

THE MINERAL INDUSTRY OF

THAILAND

By Pui-Kwan Tse¹

In 1994, the Thai economy continued to improve after the recovery that began at yearend 1992 and the gross domestic product (GDP) grew by an estimated 8.5% from 1993.² The Bank of Thailand (BOT) estimated that the revenue deficit for 1994 was about \$8.5 billion³ or 5.9% of GDP. The consumer price index increased sharply at yearend 1993 and continued in the first half of 1994; however, it rose only about 5% in 1994. According to BOT, the utilization of manufacturing capacity in the private sector was at 78.5% in 1994, which was a good indicator for measuring the threat of inflation.

The Thai Government was focusing on three areas in terms of macrocontrol economic stability—continuing price stability, ensuring a sustainable revenue balance, and improving the infrastructure. The Thai Government also tried to maintain Thailand's trade competitiveness and attract foreign investment because the total value of export accounted for about 30% of GDP in 1994. However, Thai industrialists and investors expressed concern that the Thai labor force was lacking in scientific and technical skills. According to Thailand Development and Research Institute's study, more than 81% of the country's 4 million industrial workers had a sixth-grade education and the country faced a serious shortage of engineers and technicians. The skilled labor force would be in short supply from now into the 21st century. It was becoming increasingly difficult for investors to find and retain skilled workers. The Thai Government feared that its country would lose its competitiveness for foreign investments with neighboring countries, such as China, Laos, and Vietnam.

Government Policies and Programs

The Thai Government continued to welcome foreign investment, and investors willing to meet certain requirements regarding local content or ownership were able to apply for special investment privileges through the Board of Investment.

In 1994, the Thai Government adopted a new Copyright Law that took effect in January 1995 to curb piracy of intellectual property in Thailand. The laws were expected to be enforced through a newly created Intellectual Property Court.

According to the Minerals Act, B.E. 2510 (1967) and its subsequent amendments, the Thai Government had the

exclusive ownership of all minerals upon, in, or under the surface of both publicly and privately owned land. Prospecting or mining required a license or lease. There were four major mining rights: the mineral prospecting license, the exclusive mineral prospecting license, the temporary mining permit, and the mining lease.

The Improvement and Conservation of National Environmental Quality Act, B.E. 2535 (1992), was issued in 1992. The act was administered by the Office of Environmental Planning and Policy (OEPP). The act mandated that all mining projects were required to submit an environmental impact assessment plan for approval before the commencement of any mining activities and to set up an environmental fund for the Thai economy. The OEPP had the authority to designate any natural area as an environmentally protected area to control its use.

Mining in forested areas was under the Forestry Act, B.E. 2484 (1941), and the National Reserved Forest Act, B.E. 2507 (1964). Mining operators were required to receive permission to use the land from the Royal Forestry Department in addition to obtaining a mining license from the Department of Mineral Resources.

Production

The mineral industry in Thailand was an important economic force. In recent years, the mining sector has diminished greatly in relative importance with the rapid rise of the manufacturing and services sectors. The new regulations under the umbrella of the National Environment Act also constrained expansion of the mining sector. The value of mineral exports fell from 15% to less than 1% of Thailand's total exports. The number of individuals employed in the mining sector dropped from a peak of nearly 100,000 in 1980 to less than 30,000 in 1994.

More than 40 minerals are produced in Thailand; however, only about 20 are considered to be economically significant. The major minerals produced were feldspar, gypsum, kaolin, lignite, limestone, tin, and zinc. Most of the major metallic minerals, such as lead, tin, and zinc, were produced and consumed domestically. Production of major mineral commodities is listed in table 1.

Trade

The United States remained the most important export market for Thailand, with exports totaling \$10.3 billion and imports amounting to \$4.9 billion. The second largest market was the European Community, followed by the Association of Southeast Nations. Growth in exports of textiles, plastic products, computers, and electronics was strong.

In 1994, the total export value for minerals was about \$127 million. Slumps in tin and zinc prices in the international market and the strong demand in the domestic market were the two major reasons for the decrease in the export of minerals.

Structure of the Mineral Industry

Minerals are counted as state-owned properties. All activities regarding mineral development are supervised by the Government to ensure that benefits would be maximized for the country. All mining companies are privately owned, except the lignite mine at Mae Moh in Lampang Province, which is owned by the Electricity Generating Authority of Thailand (EGAT), a state enterprise designated to mine lignite for power generation. Most mining companies in Thailand conduct small-scale operations. Several large-scale mines operated in Thailand, such as the zinc mine owned by Padaeng Industry Co. (PDI); lignite mines operated by EGAT; Lanna Lignite Co., Ban Pu Co., and a lead mine operated by Kanchanaburi Exploration and Mining Co. (KEMCO).

The country's mineral resources are distributed throughout the country. Petroleum occurrences are in the Gulf of Thailand, in a northern offshoot of the central plain, and in the central part of the Khorat basin in northeast Thailand. Principal companies and operating locations are shown in table 2.

Commodity Review

Metals and Industrial Minerals

Aluminum.—The Nikkei Thai Aluminum, a subsidiary of Nippon Light Metal of Japan, began to construct its second secondary aluminum alloy plant at Bangpakong in Chonburi Province.⁴ The first aluminum alloy plant at Bangpoo was commissioned in 1990 with an annual output capacity of 14,000 metric tons (mt). However, the Nippon Light Metal estimated that the demand of aluminum alloys was about 21,000 metric tons per year (mt/a) in Thailand. With limited plant space at Bangpoo, further production capacity expansion was impossible. The new plant at Bangpakong would have an annual output capacity of 24,000 mt and was expected to begin operation in 1995. When the Bangpakong plant reaches its full production capacity, the Bangpoo plant

would be closed.

Copper.—PDI and Phelps Dodge Mining Co. of the United States signed a joint-venture agreement to explore copper deposit sites in northeast Loei Province. PDI held 51% of Phelps Dodge Puthep Co. and Phelps Dodge held the remainder.⁵ Initial exploration results indicated that the ore contained about 0.4% of copper and could be refined into an estimated total of 740,000 mt of copper metal.

Iron and Steel.—The Board of Investment (BOI) of Thailand decided to liberalize the country's steel industry. Sahaviriya Steel Industries Co. (SSIC) had been granted exclusive rights in 1989 by the Government to develop hot- and cold-rolled steel plants through 1999 in Thailand. BOI's liberalization decision was based on the fact that the domestic demand of hot- and cold-rolled steel products exceeded SSIC's capacity. Annual demand of cold-rolled steel products was expected to reach 1.7 million metric tons (Mmt) in 1997; however, Sahaviriya's approved cold-rolled steel products capacity was only 670,000 mt.⁶

SSIC commenced the country's first hot strip mill in 1994. The mill was designed by Innse of Italy, which supplied all the mechanical equipment and also acted as project manager for all auxiliary plants and services. The mill is a 1.7-meter (m)-wide hot strip mill with a total annual production capacity of 2.4 Mmt.⁷ SSIC awarded a contract of about \$400 million to NNK Corp. of Japan to supply a cold-rolled mill. The mill was expected to come on-stream in August 1997.⁸

Nam Heng Steel awarded an \$80 million order for a new minimill at Lop Buri, 130 kilometers (km) north of Bangkok, to a consortium with Concast Standard AG of Switzerland as lead contractor. Construction of the mill was scheduled to begin in early 1995. The mill was expected to be commissioned in April 1996.⁹ The mill, equipped to meet all applicable environmental regulations, would include with a 50-mt, 40-MVA arc furnace and a continuous caster and rolling mill. The continuous casting machine would produce billets of 150 millimeters (mm) square and 12 m length.

BOI approved the Thai Special Steel Industry (TSSI) to build a rolling mill in eastern Thailand. TSSI was still waiting for BOI approval to build an integrated minimill using Corex technology in the same location. TSSI was set up by Bangkok Fastening Co. Ltd. and Thai Petrochemical Industry Group.¹⁰

Lead and Zinc.—The Vietnamese Government approved PDI and Vietnam's Thai Nguyen to form a joint-venture company and granted an exploration license to look for lead and zinc deposits in the Cho Dien area in Bac Thai Province, Vietnam. The area had proven reserves of about 60,000 mt and potential resources of about 3 Mmt of zinc sulfide.¹¹ The average zinc content was 10% in the deposit. PDI was scheduled to submit a feasibility study on the deposit to the

Vietnamese Government in March 1995. According to the PDI plan, the operating mine would produce 200,000 mt/a of ore and 10,000 mt/a of zinc concentrates. PDI planned to buy most of the concentrates from Cho Dien for its zinc smelter in Tak, Thailand.

Potash.—Asia Pacific Resources (APR), based in Vancouver, Canada, completed a 2-year exploration and development program on a potash resource at Udon Thani, Thailand. APR estimated that the deposit which covered an area of 2,333 square kilometers (km²) would provide 500,000 mt/a of potash for 25 years. The average potash grade was 30.5% potassium oxide (K₂O).¹² APR has a 75% interest in the Udon Thai concession and will hold the interest as equity in Asia Pacific Potash Corp. Other shareholders include Thai Central Chemical Corp. (15%) and the Thai Government (10%).

Tin.—Andersen 2000 of the United States signed a contract with Thailand Smelting and Refining Co. (Thaisarco) to supply an integrated sulfur dioxide scrubbing system with liquid waste regeneration for its tin smelter in Phuket to meet more restrictive environmental regulations in the future.¹³ Currently, the sulfur dioxide emissions from the roasting process in the Phuket tin smelter are still below the existing national limits set by Thailand's Ministry of Industry. According to Thaisarco, the new scrubbers would reduce sulfur dioxide emissions from the plant by more than 95%, far below most of the world's standards.

Mineral Fuels

Thailand lacked large mineral fuel reserves. The country relied on imports to meet its petroleum and other energy demands. Thailand's energy policy has concentrated on reducing the country's dependence on imported energy by developing indigenous energy resources and promoting energy efficiency. Thailand's Seventh Five-Year Plan (1992-96) continued to stress securing stable sources of energy supply at a reasonable price. Thailand was accelerating indigenous energy resource development and was participating in the development of energy resources in neighboring countries. Nine fields were producing gas and condensate. Baanpot, Erawan, Funan, Kaphong, Platong, Satun, South Satun, and Surat of Unocal in the Gulf of Thailand, and Shell Sirikit in central Thailand produced gas and condensate. Esso's Nam Phong Field in the northeast of Thailand produced gas only. Five fields in central Thailand produced crude oil: Shell's Pru Krathiam and Pratu Tao; BP's Neung and Sawng; and North Central International's Bung Ya.

In 1994, Thailand signed a Memorandum of Understanding (MOU) of Natural Gas Purchase and Sales with the Government of Burma (Myanmar), allowing the transportation of natural gas in the Yadana Oilfield in the

Gulf of Martaban to Thailand. Beginning in 1998, Burma would supply up to 14.8 million cubic meters per day (Mm³/d) of natural gas to Thailand, with a possible future increase of up to 20 Mm³/d. Thailand also signed an MOU with Laos for purchase of 1,500 megawatts (MW) of electricity from Laos in the year 2000.¹⁴

EGAT and Krung Thai Bank PLC of Thailand and Lao Agriculture and Forest Development Co. Ltd. agreed to set up a joint venture, Thai-Laos Lignite Co. Ltd. (TLL), to invest in a lignite-fired power development project in Laos. The project was divided into two parts. The first part was the development of lignite deposit in Chiangbon Hongsa forest in Laos, which was being undertaken TLL and the Lao Government. The second part was to build the lignite powerplant, which would produce electricity for Thailand's Nan Province and Laos' Hongsa Province.

After 22 years, the Thai and the Malaysian Governments finally agreed on a joint exploration in the 7,250-km² disputed area off the coast of Malaysia and Thailand. Reports suggested that the area contained 108 billion cubic meters (m³) of natural gas. The Malaysia-Thailand Joint Authority (MTJA) was set to assume all rights and responsibilities on behalf of the two Governments. Three separate production-sharing contracts would be signed for further exploration activities. Triton Oil of the United States, which has the right to explore in the area from the Thai Government, would sign one of the three contracts with Petronas Carigali, the subsidiary of Malaysia's state-owned Petronas, in 1994. Another two contracts would be signed between PAT and Petronas Carigali. The contract would last for 35 years and involve a 50-50 split between MTJA and the contractors. A 10% royalty would be divided between the two Governments. Both Governments agreed to reduce tax and duty rates in the area by 50%.¹⁵

Thailand and Cambodia began aggressively trying to resolve a 24-year territorial dispute on the hydrocarbon-rich area, the Pattani Trough, in the Gulf of Thailand. Discussion was mainly on economic integrity on developing the Pattani Trough.

Reserves

Thailand is endowed with diverse mineral and mineral fuel resources, including extensive deposits of salt-type minerals, such as rock salt and potash. Gypsum, feldspar, limestone, kaolin, glass sand, diatomite, dolomite, and barites are also present in a substantial amounts. Reserves of major mineral commodities are shown in table 3.

Infrastructure

Thailand was struggling with expectations of the high demand for electricity and the high capital costs for constructing new powerplants. EGAT received Government approval for a partial privatization to raise funds to build

new powerplants. The first step in the privatization program was the sale of 50% of the Electricity Generating Co., which owned a power station in southern Thailand. EGAT reported that the demand for electricity was 10,700 MW in 1994 and was expected to reach 11,880 MW in 1995. In 1994, the total installed generating capacity was 12,968 MW. The Electricity Demand Forecast Working Group estimated that Thailand would require 33,532 MW by 2011.¹⁶ The Asian Development Bank estimated that Thailand would need to invest \$22 billion by 2000 to meet projected electricity demand. In EGAT's commission report, the commission recommended Thailand should build six nuclear powerplants by 2001 to meet the increased electricity demand. However, because of public opposition, EGAT decided to abandon the plan to build two 1,000-MW nuclear powerplants in Thailand.

Thailand had 3,940 km of 1-m-gauge railroad, extending to most parts of the country, and 99 km of double track. The country had a total of 44,534 km of highway, including 28,016 km of paved, 5,132 km of earth surface, and 11,386 km of under-development surface. Thailand had 4,000 km of inland waterways, with 3,700 km of this navigable with 0.9 m or greater draft throughout the year, and others with minor waterways navigable by shallow-draft native craft.

Bangkok, Pattani, Phuket, Sattahip, and Si Racha were Thailand's major seaports. At least 15 other minor seaports are elsewhere along the Thai coast. The country had a total of 129 airfields, of which 103 are usable. Permanent, paved runways were utilized at 56 of these fields, 1 with runways of more than 3,659 m; 12 with runways 2,440 to 3,659 m; and 28 with runways 1,220 to 2,439 m. Navigation aids were modern and sophisticated.

Outlook

The Thai Government is promoting the development of its petrochemicals industry on a priority basis to fully exploit natural gas from the Gulf of Thailand. The Government views such an industry as a means to add value to the gas, to provide raw materials at internationally competitive prices for downstream industries, to boost Thailand's exports, to develop its manufacturing industry, and to promote employment through the growth of labor-intensive downstream industries, such as textiles.

The Thai Government recognizes the importance of energy conservation as a means of coping with rapidly increasing demand for both electricity and refined petroleum products. However, it has so far implemented only a few concrete measures. In a major step to combat Bangkok's severe air pollution from vehicle emissions, the Government required that all refineries produce unleaded gasoline.

On the whole, Thailand's future bodes well in terms of developing into a major economic and industrial Nation

through tax reforms designed to stimulate production, investment, and export. Thailand is expected to continue an economic policy emphasizing production efficiency and competitiveness of its exports.

¹Text prepared Aug. 1995.

²Far Eastern Economic Review. Feb. 2, 1995, p. 41. Journal of Commerce. Dec. 28, 1994, p. 5A.

³Where appropriate, values have been converted from Thai baht (B) to U.S. dollars at the rate of B25.18=US\$1.00 in 1994.

⁴Metal Bulletin (London). Oct. 17, 1994, p. 11.

⁵South-East Asia Mining Letter. V. 6, No. 13, p. 1, 1994.

⁶The Asian Wall Street Journal Weekly. Nov. 14, 1994, p. 15.

⁷Metal Bulletin (London). Nov. 17, 1994, p. 21.

⁸Steel Times International. July 1994, p. 10.

⁹American Metal Market. Mar. 1, 1995, p. 5.

¹⁰Metal Bulletin (London). Sept. 22, 1994, p. 25.

¹¹Metal Industry News. Dec. 1994.

¹²Metal Bulletin (London). Oct. 10, 1994, p. 45.

¹³———. Dec. 8, 1994, p. 6.

¹⁴Industry Minerals. Oct. 1994, p. 13.

¹⁵Mining Journal. July 29, 1994, p. 78.

¹⁶Mining Environmental Management (London). Sept. 1994, p. 32.

¹⁷Journal of Commerce. Feb. 2, 1995, p. 2B.

¹⁸Asian Energy Yearbook 1995. The Petroleum Economist Ltd., London, p. 4.

¹⁹The Asian Wall Street Journal Weekly. Apr. 25, 1994, p. 7.

²⁰Financial Times (London). Dec. 16, 1994, p. 7.

Major Sources of Information

Department of Mineral Resources

Ministry of Industry

Thanon Rama 6

Bangkok 10400, Thailand

National Statistical Office

Office of the Prime Minister

Larn Luang Road

Bangkok 10100, Thailand

Mining Industry Council of Thailand

132 Sinthorn Building

Room 11, Wireless Road

Bangkok 10500, Thailand

The Electricity Generating Authority of Thailand

52 Charan Sanit Wong Road

Bang Kruai

Nonthaburi 11000, Thailand

Major Publications

Department of Mineral Resources, Bangkok:

Mineral Statistics of Thailand (annual)

National Statistical Office, Office of the Prime Minister,

Bangkok:

Statistical Summary of Thailand, 1987 et seq.

Statistical Yearbook of Thailand, 1990 et seq.

Bank of Thailand, Bangkok:

Annual Economic Report.

TABLE 1
THAILAND: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity	1990	1991	1992	1993	1994 e/
METALS					
Antimony:					
Ore and concentrate:					
Gross weight	767	141	632	1,460 r/	1,100
Sb content e/	326	60	269	620 r/	500
Metal, smelter	2,830	2,260	1,850	1,690 r/	1,500
Columbium and tantalum ores and concentrates, gross weight 3/					
Columbite and tantalite:					
Gross weight kilograms	9,000	3,000	-- r/	-- r/	--
Cb content do.	1,530	510 e/	-- r/	-- r/	--
Ta content do.	2,430	810 e/	-- r/	-- r/	--
Stuverite:					
Gross weight do.	122,000	-- r/	-- r/	-- r/	--
Cb content do.	9,810	-- r/	-- r/	-- r/	--
Ta content	9,490	-- r/	-- r/	-- r/	--
Iron and steel:					
Iron ore:					
Gross weight	129,000	240,000	427,000	209,000 r/	300,000
Fe content	70,700	132,000	235,000	115,000 r/	165,000
Metal: Steel:					
Crude thousand tons	685	711	779	954 r/	1,000
Semimanufactures (selected):					
Bars do.	598	620	1,020	786 r/	750
Galvanized iron sheets do.	208	211	217	205 r/	200
Tinned plates do.	173	190	226	223 r/	220
Lead:					
Mine output, Pb content of 42.5% Pb concentrate	22,200	16,700	11,900	6,050	7,950
Metal: Ingot, secondary	15,900	12,800	18,900	17,100 r/	17,000
Manganese ore:					
Battery- and chemical-grade, 75% MnO ₂	2,410	2,540	1,680	1,510 r/	1,500
Metallurgical-grade, 46% to 50% MnO ₂	14,200	8,490	6,150	4,940 r/	5,000
Total, gross weight	16,700	11,000	7,830	6,460 r/	6,500
Total Mn content	7,990	5,300	3,800	3,100 r/	3,100
Rare-earth minerals:					
Monazite concentrate, gross weight	377	400	89	220 r/	200
Xenotime	14	15	-- r/	-- r/	--
Tin:					
Mine output, Sn content	14,600	14,900	11,500	6,360 r/	3,900
Metal, smelter, primary	15,500	11,300	10,700	8,100 r/	8,100
Titanium:					
Ilmenite concentrate, gross weight	10,600	17,100	2,920	20,700	16,000
Leucoxene concentrate, gross weight	120	4	45 r/	106 r/	100
Rutile concentrate, gross weight	--	76	281	87 r/	100

See footnotes at end of table.

TABLE 1--Continued
THAILAND: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity	1990	1991	1992	1993	1994 e/
METALS--Continued					
Tungsten concentrate:					
Mine output, gross weight	552	440	125	32 r/	33
Mine output, W content	290	230	70	18 r/ e/	18
Zinc:					
Mine output, gross weight	404,000	496,000	407,000	446,000 r/	350,000
Mine output, Zn content	61,500	87,000	62,000 e/	70,000 e/	55,000
Metal, smelter, primary	63,300	62,200	60,600	65,000 r/ e/	65,000
Zirconium concentrate, gross weight	490	2,570	1,720	707 r/	10
INDUSTRIAL MINERALS					
Barite	108,000	93,000 r/	46,300	42,400	49,200
Cement, hydraulic thousand tons	18,100	18,100	21,800	26,900 r/	26,000
Clays:					
Ball clay	183,000	178,000	224,000	346,000	329,000
Kaolin, marketable:					
Beneficiated	208,000	256,000	301,000	397,000	415,000
Nonbeneficiated	139,000	126,000	182,000	210,000 r/	200,000
Filler	319	733	3,450	6,700 r/	6,500
Diatomite	4,590	7,330	10,400	8,290 r/	8,000
Feldspar	311,000	703,000	560,000	601,000 r/	590,000
Fluorspar: Crude mine output:					
High-grade	94,800	60,600	51,600	48,400	23,700
Metallurgical-grade	--	-- r/	-- r/	600	500
Total	94,800	60,600 r/	51,600 r/	49,000 r/	24,200
Gemstones thousand carats	3,580	4,350	4,770	4,800	4,800
Gypsum thousand tons	5,750	7,200	7,110	7,460 r/	8,100
Phosphate rock, crude	9,550	5,940	7,980	10,800 r/	10,000
Salt:					
Rock	119,000	125,000	213,000	262,000 r/	250,000
Other e/	100,000	100,000	100,000	100,000	100,000
Sand, silica	422,000	657,000 r/	595,000 r/	459,000 r/	471,000
Stone:					
Calcite	40,200	18,000	17,200	7,040 r/	7,000
Dolomite	380,000	482,000	332,000	537,000	744,000
Limestone for cement manufacture only thousand tons	19,500	19,500	25,300	32,000	42,000
Marble	55,300	75,000	87,000	88,400	87,400
Marl for cement manufacture only thousand tons	367	718	675	564 r/	500
Quartz, not further described	22,100	20,300	18,100	18,200 r/	18,000
Shale for cement manufacture only thousand tons	2,690	2,450	2,860	3,600 r/	3,500
Talc and related materials:					
Pyrophyllite	29,300	43,000	34,600	43,400 r/	40,000
Talc	4,360	5,580	4,790	7,010 r/	6,000
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Anthracite	20,600	14,300	22,000	15,500 r/	15,000
Lignite thousand tons	12,400	14,700	15,600	15,600	17,000
Natural gas (gross production) million cubic meters	6,530	8,080	8,640	9,680	9,700
Petroleum:					
Crude thousand 42-gallon barrels	8,750	8,940	9,630	9,120 r/	90,000
Natural gas condensate do.	7,210	7,940	9,680	10,500 r/	10,500
Refinery products: e/					
Liquefied petroleum gas do.	2,300	2,350	2,400	2,400	2,400
Gasoline do.	18,000	18,200	19,000	19,000	19,000
Jet fuel do.	12,000	12,000	12,500	12,500	12,500
Kerosene do.	900	900	900	900	900
Distillate fuel oil do.	28,000	28,400	28,500	28,500	28,500
Residual fuel oil do.	22,000	22,300	22,500	22,500	22,500
Unspecified 4/ do.	3,300	3,400	3,400	3,400	3,400
Total do.	86,500	87,600	89,200	89,200	89,200

e/ Estimated. r/ Revised.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Includes data available through July 28, 1995.

3/ Excludes columbium- and tantalum-bearing tin slags.

4/ Includes refinery fuel plus refinery gains or losses.

TABLE 2
THAILAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1994

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity e/
Antimony, concentrate	Associated Minerals Co. Ltd.	Bo Thang, 130 kilometers southeast of Bangkok (temporarily inactive)	6
Do.	Parasit Mining Co.	Doi Ngoem, 100 kilometers southeast of Chiang Mai	2
Barite	American Thai Barite Co. Ltd.	Siam Mine, 200 kilometers southeast of Phuket	25
Do.	P&S Mining Co. Ltd.	Loei Mine, 10 kilometers northwest of Loei	70
Do.	STA Mining Co. Ltd.	STA Mine, 105 kilometers southeast of Chiang Mai	100
Cement	Siam Cement Co. Ltd.	Kaeng Khoi, 90 kilometers north of Bangkok	3,300
Do.	do.	Tambol Tabkwang, Kaeng Khoi District 90 kilometers northeast of Bangkok	2,800
Do.	do.	Tha Luang, 90 kilometers northeast of Phuket	3,200
Do.	do.	Thung Song, 130 kilometers east of Phuket	900
Fluorspar, concentrate	Phanom Thuan Mining Co. Ltd.	Phanom Thuan, 45 kilometers north of Kanchanaburi	60
Do.	Skt Minerals Co. Ltd.	Mine is 47 kilometers southeast of Krabi	65
Do.	Thai Fluorite Processing Co. Ltd.	Ban Lad, Phet Buri	120
Do.	United Fluorite Co. Ltd.	Salak Pra, 80 kilometers northwest of Kanchanaburi	26
Do.	Universal Mining Co. Ltd.	Mae la Luang, 120 kilometers west of Chiang Mai	35
Lead, concentrate	Kanchanaburi Exploration and Mining Co. Ltd.	Song Toh, 250 kilometers northwest of Bangkok	45
Steel, rolled	Bangkok Iron & Steel Co. Ltd.	Bangkok	160
Do.	Bangkok Steel Industry Co. Ltd.	Samut Prakan Province, south of Bangkok	210
Do.	Siam Iron & Steel Co. Ltd.	Saraburi Province, 100 kilometers north of Bangkok	220
Tantalum and niobium in tin slag	Thai Tantalum Co. Ltd.	Rayong	500
Tin:			
Concentrate	Numerous small companies	Offshore Andaman Sea from southern tip of Burma to south of Phuket	NA
Do.	do.	Mostly south Thailand and along southern Burma border	NA
Refined	Thailand Smelting and Refining Co. Ltd.	Phuket	38
Tungsten, concentrate	Parasit Mining Co.	Doi Ngeom, 100 kilometers east	0.1
Do.	Siamerican Mining Enterprise Co. Ltd.	Khao Soon, 185 kilometers east of Phuket (temporarily inactive)	1.2
Do.	Sirithai Scheelite Thailand Co. Ltd.	Doi Mok, 120 kilometers northeast of Chiang Mai (temporarily inactive)	0.4
Zinc:			
Ore	Padaeng Industry Co. Ltd.	Mae Sot, 64 kilometers west of Tak	350
Refined	do.	Tak	72

e/ Estimated. NA Not available.

TABLE 3
THAILAND: RESERVES OF MAJOR MINERAL
COMMODITIES FOR 1994

(Thousand metric tons unless otherwise specified)

Commodity	Reserves
Antimony	300
Barite	14,000
Clay, kaolin	500
Feldspar	43,000
Fluorspar	1,000
Gas, natural	billion cubic meters 455
Gypsum	42,300
Lead	1,500
Lignite	2,100,000
Limestone	5,500,000
Petroleum, crude	million barrels 325
Potash	570,000
Tantalum (including tantalum bearing tin slags)	3,000
Tin	270
Tungsten	3
Zinc	3,800