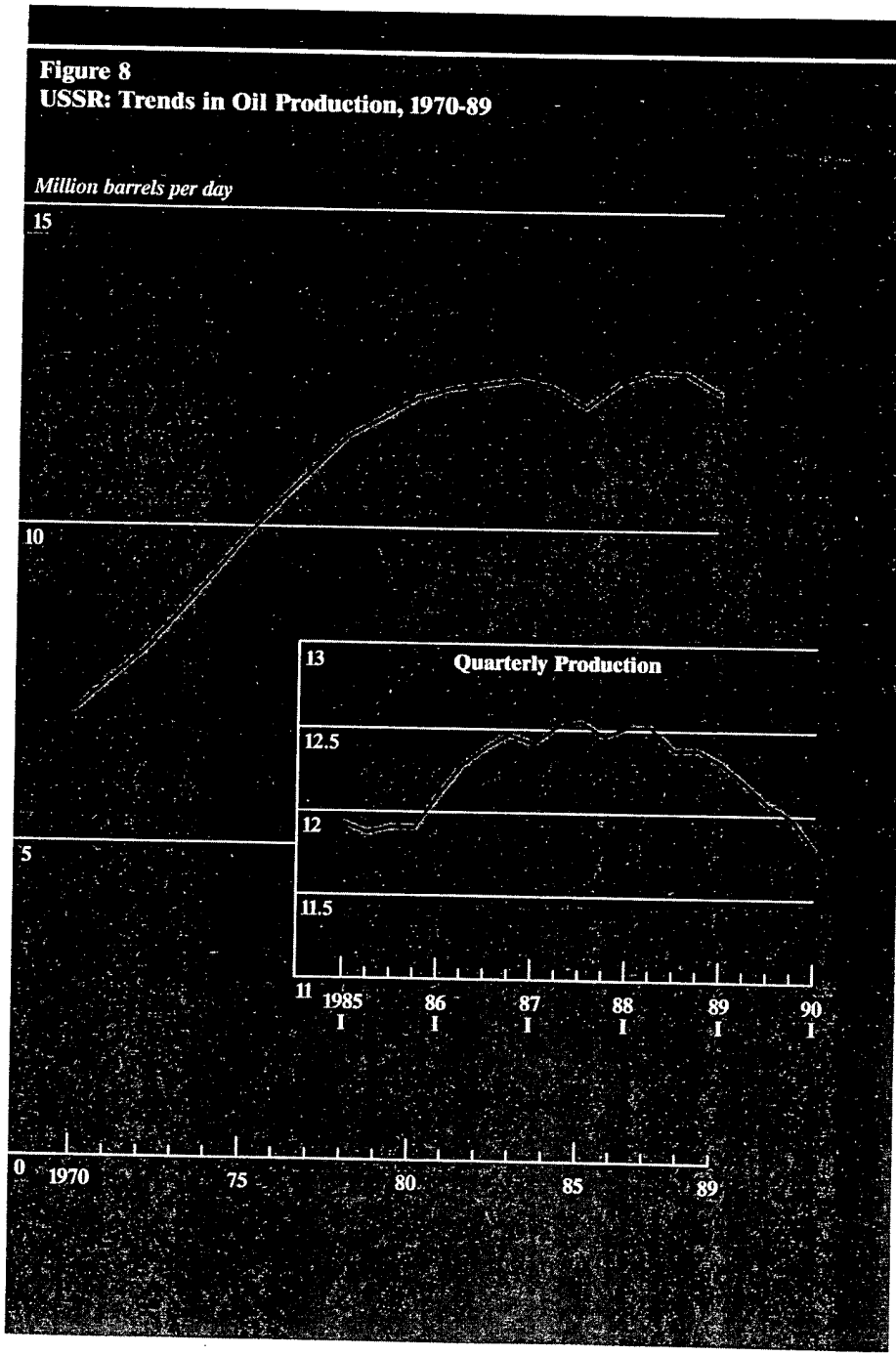


Oil

The USSR is the world's largest oil producer. Total Soviet oil output (including natural gas liquids) in 1989 was 12.14 million barrels per day (b/d), marking the second straight year that production has declined. In 1988—the latest year for which complete trade data are available—the USSR exported more than 4 million b/d. East European countries received about 40 percent of total oil exports, and roughly one-half went to Western hard currency customers, earning Moscow about $10 billion. The remainder was delivered to small client states such as Cuba and other soft currency trading partners. The USSR also imports a small volume of oil—received as payment for deliveries of military hardware and other items—but nearly all is reexported. Since the early 1980s Soviet domestic oil consumption has hovered around 9 million b/d.

Soviet oil production peaked in 1987 at nearly 12.5 million b/d. Major oil-producing regions have reached maturity, and development costs are rising rapidly as smaller and more complex fields are tapped. Moreover, the opening of such new areas as the North Caspian Basin and the arctic offshore has lagged because of inadequate domestic equipment and technology. A Soviet energy expert, speaking at an international oil seminar in January 1990, said that maintaining oil output at the current level was becoming a heavy financial burden for the country and that production would have to be cut to an economically acceptable level. The USSR's long-term options to deal with its oil problem include greater substitution of natural gas for oil; increased exploration and development of new producing regions; a reduction in consumption and/or exports; and obtaining more Western help through equipment purchases, joint ventures, and service contracts. All would entail more spending or less hard currency revenue and would complicate Moscow's current efforts to improve consumer welfare and reduce its budget deficit.

Figure 8
USSR: Trends in Oil Production, 1970-89



326341 5-90

Table 8
USSR: Oil Production and Trade

Million b/

	Production [a]	Imports [b]	Exports
1970	7.06	0.09	1.92
1971	7.54	0.13	2.10
1972	7.99	0.18	2.13
1973	8.58	0.29	2.37
1974	9.18	0.09	2.32
1975	9.82	0.15	2.61
1976	10.37	0.14	2.96
1977	10.92	0.14 [c]	3.13 [c]
1978	11.43	0.16 [c]	3.30 [c]
1979	11.71	0.16 [c]	3.22 [c]
1980	12.03	0.10	3.21
1981	12.18	0.12 [c]	3.22 [c]
1982	12.25	0.18 [c]	3.39 [c]
1983	12.33	0.27 [c]	3.67 [c]
1984	12.22	0.32 [c]	3.67 [c]
1985	11.91	0.29	3.33
1986	12.30	0.33	3.73
1987	12.48	0.32	3.92
1988	12.45	0.43	4.09
1989	12.14	0.3 [d]	3.9 [d]

[a] Including gas condensate (natural gas liquids).
[b] Nearly all for reexport.
[c] Estimated.
[d] Preliminary.

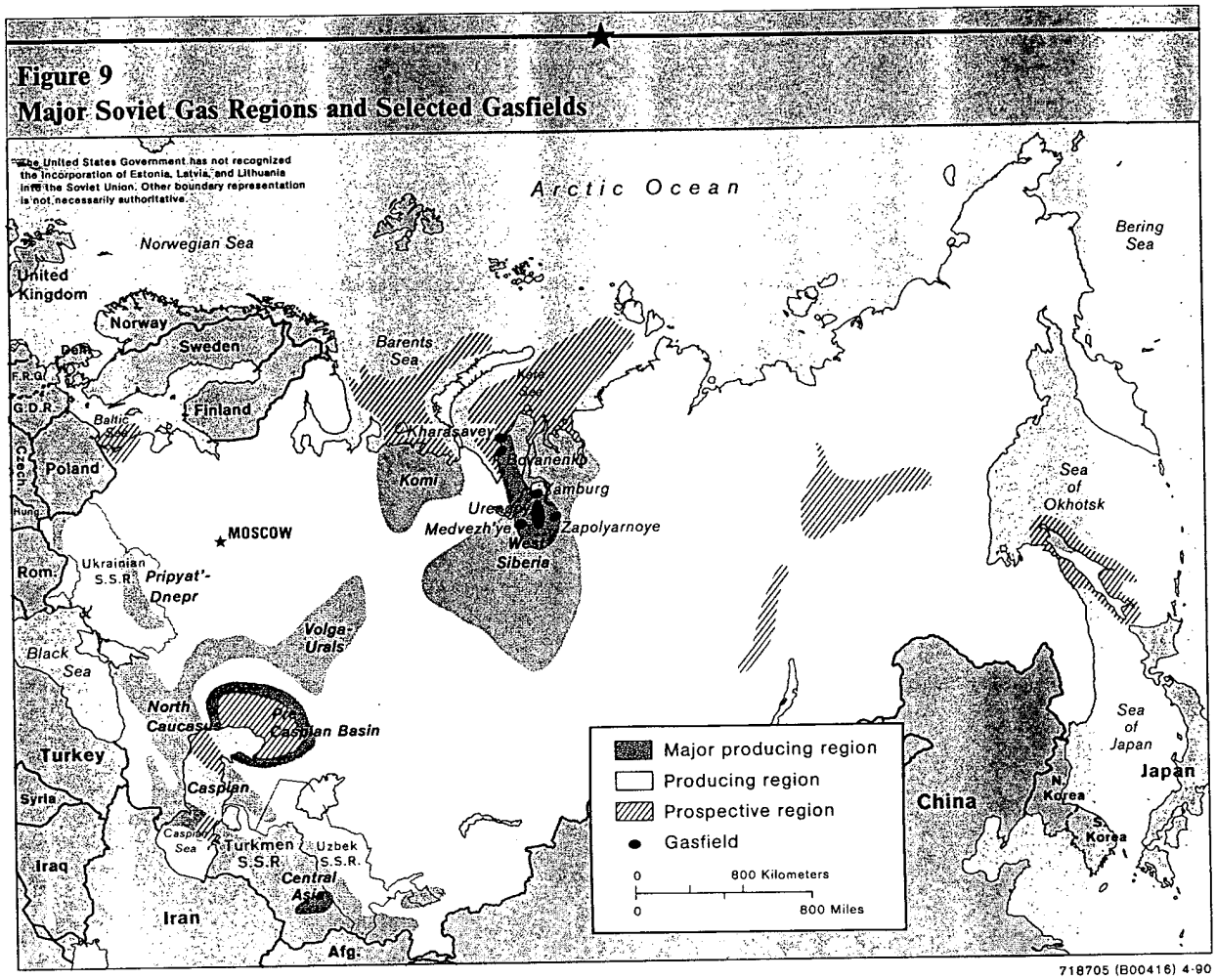
Table 9
USSR: Oil Balance

Million b/

	1980	1985	1986	1987	1988	1989 [a]
Production [b]	12.0	11.9	12.3	12.5	12.4	12.1
Imports	0.1	0.3	0.3	0.3	0.4	0.3
Exports	3.2	3.3	3.7	3.9	4.1	3.9
Of which:						
OECD	1.1	1.3	1.6	1.7	1.9	1.7
Other Western countries	0.1	0.1	0.1	0.2	0.3	0.3
Eastern Europe	1.6	1.4	1.6	1.6	1.5	1.5
Other Communist countries	0.4	0.5	0.4	0.4	0.4	0.4
Apparent consumption [c]	8.9	8.9	8.9	8.9	8.7	8.5

[a] Preliminary.
[b] Including gas condensate (natural gas liquids).
[c] Excluding changes in stocks.

Figure 9
Major Soviet Gas Regions and Selected Gasfields



Natural Gas

The USSR produced 796 billion cubic meters (28.1 trillion cubic feet) of natural gas in 1989. The country currently leads the world in gas output and holds an estimated 38 percent of global gas reserves. After many years of rapid growth, annual increases in Soviet gas production are slowing. As the industry moves farther north, costs are rising because of increased drilling and logistic and environmental constraints. The USSR exports roughly 90 billion cubic meters (3 trillion cubic feet) per year, about equally divided between Eastern and Western Europe. In 1988 Moscow earned $2.6 billion in hard currency from exports of gas. A small quantity of gas is imported from Afghanistan, and an agreement has been reached to resume gas imports from Iran, some of which could be reexported to European countries.

Moscow is relying on increased gas output to provide nearly all the growth in Soviet energy production in the 1990s, before production begins to level off in the next century. Attaining such increases will require the development of one or two large new gas deposits and the building of several transmission pipelines every five years. Maintaining growth in gas supply, however, will depend largely on the ability of the Soviet economy to absorb the increases the gas industry can provide. Much of the gas-for-oil substitution that has taken place in recent years was based on increased gas use in electric power plants equipped to burn either fuel. Using more gas to generate electricity will mean constructing new plants and bringing gas to areas not now supplied. Greater use of gas will require further expansion of transmission and distribution pipelines as well as new storage facilities. The huge existing gas pipeline network—208,000 kilometers at the end of 1988—already is showing signs of age and may need extensive repair in the near future.

Figure 10
USSR: Trends in Natural Gas Production, 1970-89

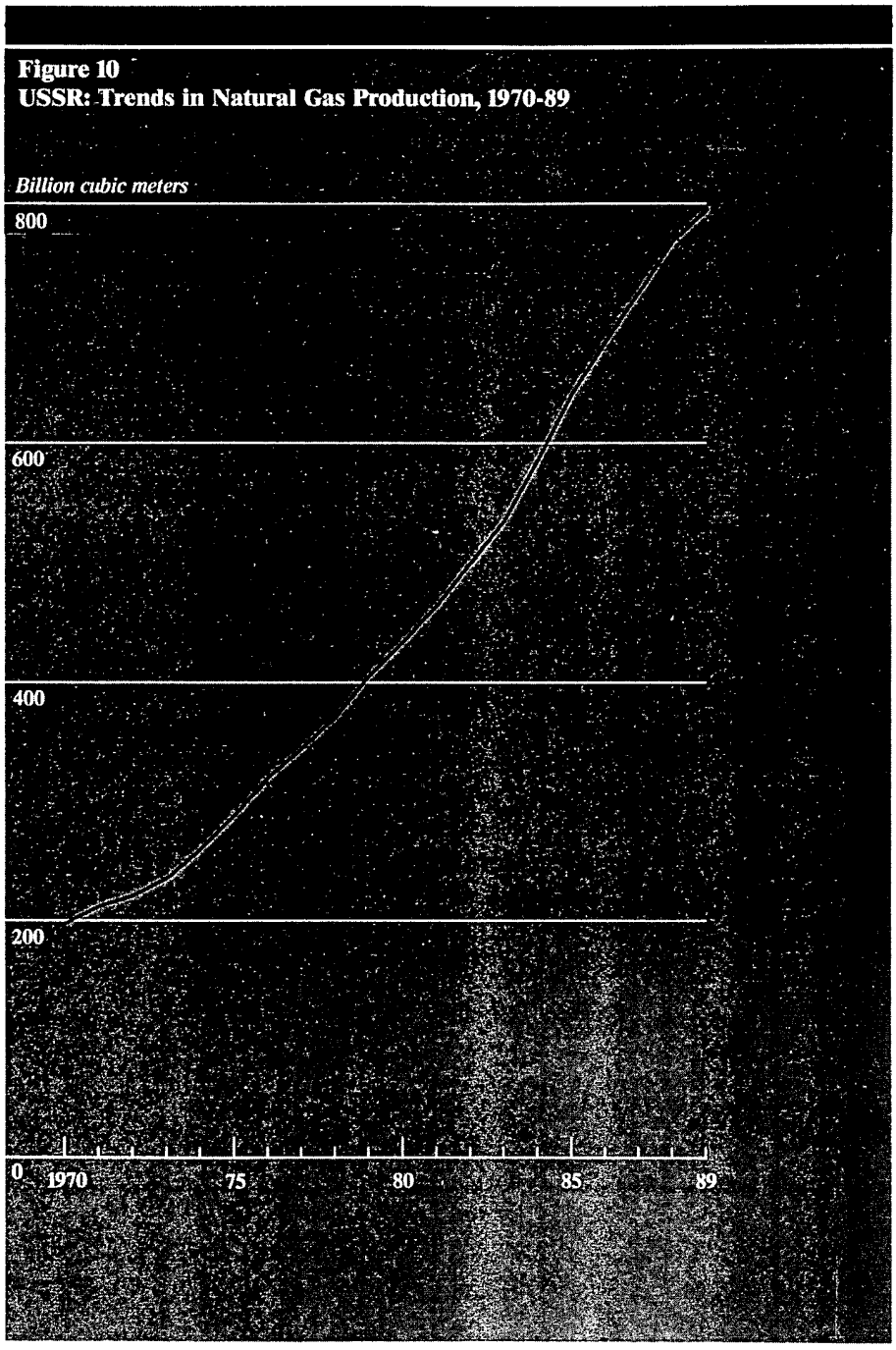


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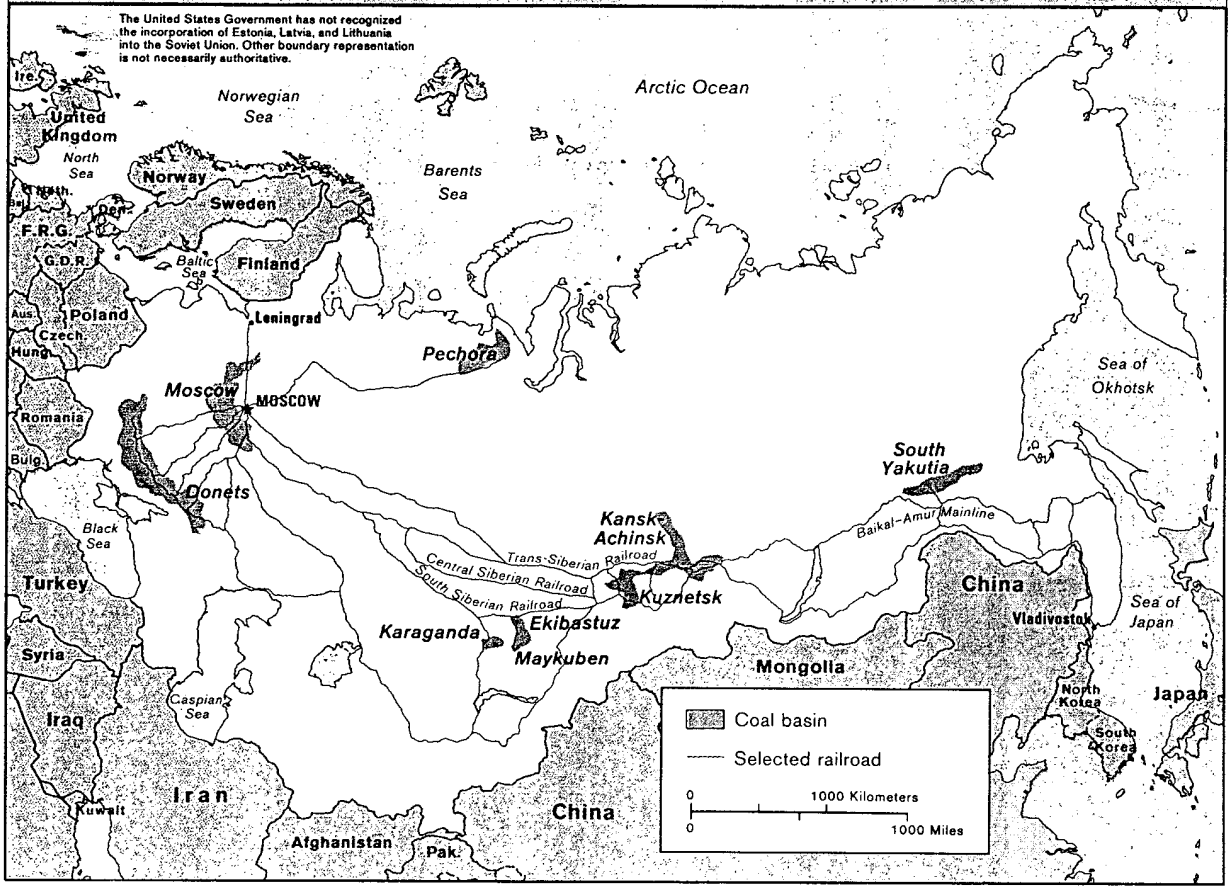
Table 10
USSR: Natural Gas Production and Trade [a]

Billion cubic meters

	Production	Imports	Exports
1970	197.9	3.6	3.3
1971	212.4	8.1	4.6
1972	221.4	11.0	5.1
1973	236.3	11.4	6.8
1974	260.6	11.9	14.0
1975	289.3	12.4	19.3
1976	321.0	11.8	25.8
1977	346.0	11.4 [b]	28.9 [b]
1978	372.2	9.3 [b]	40.3 [b]
1979	406.6	6.2 [b]	46.5 [b]
1980	435.2	2.7	54.2
1981	465.3	2.1 [b]	61.7 [b]
1982	500.7	2.1 [b]	59.6 [b]
1983	535.7	2.0 [b]	64.2 [b]
1984	587.4	2.0 [b]	69.0 [b]
1985	642.9	2.4	68.7
1986	686.1	2.2	79.2
1987	727.4	1.6	84.4
1988	770	1 [b]	86 [b]
1989	796	NA	NA

[a] Evaluated at 20 degrees Centigrade and 760-mm mercury.
[b] Estimated.

Figure 11
Major Soviet Coal-Producing Basins



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Coal

The USSR produced 740 million metric tons of raw coal (roughly 660 million tons of cleaned or net coal) in 1989, placing it third in world coal output behind the United States and China. Most of the output increases achieved in 1985-88 came as a result of increased work hours at coal mines, one of the factors behind the nationwide coal strikes in the summer of 1989. Soviet coal exports are small as a share of total production—about 42 million tons in 1988, including coke—and go largely to Eastern Europe and Japan. The USSR also imports about 14 million tons of coal and coke from Poland.

The coal industry must overcome the increasing costs of production from aging underground mines in the Ukraine. More than one-half of Soviet coal is mined underground. But most of the USSR's huge coal reserves are low in energy value (as a result of either high moisture or ash content), requiring novel approaches to mining, transportation, and combustion. More important, the major coal deposits Moscow is depending on to move coal back to the forefront of Soviet energy production in the next century are thousands of kilometers from the industries and population centers that most need the energy. Little progress has been made in the development of the required coal-use and energy-transfer technologies—large-capacity lignite-fired boilers, coal-slurry pipelines, ultra-high-voltage electricity transmission systems, and synthetic fuels plants.

Figure 12
USSR: Trends in Coal Production and Quality, 1970-89

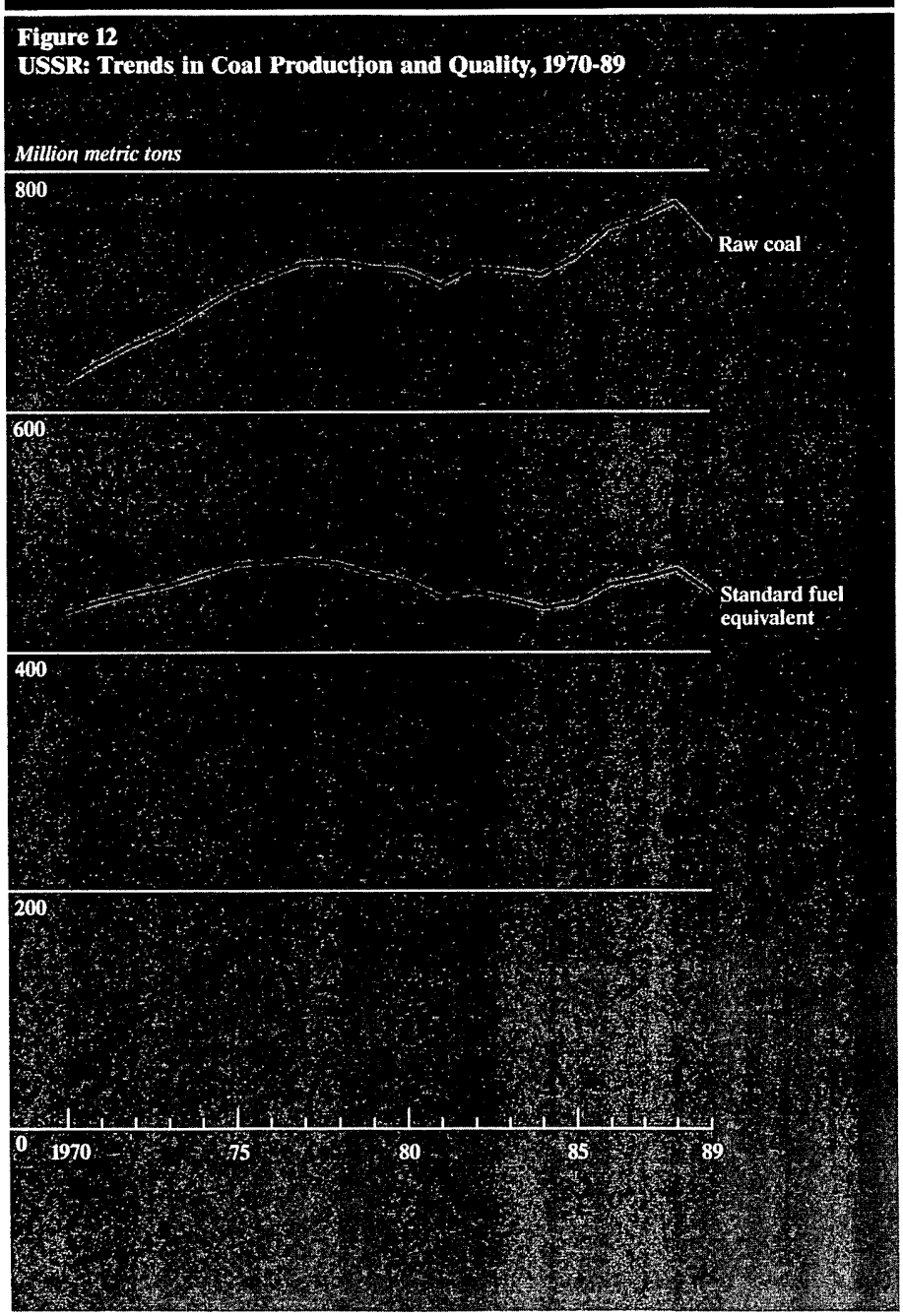

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Table 11
USSR: Coal Production and Trade

Million raw metric tons

	Production	Imports [a]	Exports [a]
1970	624.1	7.8	28.7
1971	640.9	9.2	29.3
1972	655.2	10.3	28.9
1973	667.6	10.7	29.3
1974	684.5	10.4	30.8
1975	701.3	10.7	30.4
1976	711.5	NA	NA
1977	722.1	NA	NA
1978	723.6	NA	NA
1979	718.7	NA	NA
1980	716.4	7.3	29.1
1981	704.0	NA	NA
1982	718.1	NA	NA
1983	716.1	NA	NA
1984	712.3	NA	NA
1985	726.4	11.4	31.2
1986	751.1	12.5	36.1
1987	759.8	10.9	37.7
1988	772	13.7	41.7
1989	740	NA	NA

[a] Including coke and coke products.

Table 12
USSR: Coal Production, by Type of Coal and Mining

	Total	Hard Coal	Lignite	Share Produced in Open Pit Mines
	Million raw metric tons			*Percent*
1970	**624.1**	476.4	147.7	26.7
1971	**640.9**	487.6	153.3	28.0
1972	**655.2**	499.5	155.7	29.0
1973	**667.6**	510.6	157.0	29.9
1974	**684.5**	523.9	160.6	31.1
1975	**701.3**	537.7	163.6	32.2
1976	**711.5**	548.0	163.5	32.6
1977	**722.1**	555.1	167.0	33.8
1978	**723.6**	557.1	166.5	35.1
1979	**718.7**	554.0	164.7	36.0
1980	**716.4**	553.0	163.4	37.8
1981	**704.0**	544.2	159.8	39.1
1982	**718.1**	555.4	162.7	39.8
1983	**716.1**	557.8	158.3	40.7
1984	**712.3**	556.5	155.8	41.2
1985	**726.4**	569.3	157.1	41.9
1986	**751.1**	587.7	163.4	42.8
1987	**759.8**	594.8	164.9	43.5
1988	**772**	599	172	44.3

Figure 13
Major Soviet Electric Power Plants (1,500 Megawatts and Larger)

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Electric Power

Only the United States produces more electricity than the USSR. Total output was 1,722 billion kilowatt-hours in 1989; nearly three-fourths came from power plants burning fossil fuels (oil, gas, coal, peat, and oil shale), 14 percent from hydroelectric plants, and 13 percent from nuclear reactors. The majority of the country's electricity (63 percent) is consumed by industrial enterprises, 15 percent goes to residential and municipal uses, 10 percent to agriculture, and 8 percent to transportation. About 2 percent of total production is exported.

The electric power industry's future is not very bright. Past failure to build enough fossil-fuel-fired generating capacity and the recent slowdown in construction of nuclear plants could leave the country with a serious shortage of power plant capacity before the end of the decade. Moscow had been counting on an expansion of its nuclear power program to provide the bulk of its new generating capacity in the 1990s and beyond. But citizen opposition to nuclear energy has become more vocal and effective under President Gorbachev's policy of *glasnost*. Critics have broadened their attacks on nuclear energy projects from an initial focus on stopping construction of Chernobyl'-type plants to questioning the suitability of locations for future reactors of all types. Exploitation of vast coal and hydropower resources in eastern Siberia cannot be expanded for electric power production until technological breakthroughs are achieved in long-distance electricity transmission.

Figure 14
USSR: Trends in Electricity Production, by Source, 1970-89

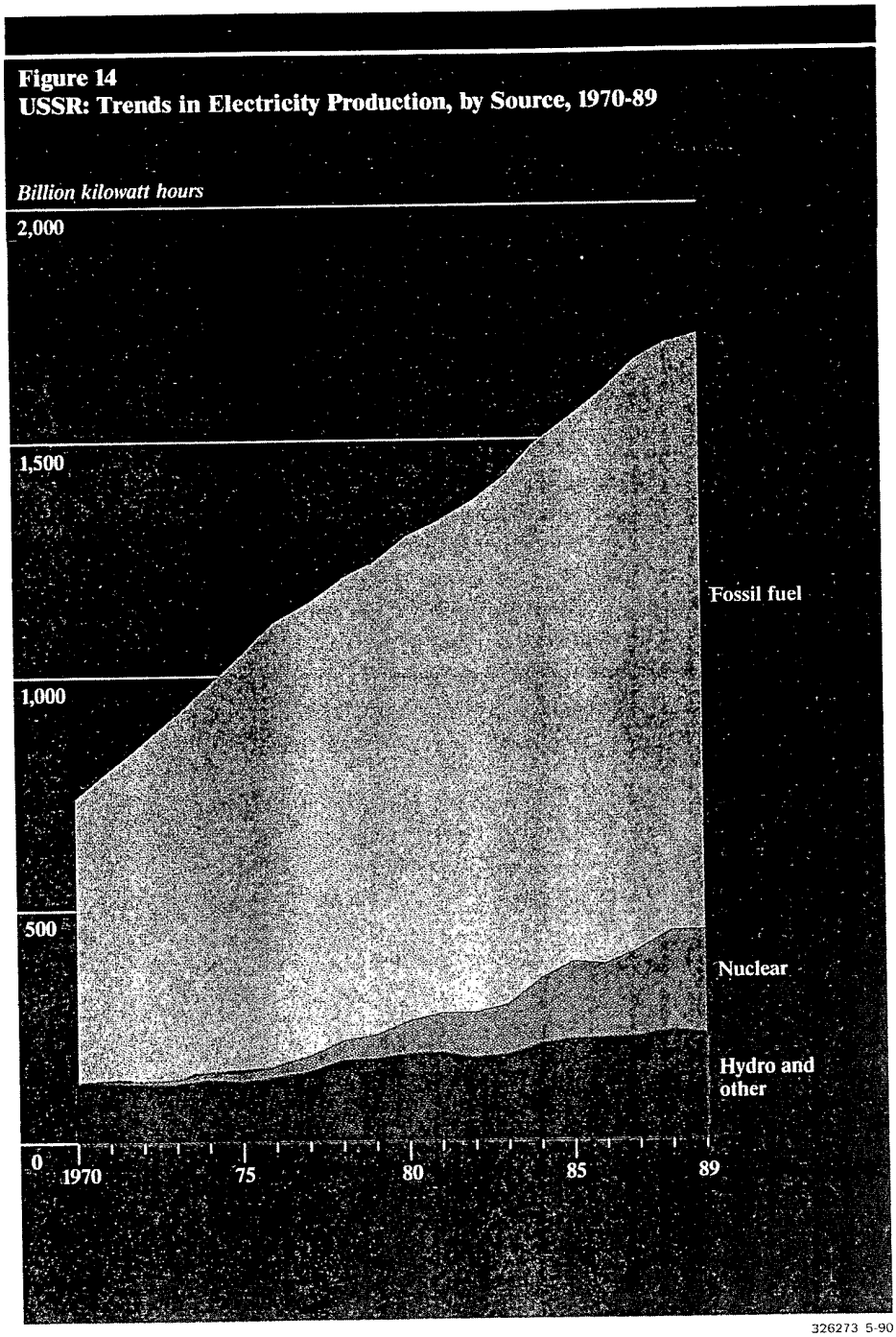


Table 13
USSR: Electricity Production, by Source

Billion gross kilowatt-hours

	Total	Fossil Fuel	Hydro	Nuclear	Other
1970	**740.9**	613.0	124.4	3.5	
1971	**800.4**	670.3	126.1	4.0	
1972	**857.4**	727.0	122.9	7.3	0.2 [a]
1973	**914.6**	780.3	122.3	11.7	0.3 [a]
1974	**975.8**	825.4	132.0	18.0	0.4 [a]
1975	**1,038.6**	891.8	126.0	20.2	0.6
1976	**1,111.4**	950.1	135.7	25.0	0.6 [a]
1977	**1,150.1**	968.5	147.0	34.0	0.6 [a]
1978	**1,201.9**	986.8	169.7	44.8	0.6 [a]
1979	**1,238.2**	1,010.8	172.0	54.8	0.6 [a]
1980	**1,293.9**	1,037.1	183.9	72.9	0.6
1981	**1,326.0**	1,053.1	186.7	85.6	0.6 [a]
1982	**1,367.1**	1,093.1	174.7	98.7	0.6 [a]
1983	**1,418.1**	1,127.3	180.4	109.8	0.6 [a]
1984	**1,492.1**	1,146.5	203.0	142.0	0.6 [a]
1985	**1,544.1**	1,161.6	214.5	167.4	0.6
1986	**1,598.9**	1,222.4	215.7	160.8	0.6 [a]
1987	**1,664.9**	1,257.5	219.8	187.0	0.6 [a]
1988	**1,705.1**	1,258.0	230.8	215.7	0.6 [a]
1989	**1,722**	1,273 [b]	225 [b]	223 [b]	0.6 [a]

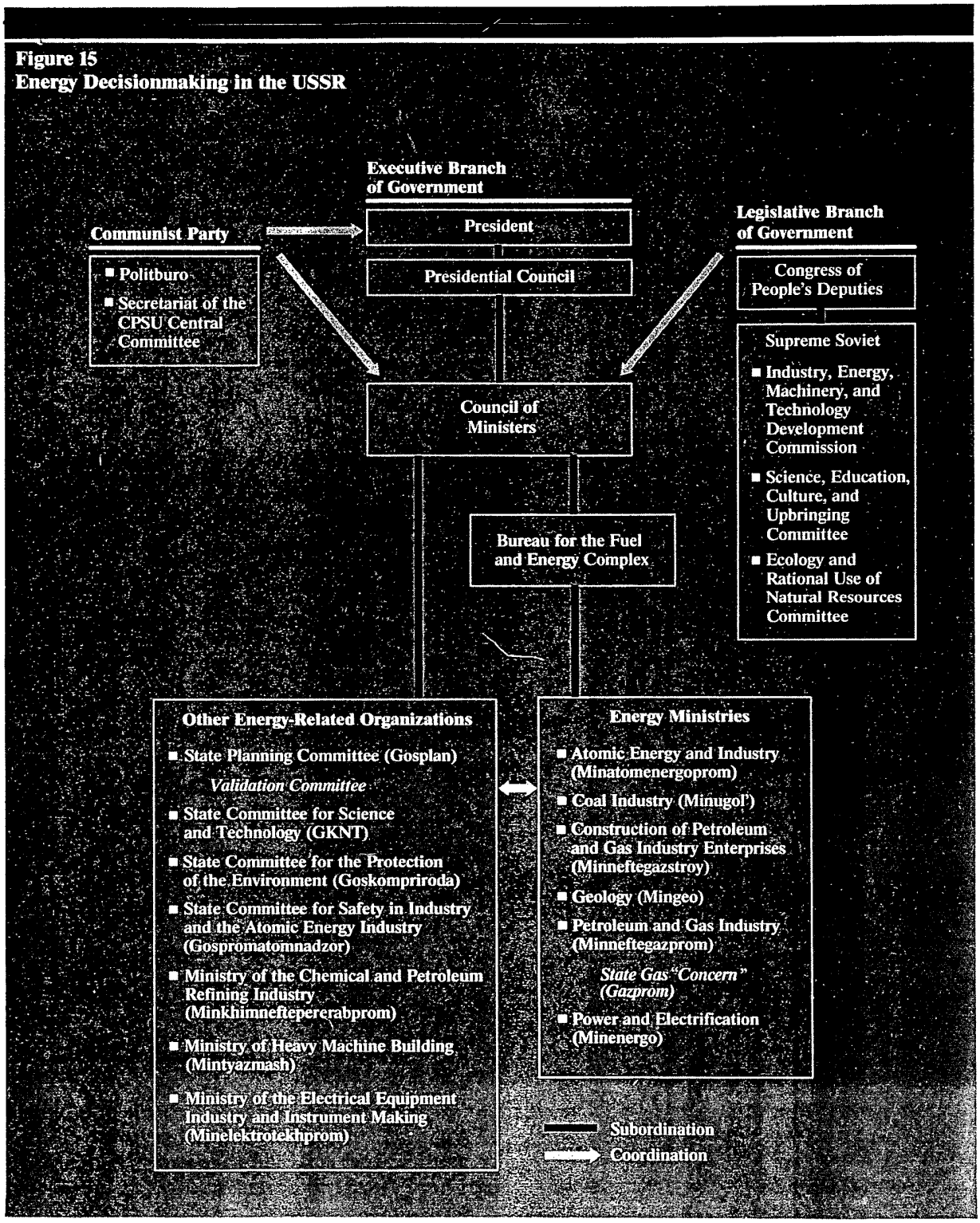
[a] Estimated.
[b] Preliminary.

Table 14
USSR: Electricity Consumption

Billion kilowatt-hours

	Total Output	Industry	Agriculture	Transport	Other	Losses	Exports
1970	**740.9**	488.4	38.6	54.4	96.0	58.3	5.2
1971	**800.4**	520.5	45.6	58.2	106.2	63.2	6.7
1972	**857.4**	552.9	51.6	61.5	115.0	69.3	7.1
1973	**914.6**	585.6	57.6	64.8	124.3	72.6	9.7
1974	**975.8**	620.7	65.9	68.6	132.4	77.3	10.9
1975	**1,038.6**	656.8	73.8	74.2	140.3	82.2	11.3
1976	**1,111.4**	692.8	83.0	82.7	150.6	90.7	11.6
1977	**1,150.1**	712.9	88.4	86.8	157.2	93.3	11.5
1978	**1,201.9**	737.3	95.6	92.6	166.5	97.8	12.1
1979	**1,238.2**	751.1	102.3	96.2	172.2	101.0	15.4
1980	**1,293.9**	772.9	110.9	102.8	181.3	106.9	19.1
1981	**1,326.0**	791.7	113.9	106.6	185.9	107.8	20.1
1982	**1,367.1**	808.4	120.5	112.0	192.5	112.6	21.1
1983	**1,418.1**	837.1	126.6	115.5	199.7	115.3	23.9
1984	**1,492.1**	874.8	137.8	118.9	209.8	126.1	24.7
1985	**1,544.1**	893.5	145.7	120.1	222.2	133.7	28.9
1986	**1,598.9**	922.3	152.1	128.0	230.2	137.3	29.0
1987	**1,664.9**	957.1	160.4	131.3	239.5	142.0	34.6
1988	**1,705.1**	980.7	166.8	132.8	245.9	139.9	39.0

Figure 15
Energy Decisionmaking in the USSR



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The Soviet Energy Bureaucracy

Electric Power

Yuriy Semenov, Minister (since July 1989)

Ministry of Power and Electrification
The State Committee for Power and Electrification was upgraded to ministerial status in 1965. It is responsible for the design, construction, and operation of hydroelectric and fossil-fuel-fired electric power plants. It also constructs, installs, and maintains the electricity transmission and distribution network and roughly 50 percent of the centralized heating system. In July 1989 its responsibility for the construction of nuclear power plants was limited to facilities already started.

Vitaliy Konovalov, Minister (since July 1989)

Ministry of Atomic Energy and Industry
Created in June 1989, it absorbed responsibilities of the former Ministries of Atomic Energy and Medium Machine Building. It is responsible for the design and operation of civilian nuclear plants and the production of nuclear materials, nuclear weapons, X-ray equipment, high-energy lasers, chemical and biological warfare equipment, equipment for the pulp and paper industry, and chemical and oil and gas equipment, including pumps, compressors, and pipeline equipment. It also produces missile propellants, computers, and dairy equipment.

Vadim Malyshev, Chairman (since July 1989)

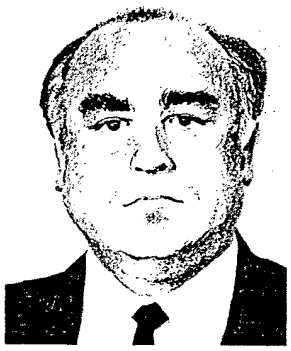
State Committee for Safety in Industry and the Atomic Energy Industry
This was created in June 1989 by the merger of the former State Committee for the Supervision of Safe Working Practices in Industry and Mine Supervision and the State Committee for Safety in the Atomic Power Industry. It is responsible for safety at nuclear power plants and industrial facilities including mining, oil and gas production, and metallurgical and chemical plants.

Lev Ryabev,
Chairman (since July 1989)

Bureau for the Fuel and Energy Complex
This was created in March 1986. As a standing body of the USSR Council of Ministers, the bureau is tasked with coordinating the work of the energy ministries and resolving problems that cut across ministerial lines.

Leonid Filimonov,
Minister (since August 1989)

Ministry of the Petroleum and Gas Industry
This was created in June 1989 by the merger of the Ministry of the Petroleum Industry and some elements of the Ministry of the Gas Industry, each of which had been elevated from state committee to ministerial status in 1965. It is responsible for the onshore extraction of crude oil, associated gas, gas condensate, and offshore oil and gas extraction, and for the operation of all crude oil and a few natural gas transmission pipelines.



Viktor Chernomyrdin,
Chairman (since August 1989)

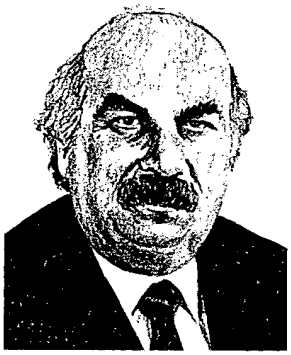
State "Concern" Gazprom
Created in August 1989 from most elements of the former Ministry of the Gas Industry as a self-financing enterprise, it is responsible for extraction, processing, transportation, and storage of natural gas. Reportedly operating in a manner similar to that of a Western integrated national gas company, it is charged with expanding commercial and technical cooperation with foreign countries.

Ministry of the Coal Industry
This was created as the State Committee for the Fuel Industry in 1962 and renamed in 1965. It is responsible for extraction and processing of coal and oil shale and production of coal briquettes.

Mikhail Shchadov,
Minister (since December 1985)

Other

Ministry of Geology
This was created as the Committee for Geology in 1939 and elevated to ministerial status in 1946. It is responsible for the exploration and surveying of the mineral (including fuels) resources of the USSR, the expansion of proved reserves, and the development of new prospecting and analytical technologies. It received authority in 1989 to develop selected oilfields.



Grigoriy Gabrielyants,
Minister (since July 1989)

State Commission for Useful Mineral Reserves
Created in 1955, the State Committee for Stockpiling Useful Minerals received its current title in 1963. It confirms reserve estimates of the Ministry of Geology and approves field development plans submitted by the operating ministries. It also maintains reserve stocks of fuels.

No photo available

Aleksey Bybochkin,
Chairman (since August 1971)

Vladimir Velichko,
Minister (since July 1989)

Ministry of Heavy Machine Building
This was created in June 1989 by the merger of the former Ministries of Heavy, Power, and Transport Machine Building; Construction, Road, and Municipal Machine Building; and Chemical and Petroleum Machine Building. It is responsible for the manufacture of a broad range of equipment for heavy industry, including machinery for the electric power, chemical, energy, metallurgical, mining, hoist-transport, railway, and printing industries. It also produces armored vehicles, diesel engines, and generators for the military as well as civilian and military construction machinery and equipment for the construction-materials and timber industries.

Oleg Anfimov,
Minister (since July 1989)

Ministry of the Electrical Equipment Industry and Instrument Making
This was established in June 1989 by the merger of the former Ministry of the Electrical Equipment Industry and the Ministry of Instrument Making, Automation Equipment, and Control Systems. It is responsible for the development and production of electrical cable and insulation, storage batteries, lighting equipment, electric motors, generators, transformers, radar components, some communications equipment, and biological/chemical agent detectors. It also produces precision instruments, clocks, watches, optical equipment, and automated control systems.

Nikolay Lemayev,
Minister (since July 1989)

Ministry of the Chemical and Petroleum Refining Industry
This was created in June 1989 from the former Ministries of the Chemical Industry, Petroleum Refining and Petrochemical Industry, and parts of the former Ministry of Mineral Fertilizer Production. It is responsible for the production of oil products, products of organic synthesis, synthetic rubber, tires, rubber footwear, and carbon black. It mines chemical raw materials and produces basic industrial chemicals, chemical fibers (including glass fibers), plastics, dyes, paints, reagents, industrial gases, and household and photographic chemicals.

Vladimir Chirskov,
Minister (since February 1984)

Ministry of Construction of Petroleum and Gas Industry Enterprises
Created in 1972, it is the primary contractor for the construction of oil and gas field facilities and infrastructure (including processing plants), installation of equipment during development, and the laying of oil and natural gas pipelines (including compressor and pumping stations).

Appendix A

US-USSR: Comparative Energy Statistics, 1987

	United States	USSR	US/USSR (*percent*)
Area (*million square kilometers*)	9.4	22.4	42
Population (*million persons at midyear*)	243.4	284.2	86
Total energy production (*million b/d oil equivalent*)	32.6	33.0	99
Per capita energy production (*b/d oil equivalent*)	0.125	0.109	115
Total energy consumption (*million b/d oil equivalent*)	37.6	27.5	137
Per capita energy consumption (*b/d oil equivalent*)	0.147	0.091	162
Oil production (including NGLs) (*million b/d*)	11.1	12.5	89
Oil consumption (*million b/d*)	16.6	8.9	186
Per capita oil consumption (*b/d*)	0.07	0.03	219
Natural gas production (*trillion cubic feet*)	17.15	25.69	67
Coal production (*million metric tons, net*)	832	680	122
Electricity production (*billion kilowatt-hours, gross*)	2,747	1,665	165
Percent nuclear	17.7	11.2	
Installed electric generating capacity (*million kilowatts*)	718.1	332.3	216
Energy imports as a share of consumption (*percent*)	20.3	1.7	
Energy exports as a share of production (*percent*)	6.0	17.7	

Appendix B

Sources

Major data sources for this publication include:

Narodnoye khozyaystvo SSSR (National Economy of the USSR), Moscow: Finansy i Statistika (annual).

Material'no-tekhnicheskoye obespecheniye narodnogo khozyaystvo SSSR (Material-Technical Supply of the USSR National Economy), Moscow: Finansy i Statistika, 1988.

Promyshlennost' SSSR (USSR Industry), Moscow: Finansy i Statistika, 1988.

Vneshniye ekonomicheskiye Svyazi SSSR (Foreign Economic Relations of the USSR) or *Vneshnyaya torgovlya SSSR* (USSR Foreign Trade), Moscow: Finansy i Statistika (annual).

Statisticheskiy yezhegodnik stran-chlenov soveta ekonomicheskoy Vzaimopomoshchi (Statistical Annual of Member Countries of the Council for Mutual Economic Assistance), Moscow: Finansy i Statistika (annual).

Conversion Factors

To Convert From	To	Multiply By
Million tons standard fuel per year	Million b/d oil equivalent	0.013976
Million tons standard fuel	Million tons coal equivalent	1
Million tons standard fuel	Quadrillion BTUs	0.027776
Cubic meters	Cubic feet	35.314667
Metric tons	Short tons	1.102311