

# THE MINERAL INDUSTRY OF CHINA

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China is one of the fastest growing economies in the world. In early 1990's, the Government set its major goals to reduce the country's economic growth and inflation rate to single digits. Therefore, the Government continued to implement its macroeconomic policies that began in 1993. Preliminary statistics indicated that the gross domestic product grew 9.7% in 1996, 0.5% lower than that of 1995. The inflation rate decreased to 6.1%, much lower than the alltime high of 21.4% in 1994.

The Government's continuing tight monetary policies adversely affected struggling state-owned enterprises. About 45% of state-owned enterprises reported losses in 1996. The total loss was estimated at \$8.3 billion, which increased by 45% from that of 1995. Two out of three state-owned factories in the highly industrialized northeast part of China completely or partially stopped production. The Government understood that problems of state-owned enterprises were the result of the irrational economic structure and the poor efficiency of enterprises in the past four decades (China Daily, 1997b). China's state sector accounts for about 40% of the country's industrial output. It also represents the largest share of the country's industrial assets. Most strategic industries such as coal, oil and gas mining, and ferrous and nonferrous production remain state-owned. Government officials committed to restructure the state-owned enterprises but they were also worried about unemployment rate in the country. The Government maintains that the unemployment rate was 3% in the urban areas in 1996; this official unemployment rate, however, does not account for more than 75 million people from the countryside who left their homes to look for work in the urban areas and for people sent home with only a basic living allowance. Also, about one-third of the rural labor force is underemployed. The Government had allowed selected enterprises to declare bankruptcy in designated cities during the past 2 years (Far Eastern Economic Review, 1996).

In mid-1996, the People's Bank of China (PBC) and the State Economic and Trade Commission (SETC) announced that state banks would increase "circulating capital loans" in the second half of the year to 300 key state enterprises to ease shortage of operation funds (China Daily, 1996b; China Metals, 1996d). Sixteen of China National Nonferrous Metals Industry Corp. (CNNC) subsidiaries were included in the list—Baotou Aluminium Plant, Fushun Aluminum Plant, Changcheng (Great Wall) Aluminum Corp., Guizhou Aluminum Plant, Huludao Zinc Plant, Jiangxi Copper Co., Jinduicheng Molybdenum Co., Jinchuan Nonferrous Metals Corp., Liancheng Aluminum Plant, Lanzhou Aluminum Plant, Northeast Light Alloys Plant,

Qingtongxia Aluminum Plant, Shaoguan Linnan Co., Tongling Nonferrous Metals Co., Yunnan Smelter, and Yunnan Tin Co.

In 1994, the Government established PBC as an institution for making and implementing monetary policy for the financial system. During the same period, the Government created several commercial banks and financial institutions to replace the Government as the key conduit for financing state-owned enterprises. The commercial banking law was passed to forbid any individual from interfering with bank lending. However, commercial banks and financial institutions continued maintaining their main function of financing state-owned enterprises. According to the State Statistical Bureau (SSB), commercial banks and financial institutions were required to write off more than \$6.38 billion bad debts in 1996, up 38.8% from previous year (Washington Post, 1997). Much of the bad debt problem is the result of questionable loans granted under pressures by local officials to maintain guaranteed employment and social services of state-owned enterprises. In the second half of 1996, PBC closed hundreds of financial institutions and cracked down on banks that were exploiting regulatory loopholes to lend money to state-owned enterprises for illegal stock market investment (Washington Post, 1997).

Government officials remained publicly committed to a future tight monetary policy. The amount of money lent to enterprises rose by about 23%, without inflation adjustment, in 1996 compared with that of 1995. Also, the Government cut interest rate twice in 1996 as part of its efforts to ease pressures on debt-burdened state-owned enterprises and to encourage increased economic activity. According to an official from the State Council, China will continue economic reform but greater emphasis will shift from that of an extensive growth economy to that of an intensive growth economy, or change from quantitative growth to a more efficiency-oriented growth (China Daily, 1996b). The more cautious attitude toward market-oriented economic reform is apparent in a strong emphasis on state planning in industrial policy and is likely to persist for some time.

## Government Policies and Programs

The Standing Committee of the eighth National People's Congress approved the amendments to the mineral resources law on August 29, 1996 that will take effect on January 1, 1997. The amendments strengthened the state-ownership of China's mineral resources and allowed the local governments' responsibility for guaranteeing exploration and exploitation of mineral resources. The amendments also allowed private

enterprises and Sino-foreign joint-venture companies to participate in the exploration and exploitation of mineral resources in China under the supervision of the state.

On August 29, 1996, the Committee also approved the coal law which took effect on December 1, 1996. The coal law stated the ownership of all coal resources is owned by the state and this will not be changed despite changes in the surface land ownership or the right of use of the land where coals are located. The state protects lawful exploration rights and mining rights from any encroachment and ensures the operation against any interference and disruption in mining areas and exploration sites. Mining rights cannot be sold and leased. The Ministry of Coal Industry (MCI) is responsible for administering and enforcing the coal law.

The State Council approved the Ministry of Foreign Trade and Economic Cooperation (MOFTEC) to issue provisional measures on the establishment of Sino-Foreign Joint-Venture Trading Companies on a pilot basis which took effect on September 30, 1996. The regulations govern that the shares of the Chinese company in the registered capital of a joint-venture trading company shall not be less than 51%, and that of the foreign company shall be at least 25%. The legal representative must be appointed by the Chinese company. The pilot basis regulations show the view that the Chinese Government plans to expand further its trade with other countries.

The Government encourages foreign investments on new technological renovation projects that would improve the industrial infrastructure, increase productivity, and better utilize mineral resources. Potential investment projects usually go through a multitiered screening process. The first step is approval of the project proposal. The central Government delegated varying levels of approval authority to local governments. Formerly, only the Special Economic Zones and "open" cities could approve projects valued at up to \$30 million. This approval authority has been extended to many provincial capitals and coastal cities. The inland cities and regions are limited to approve projects valued below \$10 million. Projects exceeding these limits are approved by the MOFTEC and the State Planning Commission (SPC) for greenfield projects or SETC for projects involving existing enterprises. If an investment involves \$100 million or more, it must also obtain the State Council approval, after MOFTEC's review and approval.

On April 1, 1996, the Government abolished the tax and tariff breaks on imports of capital equipment for companies having foreign partners. The elimination of these incentives reflect its interest to reduce labor-intensive and small-scale projects that dominated the early years and a shift to establish fewer and bigger technology-intensive projects. Also, these changes were to unify the tariff rate in accordance with the practices of the World Trade Organization and to ensure equal competition in a social market economy.

According to the Ministry of Geological and Mineral Resources (MGMR), the output value of the mining industry accounted for about 6% of the country's industrial output value in 1996 (China Daily, 1996e). More than 25% of the country's total industrial output value is accountable by the processing of

mineral products and the output generated by the mining industry. About 21 million people are employed in the mining industry. The Government has stepped up its effort to improve safety measures on coal mines. In 1995, the number of accidents in coal mines, involving more than 3 deaths, was 529 which resulted 3,362 deaths, 19.4% and 8.3% more than those in 1994, respectively. The Ministry of Labour, the Ministry of Supervision, MCI, MGMR, and the All-China Federation of Trade Unions jointly issued the reminder to local governments and enterprises that the mining safety law must be enforced at all levels.

## Production

According to the International Iron and Steel Institute, China overtook Japan to become the largest crude steel producer in the world in 1996 (Metal Bulletin, 1997). The country produced 101 million metric tons (Mt) of crude steel and consumed more than 100 Mt of steel products in 1996. Domestic steel producers can only supply about 88% of various steel products. The Customs General Administration of China reported that China imported 15 Mt of rolled steel in 1996 (China's Custom Statistics, 1996), an increase of 15% from that of 1995, chiefly as the result of the ready availability of cheap Russian steel. The export of steel products decreased by 1.93 Mt in 1996 from that of 1995. China's steel market remained oversupplied. An estimated 17 Mt of unsold steel products remained in enterprises' warehouses. Flat rolled and coated products continued to be in short supply. Domestic producers can only supply about 60% of galvanized sheet and less than 30% of tinplate for the domestic demand. The import of these products, however, exceeded the quantities needed. A cut in the import duties on most of these categories in April may have contributed to this. The excessive supply of steel products pushed down the price of steel in the domestic market. China's exports are mainly long products such as rebar, ingot, and plate to developing countries.

Despite the achievements in pig iron and steel output, the overall economic performances of the iron and steel enterprises are far from satisfactory. About 50% of 873 iron and steel enterprises reported in the red in 1996 (China Metallurgical News, 1997b). The Ministry of Metallurgical Industry (MMI) has decided to place more emphasis on restructuring the product mix and reducing production cost rather than on increasing output. MMI hoped that 90% of the country's steel will be produced according to international standards and more than 95% of steel consumed in the country will be supplied domestically.

China produces about 30 Mt of ferrous scrap per year, but the country continues in short supply of ferrous scrap. This situation was exacerbated by the moderate growth in electric furnace capacity in recent years. By the year 2000, the scrap supply/demand gap will be around 7 Mt. High international scrap prices forced Chinese importers to reduce scrap imports in 1996. In the first half of 1996, China imported about 500,000 metric tons (t) of scrap compared with a full year figure of 1.4 Mt in 1995 and 2.2 Mt in 1994, respectively.

China continues its shortage of iron ore. According to preliminary statistics, the country produced 249.55 Mt of iron ore in 1996. According to an official from MMI, it requires 3.36 t of domestic ore or 1.6 t of imported ore to produce 1 t of pig iron (China Metals, 1997b). China imported about 50 Mt of iron ore to meet its demand in 1996. The gap between supply/demand for iron ore is expected to grow larger in the future because iron ore producers are facing a lack of working capital to buy raw material and spare parts. They have little investment to upgrade production capacity and can not afford to pay the power fee, resulting in frequent blackouts.

In 1996, the demand of steel products in the domestic market continued to be weak. Prices on ferroalloy products continued falling because the supply exceeded demand in the domestic market and in the world market. The per ton price of ferrotungsten and ferrochromium dropped from \$5,639 and \$7,349 in the first half of the year to \$5,422 and \$7,108 in September, respectively. However, the per ton price of ferromolybdenum increased from \$5,301 in August to \$9,277 in September, in response to the sudden price increase of molybdenum concentrates in the international market.

Russia has replaced Japan to become China's largest steel supplier. The change may be attributed to the difference in steel prices between Russia and Japan. The prices of Russian steel products are 20% to 30% cheaper than those from Japan. Also, Russian steel producers are willing to have flexible payment terms—60 to 90 days or even longer. This would save the Chinese steel traders a large amount of interest payment, especially under the Government tightened credit policies.

According to the MMI's Ninth Five-Year-Plan period (1996-2000) submitted to SPC, China will need 120 Mt of steel by the year 2000. MMI planned to increase the steel production capacity to 130 Mt and the actual steel production to 115 Mt by the year 2000. During the Eighth Five-Year-Plan period (1991-95), the steel sector invested \$21.0 billion to increase its annual steel production capacity from 71.2 Mt to 110 Mt by 1996. New output capacity projects for an additional 20 Mt are under construction and are expected to be completed by 1999. However, in order to complete these projects, an additional \$10.8 billion is required in the next several years. MMI estimated that the steel sector will need a total of \$26.7 billion of fixed assets investment for the Ninth Five-Year-Plan period. Of this total, MMI is expected to receive \$5.8 billion in loans from SPC. The remainder will be contributed by foreign investors and domestic steel enterprises.

MMI also planned to expand the production of high value added products such as hot plates, cold sheets, galvanized sheets, and tinplates which the country imports about 3 Mt yearly. MMI has identified rolled steel for automobiles, shipbuilding, defense, and power; cold silicon steel; and stainless steel for its development priorities. Automotive steel and stainless steel are the top two priorities.

MMI expects that China will need about 8 Mt of automotive steel by the year 2000. But China lacks the capability to produce one-side hot-dipped sheets and galvanized sheets more than 1,500 millimeters (mm) in width, cold rolled plates/sheets with strengths greater than 75-kilogram-per-square-millimeter;

and galvanized sheets with zinc adhesion above 50-gram-per-square-millimeter. MMI planned to achieve self-sufficiency of automotive steel to 85% by the year 2000, up from the present level of 60%. However, with the exception of the Baoshan and Wuhan plants, other automotive steel facilities in China are equipped with 1960's and 1970's equipment. MMI planned capital construction and technical renovation to upgrade facilities in Baoshan, Benxi, Chongqing, Fushun, Shanghai No. 5, and Wuhan. MMI estimated that it will require investment of about \$1.1 billion to import modern machinery from western countries in the next several years to accomplish the goal.

MMI planned to expand domestic galvanized sheet production to 1 Mt in the next 4 years. There are five major galvanized sheet producers in China—Benxi in Liaoning, Baoshan in Shanghai, Chongqing in Sichuan, the South Galvanizing Plant in Guangdong, and Wuhan in Hubei, with a combined designed output capacity of 1.25 Mt including expansion projects which are under construction. In addition, four greenfield plants are under construction—Panzhuhua in Sichuan; two Sino-South Korean joint ventures, Pujing in Liaoning, Posco in Jiangsu; and a Sino-Japanese joint venture, Jinjiang in Yunnan. China consumed about 1 Mt of galvanized sheet in 1996 and is expected to increase demand to 1.6 Mt in 2000. The automotive sector accounts for about one-third of the total consumption, followed by the construction sector and the light industry sector.

China's stainless steel consumption has grown at about 6% per year over the past several years and will reach 900,000 t in 2000. Because of technological and output capacity problems, China's major stainless steel producers—Fushun in Liaoning, Great Wall in Sichuan, Shanghai No. 3 and No. 5 in Shanghai, and Taiyuan in Shanxi had only a total annual output capacity of 350,000 t. Production of stainless steel was around 325,000 t, of which nickel stainless steel accounts for 75% and chromium stainless steel for about 25%. Major consumers of stainless steel are the construction, light industry, and chemical sector. MMI has endorsed two major modernization projects—Shanghai No. 3 and Taiyuan; both are Sino-foreign joint ventures.

In mid-1996, the State Council issued an order prohibiting the imports of heavy rails for the rest of the year and reducing the annual heavy rail production from 1.03 Mt to 950,000 t in 1996. Quality problems on import rails prompted the State Council to issue the order. China imported 490,000 t of heavy rails between 1994 and 1995. According to the State Commodity Inspection Bureau, about 40% of the imported rails were rated as substandard (China Metals, 1997a). According to the Railway Ministry plan during the Ninth Five-Year-Plan period, it only will require of about 5 Mt heavy rails (810,000 t for 1996; 900,000 t for 1997; 1.12 Mt for 1998; 1.13 Mt for 1999; and 1.08 Mt for 2000) (China Metals, 1996g). The demand for heavy rails would likely be around 1.12 Mt per year. The country has an annual output capacity of 1.5 Mt of heavy rails from four major steel plants—Anshan, Baotou, Panzhihua, and Wuhan. At the end of 1995, unsold heavy rails were more than 246,000 t and orders from consumers were less than 220,000 t in the first half of 1996. All four major heavy rail

producers operated at 50% of their output capacity and were in the red.

According to the SSB, China produced 4.70 Mt of 10 nonferrous metals—aluminum, antimony, copper, lead, magnesium, mercury, nickel, tin, titanium, and zinc in 1996, an increase of 313,000 t over the preliminary figure for 1995 (China Economic News, 1997). This is 417,000 t less than the final 1995 output figure derived from the third national industry survey which was published in late 1996. CNNC and its subsidiaries accounted for 2.55 Mt of the total.

China is the largest antimony producer in the world, most of which is exported. In 1996, the price of antimony hit the record low of the past 2 years. China produced more than 90,000 t of antimony in the past several years. But China consumes only about 10,000 t of antimony and exports about 50,000 t of antimony yearly. In 1993 and 1994, as the prices of antimony rose in the international market, many antimony producers resumed productions in China. As a result, the output of antimony increased more than 10% yearly in the past 2 years. By the end of 1995, there were more than 40,000 t of unsold antimony in China. The antimony stock continued to increase in 1996. Domestic antimony prices kept falling. In Changsa, Hunan Province, the market price of No. 1 antimony (greater than 99.90% Sb) dropped from \$4,639 per metric ton (/t) in 1995 to \$3,373/t in April 1996. In 1995, the Government met with antimony producers to discuss a restriction on the output of antimony. At the conclusion of the meeting, executives from 60 antimony producers agreed to reduce antimony output by 20%. The output of antimony, however, increased by 20% in 1995 over that of 1994.

In March 1996, the Government met with antimony producers again to set the bottom price for No. 2 antimony (less than 99.90% Sb) at \$3,370/t and to reduce output of antimony by another 20%. Annual production of antimony in the next several years is expected to be about one-half that of 1995. The plan was based on an assumption that the country will consume about 13,400 t of antimony annually by the year 2000 and will export 50,000 t, mostly in antimony metal, yearly. This plan may be difficult to implement because the antimony sector is dominated by small producers. In 1995, the country's plan was to produce 42,000 t of antimony, but actual output was three times more.

The output of aluminum sector has grown at a steady rate over the past decade. In 1996, the domestic aluminum market was generally characterized with a surplus. The total supply of aluminum in China was about 3 Mt, 1.8 Mt from domestic production, 820,000 t from 1995 stock, and 367,000 t from imports. China consumed about 2 Mt of aluminum and exported about 110,000 t of aluminum in 1996. In 1996, the price of aluminum A00 (greater than 99.70% Al) decreased from \$1,988/t in January to \$1,687/t in December in all major cities in China. During the same period, imports of aluminum and its alloy increased by 3% while exports decreased by 34%. Aluminum exports were decimated by the reduction of value-added-tax (VAT) rebate which took effect in 1996. The alumina price was also on a downward spiral in 1996. The price jointly quoted by the country's five major alumina

producers dropped by \$482/t since January 1996. Prices of imported alumina also decreased during that period. This comprehensive tax composed of import duty, VAT, and others, imported alumina was about \$240/t higher than that domestic alumina. Even though imported alumina prices were higher, China needed to import at least 1 Mt of alumina to support the metal production because some aluminum smelters required a feed mixture of domestic and imported alumina at a ratio of 2 to 1 to ensure the best performance of their electric cells.

In 1996, China's copper market was depressed. The total supply copper in the domestic market exceeded the demand. Copper prices continued to decline in the domestic and international market in 1996. In January 1996, the domestic market price of No.1 copper (Cu) (greater than 99.95% Cu) was \$3,133/t while in December 1996, it slipped down to \$2,410/t in major cities. In 1996, China produced about 1 Mt of refined copper. At the same time, the country imported more than 290,000 t of unwrought copper and its alloys and 420,000 t of copper products, an increase of 55% and 28%, respectively, over the same period of 1995. According to an official from CNNC, most copper products were imported by Sino-foreign joint ventures (China Metals, 1996h). The increase of imports of copper products weakened the demand of refined copper in the domestic market. Some western analysts believed that China imported as much as 150,000 t of copper into bonded warehouses in the second-half of 1996 that would not show up in the official import statistics. China usually increases its import of copper when the copper price is low in the international market.

China is the largest tungsten producer in the world. In 1996, because of weak world market prices for tungsten, China reduced its exports of tungsten by more than 30%. The world market was in oversupply of tungsten materials resulting from releases of government stockpiles by China, Russia, and Kazakhstan in the past 2 years. In 1996, CNNC organized a worldwide tungsten producers meeting in Nanchang, Jiangxi Province, to discuss the strategic stockpile sale problem. China's large- and medium-sized tungsten mines reduced production of concentrates because of weak market prices. Small mines also reduced their output by more than 19% per year because the tungsten prices have fallen well below economic levels for operation. China's Strategic Reserve Bureau agreed to buy 3,000 t of newly mined tungsten from state-owned mines and would not make any short-term releases. The Government strengthened enforcement to implement the newly revised mineral resources law to control illegal tungsten mining activities.

Rapid expansion of production and reduced exports caused the decline in prices of rare earths in the domestic market. Since mid-1995, per tonnage price for rare earth chloride has dropped from \$1,747 to \$1,446; cerium oxide from \$7,831 to \$6,867; neodymium oxide from \$26,506 to \$20,482 and misch metal from \$8,434 to \$5,542. According to the Rare Earth Office of the SPC, between 1993 and 1995, rare earth production increased from 22,720 t to 48,000 t (rare earth oxide content) in China (China Metals, 1996a). Domestic rare earth consumption and exports of rare earth were 13,000 t and 27,000

t, respectively, in 1995. There are more than 400 rare-earth plants with a total output capacity of 50,000 t in China.

## Trade

China has some of the largest mineral reserves in the world. In general, the country has sufficient mineral resources to support its soaring economic growth. The country's total trade of mineral products amounted to about \$40 billion, accounting for one-fifth of the country's total trade value. The total import value of primary minerals and their products maintained the level in 1996 as in the past several years, while the export value of minerals, metals, and their products has been increasing to more than \$4 billion in 1996. China has imported more metallic raw minerals such as iron ore and copper ore, while exporting more of their finished products. In recent years, the percentage of nonmetallic products in the country's total trade has increased faster than metallic products.

The State Tariff Commission (STC) announced that 14 commodities' export duties will be abolished, beginning on January 1, 1997, including that in refined lead, lead and zinc scrap (Economic Daily, 1996). STC also adjusted the provisional export duties on refined zinc to 0%; lead ore and concentrates to 5%; zinc ore and concentrates to 10%; and tin ore and concentrates to 20%. The provisional export duties on lead and zinc concentrates were increased from 0% to 5% and 10%, respectively, in light of tightening supply at home, even though the standard duties remained unchanged at 30%. On the contrary, the provisional export duty of refined zinc was reduced to 0%, apparently to encourage export of surplus zinc metal in the domestic market.

## Commodity Review

### Metals

**Aluminum.**—Alcoa World Alumina and Chemicals (AWA) in Australia and China International Mining Co., a subsidiary of CNNC in Australia, reached an agreement for the supply of 400,000 metric tons per year (t/yr) of alumina to CNNC for 30 years. AWA will receive an advance payment of \$240 million from China International Mining Co. This agreement will reduce China's dependence on spot purchase of alumina in the future years. Before this, all China's alumina imports were bought on the spot market. Domestic alumina producers objected to this agreement. Domestic alumina producers feared that imports will depress the domestic alumina price even further in the future. To assuage domestic alumina producers, CNNC met with officials from aluminum and alumina producers in September 1996. CNNC will require aluminum smelters to buy at 2.16 Mt of alumina from domestic producers in 1997.

SETC granted approval for CNNC to import 400,000 t of alumina in 1996-97 at a preferential import tariff of 6% instead of the normal 20%. The quota and tariff began in September 1996. CNNC assured SETC that it would not use the quota to make profits for itself, but to ensure a stable supply of alumina to the aluminum sector and to enhance the sector's

competitiveness. At present, China's alumina producers are able to supply two-thirds of the country's need. The approval of a lower tariff on CNNC's alumina imports was strongly opposed by Minmetals and other alumina importers.

The Northeast Light Alloy Fabrication Plant, a subsidiary of CNNC, and United Development Ltd. (UNI), a subsidiary of Eisenberg Group of Israel, formed a joint venture—United Northeast Aluminum in Harbin, Heilongjiang Province. UNI will hold 50% equity in the new company but UNI planned to include additional foreign investors in the joint venture. The joint venture will involve renovation of the existing Northeast plant in Harbin. Also, under the agreement, the partners will build a 120,000-t/yr high precision aluminum alloy line for plates and strips. Foreign investment will account for about \$150 million in the new facility. The Chinese contribution will largely come from plant and land. The total cost for renovating the existing plant and the construction of the new facility is about \$420 million. The balance of investment will come from bank financing.

Jilin Aluminum Industry Co., originally named Panshi Aluminum Factory, completed the first phase construction of its aluminum smelter in 1996. The designed aluminum output capacity is 25,000 t/yr. According to the plan, the company will begin its second phase construction soon after the first phase construction is completed. After the second phase completion, the company will have a total output capacity 50,000 t/yr of aluminum.

Japanese companies, Nippon Kinzoku Co. and Tak Corp., and Baoding Nonferrous Co. formed a joint venture, Baoding Longda Aluminum Industry Co. in Baoding, Hebei Province. The joint venture will produce 12,000 t/yr of aluminum alloys for auto manufacturing ventures in China. Baoding Nonferrous Co. will have 50% of the shares and Nippon Kinzoku Co. and Tak Corp. will have 35% and 15%, respectively.

In 1995, Kaiser Aluminum and Chemical Corp. of the United States signed a contract with CNNC to buy 49% shares of two existing aluminum smelters—Lanzhou and Lanhai in Lanzhou, Gansu Province. According to the contract, Kaiser was to invest \$60 million in cash. By the end of 1995, Kaiser only contributed \$8.96 million into the smelters. Since then, Kaiser stopped any further financing. Soon after the signing the contract, Kaiser found that some of the electrolytic cells in Lanzhou Smelter were shut down because of insufficient power supply and promptly asked for a guarantee that the power supply would be assured by the provincial government. The provincial government gave the guarantee, but the power supply was not assured. Between 1995 and 1996, power shortage caused the smelter to shut down 30% to 40% of the cells. Power shortage also pushed up the power rate. In the past 3 years, the power rate for the Lanzhou Smelter increased from 0.195 yuan per kilowatt hour (yuan/kWh) to 0.33 yuan/kWh. Beginning January 1, 1997, the power rate will be increased to 0.37 yuan/kWh. According to officials of Lanzhou Smelter, it will lose more than \$240 for each ton of aluminum output at current aluminum market value (China Metals 1996b). Without additional financial input, Kaiser may lose the legal status as the joint-venture partnership in the Huang He (Yellow River)

Aluminum Co. Ltd. The Government requires that foreign partners in a Sino-foreign joint venture must hold no less than 25% of the shares of the company.

Kaiser formed a joint venture with a township-run enterprise, Gunagda Aluminum Section Co. Ltd. in Guizhou. The joint venture, Guizhou Kaiser Aluminum Industry Co. Ltd., plans to increase the existing plant's aluminum capacity from 3,000 to 12,000 t/yr. The expansion will cost about \$5.4 million.

SPC gave approval for the joint venture between the Yichang group in Hubei Province and a Hong Kong-based company to build a 100,000-t/yr greenfield aluminum smelter in Yichang, Hubei Province. The smelter will cost \$265 million and the Hong Kong interests will have 85% of the shares.

Mawei Ruimn Aluminum Strip Co. Ltd. in Fujian, a joint venture between Nanping Aluminium Smelter and a Hong Kong based company, imported from Schloemann-Siemag AG of Germany a six-roll cold rolling mill and associated machines to produce aluminum strip.

Reynolds Metals of the United States invested \$45.8 million for 32.48% shares of Bohai Aluminium Industry Co. Ltd. in Qinhuangdao, Hebei Province. The joint venture plans to increase aluminum alloy output capacity to 57,000 t/yr for strip, 56,000 t/yr for foil, and 16,000 t/yr for section by the year 2000.

Reynolds Metals signed a letter of intent with the Shanxi provincial government to build a 115,000-t/yr aluminum smelter in Changzhi, Shanxi Province. The total investment is about \$578 million. Reynolds will take 49% of the shares. The agreement requires SPC approval.

Alcan of Canada and Shanxi Aluminum Co., a subsidiary of CNNC, signed an agreement to build a 240,000 t/yr aluminum smelter and a 600-megawatt (MW) powerplant in Taiyuan, Shanxi Province. Investment for the project is expected to be more than \$1.2 billion. The proposal requires SPC approval.

**Copper.**—China plans to build in the next 5 years several copper mines which include Yulong in Xizang Autonomous Region, Chengmenshan in Jiangxi Province, Axili in Xinjiang Autonomous Region, and Dongguashan in Anhui Province. Yulong is the country's second largest copper deposit behind Dexin Mine in Jiangxi Province. The deposit contains 700 Mt of ore with an average grade of 0.94% Cu. About 180 Mt of ore contains more than 2.8% Cu. The Government designated the Xitieshan Mining Administration in Qinghai Province to undertake the development project. Investment will be \$700 million for the construction of a 100,000-t/yr mining and smelting complex. The plan calls for using the wet process (leaching-extracting-electrowinning) to treat oxidized copper ore on the surface, accounting for 41% of the total reserves.

The Chengmenshan copper deposit development plan was approved by SPC. The deposit occurs beneath a lake and the ore is in oxide form. According to officials from Jiangxi Copper Co., the company is negotiating with a company from the United States for the cooperative development of the deposit (China Metals, 1996c). Besides the technical problems, CNNC also faces financial difficulties to develop these deposits simultaneously.

Tongling Nonferrous Metals Co. is investing \$600 million in

four projects in the next 5 years to increase its copper production. According to a company official, the plan has been approved by both SPC and SETC and the company has secured access to government low-interest loans (China Metals, 1996i). Jinlong Copper Co. Ltd., a joint venture with Japanese and Hong Kong companies is its first project. The project will employ flash smelter technology to increase the company's annual output capacity by 100,000 t. The second project will be a greenfield smelter which will use the ammonia leaching process. Tongling is discussing with BHP of Australia on starting a joint venture. Tongling intends to become one of modernized wet process copper producers in China with an annual output of 40,000 t of refined copper. The third project is the Dongguashan Mine. The mine has proved reserves of 937,000 t of Cu. First phase construction is to be completed by 2000 with an annual output capacity of 30,000 t of copper. The fourth project is to increase output capacity of copper semimanufacturing products. The company plans to spend about \$24 million to import equipment to increase copper tubing output capacity to 18,000 t/yr.

Jiangxi Copper Metals Corp. revised its plan to import a second flash furnace for its Guixi Smelter. Instead, it will renovate its existing flash furnace by introducing new concentrate spraying nozzle technology developed by Outokumpu of Finland. Outokumpu Engineering Contractors Oy has signed an agreement with Jiangxi Copper Metals Corp. for the supply of engineering, proprietary equipment, and technical services including supervision, start up assistance and training for the expansion of the smelter. The company will import sulfur recovery technology from the United States. The revised plan will save the company about \$60 million from the original plan. The revised plan required approval by CNNC.

Shuzhou Fukuda Metals Co. Ltd., a Sino-Japanese joint venture, completed its 14-month first phase construction of a 2,700-t/yr of copper coil line in Shuzhou, Zhejiang Province. One-half of the output products will be exported and the other one-half will be sold to Japanese-funded electronic enterprises in China.

Dabaoshan Mining Co. completed renovation of its 1,000 metric tons per day (t/d) Dabaoshan Mine in Guangdong Province in October 1996. Dabaoshan Mine has become a polymetallic mine since the start this year of copper mining. Geological prospecting indicates that the Dabaoshan deposit contains 75 Mt of copper occurring beneath the iron ore. The \$4.8-million project is designed to produce 3,000 t/yr of copper concentrates.

After 10 years of exploration, Fujian Geological Prospecting Bureau announced that a cluster of copper deposits were discovered in Zhijinshan and in Shanghang, Fujian Province. The deposits are found in an area of 4 square kilometers (km<sup>2</sup>) (China Metals, 1997c). Proven copper reserves in that area are 1.29 Mt of Cu. The area also contains 19.88 Mt of alunite and 15.3 Mt of iron sulfide.

Qingkouzhen Industry Co. and Shanghai Lihe Nonferrous Metals Works began the construction of a copper smelter, Xinsheng Smelter, in Lianyungang City, Jiangsu Province. After completion, the smelter will produce 30,000 t/yr of blister

copper.

**Gold.**—Since 1994, the Government decided to open up the gold sector to foreign investors and release gold output statistical data to the public. The reliability of these data remains confusing to western and domestic gold observers. According to the Gold Bureau of MMI, China produced 120.6 t of gold in 1996 (China Metallurgical News, 1997a). Domestic gold is produced by two sources: gold producers and nonferrous metals producers. The Government strictly monopolizes the purchases and sales of gold. Of the amount of gold purchased by PBC, gold produced from gold mines accounts for about 88% of the total and the nonferrous sector makes up the remaining 12%. In terms of output, gold producers account for 92% of the total and the nonferrous metals producers contribute 8%. The reason of the bank purchase-output discrepancy is that part of gold produced by nonstate-owned enterprises is diverted elsewhere. The gold statistical data published by MMI are the amount purchased by PBC. Chinese gold observers believe that about 10% to 20% of gold produced in remote areas is not sold to PBC.

Illegal gold mining continues to be one of many problems for the Chinese Government. Reportedly, in the Xiaqingling gold deposits area, lying between the border of Henan and Shanxi Provinces, 430 illegal gold pits were closed down, 13,000 illegal miners were dismissed, and 9,000 pieces of equipment were confiscated (China Metals, 1996a). Eight armed organization used to aid illegal gold operations were arrested. In another report, in Tongguan County, Shaanxi Province, 653 t of ore was seized and 87 ore processing mills were shut down by central and local authorities (China Daily, 1996c). The Government discovered that the Tongguan activity was supported by local officials. The lack of laws regulating exploration and exploitation of mineral resources coupled with the lack of enforcement of the laws has led to the confusion in the mineral sector.

Asia Minerals Corp. (AMP) of Canada finally received an approval from the State Council in 1996 to form a joint venture with Shandong Zhaoyuan City Gold Corp. of China in the development of the Yingezhuang Mine in Shandong Province. In 1996, AMP signed agreements with Gansu Bureau of Geology and Mineral Resources and Xinjiang Bureau of Geology and Mineral Resources to explore jointly for gold in areas of Gansu and Xinjiang, respectively. According to the Gansu agreement, AMP will have the exclusive right to explore jointly for gold in the South Qilian mountain area. The area has been identified as one of potential areas with gold mineralization and geochemical anomalies. AMP reports that small-scale placer gold deposits are found throughout the area. The partners plan to conduct detailed exploration on specific areas before mid-1997. In the Xinjiang agreement, the partners will jointly explore for gold in the western part of Kunlun Shan (Kunlun Mountain) and Altay Shan (Altay Mountain). The western part of the Kunlun Shan concession covers 15,000 km<sup>2</sup>. Chinese geologists have identified four occurrences of gold and gold-copper in the concession area. The Altay Shan concession covers 3,000 km<sup>2</sup>. Placer gold and gold anomalies have been

identified in this area.

Southwestern Gold Co. and Global Pacific Minerals announced that they have signed a joint venture agreement with CNNC to explore for gold on an area of 3,000 km<sup>2</sup> in Haoya, Nei Mongol (Southwestern Gold Co., 1997). CNNC has carried out extensive surface exploration and defined three gold zones. The main zone has been traced continuously for 2,000 meters (m) with sediments and is associated with quartz veins. Numerous trenches across this mineralization indicate a consistent width between 35 and 50 m averaging 2-gram-per-metric-ton (g/t) of gold with local higher grade zones averaging 20 g/t of gold. A second mineralized zone has been delineated over an area 1,500 m by 3,000 m and is comprised of sheeted quartz veins in metamorphosed carbonate sediments; exploration trenches contains up to 15 g/t of gold over intervals of 5 m to 15 m. The joint venture will develop a prospect within the main mineralized zone and drilling will begin in April 1997. Under the terms of the joint-venture agreement, Southwestern and Global can earn an 80% interest in the joint venture by making a cash payment of \$125,000 and spending \$2.8 million on exploration work in the next 4 years.

Minco Mining and Metals Corp. of Canada signed a letter of intent with Sichuan Bureau of Geology and Mineral Resources for exploration and production of gold in the Gala Mine. The Gala Mine is located 15 kilometers (km) from Gala city in Sichuan Province. The mine began production of gold in 1993. Minco believes that the ore zone contains probable/possible reserves of 4.5 Mt of ore grading 4.46 g/t of gold. Minco believes that within the 500 km<sup>2</sup> property there is potential to contain significantly greater reserves than currently estimated (Minco Mining & Metals Corp., 1996). Minco hold rights of first refusal on all projects owned or generated by the Sichuan Bureau in that area. It has an exclusive option to enter into a cooperation agreement with the Sichuan Bureau regarding the acquisition of a majority interest in the Gala Mine.

Minco signed a second letter of intent with Sichuan Bureau regarding the Xifanping copper-gold porphyry project. The Xifanping project is located 130 km southwest of Xichang City, Sichuan Province. It is situated within the same mineralization belt that hosts the Yulong copper deposit in Xizang. Under the agreement, Sichuan Bureau will provide detailed geologic mapping, soil sampling, and induced polarization surveys to cover the entire area. Minco will provide consulting and direction to the project. Minco must decide if it is to continue participation in the project by August 1997. If Minco decides to proceed, the company will be granted an exclusive right on the project.

**Iron and Steel.**—MMI gave approval to Anshan Iron and Steel Corp. (Angang), Baoshan Iron and Steel Corp. (Baogang), Chongqing Iron and Steel Corp. (Chonggang), Shoudu Iron and Steel Complex (Shougang), Taiyuan Iron and Steel Corp. (Taigang), and Wuhan Iron and Steel Corp. (Wugang), to become groups. Each group will operate in accordance with a modern corporate management system to give full rein to the development of its subsidiaries. In the past decade, major steel producers were operated under a contract responsibility system.

However, the contract responsibility system created financial burdens on the parent company by unprofitable subsidiaries. The group will draw a clear line for property rights, responsibility, and management between the parent company and its subsidiaries. To ensure the success of the subsidiaries, the parent company will provide financial support for a few years and assist them in investment, finance, and retirement of debts. After that, subsidiary companies will be responsible for their own profit and loss.

Angang received approval from SPC and SETC for its comprehensive expansion plan in next 5 years. SPC will provide \$1.05 billion for capital construction and SETC will inject \$1.53 billion for technological upgrade. The plan includes the expansion of Daqishan Mine in term of mining and milling capacity to 9 million metric tons per year (Mt/yr); an addition of 3.5 Mt/yr of semicontinuous casting capacity of quality hot rolled plate and strip; and the expansion of the No. 2 power generating plant. The expansion plan is designed to increase the production capacity of crude steel to 8.8 Mt/yr and rolled steel to 7.95 Mt/yr. With the technological upgrade, Angang hopes to increase the continuous casting ratio to 70% by the year 2000 from its current 25% level and to improve the quality of products of which only 7.5% of current production meets the international standard.

Baogang signed an agreement with three Japanese companies, Nisshin Steel, Hanwa Kogyo, and Mitsui Co. Ltd. and Zheyong Iron and Steel Investment (Ningbo) Corp., to build a 80,000-t/yr stainless steel plant in Ningbo City, Zhejiang Province. The total investment is about \$150 million. Baogang and Zheyong will have 51% and 15% of the share, respectively, while the remaining will be shared by the three Japanese companies. The plant was scheduled to be completed by September 1998 and will be named Baoyong Special Steel.

Baogang signed two joint-venture memoranda with two Brazilian companies, the Companhia Vale do Rio Doce (CVRD) and Brazilian Mining Corp. (MBR), to develop two iron ore mines in Brazil. Further details of the agreement with MBR will be discussed later. The memorandum between Baogang and CVRD includes increasing the supply of iron ore from CVRD to Baogang from the current level of 6 to 12 Mt/yr by 2000. All shipments are and will continue to be subject to annual pricing negotiations. The joint venture iron ore mine operation will be in the Carajas area which has iron ore reserve of 16 billion metric tons.

China Shougang International Trade and Engineering Corp., a subsidiary of Shougang, formed a joint venture with Bellary Steel and Alloys of India to build a \$243 million steel plant in Karnataka, India. The designed annual output capacity were 550,000 t of pig iron and 450,000 t of wire rod. The Chinese partner will provide technical assistance and invest \$2 million to the project. Pig iron production is expected to begin in April 1998 and wire rod to come on-stream in the following year. About 25% of its output will be exported to China and other countries in Asia. Visa Ltd., a trading company of the United Kingdom, which mainly exports chrome ore from India to China, is considering investing \$3 million in the project so that it can be involved in trading plant products.

Pohang Iron and Steel Co. Ltd. (Posco) of the Republic of Korea signed an agreement with Guangdong Merchant and Industrial Corp. and Economic Development Co. Inc. to build a 100,000 t/yr galvanizing plant in Shenzhen, Guangdong Province. The plant, Shenzhen Pohang Coated Steel, will be held 80% by Posco and 10% each by Posco's partners. Feed materials will be supplied by Posco. It is Posco's third galvanizing venture in China in the last 2 years.

SPC approved the joint-venture agreement which was signed in 1995 between Posco and Shagang Steel Group in Zhangjiagang City in Jiangsu Province. The agreement involved three joint ventures with a total investment of \$250 million. Shagang will provide \$48 million and land. One of the joint venture is a steel processing plant with an output capacity of 140,000 t/yr steel products. Posco and Shagang will have a split ownership of 80-20. The plant was expected to start production in December 1997. The second is a cold rolled galvanized sheet plant which will produce 100,000 t/yr of galvanized sheet of 0.2 to 1.6 mm in thickness and 720 to 1,250 mm in width. The cost split will be 90-10 between Posco and Shagang. It will begin operation in May 1998. The third joint venture involves production of 100,000 t/yr of cold rolled stainless sheets with 0.3 to 3 mm in thickness and 30 to 1,210 mm in width. Posco and Shagang will share the investment cost of 60-40. It is scheduled to come on-stream in March 1999.

Panzhuhua Iron and Steel Corp. (Pangang) replaced its two vanadium extraction furnaces with two newly designed vanadium converters. The total output capacity of the two converters is 110,000 t/yr of vanadium slag. It would account for 80% of the country's total vanadium slag output.

Pangang completed its 10-year, \$1.20-billion second-phase expansion plan in 1996. The second-phase plan included an addition of a 1,350 cubic meters (m<sup>3</sup>) blast furnace imported from West House of the United States, two 130-m<sup>3</sup> sintering furnaces, two 50,806-m<sup>3</sup> coke ovens, a 1,350-mm continuous casting mill imported from TNT of Italy, a 1,450-mm hot rolling mill and 1,220-mm cold rolling mill from Mitsubishi of Japan, a power plant, a vanadium pentoxide plant with a multilayer roaster, and a cold galvanizing line.

Nanjing Iron and Steel Works (Nisco) in Jiangsu Province completed the construction of its 70-ton Danieli electric arc furnace in 1996. A VOD unit was added to the existing ladle refining configuration and the electric arc furnace. Also, Nisco invested \$2.77 million to upgrade the quality and rolling speed of the rod mill. It will increase the rod mill output from 200,000 t/yr to 350,000 t/yr in early 1998. Nisco was also considering using the surplus pig iron from its blast furnaces instead of scrap to feed the electric arc furnace. Scrap is in high demand in the Nanjing-Shanghai corridor. In addition, Nisco is considering making further investment in increasing its output of flat products and to move into stainless steel as its mainstream product.

Schloemann-Siemag AG, Siemens AG, and Loi Thermprocess GmbH signed a package agreement with China International Iron and Steel Investment Corp. Schloemann-Siemag AG will provide machinery equipment. Siemens AG will supply electrical equipment. Loi Thermprocess GmbH will



provide furnaces. The \$500-million equipment will be used for Compact Strip Production (CSP) technology to produce high quality steel products. Zhujiang Iron and Steel Co. in Guangdong Province, Baotou Iron and Steel Co. in Nei Mongol Autonomous Region, and Handan Iron and Steel General Work. in Hebei Province will use CSP technology for steelmaking in their plants.

An European stainless steel producer, Krupp Thyssen Nirosta (KTN), signed a letter of intent with Shanghai Pudong Iron and Steel Group for a 60-40 split joint venture to build a \$1.4 billion stainless steel plant in Shanghai. The plant will produce 440,000 t/yr hot- and cold-rolled stainless steel coil. Reportedly, the development of the project will be undertaken into three phases. In the first phase, two Sendzimir mills will be transferred from Germany to be installed at the site by 1998. The installation of a hot strip mill will be completed in 2000. The 90-t electric furnace will be completely installed in 2000. After completion, the plant will produce 270,000 t of cold-rolled products and 170,000 t hot-rolled products. In the initial stage, hot-rolled strip and slabs will be shipped from Germany.

SPC approved the \$1.1 billion joint-venture project between Shanghai No. 3 Steel Works and KTN of Germany to produce 500,000 t of stainless steel per year. KTN will have 60% of the share. Main equipment will include 90-t electric furnace, a 100-t converter, a VOD refining furnace, a LF refining furnace, and a 20-roll cold-rolling mill which will be imported.

The Taiyuan 500,000 t/yr stainless steel project is still waiting for approval by SPC, which is to be a joint venture between Taiyuan Iron and Steel Co. and Usinor of France. It will relocate the current Taiyuan steel plant to a larger site and import a bigger tonnage electric furnace, a MRP-L converter, a VOD refining furnace, and a continuous sheet rolling mill.

Other stainless steel projects include the joint venture between Guangzhou Iron and Steel Works in Guangdong and Overseas Resources and Boulder Gold of the United States, which is expected to start producing 55,000 t of stainless wire rod in 1999. The Zhangjiagang Iron and Steel Works in Jiangsu and Posco of South Korea joint venture to produce 100,000 t cold stainless steel sheet is waiting for SPC approval.

Allegheny Ludlum of the United States formed a joint venture with Shanghai No. 10 Iron and Steel Works for production of 15,000 t/yr precision stainless narrow strip in Shanghai. Allegheny will have 60% share of the new company, Shanghai STAL Precision Stainless Co. Ltd. Allegheny will provide technology, engineering, technical, and management services. The venture had been approved by the Shanghai Government.

**Lead and Zinc.**—Zhuzhou Smelter commissioned its new electrolytic zinc plant in April 1996. The construction cost of the new plant was \$24 million. It will increase zinc output capacity from 150,000 to 250,000 t/yr. Zhuzhou Smelter plans to export one-third of its output to Asian markets. The smelter has set up a sales office in Hong Kong, Singapore, and Japan. The expansion of zinc production capacity is also advantageous to expanding the output of minor metals such as cadmium, bismuth, and indium. The smelter is examining the possibility of building a new lead plant with advanced smelting technology

to replace the old plant. Currently, the smelter has a lead output capacity of 80,000 t/yr. The new plant is not expected to increase the output capacity but it will help to reduce the smelter's pollution levels.

Union Minière Cobalt and Energy Products of Belgium bought 75% shares of Blue Lotus Metals Co. from Shanghai Jiuling which produces cobalt powder in Shanghai. The company plans to build a new unit to produce zinc powder that will be used in batteries. The new unit is expected to begin production in the second half of 1997. Both cobalt and zinc output are targeted for the domestic market. Because of environmental problems, zinc powder containing mercury, which is currently being used in the Chinese market, will be phased out by 2000. The demand of high quality of zinc powder will be enhanced.

Shaoguan Smelter and Fankou Lead and Zinc Mine announced that they merged on July 18, 1996, to become Guangdong Shaoguan Linnan Lead/Zinc Group Co. Ltd. (China Metals, 1996e). The company has fixed assets worth \$290 million and has an annual output capacity of 150,000 t of lead and zinc concentrates and a total of 220,000 t of refined lead and zinc.

The \$12.2-million construction of Mengru Lead/Zinc Mine in Yunnan Province was completed. The mine has a designed output capacity to mill 200 t/d of ore. A 5,000-t/yr capacity refined zinc plant is being built next to the mine.

Baiyin Nonferrous Metals Co., a subsidiary of CNNC, in Gansu Province and Minco Mining and Metals Corp. of Canada signed a cooperative agreement to develop the third phase construction of the Changba lead/zinc deposit in Gansu. First phase construction was completed several years ago with a mining capacity of 3,000 t/d. The second phase construction is underway. Currently, the milling plant in the Changba Lead and Zinc Mine produces 50,000 t/yr of lead and zinc concentrates, which can only supply one-third of the 150,000-t/yr capacity of the Baiyin's Northwest Lead and Zinc Smelter. The third phase development will be in Lijiagou, part of the Changba area. Proven reserves are 3.8 Mt of combined lead and zinc content. The designed capacity is to produce 5,000 to 6,000 t/d of ore. The mine will be exploited jointly for 30 years. Minco will provide cash and equipment for the construction of the mine and Baiyin will invest in the form of the resources. The agreement requires approval of the State Council.

After 2 years of construction, the Qiantongshan Lead and Zinc Mine in Shaanxi Province was put into trial operation in October 1996. The project is a joint venture between CNNC and Shaanxi provincial government. The designed output capacity is 800 t/d of ore. The mine has proven reserves of 203,000 t of lead and 919,000 t of zinc.

**Magnesium.**—The Chinese magnesium sector has grown so fast that its existing output capacity exceeds the domestic demand. At the end of 1995, according to CNNC, there were about 400 magnesium producers with a total output capacity 200,000 t/yr. There were 90 more plants which were under construction. China's magnesium output increased from 5,900 t in 1990 to 93,600 t in 1995. The 1995 figure was based on

the third national industrial survey which included enterprises that were operated by rural collectives. All magnesium plants employ the Pidgeon process except Fushun Aluminium Plant, Minhe Magnesium Plant, and Guanghua Magnesium Plant. Only 15 of the smelters have an annual output capacity exceeding 3,000 t. Most of them have output capacity under 1,000 t/yr.

Japan's Nippon Kinzoku and China's Ningxia Huayuan Metallurgical Import and Export Trade Corp. announced the formation of a joint venture, Silver River Corp., in Shizuishan City, Ningxia Autonomous Region (China Metals, 1996f). The joint venture will build a magnesium plant with an annual designed output capacity of 1,000 t. The company plans to use local dolomite for the feed. The partners will be entitled to receive the same portion of the plant's output as their designated equity shares.

**Nickel.**—Chengdu Electric Smelter in Sichuan Province completed its technological innovation of its nickel unit in June 1996. It will increase its refined nickel output capacity to 5,000 t/yr. Chengdu Electric Smelter and a Canadian company are discussing the formation of a joint venture to increase its output capacity to 10,000 t/yr. All raw materials used for refined nickel are imported from nickel mines in Xinjiang and Jilin.

The construction of Jianchaling Nickel and Gold Mine began in December 1996. The mine is located in Lueyang County, Shaanxi Province. CNNC and Shaanxi government formed a Jianchaling Mining Development Co. Ltd. to be in charge of the project. The designed output capacity is to mine and mill 1,000 t/d of ore.

**Silver.**—In China, silver is mainly produced as a byproduct from copper, lead, and zinc mines. There are a number of primary silver mines—Bainiucheng in Yunnan, Baojia in Jiangxi, Tongbo in Henan, and Zhashui in Shaanxi but the output of these mines only accounts for 10% of the country's total output of silver. China does not have any primary silver smelter. Most silver is produced by copper and lead-zinc smelters such as Baiyin Nonferrous Metals Co., Shaoguan, Shenyang, Yunnan, and Zhuzhou. In the past, the Chinese Government considered that statistical information about precious metals were classified state secrets. Silver pricing has been liberalized. Analysis of the country's silver production and consumption is still not easily available. The country produced about 900 t and consumed about 1,000 t in 1995. The chemical sector is the major consumer of silver, followed by machinery sector and defense sector.

Breckenridge Resources Ltd. of Canada announced that the company has reached an agreement with Xinyuan Mining Co. Ltd., a joint venture between Baiyu County in Sichuan Province and a Hong Kong based company Norsang Corp., in developing the Xiaocun silver and base-metal deposit in Baiyu, Sichuan Province. If the agreement is approved by Chinese authorities and receives Canadian regulatory approvals, the share will split into 68-25-7 between Breckenridge, Baiyu, and Norsang, respectively. According to the Breckenridge and Rescan Engineering prefeasibility study, the deposit is capable of

supporting a 1,400 t/d mine and mill complex for 15 years based on currently defined reserves. The deposit has minable reserves of 7.4 Mt at a grade of 225 g/t silver, 9.15% zinc, 5.65% lead, 1.04% copper, and 0.61 g/t gold (Breckenridge Resources Ltd., 1997).

### *Industrial Minerals*

**Phosphate and Potash.**—The Chinese Ministry of Chemical Industry set an effort to increase the production of fertilizer to meet demand in the next several years. Increased self-sufficiency in phosphate and potash fertilizer is the ultimate goal for the Government. In China, most fertilizer plants are small. By the end of the century, the Government intends to develop 11 modern, large-scale mines to meet the needs of the domestic fertilizer sector. Six of these will be phosphate rock mines: Kuen Yang in Yunnan Province; Kai Yang and Wang Fu in Guizhou Province; and Jingxiang, Yichang, and Baokang in Hubei Province. The other five mines will be: Qaidam Basin in Qinghai Province; pyrite mines at Yenfu, in Gunagdong Province; Lujiang in Anhui, and Tanyaokuo in Nei Mongol; and a boron mine at Wongqiuanguo in Liaoning Province.

The State Council approved the commencement of a feasibility study for the second phase construction of a new potash fertilizer project in Qinghai Province. The plant, which is a proposed joint venture between China and Israel, is expected to produce 800,000 t/yr of potash. If the study proves favorable, the facility is expected to be fully operational within 3 years. Engineering work and geologic studies are being performed by Qinghai Potash Fertilizer Factory in association with China Minda Chemical and Mineral Industry General Corp. This involves the design of a system for extracting and pumping the raw material to the factory for processing. The latter is fully expected to utilize a cold crystallization technique to extract the potash salt present in Qarhan Salt Lake, Qinghai Province.

IMC Agrico of the United States signed a letter of intent with Yunnan Provincial Petroleum and Chemical Industry Bureau and the Yunnan Phosphorus Chemical Industry (Group) Corp. to conduct a feasibility study for the development of the resources of phosphate ore in Yunnan Province. If commercially viable, joint development of phosphate fertilizer will be pursued by the partners.

**Rare Earths.**—In 1990, the State Council decided to impose mandatory planning on the production of rare earths. In 1991, the State Council issued a circular to protect the exploitation of ionic rare earths. All projects of rare-earth mining, separation, and smelting including both greenfield or expansion must be approved by the Rare Earth Leading Group under the State Council which was renamed as the Rare Earth Office and reaffiliated to SPC. Under Chinese regulations, the rare-earth mining sector is completely closed to foreign investment. For rare earth separation and extraction, foreign investment is also restricted, but it will be allowed if advanced technologies and equipment are involved. Foreign investment in the production of high-tech rare-earth materials is encouraged. The Rare Earth Office has yet to approve any Sino-foreign joint venture on rare

earth separation and extraction projects.

Japanese companies are active in the production of high-tech rare-earth materials in China. Okura, Seimi Chemical, Sanyu Steel and Rare Earth of Japan signed a joint venture agreement with Baotou Iron and Steel and Rare Earth Corp. to produce rare earth polishing powder in Baotou, Nei Mongol. Kasei Optonix Asia, a subsidiary of Mitsubishi Chemical of Japan, reached an agreement with Zhujiang Smelter to invest \$8.5 million to produce phosphor in Guangzhou, Guangdong Province.

The Rare Earth Office plans to increase rare-earth production in the Ninth Five-Year-Plan period. The specific targets are to increase rare-earth ore output capacity to 70,000 t and rare earth processing capacity to 50,000 t by 2000. Domestic rare earth consumption will increase to 18,000 t and exports will be 25,000 t.

### **Mineral Fuels**

While the country's economy continuously keeps growing and the living standards rise, fuel consumption is expected to grow by 6% annually in the next several years. However, the energy supply is predicted only to increase by 2%. Power shortages led to outages during peak demand periods. To meet the needs of development, the Government hopes to add 300,000 MW to the grid by the year 2000, and another 800,000 MW by 2020. In order to achieve the goal of balance supply and demand in the energy sector, the Government is encouraging various forms of cooperation—"equity", "independent", and "build-operate-transfer (BOT)". The progress on the Sino-foreign cooperation was slow in the past years following the central Government directive that restricted investment returns. In the past couple months, both the central government and investors have stepped back from previously rigid positions. China has relaxed its insistence on what industry analysts considered to be unrealistically low rates of return. Foreign investors have decided that they can pursue the power projects without sovereign guarantees from the central Government.

Electricite de France and FEC Alstom signed a draft franchise contract with the Guangxi Zhuang Autonomous Region Government to construct the \$600 million Laibin B Power Plant which will be capable of generating 700,000 kilowatts of electricity. One-quarter of the installation's cost is to be provided by shareholders and will be regarded as the registered capital of the operating company. The remaining 75% will be raised through financial institutions. The term of the franchise is to be 18 years. After that, operation of the installation will be transferred without cost to the government of Guangxi, making it the first BOT powerplant in China.

According to an official from China National Nuclear Corp., the Government decided to relocate the nuclear powerplant from the site at Dailian, Liaoning Province, to Lianyungang, Jiangxi Province (China Daily, 1996d). The change of site will not affect the 1992 agreement between China and Russia. The Russian Government will partially finance a loan to the project. Domestic funds will be shared by China National Nuclear Corp., Jianguo International Trust and Investment Corp., Jianguo

Electric Power Co., and East China Electric Power Group. Lack of adequate coal and hydropower resources were energy obstacles for economic development in the province.

In recognition of China's growing importance on the world energy scene, the International Energy Agency and China's SPC signed a memorandum of understanding on cooperation on energy policies such as energy conservation and efficiency, foreign investment and trading in the energy sector, energy supply security, and statistical information.

Beginning of January 1, 1997, the operations of the country's thermal powerplants are required to comply with the new standards for atmospheric pollutant emission guidelines. New thermal powerplants must be equipped with a flue-gas desulfurization system if sulfur content in the coal to be used is 1% or higher. The emission of nitrogen dioxide is also to be reduced.

**Coal.**—China depends heavily on coal to meet its energy needs. The coal sector provides 75% of the country's energy. The status of coal as a major fuel in China is not expected to change much in the near future. China, with verified coal resources of 1 trillion metric tons, is the largest coal producer in the world. The country produced more than 1.37 billion metric tons of coal in 1996. By 2000, annual output is expected to increase to 1.45 billion metric tons. The economically developed areas in the eastern part of China, which consumes most of the energy, has 11% of the country's coal resources, while the underdeveloped western region accounts for 89%. Because of intensive mining in the past three decades, many coal mines in the eastern part of China are expected to cease output by the year 2020. Provinces and autonomous regions in north and northwest China are ambitiously building into energy bases in the next century. However, without sufficient water supply or convenient transportation, large-scale mining in the north and northwest region of the country is very difficult.

The Government plans to consolidate 14 state-owned coal companies into four enterprises (groups) in early 1997. The four enterprises will be organized into four areas: coal trade, comprehensive coal utilization, construction and development, and materials and equipment manufacturing and trading. The Government hopes that the establishment of the four enterprises will increase the country's competitive edge in the international coal market. China plans to increase its coal exports to 40 Mt by 2000. Currently, coal mining and railway transport are supervised separately by MCI and the Ministry of Railways. The Government believes that unified management and integration may help to transport coal from the northwest part of China to the coastal areas for exports more timely. These four enterprises will be under the supervision of MCI.

The State Council approved MCI, MGMR, and China Natural Gas and Petroleum Corp. (CNPC) to form Zhonglian Coalbed Gas Co. Ltd. to develop and utilize coalbed methane. According to government figures, China has 35 trillion cubic meters of coalbed methane, equivalent to 45 billion metric tons of coal (Journal of Commerce, 1996). Since 1949, there have been 15,000 coal mine explosions caused by methane accumulations. China has tried to develop coalbed methane in

the past four decades, but was hampered by lack of domestic technology and governmental support. The cost of exploration for methane is large and the return on investment is long term. The report prepared by MCI, MGMR, and CNPC recommended that the Government provides preferential policies such as exemption of VAT, income taxes, and resources taxes and grants rights to raise funds abroad for development work.

The construction of Zhunge'er Coal Mine project in Nei Mongol is proceeding smoothly. The project includes construction of an open pit coal mine with a designed output capacity of 15 Mt/yr, a coal-fired powerplant with installed capacity of 200,000 kW, and a 264-km electrified railway. The first stage construction of the coal mine, powerplant, and the railway were completed according to schedule.

The State Council approved the construction of a 720-km pipeline for transporting liquefied coal from Yuxian, Shanxi Province to Qingdao, Shandong Province. The coal pipeline will carry 7 Mt of clean coal per year. The coal will be used for the two coal-fired plants, Weifang and Qingdao, in Shandong Province.

**Oil and Gas.**—China produced 156.45 Mt of crude oil, 141.45 Mt from onshore and 15 Mt from offshore in 1996. However, the gap between supply and demand continues to widen. China imported 22.62 Mt in 1996, which accounted for 12% of the country's demand. According to an official from China National Chemicals Import and Export Corp., China will import about 34 Mt of crude oil in 1997 and this level of imports is expected to continue for a long time unless substantial new deposits are found (China Daily, 1997a). Onshore oilfields in the east of China produced 85% of the country's total output for the past decade, and will face difficulties in stabilizing production in the next decade. China is pinning its hopes on the northwestern part of the country, Xinjiang Uygur Autonomous Region, which it is expected to have vast reserves. In 1993, the Chinese Government invited foreign oil investors to bid on the Tarim Basin, Xinjiang Uygur Autonomous Region; several contracts were awarded. Since then, after conducting seismological study and drilling in the area, foreign investors' interests in the area have sharply declined. But the Government, however, continued to exploit oil and gas in Xinjiang Uygur Autonomous Region. China's goal is to have an annual output capacity of 24 Mt of crude oil from Xinjiang's three basins—Junggar, Tarim, and Turpan-Hami, in the next 5 years.

Initially, the Government plans to keep its oil market tightly regulated until the year 1999. In 1994, China implemented a two-tier oil price system. The Government also experimented with oil price reform by permitting trade of limited quantities of oil on oil exchanges in Beijing and Shanghai. However, conditions for deregulating the oil market proved to be immature and the Government closed the oil exchanges. Some Sino-foreign joint venture onshore oilfields are scheduled to produce oil in 1997. Under the preferential policy, foreign investors are permitted to sell oil at world market prices that are higher than the oil prices adopted in two-tier oil price system. This will create a three-tier oil price system. Domestic oil analysts expected that the emerging the three-tier oil price system would

force the Government to accelerate a reform oil sector. For decades, the Government set low prices on oil and gas to aid the fertilizer, refinery, and petrochemical sectors. Once oil prices are deregulated, these sectors will face increases in production costs because of higher raw materials prices.

The State Council approved the establishment of a third oil company, to be based at the Bureau of Petroleum and Marine Geology of the MGMR. The new company, the China National Star Petroleum Corp. (CNSPC), will undertake the prospecting and development of onshore and offshore oil and gas. CNSPC will be allowed to negotiate with foreign investors for oil and gas exploration and development. It is uncertain how the Government will allocate oil-bearing areas to the three companies—CNPC, CNSPC, and China National Offshore Oil Corp. When the Government receives applications for oil exploration and development, MGMR is responsible for allotting oil-bearing areas and issuing licenses to oil companies. The new company is under the supervision of MGMR and domestic oil analysts are confused as to whom will handle possible disputes among the three companies. All three oil companies are considered to be ministerial level.

China aims to develop and use more natural gas to improve its energy mix to ease pollution. CNPC has verified 340 billion cubic meters of natural gas in Shaanganning, an area between the provinces of Gansu and Shaanxi and Ningxia Hui Autonomous Region, and 200 billion cubic meters in Xinjiang Uygur Autonomous Region. Sichuan Province contains a very significant proportion of natural gas resources. An estimated of 7.18 trillion cubic meters of natural gas resource is in the province. Proven reserves are 3.70 trillion cubic meters. There are five major gasfields in the province—the Central Field, the Eastern Field, the Northwest Field, the South Field, and the Southwest Field. Annual output capacity is 7.1 billion cubic meters. The Government plans to increase production by 25% to 9 billion cubic meters in the year 2000. According to the Sichuan Petroleum Authority (SPA) and foreign petroleum experts, the Eastern Field appears to contain the most promising reserves.

In December 1995, Texaco of the United States secured rights from SPA to explore in Sichuan's Southwest Field. The exploration permit covers the Ya'an and Leshan oil blocks. Texaco is conducting seismic tests and will begin exploratory drilling in 1997. According to the agreement, Texaco will assume the financial risk for exploration. If the resources are proven to be commercially viable, SPA and Texaco will share production and distribution costs (US Embassy, 1996).

In June 1996, Enron of the United States and SPA reached an agreement to conduct a feasibility study to increase production in Sichuan's Central Field. Enron will develop a method to improve the recovery of oil and gas in the Chuanzhong block. If the results are positive, Enron and SPA will cooperate to develop oil and gas in the area. Enron and SPA are also considering cooperating in the development of the resources in the Eastern Gas Field.

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21 Hepingli Bei Lu, Beijing 100713
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64 Funei Dajie, Beijing 100812
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46 Dongsi Xi Dajie, Beijing 100711
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TABLE 1  
CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1992	1993	1994	1995	1996
<b>METALS</b>					
<b>Aluminum:</b>					
Bauxite, gross weight	2,700	3,500	3,700	5,000	6,200
Alumina, gross weight	1,580	1,820	1,850	2,200	2,490
Metal, refined, primary and secondary	1,100	1,260	1,500	1,870 r/	1,780
<b>Antimony:</b>					
Mine, Sb content	59,400	60,000	91,000	125,000 r/	100,000
Metal	68,100	81,300	101,200	130,000 r/	99,500
<b>Bismuth:</b>					
Mine output, Bi content	820	740	610	740 r/	800
Metal	1,060	1,050	850	800 r/	800
Cadmium, smelter	1,150	1,160	1,280	1,450 r/	1,400
<b>Cobalt:</b>					
Mine output, Co content	260	240	270	980 r/	800
Metal	220	190	200	240 r/	200
<b>Copper:</b>					
Mine output, Cu content	334,200	345,000	395,600	445,000 r/	450,000
<b>Metal:</b>					
Smelter, primary	418,000	443,000	482,400	538,000 r/	550,000
Refined, primary and secondary	659,000	730,300 r/	736,100	1,080,000 r/	906,000
Gold, mine output, Au content	125	130	132	140	145
<b>Iron and steel:</b>					
Iron ore, gross weight	197,600	234,660	240,170	249,350	249,550
Pig iron	7,590	8,740	97,410	105,300 r/	105,310
Ferroalloys	2,650	3,000	3,360	4,320 r/	3,520
Steel, crude	80,940	89,560	92,610	95,360 r/	101,100
Steel, rolled	66,970	77,160	84,280	89,800 r/	86,110
<b>Lead:</b>					
Mine output, Pb content	330,200	338,100	461,900	520,000 r/	500,000
<b>Metal:</b>					
Smelter, primary	295,000	326,000	366,000 r/	360,000 r/	365,000
Refined, primary and secondary	365,000	412,000	467,900	608,000 r/	530,000
Magnesium metal, primary	10,550	11,800	24,000	93,600	50,000
Manganese ore, gross weight	5,300	5,860	3,570	6,900	6,000
Mercury, mine output, Hg content	580	520	470	780 r/	240
Molybdenum, mine output, Mo content	19,200	18,300	21,400	33,000 r/	30,000
<b>Nickel:</b>					
Mine output, Ni content	32,800	30,700	36,900	41,800 r/	43,000
Matte	36,100	34,600	37,200	42,600 r/	42,000
Smelter	30,800	30,500	31,300	38,900 r/	43,300
Silver, mine output, Ag content	800 r/	840 r/	810 r/	910 r/	1,140
<b>Tin:</b>					
Mine output, Sn content	43,800	49,100	54,100	61,900 r/	60,000
Metal, smelter	39,600	52,100	67,800	67,700 r/	56,000
Titanium, sponge	1,710	1,490	850	1,720 r/	1,990
Tungsten, mine output, W content	25,410	21,600	27,000	28,400 r/	24,000
Vanadium (in vanadiferrous slag product)	4,700	5,000	5,400	7,000	7,500
<b>Zinc:</b>					
Mine output, Zn content	758,100	775,000	990,300	1,011,000 r/	1,010,000
Refined, primary and secondary	719,000	857,000	1,012,000	1,077,000 r/	1,119,000
<b>INDUSTRIAL MINERALS</b>					
Asbestos	225,900	242,600	303,100 r/	263,000 r/	250,000
Barite	1,500	1,500	1,500	1,500	1,500
Boron, mine, B <sub>2</sub> O <sub>3</sub> equivalent	126,800	155,400	188,200	294,600 r/	183,000
Bromine	16,650	24,600	31,400	30,000	31,000
Cement, hydraulic	308,220	367,880	421,180	475,910 r/	490,000

See footnotes at end of table.

TABLE 1--Continued  
CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1992	1993	1994	1995	1996	
INDUSTRIAL MINERALS--Continued						
Dolomite	thousand tons	4,910	4,950	4,150	8,090	7,000
Fluorspar	do.	1,890	2,050	900	2,000	2,000
Graphite		300,000	310,000	183,000 r/	204,000 r/	210,000
Gypsum	thousand tons	11,000	10,600	6,820 r/	7,340 r/	8,000
Kyanite and related materials		2,500	2,500	2,500	2,500	2,500
Lithium minerals, all types		15,500	15,500	16,000	16,000	16,500
Magnesite	thousand tons	1,510	1,230	990	610 r/	600
Nitrogen: N content of ammonia	do.	19,000	18,000	20,100 r/	22,600 r/	23,000
Phosphate rock and apatite, P <sub>2</sub> O <sub>5</sub> equivalent	do.	6,400	6,350	7,430 r/	7,960 r/	6,350
Potash, marketable, K <sub>2</sub> O equivalent	do.	21	25	74 r/	80 r/	110
Salt	do.	28,100	29,530	29,746	29,780 r/	28,920
Sodium compounds: Soda ash, natural and synthetic	do.	4,550	5,350	5,810	5,980 r/	6,390
Sulfur:						
Native	do.	320	330	330	160 r/	170
Content of pyrite	do.	4,930	5,330	5,870	4,570 r/	4,680
Byproduct, all sources	do.	650	700	700	700	700
Total	do.	5,900	6,360	6,900	5,430 r/	5,550
Talc and related materials	do.	2,500	2,300	2,400	2,400	2,400
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite	thousand tons	214,000	220,000	248,000 r/	260,000	270,000
Bituminous and lignite	do.	896,000	920,000	992,000 r/	1,101,000 r/	1,104,000
Total	do.	1,110,000	1,140,000	1,240,000 r/	1,361,000 r/	1,374,000
Coke, all types	do.	79,840	93,200	114,770	135,010 r/	137,000
Gas, natural:						
Gross	billion cubic meters	16	17	17	18 r/	20
Marketed	do.	14	15	15	16 r/	17
Petroleum:						
Crude (including crude from oil shale)	million 42-gallon barrels	1,050	1,060	1,080	1,100	1,170
Refinery products	do.	830	860	950	950	980

r/ Revised.

1/ Table includes data available through May 30, 1997.

TABLE 2  
CHINA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1996

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies 1/	Location of main facilities	Annual capacity e/
Aluminum:			
Alumina	Pingguo Aluminum Industry Co.	Guangxi, Pingguo	300
Do.	Guizhou Aluminum Plant	Guizhou, Guiyang	400
Do.	Changcheng (Great Wall) Aluminum Corp.	Henan, Zhongzhou	200
Do.	do.	Hunan, Zhengzhou	640
Do.	Shandong Aluminum Plant	Shandong, Zibo	650
Do.	Shanxi Aluminum Plant	Shanxi, Hejin	1,200
Metal	Baiyin Aluminum Plant	Gansu, Baiyin	50
Do.	Huang He (Yellow River) Aluminum Corp.	Gansu, Lanzhou	82
Do.	Liancheng Aluminum Plant	do.	85
Do.	Pingguo Aluminum Industry Co.	Guangxi, Pingguo	100
Do.	Guizhou Aluminum Plant	Guizhou, Guiyang	160
Do.	Changcheng (Great Wall) Aluminum Corp.	Hunan, Zhengzhou	50
Do.	Fushun Aluminum Plant	Liaoning, Fushun	100
Do.	Qingtongxia Aluminum Plant	Ningxia, Qingtongxia	100
Do.	Qinghai Aluminum Smelter	Qinghai, Xining	200
Do.	Shandong Aluminum Plant	Shandong, Zibo	60
Do.	Jiaozuo Aluminum Plant	Henan, Jiaozuo	53
Do.	Sanmenxia Aluminum Plant	Henan, Sanmenxia	30
Do.	Yanji Aluminum Plant	Jilin, Yanji	15
Do.	Baotou Aluminum Plant	Nei Mongol, Baotou	120

See footnotes at end of table.

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

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies 1/	Location of main facilities	Annual capacity e/
Aluminum--Continued:				
Metal--Continued:		Tongchuan Aluminum Plant	Shaanxi, Tongchuan	50
Do.		Taiyuan Aluminum Plant	Shanxi, Taiyuan	30
Do.		Yunnan Aluminum Plant	Yunnan, Kunming	40
Asbestos		China National Nonmetallic Industry Corp.	Nei Mongol, Baotou; Shanxi, Lai Yuan and Lu Liang	130
Barite		do.	Guizhou, Xiangshou	NA
Coal		Ministry of Coal Industry	Hebei	70,000
Do.		do.	Heilongjiang	100,000
Do.		do.	Henan	100,000
Do.		do.	Liaoning	70,000
Do.		do.	Nei Mongol	90,000
Do.		do.	Shandong	60,000
Do.		do.	Shanxi	400,000
Do.		do.	Sichuan	80,000
Cobalt	tons	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchang	400
Copper, refined		Tongling Nonferrous Metals Co.	Anhui, Tongling	100
Do.		Wuhu Smelter	Anhui, Wuhu	60
Do.		Baiyin Nonferrous Metals Co.	Gansu, Baiyin	50
Do.		Jinchuan Nonferrous Metals Corp.	Gansu, Jinchuan	20
Do.		Luoyang Copper Processing Factory	Henan, Luoyang	50
Do.		Daye Nonferrous Metals Co.	Hubei, Daye	20
Do.		Guixi Smelter (Jiangxi Copper Metals Co.)	Jiangxi, Guixi	100
Do.		Shenyang Smelter	Liaoning, Shenyang	100
Do.		Shanghai Smelter	Shanghai	80
Do.		Taiyuan Copper Industry Co.	Shanxi, Taiyuan	30
Do.		Tianjin Copper Electrolysis Factory	Tianjin	25
Do.		Yunnan Smelter	Yunnan, Kunming	100
Gas, natural	billion cubic meters	China National Petroleum Corp.	Sichuan	10
Gold, refined	thousand kilograms	China National Gold Corp.	Henan, Lingbao	10
Do.		Laizhou Gold Co.	Shandong, Laizhou	15
Do.		Zhaoyuan Gold Co.	Shandong, Zhaoyuan	15
Graphite		China National Nonmetallic Industry Corp.	Shandong, Laixi and Pingdu	190
Iron and steel:				
Iron ore		Maanshan Iron and Steel Co.	Anhui, Maanshan	10,000
Do.		Shoudu Iron and Steel Corp.	Beijing	20,000
Do.		Meishan Metallurgical Co.	Shanghai	2,000
Do.		Jiuquan Iron and Steel Co.	Gansu, Jiayuguan	4,000
Do.		Hainan Iron Mine	Hainan, Changjiang	4,600
Do.		Handan Xingtai Metallurgical Bureau	Hebei, Handan	3,800
Do.		Tangshan Iron and Steel Co.	Hebei, Tangshan	3,000
Do.		Wuhan Iron and Steel Corp.	Hubei, Wuhan	5,100
Do.		Banshigou Iron Mine Mining Co.	Jilin, Hunjiang	1,400
Do.		Anshan Iron and Steel Corp.	Liaoning, Anshan	30,000
Do.		Benxi Iron and Steel Co.	Liaoning, Benxi	13,700
Do.		Baotou Iron and Steel and Rare Earth Co.	Nei Mongol, Baotou	10,000
Do.		Taiyuan Iron and Steel Co.	Shanxi, Taiyuan	4,000
Do.		Dabaoshan Mining Co.	Guangdong, Qujiang	1,670
Do.		Panzhihua Mining Co.	Sichuan, Panzhihua	13,000
Do.		Kuming Iron and Steel Co.	Yunnan, Kuming	1,400
Ferroalloy		Shoudu Iron and Steel Corp.	Beijing	35
Do.		Northwest Ferroalloy Co.	Gansu, Yongdeng	60
Do.		Zunyi Ferroalloy Co.	Guizhou, Zunhi	100
Do.		Jilin Ferroalloy Co.	Jilin, Jilin	250
Do.		Jinzhou Ferroalloy Co.	Liaoning, Jinzhou	90
Do.		Liaoyang Ferroalloy Co.	Liaoning, Liaoyang	70
Do.		Shanghai Steel Co.	Shanghai	180
Do.		Emi Ferroalloy Co.	Sichuan, Emei	70
Do.		Hengshan Ferroalloy Co.	Zhejiang, Jiande	70

See footnotes at end of table.



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

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies 1/	Location of main facilities	Annual capacity e/
Iron and steel--Continued:			
Crude steel	Maanshan Iron and Steel Co.	Anhui, Maanshan	3,000
Do.	Shoudu Iron and Steel Corp.	Beijing	10,000
Do.	Handan Iron and Steel General Work	Hebei, Handan	2,400
Do.	Tangshan Iron and Steel Co.	Hebei, Tangshan	2,300
Do.	Wuhan Iron and Steel Corp.	Hubei, Wuhan	6,000
Do.	Anshan Iron and Steel Corp.	Liaoning, Anshan	10,000
Do.	Benxi Iron and Steel Co.	Liaoning, Benxi	2,700
Do.	Baotou Iron and Steel and Rare Earth Co.	Nei Monggol, Baotou	3,500
Do.	Baoshan Iron and Steel Corp.	Shanghai	10,000
Do.	Shanghai Iron and Steel Co. Ltd.	do.	6,000
Do.	Taiyuan Iron and Steel Co.	Shanxi, Taiyuan	2,500
Do.	Panzhuhua Iron and Steel Corp.	Sichuan, Panzhuhua	3,000
Lead	Baiyin Nonferrous Metals Co.	Gansu, Baiyin	50
Do.	Shaoguan Smelter	Guangdong, Shaoguan	35
Do.	Shuikoushan Mining Bureau	Hunan, Hengyang	30
Do.	Zhuzhou Smelter	Hunan, Zhuzhou	80
Do.	Shenyang Smelter	Liaoning, Shenyang	70
Do.	Kunming Smelter	Yunnan, Kunming	20
Magnesium	Fushun Aluminum Plant	Liaoning, Fushun	5
Do.	Minhe Magnesium Plant	Qinghai, Minhe	7
Nickel, refined	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchuan	40
Do.	Chengdu Electro-Metallurgy Factory	Sichuan, Chengdu	5
Petroleum, crude	Shengli Bureau	Hebei, Shengli	33,350
Do.	Daqing Bureau	Heilongjiang, Daqing	55,000
Do.	Liaohe Bureau	Liaoning, Liaohe	15,000
Do.	Bohai Offshore Oil Corp.	Bohai	4,000
Do.	Nanhai East Corp.	Nanhai	5,000
Potash	Ministry of Chemical Industry	Qinghai	40
Rare earths	Gansu Rare Earths Co.	Gansu, Baiyin	32
Do.	Jiangxi Rare Earths Co.	Jiangxi, Nanchang	1
Do.	Zhujiang Smelter	Guangdong, Guangzhou	5
Do.	Baotou Iron and Steel and Rare Earths Corp.	Nei Mongol, Baotou	25
Do.	Shanghai Yaolong Nonferrous Metals Co.	Shanghai	2
Salt	Ministry of Chemical Industry	Anhui	200
Do.	do.	Qinghai	320
Talc	China National Nonmetallic Industry Corp.	Guangxi, Longshen	130
Do.	do.	Liaoning, Haicheng	50
Do.	do.	Shandong, Qixia	5
Tin, smelter	Dachang Mining Administration	Guangxi, Dachang	5
Do.	Yunnan Tin Industry Co.	Yunnan, Gejiu	20
Do.	Laibin Smelter	Yunnan, Laibin	12
Titanium	Zunyi Titanium Plant	Guizhou, Zunyi	5
Do.	Fushun Aluminum Plant	Liaoning, Fushun	1
Tungsten, concentrate	China National Nonferrous Metals Industry Corp.	Guangdong, Guangxi, Hunan, Jiangxi, and Zhejiang	60
Zinc	Northwest China Lead -Zinc Smelter	Gansu, Baiyan	110
Do.	Shaoguan Smelter	Guangdong, Shaoguan	160
Do.	Liuzhou Zinc Products Factory	Guangxi, Liuzhou	32
Do.	Shuikoushan Mining Bureau	Hunan, Hengyan	28
Do.	Zhuzhou Smelter	Hunan, Zhuzhou	250
Do.	Huludao Zinc Smelting Co.	Liaoning, Huludao	320
Do.	Shenyang Smelter	Liaoning, Shenyang	20
Do.	Laibin Smelter	Yunnan, Laibin	50

e/ Estimated. NA Not available.

1/ Companies are owned either by State Government or Provincial Government.

TABLE 3  
CHINA: EXPORTS OF SELECTED MINERAL COMMODITIES IN 1996

(Metric tons)

	Quantity	Value (thousands)
<b>METALS</b>		
<b>Aluminum:</b>		
Bauxite	20,000	\$14,345
Alumina	10,000	2,569
<b>Metal and alloys:</b>		
Unwrought	110,053	162,165
Semimanufactures	59,118	126,045
Antimony metal, unwrought	31,192	62,606
Barium sulfate	1,860,000	57,841
<b>Copper, metal and alloys:</b>		
Unwrought	53,003	117,390
Semimanufactures	80,705	276,314
<b>Iron and steel:</b>		
Ferrosilicon	260,000	164,548
Pig iron and cast iron	3,590,000	517,614
<b>Steel:</b>		
Bars and rods	650,000	215,970
Shapes and sections	490,000	149,491
Sheets and plates	2,170,000	741,579
Tube and pipe	300,000	289,741
Magnesium carbonate and oxide	1,940,000	264,841
Manganese, unwrought	45,652	62,849
Tin, metal and alloys, unwrought	36,128	200,391
<b>Tungsten:</b>		
Tungstates	12,425	68,588
Ore	140	345
<b>Zinc:</b>		
Metal and alloys, unwrought	226,777	218,243
Oxide and peroxide	26,697	23,687
<b>INDUSTRIAL MINERALS</b>		
Cement	11,800,000	450,914
Fluorspar	1,110,000	117,750
Graphite, natural	158,368	41,212
Talc	1,020,000	74,923
<b>MINERAL FUELS</b>		
Coal	29,030,000	1,109,967
Coke, semicoke	7,790,000	619,145
<b>Petroleum:</b>		
Crude oil	20,330,000	2,777,195
Refinery products	4,170,000	868,563

Source: China's Customs Statistics (1996.12).

TABLE 4  
CHINA: IMPORTS OF SELECTED MINERAL COMMODITIES IN 1996

(Metric tons unless otherwise specified)

	Quantity	Value (thousands)
METALS		
Aluminum:		
Alumina	1,160,000	\$236,977
Metal and alloys, unwrought	366,733	457,778
Semimanufactures	267,685	594,973
Scrap	298,937	133,937
Chromium: Chromite	760,000	1,243,444
Copper:		
Ore	820,000	393,174
Metal and alloys, unwrought	290,945	571,404
Semimanufactures	423,302	1,101,723
Scrap	710,183	318,135
Iron and steel:		
Iron ore	43,870,000	1,320,589
Pig iron and cast iron	40,000	6,304
Steel:		
Bars and rods	4,510,000	1,318,449
Seamless pipe	520,000	526,506
Shapes and sections	350,000	178,168
Sheets and plates	10,440,000	4,859,769
Manganese ore	1,590,000	133,553
INDUSTRIAL MINERALS		
Diamond kilograms	647	177,456
Fertilizers:		
Compound fertilizers	7,210,000	1,660,673
Potassium chloride	3,440,000	386,648
Potassium sulfate	420,000	84,517
Urea	6,010,000	1,242,021
Sodium carbonate	62,734	10,656
Titanium dioxide	84,833	53,724
MINERAL FUELS		
Coal	3,200,000	145,930
Petroleum:		
Crude oil	22,620,000	3,406,548
Refinery products	15,830,000	2,384,520

Source: China's Customs Statistics (1996.12).