

THE MINERAL INDUSTRY OF RUSSIA

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Russia extends over more than 75% of the territory of the former Soviet Union (FSU) and accordingly possesses a large percentage of the FSU's mineral resources. Russia is a major mineral producer, accounting for a large percentage of the FSU's production of a range of mineral products, including aluminum, bauxite, cobalt, coal, diamonds, mica, natural gas, nickel, oil, platinum-group metals, tin and a host of other metals, industrial minerals, and fuels.¹

Still, significant mineral deposits and metallurgical facilities are located in other former Soviet republics, making Russia dependent on trade with countries of the FSU and other countries of the world to obtain needed mineral commodities. For example, Russia is significantly import dependent on alumina, bauxite, chromite, manganese, and titanium and zirconium raw materials. Russia is also a large exporter of minerals, and is exporting a large percentage of its production of nonferrous and precious metals and oil and gas.

In 1996, Russia was exporting much of its mineral output to world markets rather than to the FSU, owing to the fall in domestic consumption in the FSU and Russia's need for timely payments in currency rather than barter. In cases where Russia was still exporting minerals to other FSU countries, it was at times incurring heavy debt from nonpayment as was the case with natural gas shipments. FSU countries, such as Kazakstan, were in turn, exporting to world markets rather than Russia for the same reasons.

Government Policies and Programs

In August, Russia undertook a large government reorganization. According to Russian Federation Presidential Edict No. 1177, "On the Structure of the Federal Organs of Executive Power," signed August 14, 1996, the following changes were made related to the mineral industry as reported in *Rossiyskaya Gazeta*, Moscow, August 16, 1996, p. 7: "The Russian Federation Ministry of Industry was formed on the basis of the Russian Federation State Committee for Industrial Policy. The Russian Federation Committee for Machine Building, the Russian Federation Committee for Metallurgy, and the Russian Federation Committee for the Chemical and Petrochemical Industry, were all abolished. The Russian Federation Ministry of Natural Resources, and the Russian Federation State Committee for the Protection of the Environment were formed on the basis of the Russian Federation Ministry of Protection of the Environment and Natural Resources. The Russian

Federation Committee for Water Resources and the Russian Federation Committee for Geology and the Use of Natural Resources were abolished. The Russian Federation Ministry of Science and Technical Policy was transformed into the Russian Federation State Committee for Science and Technologies." The decree called for the abolition of the Russian Federation Committee for Precious Metals and Stones (Roskomdragmet) with its functions transferred to the Russian Federation Ministry of Industry and the Russian Federation Ministry of Finance. The decree called for changing the status of the Russian Federation Committee for State Reserves from a federal committee to a state committee called the Russian Federation State Committee for State Reserves.

The Russian Federation Ministry of Industry was to have administrative jurisdiction in the sphere of the metallurgical, chemical, petrochemical, biotechnological, textile, light, medical, and machine-building industries, as well as in the production and processing of precious metals.

Further reorganizations followed in early 1997 which included the Ministry of Industry being abolished in March and its functions transferred to the Russian Ministry of Economics; and the Ministry of Foreign Economic Relations was turned into the Ministry of Foreign Economic Relations and Trade.

For a brief period in 1995, the Russian Government permitted the publication of mineral industry data, which had been secret during the Soviet period including the volume of production of nonferrous metals. However, in November 1995, an edict was signed "On State Secrets" that reclassified as secret a great deal of information on the mineral sector including as reported in *Rossiyskaya Gazeta*, Moscow, December 27, 1995, p. 5-6: "information on the production of nonferrous and rare metals or other materials of strategic importance by the metallurgical industry. Information on state reserves of precious metals (other than gold) and natural diamonds in physical or monetary terms for the Russian Federation as a whole, the republics (of the Russian Federation), or federal agencies of the executive branch of government; information revealing projections of gold production and natural diamond mining and data on natural diamond mining for 1 year or more in physical terms in the Russian Federation as a whole, the republics, and federal agencies of the executive branch of government; information revealing the projected or actual production volume of the platinum-group metals (platinum, palladium, iridium, rhodium, ruthenium, and osmium) and silver in physical terms for the Russian Federation as a whole, the republics, and federal agencies of the executive branch of government; summary information on quantities of precious metals and precious stones

¹References will be provided by the author upon request.

added to Russian state reserves and on their release to consumers for 1 year or more in physical or monetary terms for the Russian Federation as a whole; summary information on the consumption or output of precious metals and natural diamonds in comparison with their extraction volume in physical or monetary terms for 1 year or more for the Russian Federation as a whole and federal agencies of the executive branch of government; information on the consumption of the platinum-group metals and silver in physical terms in comparison with the production volume of these metals for 1 year or more for the Russian Federation as a whole; information on the remaining underground reserves (in deposits) of natural diamonds of 25 million carats or more, gold of 100 metric tons (t) or more, platinum-group metals of 50 t or more, and silver of 10,000 t or more, and on any increment in known reserves of these minerals in the Russian Federation as a whole, the republics, and individual large deposits if the reserves correspond to the quantities listed above; information on the production costs of silver, platinum, metals of the platinum group and natural diamonds in the Russian Federation as a whole and federation members, as well as quality-assessment information used in the calculation of known reserves of gold in gold deposits or complex ore deposits in the quantities listed; information revealing the resource potential and remaining underground reserves or data on the extraction of strategic minerals for the Russian Federation as a whole and federation members; and summary data on Russian exports and imports of nonmonetary gold, precious metals and stones, or articles made of them.”

This edict remained in effect through 1996.

Environmental Issues

In 1996, the Ministry of Natural Resources and Environmental Protection was abolished and the ministry was converted to a State Committee, which was a reduction in status. Despite this apparent lessening of the profile of the environmental protection function, in 1996 the Russian President issued a decree on the authorization of the concept of Russia's transition to sustainable development. The strategy of Russia's transition to sustainable development will be developed by The Ministry of the Economy, the State Committee for Science and Technology, and the State Committee on Ecology.

Production

In 1996, the Russian State Statistics Committee published few actual mineral production numbers, mainly for ferrous metals, fuels, gold, and few industrial minerals. The Russian State Statistics Committee also published percentage increases or decreases for the production of some nonferrous metals. In 1996, reported production of mineral fuels and ferrous metals decreased compared with that of 1995, with the decline generally in the range of 10% or less. Production data, however, for a number of nonferrous metals showed both increases and decreases compared with 1995, generally in a range of less than 10%. Gold production reportedly decreased by 7% in 1996. In

the industrial minerals sector, production continued to fall precipitously. Reported output of gypsum, building lime, and porous aggregate fell between 29% to 31% compared with 1995, while output of asbestos, industrial lime, and asbestos pipes and sleeves fell between 10% and 12%. Caustic soda production fell by 25%, cement by 24%, soda ash by 20%, and sulfuric acid by 17%.

Trade

In 1996, Russia continued to increase its exports of mineral commodities whenever possible to world markets while reducing exports of mineral commodities to FSU countries. However, for a number of minerals, particularly ferrous metals, Russia had difficulty selling on world markets. Russia's leading mineral export in terms of value was natural gas followed closely by crude oil and petroleum products. Table 3 lists select mineral exports for 1996.

Russian metals exporters were criticized for exporting metals without taking into account the trade legislation in importing countries which led to sharp opposition by the producers of similar products in these regions. While before 1995, only four antidumping cases were brought against Russian metal products exports, mainly by the United States and the European Community, (cast iron, ferrochrome, ferrosilicon, and sponge titanium); in 1996 the number was close to 50. Canada, Chile, India, Indonesia, Mexico, the Republic of Korea, South Africa, Taiwan, Thailand, and Turkey joined the list of plaintiff countries. The main objects of antidumping complaints were exports of rolled steel.

Complaints also were raised by a Russian Deputy Prime Minister in charge of foreign trade concerning Russia's large exports of ferrous and nonferrous scrap. Uncontrolled exports of nonferrous metal scrap were thought to be undermining Russia's ecology, economy and national security and even the physical well-being of its citizens. The Deputy Minister stated that the country should use scrap to make metals rather than export it. It would make Russia a cleaner place as the use of scrap as a recycled raw material reduces environmental pollution. He also stated that it makes better use of natural resources and will help keep the strategic reserves high enough to sustain national security.

Furthermore, he stated, that there is a real danger that items containing nonferrous metals are stolen. He explained that criminals remove components, apparatus, and whole engines and units from vehicles to get at the metals inside them and send them abroad, where they are in high demand, in the form of scrap.

A governmental commission in October recommended licensing scrap ferrous and nonferrous metal collection, processing and sales, but the Government did not pass a resolution to enforce this. Scrap merchants at the time complained on the grounds that exports helped them financially and that Russian metallurgical plants were too strapped for cash to pay for scrap.

Commodity Review

Metals

Aluminum.—In 1996, production of primary aluminum increased by more than 5% and bauxite by 6% compared with that of 1995. The percentage of toll smelted aluminum decreased slightly from 44% of total output in 1995 to 43% in 1996. All primary aluminum smelters increased output in 1996 with the exception of the Nadvoitsy smelter. The increase in output was possible in part because of the expiration of the international memorandum of understanding in March 1996, which brought about reductions in output. In 1996, domestic aluminum consumption continued to decrease, reportedly falling from 681,000 t in 1995 to 431,000 t in 1996. Exports of primary aluminum compared with 1995 increased by 14.8% to 2,616,900 t, practically all of which was exported to markets outside the FSU.

Russian production of alumina in 1996 was reportedly 2.15 million metric tons (Mt.) Several enterprises in the bauxite and alumina sectors were experiencing difficulties in 1996. Efforts were underway by the Alyuminy concern that represents Russia's aluminum producers to assist the Achinsk alumina refinery and the Severalboksitruda bauxite mining association, both of which were threatened by bankruptcy. The large Severalboksistruda association reportedly has the capacity to mine 6 million tons per year (Mt/yr) to 7 Mt/yr of bauxite, but was only producing about 3 Mt in 1996.

In an effort to create transnational regional integration of alumina and aluminum producers, the Siberian Aluminum alliance was formed. It includes two of Russia's largest primary aluminum smelters in Siberia, the Bratsk smelter with an 850,000 metric tons per year (t/yr) capacity and the Sayansk smelter with a 320,000 t/yr capacity, and the Pavlodar alumina refinery in Kazakhstan with capacity to produce 1.1 Mt/yr of alumina. The alliance also includes the Russian commercial bank Zalogbank and the United Kingdom's Trans-World Metals Group (TWG), which own or controls these Russian smelters and the Pavlodar plant.

While in the first half of the 1990's, there was a significant disparity between domestic production costs and world prices for aluminum, the situation had changed. Because of the increase in cost for producing aluminum even at Russia's most efficient aluminum plants, the profit margin became much smaller. While there would be considerable advantage to producing value added fabricated aluminum, there was still very little domestic demand for these products.

At the Samara Metallurgical Company (Sameco), one of Russia's principal aluminum fabrication plants, production in 1996 decreased to 76,900 t compared with 155,000 t in 1995. The large fall in production was attributed by the company partly to the Government's monetary policy of fixing foreign exchange rates through the ruble trading band and later the so-called "crawling peg" against the dollar, which made exports less profitable. Also, there was low domestic demand for processed aluminum, partly because of the high prices for primary aluminum charged by Russian smelters. Sameco

targeted output for 1997 at 134,700 t of fabricated aluminum and exports at 92,700 t. Sameco exported 40,800 t of fabricated aluminum in 1996.

The privatization of the Russian aluminum industry remained a controversial domestic issue. The story of the privatization of the Russian aluminum was covered extensively in the Russian as well as the western media. Much of the debate centered on whether or not certain people had acquired too much former state property too cheap, and whether the state was getting adequate tax revenues from the aluminum industry. The debate was taking place against the background of an at times violent struggle for control of the aluminum smelters.

In the early 1990's, a previously not well known London based company, TWG became actively involved in the Russian aluminum industry. TWG, through a complicated series of structures and using the services of two emigre brothers, acquired 54% of the shares in the Bratsk aluminum smelter, 60% of the of the Sayansk smelter, 37% of the Novolipetsk smelter, 20% of the Novokuznetsk smelter, and 12% of the Krasnoyarsk smelter. A major issue of concern was whether the shares in these enterprises were sold at too low a price. At the first auction for shares in the Bratsk aluminum plant, which now brings in hundreds of millions of dollars in profit a year, the plant was appraised at \$8 million.

The mode of operation in the aluminum sector changed with the ownership of TWG. TWG set up a tolling arrangement for producing aluminum at Russian plants whereby the toller delivers the raw material, pays production costs, and take delivery of the prepared metal. To operate efficiently, the Russian aluminum industry thus became dependent on raw material deliveries for tolling and on working capital from foreign entrepreneurs. As a result, Russian enterprises that had been supplying the industry with bauxite and alumina lost their markets and suffered accordingly.

Another significant feature of the debate on the restructuring of the aluminum production sector centered on the value to the country of these tolling arrangements. Through tolling operations, whereby the raw materials are supplied from abroad and the smelted product is exempt from export duties, TWG was able to remain outside of the Russian system of high taxes and interest rates and shortage of working capital. One side of the argument concerned the fact that the state had failed to receive considerable tax revenues from exports derived from tolling operations. On the other side of the debate, however, it was argued that the aluminum industry had been the only metals industry in the FSU to maintain its peak production level, and thus the state in return had functioning plants, taxes from their profit, and the increasing skills of workers and managers.

One plant, the Krasnoyarsk aluminum plant, successfully resisted TWG control, and in the process raised the call to resist foreign domination. Krasnoyarsk along with the Bratsk plant is the largest in terms of production capacity. Krasnoyarsk justified resisting TWG control by stating that it was trying to preserve domestic management and maintain local raw material supplies and financing. In the process of the struggle for control of Krasnoyarsk, there was violence including murder and behind the scenes intrigue including TWG being stricken from the rolls

of Krasnoyarsk shareholders. Resisting TWG was not necessarily financially rewarding as in 1996 Krasnoyarsk's profit dropped by a large amount and the Achinsk alumina complex, which supplied Krasnoyarsk with raw material, almost went bankrupt.

Chromium.—Russia was suffering from a chromite shortage in 1996 as it had relied on the Donskoy complex in Kazakhstan for almost its entire chromite supply. After the Japan Chrome Corp. took over the management of the Donskoy complex in mid-1995, shipments to Russia practically ceased. Russia has only one small chromite mining operation in the Urals and was striving to develop its own chromite resources. In April, Russia awarded the Norwegian Elkem Co. a 5-year renewable license to the explore the Bolshaya Varaka deposit in Karelia and the Belgian B & D Industrial Group is backing the Russian Karelmet company to develop the Aganozero deposit in Karelia. Also, in mid-October, Russia awarded the Novotroitsk chrome compound plant from the Orenburg region of Russia a tender to mine chrome deposits in the Altay region of West Siberia.

Cobalt.—In 1996, Norilsk Nickel (NN), the country's major cobalt producer, mined over 90% of the country's cobalt; cobalt production decreased by almost 3.4% compared with 1995 while nationally production decreased by almost 6%. NN planned to increase output of cobalt by 27% by the year 2000, according to its comprehensive financial and industrial rejuvenation program. (For more information on Norilsk operations and plans, refer to the section in this report on nickel.) In 1996, the Severonikel metallurgical plant on the Kola peninsula, part of the Norilsk Nickel complex, had to stop cobalt production. It arranged to supply cobalt concentrate to the Verkhny Ufaley plant in the Urals for processing. Verkhny Ufaley reportedly has the capacity to produce 2,500 t/yr of cobalt, and this arrangement with Severonikel was enabling Verkhny Ufaley to produce cobalt at almost full capacity. Verkhny Ufaley exported about 90% of its cobalt production.

Copper.—Although production of copper concentrate fell by less than 1% in 1996 compared with 1995, output of refined copper rose by almost 7%. The percentage of toll refined copper rose from 4.3% of total output in 1995 to 5% in 1996. NN, the country's largest copper producer, reported fulfilling its 1996 production targets for nickel and copper, according to data from the plant's administration. In 1996, NN production of copper in concentrate increased by 1.7% compared with 1995 while production of refined electrolytic copper increased by 4.7%. NN reported total copper sales in 1996 of 342,900 t, which was 12,000 t more than in 1995. NN planned to increase copper production by about 8% to 370,000 t by the year 2000, according to a comprehensive financial and industrial rejuvenation program drafted by the company.

In 1996, Russia reportedly exported 529,600 t of copper of which 527,400 t was exported outside the Commonwealth of Independent States (CIS). This was a 12.4% increase in total exports compared with 1995 and a 51.6% drop in exports to the CIS. Norilsk exported 241,000 t which was a 20% increase

compared with 1995.

In 1996, the copper sector, as was the case with many of Russia's mining and metallurgical sectors, was involved in reorganizing for survival in a market economy environment. This involved restructuring the industry through private ownership and investment. One of the main areas where this process was occurring was in the southern Urals, particularly in Chelyabinsk Oblast. This oblast is one of the main centers of Russia's nonferrous metallurgical industry, producing copper, lead, and zinc, as well as other mineral commodities. Among Chelyabinsk's largest enterprises are the Karabash copper smelter and the Kyshtym electrolytic copper refinery.

Since 1990, copper output from Chelyabinsk oblast enterprises had increased from 49,000 t/yr to 76,000 t/yr. Metallurgical enterprises in the oblast process mainly raw materials from outside the oblast. Copper and zinc ores are extracted in the oblast but are sent elsewhere for beneficiation. This pattern of shipment was very costly.

To correct this situation, oblast enterprises founded the Aleksandrinsk Ore-Mining Company (AGK) in September 1995 to develop the Aleksandrinsk copper mine to provide an adequate raw material base for the metallurgical facilities. The founders of AGK were the Kyshtym copper electrolytic plant (35% of the capital investment), the Chelyabinsk electrolytic zinc plant (14%), the Magnitogorsk metallurgical steelmaking complex (19%), and the Chelyabinsk Scientific Research Institute of Open-Pit Mining (10%), as well as the Swiss Euromin company, which submitted the highest bid for the right to participate in the development of this deposit.

The main consumers of the new enterprise's products will be the enterprises that founded the AGK. According to the plans, the beneficiation facility will be a prefabricated modular structure, so that its equipment can be easily dismantled and moved to a new location after the mine has been depleted. The "Strategy for the Development of the Metallurgical Complex of Chelyabinsk Oblast" stipulates that, in the event of the success of the AGK plan, several other such enterprises will be built in the oblast, which will completely eliminate Chelyabinsk's metallurgical enterprises' dependence on raw materials from outside the oblast.

The Aleksandrinsk deposit was discovered in the early 1960's and reportedly contains 6.4 Mt of copper-zinc ore. According to the business plan drawn up by Bharti Engineering Associates, a Canadian consulting firm, the total cost of developing the deposit will be \$43 million. The projected output of the openpit mine is 400,000 t/yr of ore and subsequent underground mining will yield another 300,000 t/yr of ore. The mine will be worked for 10 years. AGK has already begun openpit mining and announced the start of construction of a beneficiation plant. The Kyshtym Electrolytic Copper Plant (KMZ) was founded in 1757 to produce iron. At the beginning of this century, the plant was converted to copper refining. Kyshtym was privatized in 1993. KMZ's 5,000 employees own 52% of the shares. The biggest outside shareholders are East Point Holding, a company registered in Cyprus, which owns a 28% share; and Chelindbank, a local commercial bank, which owns 10%. The plant has the capacity to produce over 75,000

t/yr of cathode copper; 7,000 t/yr of copper vitriol; 3,600 t/yr of copper electrolytic foil; 600 t/yr of atomized copper powder; and 600 t/yr of copper granules. In the last 2 years the plant had been assimilating the production of gold and silver in a doré alloy, industrial selenium, and platinum-group metals concentrates. Kyshtym has the capacity to produce 4.5 t/yr of gold and 23 t/yr of silver.

The copper smelting shop at KMZ was built in 1910 and was regarded as one of the country's most antiquated metallurgical facilities. In mid-1995, KMZ signed a contract with the German Maerz company and the Finnish firm Outokumpu on deliveries of equipment for a new copper smelting shop. The shop will have a capacity to produce 350 metric tons per day of anode copper and was scheduled to begin operating in the first quarter of 1997.

The old smelter at KMZ produced copper matte and ferruginous slag with an iron content of up to 32%. More than 17 Mt of this slag had accumulated in the region during the period of the enterprise's operations. The pollution on the grounds of the plant and in surrounding areas was so severe that special measures were needed to be taken, possibly including the removal and burial of the top layer of soil of contaminated ground near the plant.

KMZ was concerned about finding export markets. Until recently, the plant's products did not have a certificate of quality from the London Metal Exchange; and therefore, were sold on the foreign market at an average of \$50 per ton less than products of competitors. A KMZ team was preparing documents for registering the plant's cathode copper on the London exchange.

The Karabash Copper Smelting Complex (KBM) also had been operating since the beginning of the century with quite detrimental effects on the environment in the city of Karabash. In mid-1995, the Chelyabinsk Oblast Administration closed the complex's concentration plant and prohibited smelting ore concentrates. KBM was left out of the federal program for the development of metallurgy in the Russian Federation and State support was eliminated. The copper smelting production unit still had two reverberatory furnaces operating on copper scrap and waste products and producing copper alloys. Copper matte was no longer produced. KBM received raw materials from the Tsentralnaya copper-zinc mine where extraction was halted and the shaft was filled with water. The remaining ore reserves in this mine are estimated at around 6 Mt.

Faced by the threat of complete ruin, KBM administrators established the Blister joint-stock company in conjunction with the KMZ, the Oskar firm, the Erdenet Mongolian-Russian joint venture, and several investment firms. The company's functions include the revitalization of the complex and the renovation of its waste treatment facilities. The Blister company was expected to organize the smelting of copper blister from concentrate from the Mongolian Erdenet deposit. The company expected to obtain the first ton of metal in the second quarter of 1997. It planned to produce 40,000 t/yr of blister copper. Although this plan was supported by oblast authorities, the oblast administration chief issued a special decree giving the Blister company 5 years to solve the complex's environmental

problems.

The disposal of accumulated waste products in Karabash rayon was a major problem. They contain large quantities of arsenic, copper, iron, selenium, sulfur, and zinc, as well as gold and silver. A joint venture, Karabash Mining, Ltd., was formed by the following entities to process the valuable waste products of the Karabash copper smelting complex: the Karabash complex, which owns 25.5% of the charter capital; RTIPT, Ltd., an affiliate of Australia's Eurasia Mining, with 50% of the charter capital; the Uralniks limited partnership in Yekaterinburg with 18%; the Karabash Administration, and the Edelweiss firm. The joint venture began building a pilot facility for processing wastes. According to plans, copper, gold, silver, and rare-earth metals would be recovered from the waste.

Similar efforts to revive the copper industry were taking place in other parts of the Urals. In the Sverdlovsk region, the Sredneuralsk copper smelter planned to increase output from 85,000 t in 1996 to 110,000 t in 1997. It was installing a new smelting section equipped with Russian designed Vanyukov furnaces. The project was being financed primarily by the Swiss trading firm Glencore International, which via associated companies, is a major shareholder in Sredneuralsk as is the Moscow firm Ekologiya. Plans for Sredneuralsk also called for expansion of the oxygen and sulfuric acid production shops with equipment for the oxygen shop being supplied by Germany's Linds AG. Sredneuralsk receives most of its raw materials from the Gai copper mining complex in Orenburg oblast in the southern Urals, from the Bashkir copper and sulfur plant in Sibai, Bashkortostan in the southern Urals, and the Uchaly mining complex and Buribay Mine that are also in Bashkortostan. Sredneuralsk's main customers are the Uralektromed copper refinery in Sverdlovsk oblast and KMZ.

The Uralektromed refinery, which has the capacity to produce 310,000 t/yr of refined copper, produced 160,000 t of copper in 1996, mainly from tolled material. About 80% of the refinery's output was shipped to Europe. In 1996, Uralektromed commissioned a facility to recover gold from concentrate from the Berezovskiy gold mine in Sverdlovsk oblast which was leased by Uralektromed following the bankruptcy of the mine. Uralektromed envisioned acquiring other bankrupt gold mines in the Urals and eventually achieving gold production of 10 t/yr. Uralektromed, which was investing its own resources in the gold project, also was seeking financing for gold production from domestic banks and international sources.

The Kirovgrad smelter, also in Sverdlovsk region, embarked on a program to modernize its production facilities and restructure its finances. The major portion of the investment funds will come from the smelter's principal shareholder, M-Invest-Holding, a member of the Moscow-based Menatep Group. The smelter was also seeking tax relief from the Sverdlovsk regional authorities. The Kirovgrad smelter has the capacity to produce 140,000 t/yr of blister copper, but was operating far below capacity.

Gold.—The Russian gold mining industry employs more than 400,000 people in 30 regions. In 1996, according to the

Ministry of Industry, Russian mining companies and artels in 1996 produced 114.7 t of gold, compared with 122.2 t in 1995 and around 134 t in 1994. The 1996 mining quota was 145.3 t of gold. Byproduct gold production totaled 5.1 t, compared with 5.66 t in 1995, and gold recovered from scrap and waste came to 3.2 t compared with 4.1 t in 1995. However, as was the case with a large number of Russian mineral production statistics, seemingly authoritative agencies issued differing data. In 1996, according to Roskomdragmet 123 t of gold were mined. According to the State Committee on Statistics (Goskomstat) 111 t were mined; while according to the Russian Union of Gold Prospectors Artels production totaled 123.35 t compared with 131.94 t in 1995. Table 4 shows the national gold production series from 1991 to 1996 reported by the Union of Gold Prospectors Artels.

In 1996, Yakut/Sakha, the country's largest gold producing region, produced 23.2 t of gold compared with 26 t in 1995. Projected gold production in 1997 is 25 t.

Magadan Oblast in the Russia Far East, which until the early 1990's had been the country's largest gold producing region, in 1996 produced 21.7 t of gold compared with 22.2 t in 1995. Mining companies from Magadan region set a 1997 quota to produce 30.7 t of gold.

In the Magadan region, gold was still mined primarily from alluvial deposits. The miners set a 1997 gold lode mine production target of 11.5 t. Of this, 8 t was to be produced at the Kubaka lode by the local company Geometall in partnership with Cyprus Amax Minerals Co. of the United States.

The Kubaka gold lode is estimated by Magadan geologists to contain 70 t to 80 t of gold. The first gold was scheduled to be produced in February 1997. Kubaka was expected to produce over 9 t/yr of gold over an estimated mine life of 7 years.

Russia's Prime Minister signed an order on the construction of a gold refinery in the Magadan region. The refinery would save local mining companies the expense of shipping gold to state refineries in European Russia. Most of the gold produced in the Magadan region is refined by the Priokskoye nonferrous metals plant in the city of Kasimov in Ryazan region, south of Moscow. The most preferable locations for the new refinery according to regional officials were either the settlement of Karamken, the site of the Karamken gold mining and metallurgical plant, which was idle because of a lack of raw materials; or the settlement of Orotukan, the site of the Orotukan gold mining and milling complex that was experiencing serious financial problems.

The artels, or private entrepreneurial brigades of gold prospectors, produced 65.2 t of gold in 1996 compared with 68.5 t in 1995, according to the Union of Russian Gold Prospectors Artels. However, they produced 57.5% of Russia's gold in 1996 compared with 56% in 1995. The artels were attempting to shift from alluvial gold mining to gold lodes during the last 3 years. The commissioning by the Polyus artel of a mill at the Olimpiad gold lode close to Severo-Yeniseysk in Krasnoyarsk kray helped avert a larger drop in the country's gold production as Polyus produced about 6 t of gold in 1996. It achieved a daily output level of 50 kilograms (kg) of gold per day at yearend.

Efforts were underway to revive gold production in the Urals, one of the country's oldest gold producing regions. In 1996 production at the Yuzhuralzoloto (Southern Urals Gold) company was estimated at less than 1 t. Only one of Yuzhuralzoloto's two milling enterprises were operating because of raw materials shortages. Both mills combined have the capacity to process 1 Mt/yr of ore, and the one operating mill has the capacity to process 340,000 t/yr of ore. Mining was conducted mainly at the Kachkar gold lode with reported reserves of 80 t where mining was occurring at a depth of 700 meters. Yuzhuralzoloto was planning to expand its mining operations through development of the Zapadny Kurasan gold lode with reported proven reserves of 8 t, at which development had started, and the Svetlinskoye gold lode at which mining had also started with an estimated 80 t of gold and 30 t of silver reserves.

Yuzhuralzoloto had established a joint venture to develop Svetlinskoye with Rio Tinto Ltd. (RTZ) of the United Kingdom, but RTZ pulled out of the project early in the year. Yuzhuralzoloto was receiving enquiries from other western companies concerning investing in the development of Svetlinskoye. Output from Svetlinskoye is projected at 4.5 t/yr of gold and 1.2 t/yr of silver. Yuzhuralzoloto holds rights to develop small lodes in the region and to recover gold from wastes at worked out gold mining sites. Yuzhuralzoloto also completed negotiations to process gold from tailing dumps at the Gai copper mining complex.

In the early 1980's in the U.S.S.R., up to 60 t/yr of gold were processed for jewelry making at 26 specialized enterprises. The primary buyers of jewelry during those years were the residents of the Republics of Central Asia and the Transcaucasus. Since that time, the production of jewelry had declined by five fold in Russia. In 1996, only 10 t of gold were used for jewelry making in Russia. Demand, however, had not significantly decreased, and foreign firms in Russia were capturing a large percentage of the FSU's jewelry market.

The gold sector experienced significant reorganization in 1996. The Government's Decree No. 1,378 transferred the functions of the abolished Roskomdragmet to the Ministry of Finance. According to the decree, financing of precious metal purchases is to be carried out through the federal budget, thus limiting the involvement of commercial banks in financing gold extraction and purchasing gold. The Ministry of Finance received the right to form the Russian Federation State Fund of Precious Metals and Precious Stones (Gosfond Rossii) "to handle the safekeeping, replenishment, and tracking of precious metals and precious stones and articles that contain them." Gosfund is administered within the Ministry of Finance by the State Depository of valuables (Gokhran, which was transferred from Roskomdragmet to the Ministry of Finance as part of the reorganization.) The Ministry of Finance will engage in acquiring precious metals and precious stones for Gosfond and will assume control of the use, circulation, and release of precious metals and gemstones to consumers for production, scientific research, cultural purposes, and for export.

All gold mined in Russia by organizations and private gold miners was still subject to being turned over to state refineries.

The gold was paid for with funds from the federal budget. The gold was bought at the price on the London Metal Exchange. The state was accepting gold, but not paying the miners. The total debt of the refineries to the gold miners at the beginning of December amounted to about 600 billion rubles.

Although over 100 commercial banks were allowed to engage in some transactions with gold, commercial banks did not have the right to sell gold abroad. There were eight leading commercial banks granted the right, as an experiment, to export gold abroad. However, the Central Bank had not given these banks the necessary licenses to export because of the absence of federal regulations regarding procedures for shipment and for settlements. The Russian jewelry industry was the only independent wholesale buyer of gold.

In the 1997 budget, about 10 trillion rubles were allotted for acquiring precious metals and stones. But in order for the money to begin to be transferred to the gold miners, it still had to be collected into the budget which had proven very difficult owing to the country's problems in collecting taxes.

In 1996, although there was a great deal of discussion about liberalizing the gold market and involving private capital and enterprises in gold production, the Government did not take the necessary measures to accomplish that. Although Roskomdragmet was eliminated and management of the branch shifted over to the Ministry of Finance and the Ministry of Industry, the actual changes did not appear to be major. The banks were still not actively involved in a domestic gold market, which still did not exist, and the banks were not conducting any operations with gold abroad. Measures were being discussed in 1997 to ease restrictions on gold trading and exports that was considered necessary for domestic commercial banks to finance gold mine development.

Also, large numbers of foreign investors were not attracted to the sector and some who were already there closed down their offices and departed, such as RTZ. Others such as Star Technology never undertook mining operations, even though they had planned on doing so right after the elimination of certain conditions that were interfering with the conduct of the operations. Thus, the government continued as the most important entity in the gold mining sector, determining the rules of its operation while at the same time often creating financial hardship for the mining enterprises.

As of January 1996, according to Roskomdragmet, the gold reserve of Russia comprised 340 t. In 1996, the Central Bank acquired 100 t of gold to supplement its reserves. The Central Bank was to remain the ultimate gold buyer in Russia during the next few years, according to the Deputy Chairman of the Bank. He said the main purpose of the Central Bank is to boost gold and currency reserves and that the Central Bank has accumulated over 90% of the country's gold reserves. It was ready to increase gold reserves by 90 t/yr in 1997 and 1998.

Although gold production continued to fall, a First Deputy Minister of Natural Resources refuted that the industry was collapsing. He said that in 1996 the commissioning of facilities at the Olimpiada gold lode in Krasnoyarsk territory, the Karalveem and Dvoynoye lodes in Chukotka, and the Kubaka, Julietta and Shkolnoye lodes in the Magadan region should

enable Russia to mine an additional 30 t/yr of gold.

Iron Ore.—In 1996, Russia produced 72.1 Mt of iron ore and 23.4 Mt of pellets which was respectively 8% and 11% less than in 1995. Table 5 shows iron ore production at Russia's leading iron ore mines in 1995 and 1996.

From 1991 to 1996, iron ore production fell by about one-third. Since 1991, no new mining capacity had been added. Whereas in the 1980's, new capacities averaging 7.6 Mt/yr were put into operation for iron ore extraction, afterward they were going out of operation at the rate of 7 Mt/yr. At the same time the ratio of overburden to ore increased by 30% while the replacement time for depreciated equipment had been greatly extended. The iron ore industry experienced many of the problems of other Russian mineral industries including nonpayment by consumers, rising costs for energy and other inputs, and excessive tax burdens.

Despite these problems, a number of changes had occurred in the iron ore production sector with the introduction of market economic reforms that were rationalizing the industry. These changes included far larger differentiations in the price paid for iron ore in the different consuming regions that more accurately reflected cost factors such as transportation.

Although a number of mining enterprises were experiencing serious financial difficulties, a few of the better enterprises such as those in the Kursk Magnetic Anomaly (KMA) appeared to be successfully making the transition to a market economy.

The KMA, which was discovered in 1932, is the major Russian iron ore mining region. The region is unique in the size of the deposits and in the high iron content of the ore. During Soviet times, iron ore mining and beneficiation complexes (GOK) were built in the KMA, including the Mikhaylovskiy GOK in Kursk Oblast and the Lebedinskiy and Stoylenskiy GOK's in Belgorod Oblast.

The Stoylenskiy GOK in the KMA, one of Russia's oldest enterprises, is located near the city of Staryy Oskol. Despite the country's economic difficulties, the GOK managed to survive and maintain production. Stoylenskiy for 5 years had been a joint-stock company with its 8,000 personnel as shareholders. Its firm incorporates a network of additional enterprises that ensure a livelihood for the enterprise personnel and the citizens of Staryy Oskol. The Stoylenskiy GOK besides its iron mine and four ore-dressing mills, also includes a meat-processing plant, a cheese and dairy shop, a plant producing high-quality refined vegetable oil, a clothing factory, and a chalk plant under construction which was getting ready for its first output. The GOK has a medical complex with up-to-date diagnostic and therapeutic equipment manufactured by American, Japanese, and Israeli companies. The GOK also provides a wide range of social and cultural services to its workers and the town, which its management considers a valuable contribution to the well being of the community and not in contradiction to profit making.

Stoylenskiy's General Director stated that the GOK's success was based on knowing how to sell its product. He stated that in order to maintain steady production, the GOK needed a reliable buyer of which in Russia there was none. The GOK's main

customer in Russia, the Novolipetsk metallurgy combine, had constant indebtedness of 40 to 60 billion rubles per year. In 1996, the GOK was selling practically everything it produced abroad, mainly to Poland, the Czech Republic, and Yugoslavia.

The Stoylenskiy GOK was one of Russia's few enterprises turning out products only on a prepayment basis, so there was no problem with nonpayments. Four years ago, moreover, the GOK launched a campaign to reduce costs. While every ruble of output had cost 96 kopecks, by 1996 it was reduced to 50 kopecks. The GOK stated it reduced costs by organizing its own in house auxiliary facilities including a repair plant, a construction trust, and teams of firefighters and mine rescuers. A third economic factor that enabled the GOK to boost income was more efficient use of all means of production and also the introduction of up-to-date technologies to reduce input consumption including water, electricity, fuel, gas, lubricants, etc.

Based on its success, the share price of stock reportedly had greatly increased. The General Director was of the opinion that when the chalk plant started up in 1997, the GOK's shares would become more valuable. The GOK will sell the chalk as raw material and the General Director stated that the GOK already has a portfolio of orders from Finland, Denmark, and Switzerland. He stated that there is enough chalk on the surface of the pit for 100 years of production. Russia was a net importer of chalk in 1996.

In contrast to Stoylenskiy where the control of the shares remained within the enterprise, the control of Lebedinskiy was being contested between the enterprise and outside investors represented by the Rossiyskiy Kredit Bank. The struggle was understandable, considering the significance of the complex in the mining and production of iron ore. Lebedinskiy is Russia's largest iron ore mine, with sales in 1996 of 15.757 Mt of iron ore concentrates and 6.375 Mt of pellets which was respectively 7% and 18.4% less than in 1995. In ruble value, however, sales were down by only 0.6% compared with 1995, but profits were down by 70.6%. In 1996, Lebedinskiy registered profits of 206.75 billion rubles. It was one of the few key enterprises of Russia at which production was not being severely disrupted and continued to show significant profits. Seventy percent of the enterprise's production is exported. The complex had not been affected by unemployment, and the social sector had also been retained in its previous form. The complex employs 17,000 to 18,000 workers.

When the legalized sale of stock in enterprises by the investment funds was underway, the firms who were clients of the Rossiyskiy Kredit Bank initially bought over 15% of the shares in the Lebedinskiy complex. Fifty-one percent of the shares in the complex were distributed to the employees in a form of privatization that was widespread. However, the employees could sell their share under any circumstances dictated by personal need or profit. Many of these shares were purchased by the Rossiyskiy Kredit Bank which then acquired a larger percentage of Lebedinskiy shares.

The ownership of the complex perceived itself in jeopardy by the Bank's shareholdings and tried to remove the Bank's influence. Lebedinskiy decided to sharply reduce the Bank's

influence by having the shareholders vote to have a second issuance of stock while limiting the participation of the Rossiyskiy Kredit Bank shareholders in the voting concerning this issuance. Lebedinskiy was able to keep the bank shareholders from voting with the aid of a court order. This order was then rescinded after the shareholders meeting. The shareholders meeting ratified the decision on a secondary issuance of shares, as a result of which the proportion of bank shareholders in the complex sharply declined. Further court decisions were being awaited to clarify the situation. Meanwhile the Rossiyskiy Kredit Bank became a shareholder in the neighboring Mikhaylovskiy iron ore GOK in Kursk Oblast.

In two of Russia's other major iron-ore-producing regions, Siberia and the Urals, the large iron-ore-mining operations were experiencing greater economic difficulties. The Urals and Siberia could experience a shortage of iron ore despite possessing large iron ore mining complexes with large resources. Although ore resources at existing mining operations in these regions are adequate for up to 20 more years, only enough reserves have been prepared for extraction to last about 7 more years. Furthermore, with the industry switching to market economic criteria, up to 30% to 50% of the resources classified as reserves according to the Soviet reserve system used in the planned economy, are not economic reserves in the context of a market economy. Furthermore there have not been discoveries in these regions of other undeveloped deposits that could be considered economic. The country anticipates regional imbalances in supply to steelmaking facilities because of the need to respond to economic criteria in producing iron ore. If iron ore production in Siberia continues to decline, it will exacerbate the regional supply problem. Almost 70% of Russia's steelmaking capacity is in Siberia, while almost 80% of iron ore reserves are in central and northwest Russia.

An iron-ore-producing region that might be more favorably located than the ones in the Urals or Siberia is the mining region in the northwestern part of the country. In this region, there has been some interest in creating integrated production linkages. The Severstal steel mill in this region owns large portions of the shares of some of the major iron ore mining companies in the northwest including the Kostomuksha, Kovdor, and Olenegorsk iron ore mining complexes.

In the Urals, the Kachkanar mining complex in Sverdlovsk oblast is the largest producer of concentrate and pellets. In 1996, Kachkanar produced about 7.3 Mt of commercial grade ore which was less than the 7.7 Mt produced in 1995. The Kachkanar complex mines the Gusevogorskoye field with reported reserves of 2 billion tons of ore grading 15.8% iron. The Urals region contains other iron ore mines including those at the Vysokogorsky complex with reported total reserves of 375 Mt grading 38% iron, although reserves are calculated to depths exceeding 1,100 meters. Ninety five percent of the ore is mined at depths below 600 meters. Vysokogorsky produced about 3 Mt of ore and 2.8 Mt of agglomerate in 1996 and planned to keep production at this level in 1997. The mine produced about 5 Mt/yr during Soviet times.

Lead and Zinc.—In 1996, mine production of zinc in ore

fell by almost 4% and of lead in ore by more than 20% compared with 1995. The percentage of tolled smelted lead rose from 24% in 1995 to 29% in 1996 and of toll refined zinc from 45% in 1995 to 51% in 1996. Production of metallic lead, including secondary lead remained at its 1995 level and production of zinc metal rose by almost 4%.

The Chelyabinsk electrolytic zinc plant (ChETsZ) in Chelyabinsk oblast in the Urals is the largest producer of zinc in Russia. ChETsZ was commissioned in the mid-1930's. In 1996, the controlling block of stock in ChETsZ was held by the Swiss company Euromin. Since its startup, the plant has been modernized several times and this has increased its capacity more than sixfold. In 1995, ChETsZ's annual output was estimated at 130,000 t of zinc, 300 to 350 t of cadmium, just under 10 t of indium, 5,000 t of industrial zinc sulfate, 65,000 to 70,000 t of copper clinker, and 10,000 t of lead cake. In 1996, production at ChETsZ was estimated to have increased, possibly in the range of 5% or greater, in keeping with the reported national increase in metallic zinc production. The plant is supplied with raw materials by mining and beneficiation complexes within a 150 to 300 kilometers (km) from Chelyabinsk. Besides domestic raw material, it uses imported concentrate supplied by the Noja Holding Company and the Swiss firm Glencore International. More than 50% of its products are exported.

A decision to renovate ChETsZ was made by the U.S.S.R. Council of Ministers in 1984. The plan, envisaging the construction of Russia's largest automated zinc electrolysis shop at the plant, was approved 2 years later. Construction of the shop began a year after that. By 1990 the Italian firm Snamprogetti had transferred automated zinc electrolysis technology to the plant and installed the equipment. Thus, by 1996, around 75% of the plant's renovation had been completed.

Completion of the renovation work and startup of the electrolysis shop by 1997 reportedly would require \$27.2 million in investments. In the beginning of 1995, the ChETsZ board of directors decided to ask the European Bank for Reconstruction and Development (EBRD) to finance the completion of the project. The business plan was drawn up by Booz, Allen & Hamilton, an English consulting company. Financing was being sought from the EBRD. The plan called for final completion of renovation of the plant and the construction of Russia's largest automated electrolysis shop, capable of producing 200,000 t/yr of zinc.

The administrators of ChETsZ hoped to modernize the entire production process after the new shop was opened, beginning with the leaching shop, where they planned to install more powerful hydrometallurgical equipment. Besides this, plans called for building a power substation on the grounds of the enterprise. With a heat and electric powerplant of its own, ChETsZ believes it will be able to decline the services of the regional monopolist, the Chelyabenergo joint-stock company, and reduce its expenditures on electricity by almost one-half. The plant uses around 6 million kilowatt hours of electricity per day; and the projected savings from the use of its own power plant should pay for the substation in 3-1/2 years at most.

Nickel.—In 1996, Russia's mine output of nickel fell by 8% to 230,000 t compared with 251,000 t in 1995. Production of primary nickel was estimated to have decreased in 1996 to 190,000 t compared with 200,000 t in 1995. Nickel exports in 1996 increased by 9.4% compared with 1995 to 167,200 t, of which 166,900 t went to countries outside of the CIS.

The NN Russian joint-stock company (RAO), with mining and metallurgical facilities in East Siberia and on the Kola Peninsula mining mixed sulfide ores, was the country's major producer of nickel. A much smaller portion of the country's nickel was produced from laterite ores by enterprises in the southern Urals. NN is the world's second largest producer of nickel, the world's largest producer of palladium, and one of the world's top three producers of platinum.

The Norilsk mines in East Siberia form the core of the mining operations while the major nickel refinery, the Severonikel plant, is located in northwestern Russia on the Kola Peninsula. The core mining and beneficiation units of Norilsk in East Siberia reported the following results in 1996 compared with 1995. (*See table 6.*) These mining units were able to increase nickel output despite the drop in ore production by mining higher grade ore.

Despite the fact that output was near 1995 levels and exports increased, in 1996, NN experienced negative financial results. Norilsk company officials reported losses of 3.29 trillion roubles (\$572 million). Norilsk officials blamed their financial predicament on the fact that profits were spent on social costs, which the company officials believed the state rather than NN should be supporting. Norilsk was trying to enact a restructuring plan in which the state would assume responsibility for financing Norilsk's vast social infrastructure, including paying for resettling tens of thousands of Norilsk's pensioners from the far north.

Norilsk's reported losses, however, could be misleading for a number of reasons including the use of accounting methods that differ from standard western practices. Also, accusations appeared of underreporting of profits to avoid taxes. NN was under pressure by the Government to pay back taxes and the Government also expressed dissatisfaction with the illegal sale abroad of nickel, cobalt, platinum, and other strategic raw materials stolen from Norilsk Nickel.

Norilsk Nickel was created in 1989 by a government directive consolidating nickel mining and metallurgical operations in East Siberia and on the Kola Peninsula. NN was registered as an RAO in April 1994 and subsequently none of NN's enterprises could engage in independent economic activity apart from the RAO. The RAO NN includes: the Norilsk mining and metallurgical complex in East Siberia (NMGK), the Severonikel and Pecheneganikel complexes on the Kola peninsula, the Olenegorsk engineering plant on the Kola Peninsula, the Krasnoyarsk metallurgical plant for Nonferrous and Precious Metals in East Siberia, and the Gidronikel Scientific Research Institute in St. Petersburg. The controlling block of stock in NN had belonged to the state. As collateral for a loan, in December 1995, the state block was transferred to the administration of the ONEKSIMbank. The Moscow-based bank was administering NN as it was the trustee of the majority 38% government stake

in the company which is the equivalent to 51% of the voting shares. In August 1997, the 38% share in NN being held by ONEKSIMbank was sold through an international tender which became the subject of much controversy. The Swift company, a member of the ONEKSIMbank, purchased the 38% Government stake in Norilsk. All shares owned by Swift have voting rights, giving Swift more than 50% of the voting shares in Norilsk.

In October, the General Director of NN signed an order designating some of the subdivisions of NN as separate joint-stock companies. The transition at NN was to be from a structure of management shaped in the command economy to a structure adapted to market relationships, where each subunit of the RAO enterprise would bear responsibility for the economic results of its work. The announced reasons for the issuance of the order was the need for a more efficient system of management, the reduction of administrative structures, and the simultaneous granting of legal autonomy to NN's enterprises as an effective method of organizational funding of NN's subdivisions. NN's largest auxiliary subdivisions were to become subsidiaries in the near future. The Mayak, Komsomolskiy, Taymyrskiy, Oktyabrskiy, and Kalisty mines and the Talnakh beneficiation plant, for example, would form the Talnakh Mining and Beneficiation Association, a joint-stock company, and auxiliary units such as the Norilksbyit (Norilsk Supply) Production Association would become the Norilksbyit joint-stock company. NN believed that this would enhance performance as the success or failure of any subdivision was lost in the overall results of the huge complex's performance, and according to the NN management it was impossible to find responsible parties for anything that happened. The results of creating subdivisions of the complex will entail large staff cuts in the subdivisions that are being granted autonomy.

In the second half of 1996, the RAO's new management, the ONEKSIMbank, eliminated the previous network of intermediary firms that sold the finished product and shifted all sales to the firm, the general agent Interrosimpeks. This made it possible, NN's management believed, to exert a positive influence on the selling prices in the world market of the RAO's products and to improve sales efficiency as a whole.

A comprehensive financial and industrial rejuvenation plan drafted by NN called for output from NN by the year 2000 to increase to 213,000 t of nickel, 370,000 t of copper, and about 4,000 t of cobalt. Norilsk Nickel's Pechenganikel subsidiary on the Kola Peninsula in Murmansk Oblast will convert entirely to underground mining operations for production of 8 Mt/yr of ore. It will also partially upgrade milling capacity to obtain up to 600,000 t/yr of concentrate.

Platinum-Group Metals.—In August 1996, the platinum group metals (PGM) sector experienced the significant reorganization that affected all precious metals sectors when the Roskomdragmet was abolished and its functions transferred to the Ministry of Finance. According to the decree on this reorganization, the Ministry of Finance received the right to form the Russian Federation State Fund of Precious Metals and Precious Stones (Gosfond Rossii) to handle the safekeeping,

replenishment, and tracking of precious metals and precious stones and articles that contain them. Gosfund is administered within the Ministry of Finance by the Gokhran department which had been transferred from Roskomdragmet. The Ministry of Finance is to engage in acquiring precious metals and precious stones for Gosfond and will assume control of the use, circulation, and release of precious metals and gemstones to consumers for production, scientific research, cultural purposes, and for export.

Norilsk Nickel mines more than 95% of Russia's PGM at its mines in East Siberia and produces PGM at its metallurgical plant in Krasnoyarsk, East Siberia. In 1996, total ore mined at Norilsk decreased by 3.1% compared with 1995, and may have led to a slight decrease in PGM production.

The Johnson Matthey Company estimated that in 1996 Russian platinum exports totaled 1.22 million ounces which was 60,000 ounces less than in 1995, that palladium exports were 4.6 million ounces which was an increase of 400,000 ounces compared with 1995, and that rhodium exports increased by one-third compared with 1995, although no actual number was given. Russian PGM exports far exceeded estimated annual production, and it was assumed that these exports were from stockpiled material. For the previous 3 to 4 years Russia had exported PGM to the world market in excess of estimated production.

Uncertainty that surrounded the true state of Russian PGM stockpiles resulted in varying assessments regarding the sustainability of Russian exports. The Johannesburg Business Day on January 27, 1997, reported that platinum market analysts considered it probable that Russian stockpiles could sustain sales above production levels for 2 to 3 more years. The Anglo American Platinum Corporation (Amplats) stated that it was preparing to increase its market share in 1997 if Russia sold less because of depleted stockpiles. Amplats managing director, according to the Johannesburg Business Day, said during a visit to the Rustenburg Platinum Holdings, that he believed that by the end of the year the market would start to change because of a decline in Russian stockpiles. Johnson Matthey was also predicting a decrease in Russian PGM exports in 1997 because of diminishing stockpiles.

Silver.—The silver sector was also subject to the same reorganizational changes that affected all precious metals sectors in 1996. (Refer to the section on gold for a more detailed discussion of these changes). Silver production in Russia was primarily associated with gold production or a byproduct of nonferrous metals production. The country's major silver mining area was Magadan oblast in the Russian Far East. In 1996, production from Magadan oblast totaled 47.7 t of silver, but the oblast sold 133.9 t, mainly from stocks. In 1997, the silver mining quota for Magadan was set at 165 t. The Dukat mining and beneficiation complex (GOK) in the Omsukchan district of Magadan oblast, which mines the FSU's biggest silver field, was assigned 150 t of the 1997 silver quota. It produced 45 t of silver in 1996, and sold 125 t, presumably from its stocks. Dukat is Russia's largest silver mine and possesses about 90% of the country's reserves of silver ore.

Dukat according to the Magadan administration has proven reserves of more than 10,000 t of silver and 27 t of gold. The ore also has a high lead and zinc content with proven reserves of 63,300 t of lead and 22,600 t of zinc. The reserve figures were calculated based on the Soviet reserve classification system which is not comparable to Western market-based systems for determining reserves.

The Dukat GOK does not have metallurgical facilities to process its concentrates into metal, which was done in Kazakhstan. With the dissolution of the U.S.S.R., shipments to Kazakhstan were curtailed. Thus, Dukat was producing output which it was storing rather than marketing, and the enterprise's debts became exceedingly large, reaching about \$35 million. For almost 1 year, the miners had not been receiving wages.

Dukat's ore-processing problems were temporarily resolved by a contract with the Canadian firm Cominco Ltd. to process Dukat ore. Dukat, however, believed it was not obtaining the total value of its ore through this contract as, in addition to gold and silver, the ore contains 22 other constituents, including rare earths which were not being recovered by Cominco. The recovery of these constituents Dukat believed would sharply increase its profitability.

In 1996, Dukat was seeking investment funds to make Dukat a profitable, state-of-the-art enterprise. Negotiations with potential Russian investors, including the largest commercial banks, did not end in success. Then it was decided that an international investment tender would take place to attract a strategic owner for Dukat. In October, a tender was put out for the Dukat Mine which was followed by repeat tenders in 1997. The issue of the future ownership of Dukat persisted into 1997.

Steel.—In 1996, Russia produced 49.2 Mt of crude steel which was 4% less than in 1995 and 38.8 Mt of rolled steel, which was slightly less than the 1995 production level. In 1996, Russia exported about 22 Mt of steel which was about the same level as in 1995. Russia's 1996 pig iron production of 37.2 Mt and steel pipe production of 3.5 Mt were each 6.5% and 5.4% less respectively than in 1995. In 1996, Russia utilized 65% of its steelmaking capacity, 68% of its steel rolling capacity, 66% of its pig iron production capacity, and 34% of its steel pipe producing capacity.

In 1996, about 60% of steel exports went to Southeast Asia and the rest to Europe and the United States. A 2-year trade agreement between Russia and the European Union (EU) expired at yearend 1996; the agreement established quotas for Russian sales to the EU. This agreement was extended through the first half of 1997, with negotiations occurring on a new framework for Russian steel exports to the EU.

The steel sector as a whole was experiencing great difficulty. However, owing to the fact that privatized enterprises now were able to better control their individual destinies, certain enterprises were more successful than others. One of the more successful steel mills was the Novolipetsk metallurgical complex (NLMK) in the city of Lipetsk.

While steel production since 1991 in the country has been cut in one-half, in Lipetsk it had been cut by a little more than one-quarter. Indebtedness for wages in Russia exceeded 50

trillion rubles, but wages reportedly had not been held up once at the NLMK. Russian industry was suffering from a crisis in nonpayment from its customers who if they paid at all, paid in barter; but 80% of the accounts were paid in money at the NLMK. NLMK also had been able to maintain the physical appearance of its facility as well as ensure environmental quality at its facility.

For more than 2 years a battle had been waged among shareholders for control of NLMK. The NLMK stockholders include the plant's exclusive trader, the Intermetall firm [a Russian agent of the TWG], the Cambridge Capital Management Fund managed by the investment bank Salomon Brothers, Crawford Holdings, the Sputnik Fund managed by the Renessans-Kapital Company, and the bank International Finance Company. This battle for control of NLMK appeared to extend to some of the largest companies invested in Russia and involved many leading political personages.

The battle was waged with many accusations of intrigue. The reason for the heated struggle was that the plant could have considerable earnings from producing more than 6 Mt of steel in 1996 and good future potential as the steel mill is the newest and most modern in Russia and one of the largest in Europe.

Tin.—In 1996, production of tin concentrate fell by 12% compared with 1995. The Novosibirsk tin plant in West Siberia, Russia's largest tin smelter, in 1996 increased output by 11.4% and labor productivity by 53.3% compared with 1995. It reduced net power consumption by 22.2%, and increased tin recoveries from 93.1% to 97.08%. In 1996, there was improvement in the main production indicators. Sales at Novosibirsk in 1996 were 240.5 billion rubles (\$44 million at the yearend rate), and pretax profits 8.7 billion rubles. The Novosibirsk tin plant was corporatized in 1992. Charter capital in 1996 was 100 billion rubles split into 400,000 shares with par value of 250,000 rubles each. The company had 22 corporate and 1,900 individual shareholders.

In 1996, the Novosibirsk plant exported one-half of its output. Although world tin prices had fallen, Novosibirsk was forced to export as the domestic tin market was still in a state of stagnation because of low demand. Novosibirsk officials claimed the plant had to export products at unprofitable prices to keep its production cycle operating.

Plans for 1997 called for Novosibirsk to convert vacant premises to produce gallium, pure lead, and pure bismuth. It had built up a portfolio of orders for 1997 for tin solders in ingot form, and efforts were under way to start producing wire solders to world standards to boost the company's export potential. Also, for 1997 Novosibirsk signed a contract with the electric engineering firm Asea Brown Boveri (ABB) to install power generating capacity at the plant to reduce energy costs. The first stage of the ABB facility was to be commissioned in the first quarter of 1998.

In the tin mining sector, the only reported production results appearing in the research for this report were from the Deputatskiy tin mining complex in the Yakut-Sakha Republic. In 1996, Deputatskiy increased tin production by 5% to 3,668 t. However, in 1997 Deputatskiy was forecasting a decrease in

tin output to 3,200 t.

Titanium.—Russia's only producer of titanium sponge is the Avisma titanium and magnesium complex at Berezniki in the Urals and the country's only major producer of rolled titanium products is the Verkhnyaya Salda Metallurgical Production Association in Sverdlovsk, also in the Urals. Russia must import almost all its titanium raw materials with Ukraine being the major supplier.

In 1996, Avisma increased titanium sponge output to 20,000 t compared with 14,000 t in 1995. A member of Avisma's board told Interfax that output had risen in response to higher world demand, which he said would be sustained until 1999.

The Avisma joint-stock company (AO), is part of the Rosprom (Russian industry) industrial company. The Rosprom company was established in September 1995 to manage the blocks of shares of 30 industrial enterprises, which belong to the Menatep Group. The Menatep Group is the owner of the controlling 51% block of shares of AO Avisma. The Solikamsk magnesium plant, a Urals magnesium producer, owns 7.5% of the shares of Avisma.

In 1996 Avisma's net profit amounted to 7.36 billion rubles. Menatep planned to invest \$15 million in Avisma in 1997 to consolidate the company's position on the titanium market, to develop new magnesium products, and to improve environmental and resource-consumption factors.

The titanium sponge and fabricating industries experienced sharp falls in domestic demand following the breakup of the Soviet Union and the cut back in defense manufacturing. However, the titanium industry had been able to begin its revival based on export contracts. Verkhnyaya Salda in 1996 exported 7,000 t of titanium manufactures, of which 30% went to the U.S. firm Boeing at close to world prices. Export revenues were used not only to pay wages, but also to upgrade production capacity and maintain quality. Plans called for increasing exports to Boeing by 20% in 1997. In 1996, Verkhnyaya Salda was working at about 25% of its capacity for processing about 65,000 t/yr of titanium ingots.

Russian titanium parts like window frames, pilot cabins, engine brackets and chassis components were installed in 25 new Boeing B-777's and accounted for 15% of all titanium manufactures used on these aircraft. A Boeing representative stated that the range of products made from Russian titanium would increase as orders for B-777s increased. Plans called for several hundred B-777s to eventually be fitted with Russian titanium manufactures.

It appears that in 1997 Verkhnyaya Salda would also sell semifabricated titanium products to France's Aeospatiale, Germany's Daimler-Benz, the United Kingdom's British Aerospace and Rolls-Royce, and General Electric from the United States.

Tungsten.—Many of Russia's tungsten mines had closed or were working far below capacity. Much of Russia's tungsten exports have been from its large stockpiles. Russia's mines, which were deteriorating through lack of investment and equipment, found themselves competing with the state stockpile

as large Russian stockpile exports were considered a factor in depressing world tungsten prices. Moreover, domestic converters bought tungsten from the stockpile rather than mined output as the stockpiled material was cheaper and more readily available.

The Tyrnyauz tungsten and molybdenum mining and beneficiation complex in the North Caucasus was the FSU's largest producer of tungsten. At the Tyrnyauz field, mining began in 1940. In 1996, Tyrnyauz had a design capacity to produce 12,000 t/yr of tungsten concentrate and 2,400 t/yr of molybdenum concentrate. In 1995, Tyrnyauz produced 2,900 t of a targeted 5,400 t of tungsten concentrate. However, production from Tyrnyauz was shut down between February and November 1996, and Tyrnyauz produced just 600 t of tungsten concentrate and 100 t of molybdenum concentrate. It planned to produce only 400 and 50 t respectively of tungsten and molybdenum concentrates in 1997. The shutdown in 1996 was attributed to a severe shortage of working capital.

In 1996, Tyrnyauz was still a state-owned enterprise. Plans called for Tyrnyauz to be privatized in 1997.

Concentrate from Tyrnyauz is processed at the Gidrometallurg plant in Nalchik in the Kabardino-Balkaria republic in the North Caucasus. Gidrometallurg produces between 85% to 90% of Russia's tungsten anhydride and trioxide. Gidrometallurg also processes tungsten concentrate from the Lermontov and Primorsky complexes in the Russian Far East. Gidrometallurg has the capacity to produce between 4,500 t/yr and 5,000 t/yr of tungsten anhydride, but in 1996 produced only 1,500 t because of the shutdown of Tyrnyauz. Gidrometallurg's major customers are the Pobedit hard alloy plant in Vladikavkaz in North Ossetia in the North Caucasus and the Chelyabinsk electometallurgical plant in the Urals which is a major ferroalloy producer.

Gidrometallurg's exports fell significantly in 1996 to 650 t compared with over 2,000 t in 1995; its major export markets are Austria, Germany, Sweden, and the United States. Gidrometallurg also suffers from a large deficiency of working capital because of nonpayments. It reportedly is owed 6 billion rubles and owes the state budget 1 billion rubles. Plans call for Gidrometallurg to upgrade its technology including installing a facility to recover tungsten from tailings dumps which reportedly contain over 400,000 t of wastes from which there is a potential to produce tungsten concentrate.

The only other reported tungsten mine output located for this report for 1996 was from the Lermontov tin and tungsten mining and beneficiation complex in the Russian Far East, which experienced a significant drop in output compared with 1995. Lermontov produced only 1,000 t of tungsten concentrate in the first 9 months of 1996 compared with 3,000 t in the same period in 1995. The drop in output was attributed to falling prices on the world market.

Vanadium.—Russia's sole producer of vanadium raw material is the Kachkanar iron ore mining complex in Sverdlovsk oblast in the Urals that mines titaniferous magnetites. Vanadium is produced from vanadium rich slag that is a coproduct of iron production at the Nizhny Tagil and

Chusovoy metallurgical plants that are also in the Urals. Kachkanar was undergoing financial difficulties in 1996 and was unable to pay wages owed to workers or pay for needed energy. Sverdlovenego had reduced Kachkanar's energy supply to one-half of Kachkanar's requirements because of unpaid bills. A large portion of Kachkanar's economic problems was attributed to falling demand for its products in Russia. In 1996, production of ferrovandium pellets at Kachkanar was projected to be 4.3 Mt which was slightly below the planned target of 4.5 Mt; in 1995, Kachkanar produced 4.5 Mt of these pellets.

Industrial Minerals

Cement.—In 1996, cement production decreased by 24% compared with 1995 to 27.8 Mt. Of Russia's 33 cement producing regions, output fell in 31 of these, falling by 43% in the Krasnodar region, and by between 26% and 30% in the Bryansk, Moscow, and Sverdlovsk regions. Output, however, rose by 3% in the Karachayevo-Cherkessia region and by 5% in the Tyumen region. Cement output using the more energy efficient dry method comprised 11% of total output. Of Russia's 56 cement plants, 2 had capacities of over 3 Mt/yr, 8 had capacities between 2 and 3 Mt/yr, 8 between 1 and 2 Mt/yr, 11 between 0.5 and 1 Mt/yr, and 27 were below 0.5 Mt/yr.

Diamonds.—Over 98% of all diamonds are mined by the company Almazy Rossii Sakha (Alrosa) in the Yakut-Sakha Republic. Alrosa is the sole authorized exporter of rough diamonds. In 1996, Alrosa increased output by 3% in value compared with the \$1.38 billion achieved in 1995. In 1996, Alrosa's new mill, Yubileynaya, went into operation and a new diamond pipe, Nyurbinskaya, was discovered. The Yakut-Sakha Republic government forecast that in 1997 diamond production would increase by 2.5% compared with 1996. Alrosa planned to increase its output by 25% within the next 3 years, but this calls for large investments. The company expected to obtain \$500 million in loans from foreign banks. A division of National Westminster Bank, NatWest Markets, would, under a preliminary arrangement, broker that amount of credit if Alrosa would finalize a deal with South Africa's De Beers to supply it with rough diamonds.

Alrosa was facing legal and financial problems concerning nonpayment of taxes. The Prosecutor General's office in October opened proceedings against Alrosa, which it accused of concealing large amounts of taxable income. The accusation was that Alrosa had defaulted on tax payments of over 46 billion rubles in recent years. Alrosa's president responded to the charges by stating that his company owed nothing to the federal budget.

De Beers in late December unilaterally stopped diamond trading under a 1990 agreement made with the Soviet Union. The agreement had actually ended at yearend 1995, but trading had proceeded throughout the year under terms comparable to the 1990 agreement. De Beers said the move to stop trading was a response to the drawnout process for ratifying the new agreement signed with Alrosa in September 1996. De Beers

stopped buying diamonds from Alrosa on January 1, 1997, after the Russian government failed to endorse a September 1996 contract between the two companies. The contract was eventually signed in 1997. One reason quoted for the delay was that in the wake of the reorganization of the governmental bodies administering the precious metals and stones sector there was a lack of legislation regulating trade in diamonds. This included a lack of regulations on licensing and quotas for trade in uncut and cut diamonds.

Also, there had been opposition to the De Beers contract on the part of Russia's gem industry which called for amendments to the draft rough diamond trade contract with De Beers, claiming that the agreement had to be redrawn. This was claimed necessary to ensure the domestic gem industry a larger share of Russia's uncut diamonds to ensure the industry's growth. Also, measures needed to be taken to enable the gem industry to reap additional profits from the sale of cut and polished diamonds, such as allowing consignments of uncut diamonds to be cut and polished abroad and then returned to Russia.

The gem industry in 1996 reported \$1 billion in sales of cut and polished diamonds, which was the same amount sold in 1995. Russia exports up to 97% of its cut diamonds. The gem industry, according to the President of the Association of Russian Gem Producers, has a consumption requirement of at least \$1.2 billion annually of rough diamonds and the capacity to cut and polish diamonds worth \$1.3 billion annually.

The Lomonosov diamond deposit in Arkhangelsk Oblast was discovered in 1980, with exploration continuing until 1987. Based on a technical-economic assessment completed in 1992, mining was judged profitable, and development plans for the deposit passed a government ecological evaluation. Following completion of these studies in 1992, the Russian government issued a decree directing that work on development of the deposit be accelerated. The economic situation in the country, however, was such that the Government was incapable of financing this project. This led to the formation of the Severalmaz Joint-Stock Company which received a license to develop the deposit and has sought funds on its own for this development. However, there is still no legal basis for the existence of a joint company to mine diamonds. A new law on precious metals and precious stones was circulated for a long time between the Duma and the Federal Assembly and seemed to be in an acceptable form. However, this law was then stopped by a presidential veto.

One major difficulty in attracting investors for this diamond deposit is that all data on the deposit are a state secret. Severalmaz held a tender for development of Lomonosov. However, there were no bidders because information on reserves was secret and there was no substantive economic information to show potential investors. Also, western companies such as DeBeers, which have shown considerable interest in the project, were not certain that they could even participate as the legal question had not been resolved as to whether it was possible to admit a foreign investor into this project.

Although Severalmaz had the status of a joint-stock company

along with a license to mine Lomonosov, it was far from becoming a mining enterprise. Its company executives were consulting with the Government to determine if the country even needed the development of the Lomonosov Deposit. If it did, then it was necessary to determine whether it was to be a state project or a commercial enterprise.

In other developments, De Beers and Terra, a Russian geological company, signed an agreement on the formation of a joint venture to conduct geologic work and prospect for diamonds in Arkhangelsk region. Terra holds a license to explore and develop diamond deposits in the Tovskaya and Ust-Pinega areas. The Tovskaya area is just north of Arkhangelsk and borders the Lomonosov and Verkhotinskaya areas. Ust-Pinega is southeast of Arkhangelsk.

Mica.—Russia produces about 30% of the world's sheet mica and about 10% of the world's scrap and flake mica. During the Soviet era, production data on mica were not published, but sporadic data on mica production have been appearing since the breakup of the Soviet Union. In the FSU, all mica was produced in Russia at four complexes. The mica industry apparently has been reorganized, with production coming from a number of concerns with new names. The latest date for which mica production appears to have been reported was 1994, and this data were reported in 1997. It is also the first time that any series by enterprise of production data or national production data for mica has appeared. Reportedly the Soyuzmineraly-Vostoksl'yuda cooperative north of Mongolia in Irkutsk oblast (formerly the Mam slyuda complex) in 1994 produced 6,021 t of scrap, 117 t of flake, 493 t of micanite, 479 t of formed mica, and 5,514 t of unformed mica for a total output in 1994 of 12,634 t. Table 7 shows the structure of the Russian mica industry and production in 1994.

Phosphate.—The Apatit company on the Kola Peninsula that produces apatite concentrates grading 35% P_2O_5 and higher from apatite-nephline syenite ores is Russia's major producer of raw materials for phosphate fertilizers. The company during the 1980's was producing almost 20 Mt/yr of apatite concentrate, but production fell sharply with the dissolution of the Soviet Union. However, the Apatit company has emerged from this period of sharply falling output and is now a profitable producer. Apatit in 1996 produced 7.21 Mt of apatite concentrate. The company sold 3.817 Mt of concentrates to Russian consumers, exported 1.654 Mt to former Soviet republics and 1.554 Mt to countries that border the FSU. The company's pretax profit in 1996 totaled 178.3 billion rubles, with a major portion of the profits going to support social needs and services. Apatit is responsible for the maintenance of a major part of the city infrastructure in Kirovsk where it is headquartered. In 1997, the company planned to increase production to 7.873 Mt of apatite concentrate.

The 1997 program for capital investments envisages spending about 200 billion rubles on upgrading facilities and equipment and on geologic assessments to maintain ore reserves. Apatit will also spend about 7 billion rubles on housing construction.

Mineral Fuels

Energy.—Russia is important to world energy markets because it is estimated to contain the world's largest natural gas reserves, second largest coal reserves, and eighth largest oil reserves. Russia exports a significant amount of oil and natural gas to Europe and is the world's second largest energy consumer.

The Russian Ministry of Fuel and Energy reported that most goals set for 1996 were met. According to the Ministry, the energy industry in 1996 accounted for 30% of Russian industrial output and 46% of exports. Lower inflation helped bring energy price rises down from 191% in 1995 to 23% in 1996. But, according to the Ministry, the energy industry did not successfully deal with its main task of stabilizing its financial position, which was a main factor destabilizing production, preventing investment, and threatening stable energy supplies to the economy. In 1996, investments fell in all sectors compared with 1995, including a 5.5% decrease in the gas sector and a 25.7% decrease in the oil sector.

The energy sector as of December 1, 1996, was owed over 35 trillion rubles, which was almost 100% more than at the start of the year. Debts to Unified Energy Systems, the company which runs Russia's national electricity grid, and to Russian gas producer Gazprom accounted for 78% of the total. Because of this problem with nonpayments, energy companies owed federal-budget payments of around 25 trillion rubles at the start of 1997. In the following review of mineral fuels, major portions of the reports on the separate fuels were obtained from analyses by the U.S. Department of Energy, Energy Information Administration.

Coal.—Russian coal production has declined steadily since 1988. In 1996, coal production decreased to 255 Mt compared with 263 Mt in 1995. The biggest production decrease by region was in the Donetsk basin, which produced 15.86 Mt of coal in 1996 compared with 20.44 Mt in 1995. Production at the Kuznetsk coal basin in Kemerovo region, southwest Siberia, was down 4.13 Mt. However the Kansk Achinsk coal basin in Eastern Siberia, the location of Russia's biggest brown coal fields, produced 6.58 Mt more coal than in 1995. Plans called for coal production to remain level between 1996 and 2000, and then for the industry to experience significant growth between 2001 and 2010. In 1996, open pit mining accounted for 59% of total coal production with production occurring at 65 open pits.

The Russian coal company (Rosugol), which is a state company, has operational responsibility for the coal industry. Rosugol oversees 28 coal mining companies, which control between 3 and 20 mines each, as well as several independent mines. In December 1996, Russia's President signed a decree that will provide for the government's divestiture of its stake in a number of state-owned companies, including those in the coal sector. The decree authorizes the Government to transfer management of five companies from Rosugol to a board of trustees, which will conduct the daily decisionmaking of these companies prior to their eventual sale. In 1997, management of four coal mining companies—Bashkirugol, Vostsibugol,

Krasnoyarsk Coal Company, and Khakasugol, and the oil shale mining company Leningradslanets—were to be transferred to trustees chosen through a tender held by the Government. The four coal mining companies produce roughly 70 Mt annually.

In November 1995, the World Bank agreed to loan Russia \$500 million to continue with restructuring efforts that would shut 80 mines over a 3-year period and include creation of a social safety net for displaced workers. However, while the first \$250-million tranche was paid in mid-1996, Russia failed to meet several key preconditions for the loan, and the World Bank withheld disbursement of the second \$250-million tranche until late December 1996. In 1997, the World Bank was expected to approve another \$500-million loan to Russia's coal sector.

In accordance with the goals of Rosugol's 1993 program to close 140 unprofitable and unsafe mines with a total output of 30 Mt, as of December 1996, 50 mines had been shut down, and 13 were producing at a much reduced scale. During 1996, the number of workers in the coal industry decreased by 40,000 persons. The closure of mines threatened many communities with the loss of their major source of livelihood.

Russia reportedly has 200 Mt of proven coal reserves, calculated based on the Soviet reserve system. Anthracite and bituminous coal comprise about 45% of Russia's reserves. Russia's coal reserves are located primarily in the Donets basin (Donbas) which borders and extends into Ukraine, the Pechora region in the European North, the Kuznetsk basin (Kuzbas) in West Siberia, and the Kansk Achinsk basin in central Siberia.

Coal accounted for approximately 26% of Russia's electric energy generation. However, there was an absence of efficient, environmentally clean technology for more extensive coal use for large-scale power generation. To introduce this technology would require significant research and investment.

Russia faces large environmental problems related to coal mining requiring large-scale investment, particularly in the areas of coal winning, transporting, processing, and waste recovery, including recovering and utilizing pit gas and other mining byproducts.

Improvements have been made in reducing the ash content of coal with the average ash content being 20.7% in the first quarter of 1996 which was a 9.3% decrease compared with the 1995 level. Nevertheless, steam coal in Russia is not adequately dressed and powerplants are designed to burn coal with an ash content of over 30%, generating large volumes of waste and soot within a 30 km to 50 km radius of powerplants. The powerplants are also emitting gaseous discharges of carbon dioxide and oxides of sulfur and nitrogen.

Russia's coal industry continued to experience financial difficulty. The industry suffered from a lack of investment needed to improve mining efficiency and increase labor productivity. The industry is owed large sums of money by its consumers, which has resulted in the industry lacking funds to invest or pay labor. By yearend 1996, the Federal Government owed the workers in the coal industry 1.6 trillion rubles and consumers owed the coal industry 7 trillion rubles.

Lack of funds resulted in deteriorating working conditions, increasingly unsafe mining conditions, and increased labor unrest. In December 1996, up to 400,000 miners staged a strike

that closed about one-half of Russia's coal mines. After 8 days, the Russian government pledged to pay the equivalent of \$118 million to cover the miners' salaries for December. The outstanding balance of miners' salaries still remained in the hundreds of millions of dollars. The reasons for this strike were similar to a previous large protest staged in January 1996, when over 1 million coal miners in Russia and Ukraine went on strike to demand back wages of \$200 million and \$367 million, respectively.

Russia, despite its large coal reserves, could experience difficulties supplying its metallurgical plants with coking coal during the next few years as more of the underground mines producing coking coal close and more development occurs of open pits producing coal chiefly for the power industry. About 70% of Russia's coking coal production occurs in the Kuzbas region. In the Kuzbas since 1990 there has been a shift in the balance of output from coking coal for metallurgy towards thermal coals for the power industry. Coking coal output as a share of all coal mined has decreased by over 40% since the breakup of the Soviet Union. Demand from metallurgical and coke and chemical plants, by comparison, has not fallen as steeply.

In the Kuzbas, the program to shut uneconomic mines was affecting primarily those mining coking coals. The effects of the closure program and other factors could result in a drop in annual coking coal output in the Kuzbas from 30.2 Mt in the peak year of 1990 to between about 9 Mt/yr and 11 Mt/yr at the end of the century. Moreover, Kuzbas mines will remain practically the only suppliers of coking coal to metallurgical plants in the next few years. Therefore, an anticipated 70% drop in coking coal supplies from the Kuzbas could cause serious difficulties for Russian iron and steel producers.

Moreover, Russian metallurgical plants lack adequate funds to adapt coking processes to a wider range of coals used in coke burdening charge, and so may be unable to compensate for the anticipated drop in top-grade coking coal. Thus, the full implementation of the program to reorganize coal production in the Kuznetsk basin could result in the loss of much of Russia's resource-base for the coke and chemicals industry, and necessitate Russia importing coking coal.

Natural Gas.—In 1996, natural gas output rose by more than 6 billion cubic meters compared with 1995 to 601.5 billion cubic meters. Russian net natural gas exports were 196.453 billion cubic meters, which was an increase of 4.26 billion cubic meters from 1995. Gas exports were the highest ever, exceeding the record set in 1995. In 1996, Russian gas exports outside the FSU were also a record, with the 127.996 billion cubic meters total exceeding the previous high in 1995 by 6.1 billion cubic meters. The increased exports were made possible by a decline in domestic consumption.

While total net gas exports in 1996 reached new highs, the destination of exports has changed over the past few years. The share of net exports to countries outside the FSU has increased from 51% in 1992 to 65% in 1996. The gas is exported westwards via several large pipelines that pass through Ukraine to Europe and the smaller Volga/Urals-Vyborod pipeline

to Finland.

With the exception of Yamburg, production from Russia's major gasfields is declining. Development is now occurring in new fields in the Yamal Peninsula and the Sakha-Yakutia republic. Yamal's total reserves are estimated at over 9.9 trillion cubic meters. The region's largest field is the 3.5 trillion cubic meter Bovanenkov structure.

Russia planned to begin large-scale gas production at Bovanenkov in 1997, with projected annual output levels reaching almost 85 million cubic meters per day in 2000. Output would be directed at European markets via a planned 2,500-mile Yamal to Europe pipeline, which is anticipated to startup in 1998 with a throughput of 13.45 million cubic meters per day. The line will consist of seven parallel pipelines running from Yamal to Frankfurt/Oder, Germany via Belarus and Poland. In November, Russia and Poland commissioned the first 65-mile segment of the \$2.5-billion, 400-mile Polish segment. Yamal pipeline gas shipments to Europe are expected to reach more than 155 million cubic meters per day by 2010.

One company, Gazprom, dominates the Russian natural gas industry and is the world's largest gas company, with reported reserves of more than 24 trillion cubic meters. Gazprom produces more than 90% of Russian gas and controls more than 70% of the country's gas reserves. It owns and operates Russia's 86,000-mile gas pipeline grid, and runs 26 trading houses and marketing joint ventures in 13 European countries.

In 1993, Gazprom was transformed into a state-owned joint stock company, and then in April 1994 began to be privatized. As in the oil industry, shares were divided among Gazprom employees and sold to other domestic investors, while 40% of its shares was to be held by the Government for at 3 three years. Nine percent of Gazprom's stock was set aside for foreign investment.

At the beginning of 1996, Gazprom's main stockholders were the Russian government (40%), residents of local producing regions (33%), workers in gas production and transportation (15%), Gazprom itself (10%), the joint venture Rozgasifikatsiya (1.1%), and others. The Russian government stated that it eventually would sell up to 15% of its stake in Gazprom.

There was active domestic trading in Gazprom stock in 1996 as some of the restrictions on the domestic sale of stock were lifted. The first stock offering for foreign investors occurred in October 1996, when one percent of the company's stock sold on international markets for \$373 million. Gazprom was planning to use this revenue to aid in financing the Yamal pipeline. A second offering was expected in mid-1997. Gazprom was maintaining its ratio of 9% of its shares reserved for foreign investors, and was not permitting foreigners to purchase any of the remaining 91% of the domestic shares.

In contrast to the oil sector, Gazprom has been relatively successful at maintaining output, which is mainly from western Siberia, where over 90% of Russia's natural gas is produced. However, a large amount of investment capital is needed to develop gas fields and to rehabilitate Gazprom's extensive pipeline network.

Nonpayment from Gazprom's major customers, Russia's

electric utilities, and the republics of the FSU, reached a crisis stage. Revenues that could have been used for projects have been diverted to subsidize the electric utilities, as cutting off supplies to utility companies is forbidden by law. Of the FSU countries, Ukraine owes the largest sum of money. However, the Ukraine has unique leverage as 90% of Russian gas exports to Europe are piped through the Ukraine. Exports to Europe are one of Gazprom's most secure sources of cash. Attempts to reduce gas deliveries to the Ukraine for nonpayment have failed because the Ukraine began to siphon gas destined for Europe to offset the shortfall. However, the new Yamal pipeline upon completion will allow Russia to bypass its current shipment routes across Ukraine.

Because transport costs are not taken into account in establishing price, gas prices remain uniform across Russia, creating further inefficiencies in the gas industry. Some critics have called for regulating the industry and others would like to see Gazprom dismantled. Attempts to demonopolize Gazprom were successfully countered by Gazprom during the year and Gazprom began developing a restructuring program to rationalize its many functions, including sales, transport, social services, auxiliary farms, etc.

Gazprom is working on various projects with European and Asian countries that could eventually lead to the establishment of an intricately connected gas network system throughout these regions. Also, Gazprom holds an interest in a German natural gas transmission operation with its German joint-venture partner, Wintershall.

Russia contains the world's largest natural gas reserves, with 50 trillion cubic meters of proven and more than 210 trillion cubic meters of potential resources. Three-quarters of Russia's proven reserves are located in 20 giant fields in West Siberia's Tyumen region. These fields each contain about 1 trillion cubic meters of gas. In March 1997, Gazprom announced it had selected the U.S. firm Golyer & MacNaughton to conduct an independent audit of its gas reserves. The first stage is to cover the eight fields that account for most of Gazprom's production and is to be completed by the end of 1997. The audit it was hoped would assist attracting new investors and increase the liquidity of Gazprom's stock on international markets.

Gazprom was undergoing an extensive 5-year rehabilitation of its gas trunkline system, including pipelines and compressor stations. About one-half of Gazprom's pipeline network is more than 30 years old and has exceeded its original design life. Gazprom's refurbishment effort has been aided by a 13-year, \$1.5-billion loan provided by British and Italian banks in March 1994.

Even with repair work, though, accident rates are high. About 25% of mishaps occur because of poor construction work, and a smaller percentage happen because of external pipe corrosion linked to inadequate insulation. These problems were highlighted in April 1995, when a huge gas pipeline explosion in the Komi region forced a commercial airliner to change course to avoid colliding with a 25,000-foot high fireball.

In late 1995, the EBRD study estimated that an additional \$3 billion would be needed to fully complete repairs to Russia's gas network. In late 1996, internal Russian estimates placed needed

investment at around \$12 billion. In December 1996, the EBRD approved a \$225-million loan as part of a \$300-million investment program geared towards rehabilitating Gazprom's pipeline network. The money specifically will be used for improving pipeline inspection, metering, replacing valves, and introducing mobile compressor stations along various pipeline segments. The European Community, which will rely increasingly on Russian gas imports, is continuing to examine the pipeline safety issue to study how it impacts on the security of future gas supplies.

Russia currently exports about 30% of its natural gas production. Of this amount, about two-thirds are sent to European markets and the remainder to CIS countries. Western Europe relies on Russian gas to meet about a quarter of its consumption needs. Although shipments by Gazprom to CIS countries are relatively small and are partially subsidized, a few countries, such as Belarus, Moldova, and Ukraine, have amassed large arrears since 1993. In 1996, it was estimated that it both Russian and CIS customers was owed the equivalent of \$10 billion by CIS countries for past gas deliveries by Gazprom. In October 1996, Ukraine's arrears were pegged at \$1.4 billion, most of which was incurred in 1994. In response, Gazprom had cut its Ukrainian gas shipments by more than 25% at various times in the past few years.

In late 1996, Gazprom was undergoing discussions concerning possible long-term gas sales agreements with a number of countries, including the Czech Republic, Hungary, and Ukraine to increase annual purchases. In August 1996, Gazprom continued talks with Slovenia regarding a possible 2.27 million cubic meters per day, 186-mile pipeline extension from Hungary to Italy via Slovenia.

Petroleum.—In 1996, Russia reduced the rate of decline in output to produce over 301 Mt of oil and condensate, which was almost 6 Mt less than in 1995. Output fell by almost 11 Mt in 1995 compared with 1994. Joint ventures in 1996 produced 15.1 Mt of oil which was a 16% increase compared with 1995. In 1996, total refining throughput was 176.2 Mt.

Production was still declining, which was attributed to management and production inefficiencies, outdated and inadequate infrastructure, lack of investment, declines in domestic demand, low domestic prices, difficulties in exporting, and uncertainty surrounding property right issues.

The country was also experiencing problems with oil transport as investment is needed to repair and modernize the pipeline system run by the state pipeline company Transneft. New pipelines are needed and existing pipelines must be repaired and upgraded. Although plans to expand the system are allotted top priority, not much actual work can be done without increased investment.

It was estimated that 5% to 7% of Russia's oil production is lost due to accidental leakage. One of the largest accidents in recent years occurred in September 1994, when a spill of between 100,000 and 2.3 million barrels took place near Usinsk in the Komi region north of the Arctic Circle. Since the spill, Western oil companies have reevaluated the risk of shipping oil through Russian pipelines. However, many companies have no

alternative to using the overworked Transneft trunk lines. For example, while Conoco Inc. of the United States installed a modern, environmentally safe line from its Polar Lights JV, it is forced to link with the older Komineft pipeline to reach other exchanges on the main Transneft network.

In 1996, Russian crude oil exports totaled about 125.6 Mt which was a 3% increase compared with 1995 exports of about 122.3 Mt. In 1996, exports of refinery products increased by 20% to about 56.5 Mt compared with about 47.1 Mt in 1995. This increase occurred despite continued production declines. Oil consumption, however, fell faster than production, falling from 3.8 million barrels per day (Mbbbl/d) in 1993 to 2.5 Mbbbl/d in 1996.

Russian exports of crude oil and refinery products to countries outside the CIS totaled about 160 Mt in 1996, which was about 20 Mt increase compared with 1995. The share of total crude oil and refinery products exported to countries outside the CIS rose from about 50% in 1992 to almost 90% in 1996.

Over 1.1 Mbbbl/d of Russian oil exports in 1996 went via Black Sea ports, over 0.5 Mbbbl/d through Baltic ports, 0.8 Mbbbl/d through the Druzhba pipeline, and the rest through smaller ports and pipelines. Exports from Black Sea ports increased to their highest level since 1990 and have become an issue with Turkey which has expressed strong environmental concerns regarding increased shipping traffic through Turkey's Bosphorus channel between the Black Sea and the Mediterranean through which many Russian oil supertankers now pass on their way to export markets. Most of the Russian oil joint-venture exports went via the Druzhba pipeline, with smaller amounts exported through the port of Ventspils in Latvia, as well as Black Sea ports.

Former Soviet Bloc countries imported 0.6 Mbbbl/d via the Druzhba pipeline, which passes through Ukraine on the way to the Czech Republic, Poland, and other countries in Eastern Europe. Joint venture exports averaged 200,000 barrels per day (bbl/d) in 1996, which was slightly less than in 1995. Joint ventures and other oil producers have been hampered by the lack of pipeline access to export their oil. Russian crude oil exports have increasingly been dominated by the state under a system in which the state buys crude from producers at internally set prices, and then exports the crude oil at international market prices, which are much higher. State exports increased from about one quarter of the share of total crude oil exports outside the FSU in 1995 to two-thirds of the share in 1996. The share of state exports could rise even further in 1997 if all of the state contracts are fulfilled.

As a result of reorganization and privatization processes begun in 1993, the Russian oil sector was divided among partially privatized vertically integrated companies, a smaller number of regional companies, and a number of remaining state-owned enterprises. Through this ongoing privatization process, 10 vertically integrated companies (VIC's) had been established by early 1997. These VIC's are: Lukoil; Yukos; Surgutneftegaz; Sidanco; Tyumen Oil Company; Sibneft; Slavneft; East Oil Company; Onako; and Sibero-Uralskaya. The extent of privatization of these these companies has varied.

For example, the state owned less than 17% of Lukoil, whereas its share holdings in the other VICs ranged between 19% and 51%.

Besides creating VICs, state-owned oil assets also have been divested and consolidated in four of Russia's autonomous republics: Tatneft (Tatarstan); Bashneft (Bashkortostan); Komitek (the Komi Republic); and Yunko (Chechnya). The predominantly state-owned enterprises that remain include Rosneft, Transneft, and Gazprom.

Lukoil is the largest producer of the VIC's. After a tender in August 1995, Lukoil was privatized to a greater extent than any other VIC. As a result of that tender, the Arco Corp. of the United States purchased a 6.3% stake in Lukoil for \$250 million. In September 1996, Arco followed this acquisition with the creation of the LUKArco venture, with Lukoil holding a 54% share and Arco 46% share. LUKArco plan to invest \$5 billion in energy projects during the next 18 years with one of the first investments to be in the planned export pipeline from Kazakstan's Tengiz oilfield.

Also, Lukoil has entered into numerous foreign ventures, including the \$8-billion AIOC joint venture in Azerbaijan to develop offshore deposits, as well as in projects in Kazakstan, Egypt, and Tunisia. By 2005, Lukoil planned to produce 1.35 Mbbl/d, with 945,000 bbl/d from Russia and the balance of 400,000 bbl/d primarily from Azerbaijan and Kazakstan.

Owing to uncertainty surrounding jurisdiction over resources, licensing, and taxation and uncertain access to export markets, large-scale direct foreign investment in Russia's oil sector declined in 1995 and continued to decline in 1996, as many large companies scaled down their investments. For example, Amoco, the Timan Pechora Company, and the companies operating in all three of the Sakhalin agreements have chosen not to begin their projects until the passage of appropriate legislation. Smaller foreign oil companies were less affected by some of the negative factors depressing large-scale investment in the Russian oil sector.

The Oil and Gas Law, which was signed into law in January 1996, was supposed to provide a framework for attracting foreign investment. According to an analysis by the U.S. Department of Energy, modifications made to get the law passed did not fully provide the guarantees desired by foreign investors. Some provisions that foreign companies found objectionable were: 1) the requirement to have parliamentary approval for fields in areas defined as strategic and for production-sharing agreements not awarded by tender, 2) the Russian government's right to modify conditions of a production-sharing agreement if major economic changes occur during the term of the agreement, 3) a provision that subsequent individual laws will determine which fields can be developed under production-sharing agreements, and 4) the lack of recourse available to foreign investors to resolve disputes in an international tribunal.

Foreign investors were having problems gaining access to foreign markets, with access being curtailed owing to export restrictions, including quotas, restrictive requirements to export through holders of official special exporter licenses, and high export taxes. Investors faced a further barrier when the Russian government instructed joint ventures to supply the bulk of their

oil to former Soviet Republics, where payment problems have arisen.

Joint ventures remained the main vehicle for foreign investment. Oil production joint ventures were increasing rapidly. However, the joint ventures operating in Russia's oil sector in 1996 contributed only 5% of overall production. As of July 1996, there were 106 joint ventures (JV) licensed to operate in Russia's oil and gas sectors, but only about 35 of these were engaged in actual primary oil production. Just under one-half of these primary oil producing JVs are in West Siberia. While some JVs are involved in new field developments, many ventures are engaged in rehabilitation and technical services activities at existing fields.

Conoco's Polar Lights was the largest producing JV in Russia. In August 1994, Polar Lights initiated production at the 110-million-barrel Ardalin field in the Timan-Pechora region. In the first half of 1996, exports by the Polar Lights JV ranged between 17,000 bbl/d and 36,000 bbl/d. In 1997, Polar Lights plants to commission the surrounding Oshkotin, Kolva, and Dyusushev satellite fields. Conoco's investment in the Polar Lights JV had accounted for more than 70% of total foreign direct investment in Russia's oil and gas sector in 1995. The company eventually plans to spend up to \$2 billion in regional field development.

Other major JV operators listed by the U.S. Department of Energy include Canadian Fracmaster Ltd. in the Yuganskfracmaster JV, British Gas in the KomiArcticOil JV, Occidental Petroleum Corp. in the Vanyoganeft JV, Canadian Fracmaster and PanCanadian Petroleum Ltd. in the Samotlor Services JV that produces mainly through tertiary recovery, Mieko in the Mekamineft JV, and Philbro Energy and Anglo-Suisse in the White Nights JV. At White Nights, Philbro is developing reserves of over 200 million barrels at the Tagrinsk and West Varyegan fields in West Siberia and is exporting around 12,000 bbl/d. In the past, White Nights was plagued by high tax rates, which led to production cuts.

Foreign investment was mainly occurring in three areas: Timan-Pechora; West Siberia; and Sakhalin Island. In December 1996, a consortium comprising Texaco with a 30% share, Exxon with 30%, Amoco with 20%, and Norsk Hydro with 20% signed a protocol production-sharing agreement (PSA) for development of an estimated 2.2 billion barrels of recoverable reserves in 11 area fields in Timan-Pechora's Varandey region near the Barents Sea coast. A final agreement was expected to be signed in early 1997. Current plans envisage investments of \$45 billion over the 50-year project life. Negotiations were occurring that might allow Rosneft and another Russian partner to acquire a 20% stake in the project. Also in Timan-Pechora, in November 1996, Exxon won a tender allowing it to obtain a 50% stake in a planned \$1-billion development of the Central Khovereiskaya basin, which contains nine fields with reportedly 500 million barrels of reserves. The Russian government would retain the remaining 50% equity in the venture.

In West Siberia, in 1995, Amoco signed a preliminary agreement with Yuganskneftegaz and Yugraneft in 1995 to develop the 5 billion barrel North Priobskoye field. Output is

expected to peak between 2000 and 2020, at 400,000 bbl/d, and total investment is expected to be \$35 billion over the project's 30-year life. However, final contract terms and transportation routes were still in dispute. This agreement followed another by Shell, which won exclusive negotiating rights for development of an estimated 900 million barrels of oil in the Upper Salym, West Salym, and Vadelyp fields in West Siberia. Following planned startup in 1998, peak output was expected to reach 120,000 bbl/d in 2003. Over the project's 25-year life, total investment is projected to reach \$11 billion. Further progress on the Shell project reportedly was being stalled by disagreements concerning production sharing terms.

Sakhalin Island is the site of four potentially large new developments. As reported by the U.S. Department of Energy, in June 1995, Exxon as a 60% shareholder and Japan's Sakhalin Oil and Gas Development Company Limited (Sodeco) as a 40% shareholder signed the Sakhalin-1 agreement to develop about 2 billion barrels of oil and about 425 billion cubic meters of natural gas reserves contained in the Arkutun-Dagi field. Peak production from Arkutun-Dagi could reach 200,000 bbl/d of oil and 40 million cubic meters per day of gas.

In June 1994, the Sakhalin Energy Investment Company, composed of Marathon with a 30% share, Japan's Mitsui with 20%, McDermott with 20%, Shell with 20%, and Diamond Gas (a Mitsubishi subsidiary) with 10%, signed the Sakhalin-2 PSA to develop the offshore Piltun-Astokhskoye and Lunskeye fields. Potential recoverable oil and gas reserves are estimated at 705 million barrels and almost 400 billion cubic meters, respectively. A revised development plan announced in July 1996 accelerated Sakhalin-2's startup date from 2002 to 1998. First stage production will reach 90,000 bbl/d of oil. Early output will be carried via a short pipeline to a single-point mooring buoy and storage tanker, for periodic loading onto shuttle tankers.

In May 1996, Exxon announced that talks had been completed regarding a PSA for development of the Ayashskiy and East Odoptinskiy blocks offshore Sakhalin Island. Exxon plans to spend \$300 million in exploration activities in these two blocks. Also, Mobil and Texaco concluded a PSA for the nearby Kirinskiy block, under which the firms would spend \$150 million in a 6-year exploration program scheduled to start in 1997. Prior to the signing of separate contracts, Exxon, Mobil, and Texaco were part of a single consortium that had bid on the original Sakhalin-3 tender.

A Sakhalin-4 tender was being held for additional acreage off Sakhalin Island that is estimated by Russian sources to contain a potential 1.5 billion barrels of oil and 60 billion cubic meters of gas.

After 4 years of development, in October 1996, U.S.-based Occidental wrote-off its \$105-million investment in its Parmaneft JV in the Komi Republic. However, the company will still pursue exploration activities under its contract. Occidental's action was preceded by the departure of other foreign oil companies from Russia's oil sector. In 1994 and 1995, several oil companies, including Elf Acquitaine, Saga, and PetroCanada left Russia, mainly because of the country's ambiguous and unfavorable legislation governing oil sector

investment. These companies were some of the first to invest in Russia after the breakup of the Soviet Union in 1991.

According to information supplied by the U.S. Department of Energy, Russia has 28 refineries with a total capacity of 6.7 mb/d. Most of Russia's refineries were constructed in the 1940's and 1950's and lack state-of-the-art technology.

In mid-1996, capacity utilization rates averaged about 60%, but varied widely depending upon the refinery. For example, throughput at the 188,000-bbl/d Volgograd plant was around 90% of capacity, whereas the 362,000-bbl/d Ryazan refinery operated at only 30% of maximum throughput. In addition, Russian refineries were not designed to produce light products, such as gasoline. Catalytic cracking accounted for only 4% of primary distillation capacity. Low investment levels resulted in poor maintenance and working conditions, which led to inefficient and dangerous operating conditions. In December 1996, an explosion occurred at the 464,000-bbl/d Angarsk refinery in a distillation unit that was under repair. The blast killed three workers and injured four others.

In 1993, a 5-year refinery modernization program began with funding acquired from domestic and foreign sources. The Ministry of Fuel and Energy's program to restructure the refinery sector calls for building several refineries in Russia and upgrading existing refineries. The ministry hopes to increase throughput to 4.2 Mbbbl/d in the year 2000.

However, a 1995 International Energy Agency (IEA) report, "Energy Policies of the Russian Federation," stated that this modernization program spreads financial resources too thin and "lacks discrimination between viable refineries and those that probably will not survive the ongoing economic transition." Also, the IEA forecasts Russian refinery throughput in 2000 at just over 3 Mbbbl/d, which is only 70% of Russian government forecasts. The Agency believes that existing capacity is adequate to meet Russia's near-term demand. Nevertheless, a number of upgrading projects either are underway or have been completed with Western assistance. The majority of these are targeted at increasing refining depth and secondary capacity. Russia has refinery export quotas similar to those for crude oil producers.

The 243,000-bbl/d Moscow and 388,000-bbl/d Kirishi refineries are Russia's only major source of high-quality gasoline. Car usage has quadrupled since 1992, causing the demand for gasoline to rise significantly. This increased demand has led a number of Western oil companies to enter Russia's retail market. Finland's Neste opened the first non-Russian retail outlet in St. Petersburg in 1991 and now runs 11 regular and 3 diesel stations. Other companies such as Agip (Moscow), Amoco (Ryazan), and Statoil (Murmansk) have opened Western style gas stations at a cost of up to \$1 million each.

Uranium.—According to an article published in the Russian newspaper *Nezavisimaya Gazeta*, Moscow, September 12, 1996, p. 4, the largest producers of uranium in the FSU are Uzbekistan producing 8% of the world's supply of primary uranium, followed by Kazakhstan producing 6.7%, and then Russia producing about 6%. At the beginning of 1994, there

were reportedly 250,000 t of proven and 420,000 t of estimated uranium reserves in Russia according to the Russian system of reserve classification. However, these reserves include raw materials with rather varied economic parameters. As the International Agency on Atomic Energy qualifies as economic only resources valued at \$80 per 1 kg of natural uranium, in Russia, reserves of this cost category, according to *Nezavisimaya Gazeta*, comprise 165,400 t, or 25% of all those resources in consideration.

These economic reserves are concentrated in Streltsovskiy Rayon. The total resources of deposits in the Streltsovskiy uranium ore mining region are appraised at approximately 300,000 t. Here, 10 uranium deposits containing relatively rich ores have been discovered over an area of 150 square kilometers, of which the Streltsovskiy and Tulukuyevskiy deposits reportedly have reserves of 60,000 t and 35,000 t of uranium, respectively. The region has been intensively exploited since the early 1970's, and its raw material base has been significantly depleted. At the time of their discovery, 31% of the ore reserves had a uranium content of over 0.35%. By 1996, these reserves were nearly depleted and the average uranium content of the reserves remaining is close to 0.2%. The periphery of the Streltsovskiy region has been thoroughly geologically studied, and there is no expectation of any significant replenishment to its raw material base. Individual relatively small deposits on the territory of the Transbaykal region have limited reserves and cannot be considered significant sources of supply.

The only uranium mining enterprise in the Russian Federation, the Priargunskiy mining-chemical complex, operates on the basis of reserves in the Streltsovskiy rayon. Uranium mining in Russia at the Priargunskiy mining-chemical complex in 1990 comprised around 4,000 t. In connection with the economic crisis and the changeover to market relations, uranium mining dropped to 2,300 t in 1993 and continued to decline.

Most of the discovered uranium deposits, along with their mining complexes, are located outside the boundaries of Russia. At the same time, 60% of the capacities for atomic powerplants (AES) in the CIS countries are in Russia. Russian AES produce over 10% of the country's total electrical energy. According to the Concept for Development of Atomic Energy of the Russian Federation to the Year 2030, the capacity of operating AES is to be brought up to 30% of the total power production in the country.

The annual consumption of uranium in the Russian atomic power industry comprises around 4,000 t. Russia supplies another 2,200 t/yr of uranium to AES built according to Russian designs in the countries of Eastern Europe, and around 2,000 t of uranium are exported elsewhere. As a result, Russia expends around 8,000 to 8,500 t/y of uranium. Thus, with the current uranium consumption even without taking into consideration the development of the atomic power industry, uranium reserves may be depleted by the years 2005-2010. According to the predictions of Russian specialists, after the year 2000, with a probable expansion of export and increase in the capacity of AES, expenditure of stockpiled reserves will accelerate, and by 2005-10 they may be exhausted.

Reserves

In January a Directive of the Russian Federation confirmed the list of basic types of strategic raw materials needed by the economy for which Russia had to increase its geologic exploration. The list of Basic Types of Strategic Raw Materials was composed of the following: Antimony, Bauxite, Beryllium, Chromium, Cobalt, Copper, Diamonds, Germanium, Gold, Lead, Lithium, Manganese, Molybdenum, natural Gas, Nickel, Niobium, Oil, Platinum, Quartz (especially pure), Rare earth (metals) of the yttrium group, Rhenium, Scandium, Silver, Tantalum, Tin, Titanium, Tungsten, Uranium, Zirconium.

There had been a large cut back in geologic exploration in recent years because of lack of funding. As a result, the country was not replenishing its mineral reserves at a rate adequate to compensate for the rate at which they were being depleted. In 1996, in comparison with 1995, prospecting and exploration fell 18.3%, hydrogeological and geological engineering 73%, and geologic mapping 94%. Financial constraints in 1996 regularly brought prospecting and exploration to a halt. Geologic companies found it hard to pay for inputs and to issue wages. Wage arrears in the geological sector totaled 819 billion rubles (\$146 million) by the start of 1997, with average delays in wage payments of 3 months. Geologic companies in 1996 worked on 500 of a planned 708 projects. Underfunding pushed surveying on a scale of 1:200,000 for federal requirements down from 185,000 square meters in 1995 to 120,000 square meters in 1996. Up to 82% of Russia's territory has been surveyed on this scale, but only 27% of this has been geologically mapped to international standards.

Russia had been unable to compensate for the extraction of mineral resources since 1994. In 1996, geologic exploration replenished only 37% of lead and zinc mined during the year, 28% of tin, 21% of tungsten, 18% of copper, 16% of nickel, and 15% of all bauxite, and reserves at operational mines were being rapidly depleted.

Geologic companies in 1996 concentrated on sustaining a minimum volume of proven reserves for mining companies and on prospecting for high value, strategic, and other types of raw material in very short supply in Russia. The country achieved some success in meeting these goals. In 1996, reserves of coal, platinum and diamond grew respectively 40%, 53% and 21% compared with 1995.

Plans for 1997 called for financing for geologic work to remain at about the 1996 level. Of all available funds, 68.7% will be spent on prospecting for fuel deposits, of which 66.3% will be for oil, 1.7% for solid fuel, and 0.7% for uranium.

In May, the Russian government issued a list of 250 mineral sections for investment with a section defined as a deposit or group of deposits in one region available for investment under PSA. However, the list was recalled, and in December the Government issued a reduced list of 127 sections of which 103 were for oil and gas and 17 were ferrous, nonferrous, and precious metals. The list is composed of two groups, of which one group is slated for development in 1997 and the other for 1998 to 2000. Deals for 49 projects were envisaged for 1997. At 29 of these 49 projects, production was already underway,

including at the large Samotlor oilfield in West Siberia and oilfields in the Komi Republic and Udmurtia. The list of hydrocarbon sections contains both on and offshore deposits throughout the country. (For a more detailed list of these sections, refer to Interfax Petroleum Report, Denver, Colorado, v. V, December 13-20, 1996, p. 20-22).

The Russian mining and metallurgical industry is undergoing a fundamental transformation. Practically the entire industry is being privatized in some form, enabling various forms of investment and ownership to take place. These changes are transforming the mineral enterprises into market-oriented producers driven by sales and financed through private domestic and foreign investment. In this process, enormous assets with the potential to generate great wealth are being acquired by foreign and domestic private enterprises and investors. Along with this, control by the former managerial structure is being replaced by new owners who may or may not include former management. Displaced managers are at times struggling to resist these changes, but it appears that the prevailing factor is the ability to gain control of an enterprise through investment.

The changes that are taking place are upsetting not only former patterns of management, but also of trade, input supply, financing, employment levels, etc. These changes are causing serious social disruptions to some groups and individuals, even when an enterprise performs profitably. For many other mineral enterprises that are not considered economic under the new market economy criteria, it is an especially painful period as they seek to adjust and find some market niche to ward off going bankrupt. Thus, the situation in the mineral sector and within individual industries has been highly uneven, as some industries or portions of industries have been quickly transformed into profitable market oriented producers, while many others have not yet found a way to produce profitably in a market economy setting. Some industries such as the iron ore or steelmaking industries are seeing investment flowing only into those few enterprises with the highest quality reserves or most up-to-date facilities, while the rest of the sector is struggling to survive.

The Russian mineral industry is going through a period where there is a huge struggle being waged to acquire control of its profitable assets, with the struggle occurring among foreign and domestic private enterprises and investors, national and regional governments and bureaucracies, and former and new managerial structures all seeking to keep or gain control of mineral industry production. Often the struggle is conducted in the financial arena, at times in the courts, and at times outside the law. Although the struggle to wrest control of the mineral sector is being waged in these arenas, it appears that market forces have the upper hand. As new avenues for investment keep emerging, it appears that the force of capital is succeeding

in gaining control of potentially profitable sectors of the mineral industry, and that this force is well on its way to shaping the future of the Russian mineral industry.

This transformation is leaving enormous problems in its wake for those mineral enterprises that are not deemed by investors to be potentially profitable. These types of enterprises far outnumber those that are attracting investment. At times, a creative, aggressive approach has brought some of these industries that appeared to be floundering, such as the titanium industry or apatite industry, on the road to recovery, but there are many more industries in jeopardy than those that are succeeding.

It may be that market forces will eventually restructure the Russian mineral industry down to its profitable core. In the mean time the mineral sector has to deal with many of the difficult issues of this transformation that has been as much a matter of dismantling the industry as it is of its restructuring.

Many of the problems facing the industry were discussed by the Chairman of the Russian Committee for Metallurgy in an interview in *Delovoy Mir*, Moscow, August 6, 1996, p. 4. This was the same month that the Russian Committee for Metallurgy was abolished.

According to the Chairman, development of the mineral-raw material base in Russia requires a vast amount of funds which are difficult to find. The lack of infrastructure makes it more difficult for the assimilation of already explored remote deposits and for further expansion of explored reserves. Furthermore, the investment crisis has frozen exploration for mineral reserves. The depreciation of the capital stock of many mining enterprises has reached 70%, and these enterprises are becoming inoperable. Furthermore, quite often quarries and mines in Russia produce ores that in other countries are considered uneconomic.

The reserves of mining enterprises need to be updated in proportion to the extraction of ore. The Chairman of the Russian Committee for Metallurgy predicts that by the year 2000 70% of the capacities to extract lead, zinc, and tungsten, 57% of those for copper, 66% for tin, and one-half of the capacities to extract nickel would disappear, and the capacities for rare-earth elements would be lost completely.

The Chairman stated that this great deterioration was occurring because of the loss of budgetary subsidies, and he appeared to be advocating restoring these subsidies and some degree of state control. However, such moves do not seem imminent, as the trend appears to be that private capital investment and private management rather than state subsidies and control will determine the future of the Russian mineral sector.

TABLE 1
RUSSIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Thousand metric tons unless otherwise specified)

Commodity 2/ METALS	1992	1993	1994	1995	1996
Aluminum:					
Ore and concentrate:					
Bauxite, 26% to 57% alumina e/	4,580 3/	4,260 3/	3,000	3,100	3,300
Nepheline concentrate, 25% to 30%	1,612 r/	1,394 r/	982 r/	1,006 r/	1,000
Alumina	2,718	2,500 e/	2,254	2,300 r/ e/	2,150
Metal, smelter, primary	2,730	2,820	2,669	2,722	2,874
Antimony, mine output, SB content e/	tons 10,000	7,000 r/	7,000	7,000	7,000
Arsenic, white e/	do. 2,500	2,000	1,500	1,500	1,500
Beryllium, beryl, cobbled, 10% to 20% BeO e/	do. 1,100	1,000 r/	1,000 r/	1,000 r/	1,000
Bismuth, mine output, Bi content e/	do. 5	4	4	5	
Cadmium metal, smelter e/	do. 800	700	600	725	730
Chromium, chrome ore, marketable	do. 121,000	121,000	151,400	107,700	96,700
Cobalt:					
Mine output, recoverable Co content e/	do. 4,000	3,300	3,900	4,000	3,900
Metal, refinery	do. 4,100	3,700	4,340	4,450	4,200
Copper:					
Ore, Cu content, recoverable	do. 698,500	583,600	573,300	526,000 r/	523,000
Metal					
Blister: e/					
Primary	do. 651,000	533,700	514,300	525,000 r/	549,600
Secondary	do. 10,000	10,000	10,000	20,000	20,400
Refined	do. 572,000	526,200	501,800 r/	560,300 r/	600,000
Gold, mine output, Au content	kilograms 146,000	149,500	146,600	132,170	123,000
Iron and steel:					
Iron ore, 55% to 63% Fe	82,100	76,100	73,300	78,300	72,100
Metal:					
Pig iron for steelmaking	46,100	40,900	36,100	39,800	37,200
Ferromanganese e/	200	150	125	125	120
Electric furnace ferroalloys e/	1,100	850	800	650	625,000
Crude steel	67,000	58,300	48,800	51,300	49,200
Finished rolled steel	46,800	42,700	35,900	39,100	38,800
Steel pipes	8,100	5,800	3,600	3,700	3,500
Lead:					
Mine output, recoverable Pb content	tons 35,000 r/ e/	34,000 r/	25,000 r/	23,000 r/	18,000
Metal, smelter:					
Primary	do. 33,000 r/ e/	32,000 r/	28,000 r/	19,000 r/	19,000
Secondary	do. 13,500 r/ e/	13,000 r/	6,000 r/	11,000 r/	11,000
Magnesium metal, primary e/	do. 40,000	30,000	35,400 3/	37,500 3/	35,000
Mercury metal, including secondary e/	do. 25 r/	5 r/	5 r/	5 r/	5
Molybdenum e/	do. 10,800	10,300	7,700	8,800	8,700
Nickel:					
Mine output, recoverable Ni content	do. 280,000	244,000	240,000	251,000	230,000
Nickel, products	do. 245,000	184,000	180,900	201,900	190,000
Platinum-group metals: e/					
Platinum	do. 28	20	15	18	17
Palladium	do. 70	50	40	48	47
Others	do. 6	4	3	4	4
Silver metal including secondary e/	do. 800	700	700	700	675
Tin:					
Mine output, recoverable Sn content e/	do. 16,000	14,000	13,000 r/	12,500 r/	11,000
Metal, smelter:					
Primary	do. 15,200	13,400	11,500	9,500	10,500
Secondary e/	do. 1,500	1,500	1,000	1,000	1,000
Total e/	do. 16,700	14,400	12,500	10,500	11,500
Titanium, metal e/	do. 15,000 r/	10,000 r/	10,000 r/	14,000 3/	20,000 3/
Tungsten concentrate, W content e/	do. 13,000	10,200	5,200	7,000 r/	3,500
Vanadium metal	do. 7,500 r/	7,200 r/	6,700 r/	6,000 r/	6,000
Zinc:					
Mine output, recoverable Zn content	do. 160,000 e/	154,000 r/	147,000 r/	131,000 r/	126,000 r/
Metal, refined	do. 225,000 r/ e/	203,000 r/	138,000 r/	166,000 r/	172,000

See footnotes at end of table.

TABLE 1--Continued
RUSSIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Thousand metric tons unless otherwise specified)

Commodity 2/	1992	1993	1994	1995	1996
INDUSTRIAL MINERALS					
Asbestos, grades I-VI e/	1,300	870 3/	615 3/	600	615
Barite	116	71	70	70 e/	70 e/
Cement, hydraulic	61,700	49,900	37,200	36,400	27,800
Diamond: e/					
Gem	9,000	8,000	8,600	9,000	9,300
Industrial	9,000	8,000	8,600	9,000	9,300
Total	18,000	16,000	17,200	18,000	18,600
Feldspar e/	100	70	50	50	50
Fluorspar	347 r/	236 r/	250 r/	250 r/ e/	250 e/
Graphite e/	15	10	8	8	8
Zinc e/					
Gypsum	1,416 r/	1,104 r/	789 r/	697 r/	600
Magnesite, marketable product e/	1,100	800	700	700	700
Mica e/	150	129 3/	100	100	100
Nitrogen, N content of ammonia	10,529 r/	9,900 r/	8,838 r/	9,657 r/	8,700
Phosphate rock: e/					
Apatite, concentrate, 37% to 39.6% P ₂ O ₅	11,500	9,000	8,000	8,500	7,210 3/
Sedimentary rock, 19% to 30% P ₂ O ₅	600	400	300	300	300
Total	12,100	9,400	8,300	8,800	7,510
Potash, K ₂ O equivalent	3,470	2,628	2,498	2,800	2,700
Salt, all types	3,600	2,200	2,000	2,500	2,500
Sodium compounds, n.e.s., carbonate	2,679	1,992	1,585	1,823	1,700
Sulfur: e/					
Native	100	100	80	80	80
Pyrites	800	800	700	460	400
Byproducts:					
Of metallurgy	300 r/	300 r/	320 r/	450 r/	325
Of natural gas	2,400 r/	2,300 r/	2,400 r/	2,700 r/	2,400
Total	3,600 r/	3,500 r/	3,500 r/	3,690 r/	3,205
Sulfuric acid	9,704 r/	8,243 r/	6,334 r/	6,946 r/	6,100
Talc e/	150,000	132,000 3/	100,000	100,000	100,000
Vermiculite e/	60	50	40	40	40
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Bituminous	210,000	193,000 r/	177,000 r/	177,000 r/	175,000
Lignite and brown coal	127,000	113,000 r/	95,300 r/	85,900 r/	80,000
Total 4/	337,000	306,000	272,000	263,000 r/	255,000
Coke, 6% moisture content	31,000	27,600	25,400	27,600	23,600
Gas, natural, marketed, as reported	641,000	618,000	607,000	595,000	601,500
Oil shale	3,800	3,300	3,300	2,400 r/	2,000
Peat, fuel use	7,800	2,500	2,900	4,400 r/	4,500
Petroleum:					
Crude:					
As reported, gravimetric units	399,000	354,000	318,000	307,000	301,000
Converted, volumetric units e/	2,900,000	2,600,000	2,300,000	2,250,000	2,200,000
Refinery products 5/	256,000	223,000	186,000	183,000	175,000
Uranium, U content e/	3,000	2,300 r/	2,100 r/	1,600 r/	1,500

e/ Estimated. r/ Revised.

1/ Table includes data available through Mar. 16, 1998.

2/ In addition to the commodities listed, dead-burned lime, diatomite, kaolin, lithium minerals, and natural corundum are produced, but information is inadequate to make reliable estimates of output levels.

3/ Reported figure.

4/ Run-of-mine coal.

5/ Not distributed by type and therefore not suitable for conversion to volumetric units. Data include all energy and nonenergy products but exclude losses.

TABLE 2
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1996

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location	Annual capacity e/
Alumina	Achinsk	Achinsk in East Siberia	900,000.
Do.	Bogoslovsk	Urals	1,050,000.
Do.	Boksitogorsk	European north	200,000.
Do.	Nadvoitsy	Nadvoitsy in Karelia	266,000.
Do.	Uralsk	Kamensk region	536,000.
Do.	Volkhov	Volkhov, east of St. Petersburg	45,000.
Aluminum, primary	Smelters:		
Do.	Volkhov	do.	20,000.
Do.	Uralsk	Kamensk	70,000.
Do.	Bogoslovsk	Krasnoturinsk	162,000.
Do.	Novokuznetsk	Novokuznetsk	284,000.
Do.	Kandalaksha	Kola Peninsula	62,500.
Do.	Nadvoitsy	Nadvoitsy in Karelia	68,000.
Do.	Volgograd	Volgograd	168,000.
Do.	Irkutsk	Sherekov, near Irkutsk	262,000.
Do.	Krasnoyarsk	Krasnoyarsk	755,000.
Do.	Bratsk	Bratsk	843,800.
Do.	Sayansk	Sayanogorsk	274,000.
Apatite, concentrate	Khibiny apatit association	Kola Peninsula	15,000,000.
Do.	Kovdor iron ore mining association	do.	700,000.
Asbestos	Kiyembay	Orenburg Oblast	500,000.
Do.	Tuvaasbest	Tuva Republic	250,000.
Do.	Uralasbest	Central Urals	1,100,000.
Bauxite	North-Urals mining company	Severouralsk region	NA.
Do.	South-Urals mining company	South Urals region	NA.
Do.	Severnaya Onega Mine	Northwest region	800,000.
Boron	Bor Association	Maritime region	140,000 (boric acid).
Do.	Amur River complex	Far East	8,000 (boric acid).
Do.	Alga River chemical complex	do.	12,000 (boric acid).
Chromite	Saranov complex	Saranov	200,000.
Coal	Basins:		
Do.	Donets (east)	Rostov Oblast	30,000,000.
Do.	Kansk Achinsk	East Siberia	50,000,000.
Do.	Kuznetsk	West Siberia	160,000,000.
Do.	Moscow	Moscow region	15,000,000.
Do.	Neryungri	Yakut-Sakha Republic	15,000,000.
Do.	Pechora	Komi Republic	30,000,000.
Do.	South Yakutia	Yakut-Sakha Republic	17,000,000.
Cobalt	Norilsk Nickel	Norilsk, Kola Peninsula	4,000.
Do.	Rezh, Ufaleynikel	Southern Urals	4000
Do.	Yuzhuralnikel enterprises		(total southern Urals)
Do.	Tuva cobalt	Khovu-Aksy in Tuva Republic	NA.
Copper, mining and beneficiation complexes (Cu content of concentrates)	Buribai enterprise	Buribai region	5,000.
Do.	Gai complex	Gai region	40,000.
Do.	Kirovgrad complex	Kirovgrad region	12,000.
Do.	Krasnouralsk complex	Krasnouralsk region	12,000.
Do.	Norilsk complex	Norilsk region	400,000.
Do.	Sredneuralsk complex	Ekatrinenburg region	12,000.
Do.	Uchali complex	Uchali region	40,000.
Do.	Urap complex	Stavropol region	7,000.
Copper, metal (smelting and refining complexes)	Kirovgrad (smelting)	Kirovgrad	150,000.
Do.	Krasnouralsk (smelting)	Krasnouralsk	60,000.
Do.	Kyshtym (refining)	Kyshtym	70000.
Do.	Mednogorsk (smelting)	Mednogorsk	40,000.
Do.	Norilsk (smelting and refining)	Norilsk	500,000.
Do.	Pyshma (refining)	Pyshma	350,000.
Do.	Severonikel (smelting)	Monchegorsk	20,000.
Do.	Sredneuralsk (smelting)	Revda	140,000.

See footnotes at end of table.

TABLE 2--Continued
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1996

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location	Annual capacity e/	
Diamonds	thousand carats	Almaznyy Rossii-Sakha Association	Aykhal, Mirnyy, Udachnaya areas of Yakut-Sakha Republic	10,000 gem, 10,000 industrial.
Feldspar	Deposits:			
Do.	Lupikko	Karelia	NA.	
Do.	Kheto-Lanbino	do.	NA.	
Ferroalloys	Kosaya Gora iron works	Kosaya Gora	200,000.	
Do.	Kuznetsk ferroalloy plant	Novokuznetsk	400,000.	
Do.	Lipetsk iron and steel works	Lipetsk	NA.	
Do.	Serov ferroalloy plant	Serov	NA.	
Do.	Tulachermet Scientific and Industrial Association	Tula	NA.	
Do.	Chelyabinsk electrometallurgical plant	Chelyabinsk	350,000.	
Do.	Chusovoy iron and steel plant	Chusovoy	NA.	
Do.	Klyuchevsk ferroalloy plant	Dvurechinsk	160,000.	
Fluorspar	Mining and beneficiation complexes:			
Do.	Abagaytuy	trans-Baikal	NA.	
Do.	Kalanguy	do.	NA.	
Do.	Kyakhtinsky	do.	NA.	
Do.	Usugli	do.	NA.	
Do.	Yaroslavsky	Far East	NA.	
Gold	kilograms	Gold mining regions:	200,000 (total gold).	
Do.	do.	Yakut-Sakha	Yakut-Sakha Republic	
Do.	do.	Buryat	Buryat Republic	
Do.	do.	Magadan	Magadan Oblast	
Do.	do.	Krasnoyarsk	Krasnoyarsk region	
Do.	do.	Maritime	Maritime region	
Do.	do.	Tuva	Tuva Republic	
Iron ore	Mining areas:			
Do.	Kursk Magnetic Anomaly (KMA) containing following enterprises:		50,000,000 (total KMA).	
Do.	Mikhailovka	Zheleznogorsk		
Do.	Lebedi	Gubkin		
Do.	Stoilo	do.		
Do.	Northwest containing following enterprises:		22,000,000 (total Northwest).	
Do.	Olenegorsk	Olenegorsk		
Do.	Kostomuksha	Kostomuksha		
Do.	Kovdor	Kola Peninsula		
Do.	Siberia (east) containing the following mining enterprises:		18,000,000 (total Siberia east and west).	
Do.	Korshunovo	Zheleznogorsk		
Do.	Rudnogorsk	Rudnogorsk		
Do.	Siberia (west) including the following mining enterprises:			
Do.	Abakan	Abaza		
Do.	Sheregesh	Sheregesh		
Do.	Tashtagol	Tashtagol		
Do.	Teya	Vershina Tei		
Do.	Urals containing following mining enterprises:		22,000,000 (total Urals).	
Do.	Akkermanovka	Novotroitsk		
Do.	Bakal	Bakal		
Do.	Goroblagodat	Kushva		
Do.	Kachkanar	Kachkanar		
Do.	Magnitogorsk	Magnitogorsk		
Do.	Peshchanka	Rudnichny		
Lead-zinc (recoverable metal content of ore)	Mining complexes:			
Do.	Altay mining and beneficiation complex	Altay mountains region, South Siberia	2,000 lead, 1,000 zinc.	
Do.	Dalpolymetal mining and beneficiation complex	Maritime region	20,000 lead, 25,000 zinc.	
Do.	Nerchinsk polymetallic complex	Chita Oblast	7,000 lead, 12,500 zinc.	
Do.	Sadon lead-zinc complex	Severo-Osetiya	5,000 lead, 14,000 zinc.	
Do.	Salair mining and beneficiation complex	Kemerovo Oblast	2,000 lead, 10,500 zinc.	

See footnotes at end of table.

TABLE 2--Continued
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1996

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location	Annual capacity e/
Lead, metal	Dalpolymetal lead smelter	Rudnaya in the Maritime District	20,000.
Do.	Elektrozinc lead smelter	Vladikavkaz in North Caucasus	30,000.
Magnesite	Satka deposit	Chelyabinsk Oblast	3,800,000.
Magnesium, metal (for sale)	Avisma plant	Berezniki	22,000.
Do.	Solikamsk plant	Solikamsk	21,500.
Mica	Mining complexes:		
Do.	Aldan	Yakut-Sakha Republic	NA.
Do.	Karel	Karelia	NA.
Do.	Kovdor	Kola Peninsula	NA.
Do.	Mam	Irkutsk complex	NA.
Molybdenum, mining enterprise	Dzhida tungsten-molybdenum mine	West trans-Baikal	NA.
Do.	Sorsk molybdenum mining enterprise	Sorsk region	NA.
Do.	Tymy-Auz tungsten-molybdenum mining enterprise	North Caucasus	NA.
Do.	Shakhtaminskoye molybdenum mining enterprise	Chita Oblast	NA.
Natural gas	billion cubic meters	Regions:	
Do.	do.	Komi Republic	Komi Republic
Do.	do.	Norilsk area	Norilsk area
Do.	do.	North Caucasus	North Caucasus
Do.	do.	Sakhalin	Far East
Do.	do.	Tomsk Oblast	West Siberia
Do.	do.	Tyumen Oblast including:	do.
Do.	do.	Medvezhye field	do.
Do.	do.	Urengoi field	do.
Do.	do.	Vyrngapur field	do.
Do.	do.	Yamburg field	do.
Do.	do.	Urals	Urals
Do.	do.	Volga	Volga region
Do.	do.	Yakut-Sakha	Yakut-Sakha Republic
Nepheline syenite	Apatite complex	Kola Peninsula	1,500,000.
Do.	Kiya-Shaltyr Mine	Goryachegorsk region, east Siberia	NA.
Nickel, mining enterprise (Ni in ore)	Norilsk Nickel Association	Norilsk region and Kola Peninsula	300,000.
Do.	Yuzhuralnikel company	Southern Urals	20,000 total southern Urals).
Do.	Ufaleynikel company	do.	Urals).
Nickel, metal (smelting and refining complexes)	Norilsk Nikel (smelting and refining)	Norilsk	160,000 (smelting), 100,000 (refining).
Do.	do.	Pechenga	50,000 (smelting).
Do.	do.	Monchegorsk	50,000 (smelting), 140,000 (refining).
Do.	Rezh, Ufaleynikel, Yuzhuralnikel enterprises	Southern Urals	65,000 (total, nickel products and nickel in ferronickel).
Oil shale	Leningradslanets Association	Slantsy region	5,000,000.
Petroleum	Producing regions:		
Do.	European Russia:		
Do.	Astrakhan	Northern Caspian Sea Basin	700,000.
Do.	Bashkortostan	Urals	28,000,000.
Do.	Checheno-Ingush Republic	Southern Caucasus	4,500,000.
Do.	Dagestan	North Caucasus	700,000.
Do.	Kaliningrad Oblast	Baltic coast	1,800,000.
Do.	Komi Republic	Northwest	15,000,000.
Do.	Krasnodar Kray	North Caucasus	2,000,000.
Do.	Orenburg Oblast	Urals	13,000,000.
Do.	Perm Oblast	do.	12,000,000.
Do.	Samara	Volga region	16,000,000.
Do.	Saratov Oblast	do.	1,500,000.
Do.	Stavropol Kray	North Caucasus	2,000,000.
Do.	Tatarstan	Volga region	40,000,000.
Do.	Udmurt Republic	Urals	9,000,000.
Do.	East Siberia: Tomsk Oblast	Tomsk Oblast	11,000,000.

See footnotes at end of table.

TABLE 2--Continued
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1996

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location	Annual capacity e/
Petroleum--Continued:			
Do.	West Siberia:		
Do.	Tyumen Oblast:	Tyumen Oblast	300,000,000.
Do.	Kogolym field	do.	34,000,000.
Do.	Krasnoleninskiy field	do.	12,000,000.
Do.	Langepas field	do.	30,000,000.
Do.	Megion field	do.	18,000,000.
Do.	Nizhnevartovsk field	do.	70,000,000.
Do.	Noyabrsk field	do.	37,000,000.
Do.	Purneftegaz field	do.	12,000,000.
Do.	Surgut field	do.	48,000,000.
Do.	Uray field	do.	8,000,000.
Do.	Varegan field	do.	10,000,000.
Do.	Sakhalin Island	Sakhalin Island	2,500,000.
Phosphate rock	Khibiny Apatit Association	Kola Peninsula	20,000,000 (apatite concentrate).
Do.	Kovdor iron ore mining complex	do.	700,000 (apatite concentrate).
Do.	Kingisepp complex	Leningrad Oblast	NA.
Do.	Lopatino, Yegorevsk deposits	Moscow Oblast	NA.
Do.	Polpinskoye deposit	Bryansk Oblast	NA.
Do.	Verkhnekamsk deposit	Urals	NA.
Platinum-group metals:			130 (total metal).
Ore	Norilsk Nickel Association	Norilsk region	
Metals	Krasnoyarsk refinery of Norilsk Nickel Association	Krasnoyarsk	
Potash, K ₂ O	Uralkaliy	Verkhne Kamsk deposit	3,000,000.
Do.	Silvinit	Solikamsk-Berezniki region of Urals	2,000,000.
Silver	Dukat Mine	Magadan Oblast	1,000 (total silver).
Do.	Coproduct and byproduct of gold and nonferrous metals mining		
Soda ash	Achinsk plant	East Siberia	595.
Do.	Berezniki plant	Urals	1,080.
Do.	Pikalevo plant	Leningrad Oblast	200.
Do.	Sterlitamak plant	Sterlitamak	2,135.
Do.	Volkhov plant	Leningrad Oblast	20.
Steel, crude	Amurstal	Komsomolsk na Amur	1,600,000.
Do.	Asha	Asha	450,000.
Do.	Beloretsk	Bashkir Republic	380,000.
Do.	Chelyabinsk	Chelyabinsk	7,000,000.
Do.	Cherepovets	Cherepovets	14,000,000.
Do.	Chusovoy	Chusovoy	570,000.
Do.	Elektrostal	Moscow	314,000.
Do.	Gorky	Nizhniy-Novgorod	78,000.
Do.	Guryevsk	Guryevsk	160,000.
Do.	Karaganda	Karaganda	6,300,000.
Do.	Kuznetsk	Novokuznetsk	4,700,000.
Do.	Lipetsk	Lipetsk	9,900,000.
Do.	Lysva	Lysva	350,000.
Do.	Magnitogorsk	Magnitogorsk	16,200,000.
Do.	Nizhniy Tagil	Nizhniy Tagil	8,000,000.
Do.	Nizhniy Sergi	Nizhniy Sergi	300,000.
Do.	Novosibirsk	Novosibirsk	1,100,000.
Do.	Omutninsk	Omutninsk	210,000.
Do.	Orsko-Khalilovo	Novotroitsk in Orenburg Oblast	4,600,000.
Do.	Oskol Electric Steel	Stary Oskol	1,450,000.
Do.	Petrovsk-Zabaikalskiy	Petrovsk-Zabaikalskiy	426,000.
Do.	Revda	Revda	281,000.
Do.	Salda	Sverdlovsk Oblast	1,900.
Do.	Serov A.K.	Serov	1,000,000.

See footnotes at end of table.

TABLE 2--Continued
 RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1995

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location	Annual capacity e/
Steel--Continued:			
Do.	Serp i Molot	Moscow	70,000.
Do.	Severskiy	Polevskoy in Sverdlovsk Oblast	825,000.
Do.	Sibelektrostal	Krasnoyarsk	110,000.
Do.	Sulin	Sulin	280,000.
Do.	Taganrog	Taganrog	925,000.
Do.	Tulachermet-Scientific and Industrial Association	Tula	18,400.
Do.	Verkh-Issetkiy	Ekatrinenburg	132,000.
Do.	Volgograd	Volgograd	2,000,000.
Do.	Vyksa	Vyksa	540,000.
Do.	West Siberian	Novokuznetsk	6,900,000.
Do.	Zlatoust	Zlatoust in Chelyabinsk Oblast	1,200,000.
Talc	Deposits:		
Do.	Onotsk	Irkutsk Oblast	NA.
Do.	Kirgiteysk	Krasnoyarsk Kray	NA.
Do.	Miass	Chelyabinsk Oblast	NA.
Do.	Shabrovsk	Sverdlovsk Oblast	NA.
Tin, mining and beneficiation complexes	Khingan	Khabarovsk Kray	NA.
Do.	Solnechnyy	do.	NA.
Do.	Iultin	Magadan Oblast	NA.
Do.	Khrustalnyy	Maritime region	NA.
Do.	Deputatskiy	Yakut-Sakha Republic	NA.
Do.	Pevek	Magadan Oblast	NA.
Tin, smelters	Novosibirsk	Novosibirsk	NA.
Do.	Podolsk	Podolsk	NA.
Do.	Ryazan	Ryazan	NA.
Titanium, metal	Berezniki plant	Berezniki	40,000.
Do.	Moscow plant	Moscow	NA.
Do.	Podolsk plant	Podolsk	NA.
Tungsten, mining and beneficiation complexes (W content of concentrates)	Antonovogorsk	East Transbaikal	NA.
Do.	Balkan	Urals, northeast of Magnitogorsk	NA.
Do.	Belukha	East trans-Baikal	NA.
Do.	Bom-Gorkhom	West trans-Baikal	NA.
Do.	Dzhida	do.	NA.
Do.	Iultin	Magadan Oblast	NA.
Do.	Lermontov	Maritime region	NA.
Do.	Solnechnyy	Southern Khabarovsk region	NA.
Do.	Tyrnyauz	North Caucasus	NA.
Do.	Primorye	Maritime region	NA.
Tungsten, metal	Nalchik plant	Caucasus	NA.
Uranium, U content	Priargunskiy mining and chemical enterprise	Krasnokamensk	3,000.
Vanadium, ore	Kachkanar iron ore mining complex	Urals	NA.
Vanadium, metallurgical processing facilities	Chusovoy plant	do.	17,000 (total metal).
Do.	Nizhniy Tagil plant	do.	
Zinc (nonassociated with lead), metal content of ore	Bashkir copper-zinc complex	Sibai in southern Urals	5,000.
Do.	Buribai copper-zinc mining complex	Buribai in southern Urals	1,500.
Do.	Gai copper-zinc mining and beneficiation complex	Gai in Southern Urals	25,000.
Do.	Kirovgrad copper enterprise	Kirovgrad in central Urals	1,200.
Do.	Sredneuralsk copper complex	Revda in central Urals	5,000.
Do.	Uchali copper-zinc mining and beneficiation complex	Uchali in southern Urals	90,000.
Zinc, metal	Chelyabinsk electrolytic zinc plant	Chelyabinsk	190,000.
Do.	Elektrozink plant	Vladikavkaz in North Caucasus	100,000.

e/ Estimated. NA Not available.

TABLE 3
SELECT RUSSIAN EXPORTS IN 1995 and 1996

(Thousand tons)

Commodity	Quantity	
	1995	1996
Aluminum, primary	2,619.1	2,249.9
to non-CIS countries	2,616.9	2,253.0
to CIS countries	2.2	4.2
Ammonia	3,263.9	3,257.0
to non-CIS countries	3,029.7	3,152.0
to CIS countries	234.2	105.0
Coal, hard	25,550.1	303,359.5
to non-CIS countries	20,703.9	21,242.9
to CIS countries	4,846.2	105.0
Coke	1,412.6	1,277.7
to non-CIS countries	520.5	212.5
to CIS countries	892.1	1,065.2
Copper	529.6	471.2
to non-CIS countries	527.4	466.8
to CIS countries	2.2	4.4
Ferroalloys	278.8	496.9
to non-CIS countries	267.7	478.8
to CIS countries	11.1	18.1
Iron ore and concentrates	11,256.8	13,833.5
to non-CIS countries	7,890.8	11,369.8
to CIS countries	3,366.0	2,513.7
Natural gas, Mm3	196,453.0	192,193.0
to non-CIS countries	127,996.0	121,882.0
to CIS countries	68,457.0	70,311.0
Nickel	166.0	152.8
to non-CIS countries	166.9	152.5
to CIS countries	0.3	0.3
Petroleum, crude	125,644.3	122,336.1
to non-CIS countries	105,031.6	96,209.1
to CIS countries	20,612.7	26,127.0
Petroleum refinery products	56,481.6	47,075.2
to non-CIS countries	54,875.8	96,209.1
to CIS countries	1,605.8	3,528.3
Pig iron	2,106.4	2,888.2
to non-CIS countries	2,040.4	2,829.5
to CIS countries	66.0	58.7
Potassium fertilizers	3,606.6	4,248.7
to non-CIS countries	3,565.8	4,245.5
to CIS countries	40.8	3.2

Source: Russian State Customs Committee and State Committee for Statistics, reported in Foreign Trade, [Moscow], issue 1-3, 1997, p. 37-38.

TABLE 4
RUSSIA GOLD PRODUCTION

(Kilograms)

1991	161,800
1992	150,591
1993	149,464
1994	142,578
1995	131,938
1996	123,347
Total	859,718

Source: Russian Union of Gold Prospectors Artels

TABLE 5
RUSSIAN IRON ORE PRODUCTION
AT LEADING IRON ORE MINES

(Thousand metric tons)

Mine	1996	1995
Kachkanaarski	7,276.8	7,719.2
Lebedinskiy	15,757.0	16,931.0
Mikhailovskiy	10,513.2	11,742.0
Stoylenskiy	7,951.0	7,746.0

Source: Interfax Mining and Metals Report, v. VI, issue 4, Jan. 17-24, 1997, p. 13.

TABLE 6
1996 MINE OUTPUT OF ENTERPRISES OF NORILSK NIKEL

Enterprise	1996 as a percent of 1995
Total ore mined	96.9
Norilsk beneficiation plant:	
Nickel in nickel concentrate	98.1
Copper in copper concentrate	101.7
Talnakh beneficiation plant:	
Nickel in nickel concentrate	110.8
Copper in copper concentrate	93.2

Source: Interfax Mining and Metals Report, v. VI, issue 5, Jan. 24-31, 1997, p. 10.

TABLE 7
RUSSIAN MICA PRODUCTION IN 1994

(Metric tons)

Enterprise	Location	1994 output (t)
Soyuzmineraly-Vostokslyuda	Irkutsk Oblast	12,624.
Stroymaterialy Rossii	Kireevsk, Tula Oblast	204,200 (reported figure probably mine output).
Tekhteklo-Karelsyuda	Chupa, Karelia	1,481.
Aldanslyuda	Yakut-Sakha Republic	1,810.
Kovdorslyuda	Kovdor, Murmansk Oblast	1,222.
SC Phlogopite	do.	Between 3,000 to 4,000 (phlogopite).

Source: Industrial Minerals, London, Jan. 1997, p. 39.