



# 2006 Minerals Yearbook

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## THAILAND

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# THE MINERAL INDUSTRY OF THAILAND

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Thailand's identified mineral resources are antimony, ball clay, barite, bentonite, copper, diatomite, dolomite, feldspar, fluorspar, gold, gypsum, iron ore, kaolin, lead, limestone, manganese, marl, phosphate rock, potash, quartz, rock salt, silica sand, tin, tungsten, and zinc. Thailand also has small resources of coal, natural gas, and crude petroleum. Resources of diatomite, dolomite, gypsum, kaolin, limestone, marl, potash, and silica sand were more abundant than other identified minerals in Thailand. Most identified minerals except copper and potash have been produced for domestic consumption and export since the 1980s (Department of Mineral Resources, 1998, p. 18; 2001, p. 36, 41-42).

In 2006, coal (lignite), gold, gypsum, limestone, and zinc were the five most valuable minerals produced in Thailand. The country was the world's third ranked producer of feldspar and the world's sixth ranked producer of gypsum. The country also was one of the world's leading exporters of cement, feldspar, and gypsum. Thailand's leading export mineral commodities in 2006 were cement, gypsum, refined petroleum products, refined tin, and refined zinc.

## Minerals in the National Economy

The mining and quarrying sector is an important part of Thailand's economy. This sector produced building materials, such as cement, dolomite, gypsum, and limestone, and ferrous and nonferrous metals, such as copper, steel, and zinc, which were needed for development of the country's infrastructure. The infrastructure development, in turn, was essential for continued growth in the construction, manufacturing, and real estate industries. Other industrial mineral production was for domestic consumption by the manufacturing sector as industrial raw material. In 2006, a portion of the production of antimony, barite, cement, feldspar, fluorspar, gold, gypsum, iron ore, limestone, refined petroleum products, rock salt, tin, tungsten, and zinc was exported to earn foreign exchange.

According to Thailand's national accounts compiled by the National Economic and Social Development Board, the output of the mining and quarrying sector (in 1988 constant prices) accounted for 2.29% of the country's gross domestic product (GDP) in 2005 (the latest year for which data were available) compared with 2.19% in 2004. The contribution of the mining and quarrying sector to Thailand's GDP was 2.24% for the first quarter of 2006 (Bank of Thailand, 2007a).

## Government Policies and Programs

Thailand's mineral resources are owned by the state. Mineral exploration and development are governed by the Minerals Royalty Act No. 4 of 1966 and the Minerals Act of 1967, which had been amended in 1973, 1979, and 1991, and was amended again by Minerals Act No. 5 in 2002 for underground mining;

the new amendment permits mining at depths of greater than 100 meters (m) below the surface without the specific consent of the holder of the surface right. The Minerals Act governs onshore and offshore exploration, mineral production, mineral trade, ore dressing, and the transport and export of minerals other than petroleum. Under the Minerals Act of 1967, the Ministry of Industry was appointed as the principal Government agency to oversee the mining sector. The Department of Primary Industry and Mines (DPI&M), which is under the Ministry of Industry, is empowered to administer the Minerals Act and to issue ministerial regulations; it also provides technical assistance for metallurgical activities, mineral processing, and mining. The Department of Mineral Resources (DMR), which is under the Ministry of Natural Resources and Environment, is empowered to draft national geologic and mineral policies and provides technical assistance in geologic prospecting and mineral exploration (Department of Mineral Resources, 2004).

In recent years, the Thai Government's responsibility for regulating the mining industry had declined, according to DPI&M. DPI&M changed its primary role of inspecting works to one of promoting and facilitating the mineral industry by ensuring the stable supply of metals, minerals, and raw material for upstream and downstream industries and by promoting upgrades and increased efficiencies in the mining industry's operation. DPI&M reportedly also was to promote the unification (standardization) of the operation and management of the mining and primary industries; the collaboration of the private and the public sectors to reinforce the primary industries; the expansion of the upstream and the raw material industries; and trade and investment in the mineral industry (Anusorn Nuangpholmak, 2006).

## Production

In 2006, Thailand's mineral production included antimony, barite, coal, diatomite, dolomite, feldspar, fluorspar, natural gas, gemstones, gold, gypsum, iron ore, kaolin, limestone, marble, manganese, crude petroleum, perlite, phosphate rock, quartz, salt, silica sand, silver, talc, tin, tungsten, and zinc. The main processed mineral products were cement, fluorite (metallurgical grade), refined petroleum products, steel, refined tin, and refined zinc. Thailand also produced tantalum metal powder and oxides, which were produced from tantalum-bearing scrap and tin slag purchased from domestic and foreign sources. Production of most minerals, which included metallic minerals, industrial minerals, and mineral fuels (except coal), increased in 2006. Production of most processed mineral products, such as cement, refined petroleum products, and crude steel, also increased in 2006 (table 1). The higher level of mining activity in Thailand reflected mainly the continued growth in the Thai economy, which grew by 5% in 2006 compared with 4.5% in 2005 (International Monetary Fund, 2007).

## Structure of the Mineral Industry

Thailand's mining and mineral-processing businesses were mostly owned and operated by private companies incorporated in Thailand. The coal mining businesses were owned and operated by state-owned Electricity Generating Authority of Thailand (EGAT) and several private coal mining companies, including some cement companies that owned and operated their own coal mines. Oil and gas exploration and exploitation businesses were owned and operated by subsidiaries of Thailand's major multinational oil companies, by the state-owned Petroleum Authority of Thailand (PTT) and its subsidiary PTT Exploration and Production Public Co. Ltd. (PTTEP), and by joint ventures of PTTEP and major multinational oil companies.

The mineral industry consisted of a large industrial mineral mining and processing sector, a medium-sized ferrous and nonferrous metals mining and processing sector, and a relatively smaller-sized energy sector for the exploration and production of coal, natural gas, and crude petroleum. During the past 2 years, the mineral industry expanded slightly owing to the resumption of operations at two old antimony mining and processing facilities and the opening of new mining and mineral processing facilities for iron ore and tungsten concentrate.

## Mineral Trade

In 2006, Thailand had a merchandise trade surplus of \$2.2 billion compared with a trade deficit of \$8.5 billion (revised) in 2005; the 2006 surplus was the result of a 17.2% increase in exports to \$128.2 billion in 2006 and a much smaller (7.1%) increase in imports in 2006. The country's total outstanding debt, however, continued to increase to \$59.6 billion in 2006 from \$52.1 billion in 2005 (Bank of Thailand, 2007b).

Thailand was a net importer of mineral commodities mainly because of its large import bills for coal, natural gas, iron and steel products, nonferrous metals, and crude petroleum. Thailand's exports of major industrial mineral commodities were feldspar, fluor spar, and gypsum. Exports of major processed mineral commodities were cement, gemstones, jewelry, refined petroleum products, steel products, refined tin and zinc, and other nonferrous metal products, such as antimony, copper, and gold. Thailand's imports of major mineral commodities were coal, natural gas, crude petroleum, steel products, and steel scrap (Bank of Thailand, 2007b).

## Commodity Review

### Metals

**Antimony.**—Mine production of antimony increased sharply by 295% and metal production rose by 18% in 2006 owing to higher antimony metal prices and the reactivation of idled capacity. In 2005 (the latest year for which data were available), Thailand imported 318 metric tons (t) of antimony metal, which was valued at \$1.1 million and exported 171 t, which was valued at \$0.54 million (Department of Primary Industries and Mines, 2006, p. 20, 34).

**Copper.**—The Puthep copper project moved a major step forward in November 2006 when the Thai Government granted a land access permit and permission to begin a feasibility study at the PUT 1 deposit, which is located about 20 kilometers (km) southeast of Loei, the capital of Loei Province, in northern Thailand. The feasibility study reportedly would be conducted in two phases. In the first phase, infill and extensional resources drilling, which was scheduled to start in March 2007, would be used to test the overall economic potential of the project. Activities in the second phase, which was expected to be completed by the end of 2008, would depend upon the positive results of the first phase. The Puthep copper project was a joint venture between Pan Australian Resources Ltd. (PAR) of Australia (20.66% and earning up to 60% interest) and Padaeng Industry Public Company of Thailand, which owned the remaining interest (Pan Australian Resources Ltd., 2006, p. 9, 17; Padaeng Industry Public Co. Ltd., 2007, p. 14, 26).

Thai Copper Industries PCL, which was Thailand's sole copper smelter, shut down its operations for about 17 months for overhaul and maintenance work following an accident caused by technical problems at its Rayong facilities in mid-2005; the smelter reopened on December 9, 2006. According to the company, the new startup of the operation was accomplished with the assistance of more than 120 Chilean experts from Chilean Corporacion Nacional de Cobre de Chile (Codelco). The smelting technology, which was called El Teniente, was originally supplied to Thai Copper Industries by Codelco (Thai Copper Industries PCL, 2007). Production of refined copper totaled about 20,000 t in 2006 compared with about 15,000 t (revised) in 2005 (International Copper Study Group, 2007, p. 16).

**Gold.**—Amanta Resources Ltd. of Canada, which obtained two special prospecting licenses for the Langu gold property in Satun Province, southern Thailand, in August 2004, commenced its exploration program in March 2005. The Langu gold project covered a 25-square-kilometer (km<sup>2</sup>) area that surrounded an outcropping mineralized area where high-grade replacement style sediment-hosted gold was found in Devonian limestone and shale. Rock samples taken from outcropping decalcified limestone in the Discovery quarry returned assayed values that ranged from 4.15 grams per metric ton (g/t) to 36.8 g/t gold; samples from abandoned quarried stockpile material had values as high as 153.5 g/t gold. After an extensive 6-month field investigation program, Amanta Resources completed its initial exploration program at its wholly owned Langu gold property in September 2005 and the second phase of its exploration program, which included an extensive trenching program and geophysical surveys, in August 2006. The trenching program included 3,000 m of shallow trenches. The company planned an initial drilling program of up to 5,000 m at the Langu property by the end of 2006 and would continue through the first quarter of 2007. In November 2006, Amanta Resources was granted two additional special prospecting licenses contiguous to its 25- km<sup>2</sup> exploration area at the Langu gold property. The new licenses covered an additional 32 km<sup>2</sup>, which increased the total license area held by the company at Langu to about 57 km<sup>2</sup> (Amanta Resources Ltd., 2004a, b; 2005a-c; 2006c, e).

Tongkah Harbour PCL through its 98.86% owned subsidiary Tungcum Ltd. reportedly completed site development and plant

construction at its Lei gold project in May 2006; commercial operation began in September 2006 with an initial throughput capacity of about 13,500 metric tons per day (t/d). The Loei gold project mined and processed about 177,000 t of ore and produced about 380 kg of gold in 2006. The company planned to process 440,000 t of ore in 2007. The mining licenses were valid for a 25-year period. Gold resources had been estimated to be 4.49 million metric tons (Mt) at a grade of 4.14 g/t gold (Tongkah Harbour PCL, 2005, 2006a).

Kingsgate Consolidated N.L. of Australia through its 90% owned subsidiary Akara Mining Ltd. produced gold from the Chatree Mine, which is located 45 km southeast of the provincial capital of Phichit on the border of Phetchabun and Phichit Provinces. For the fiscal year that ended on June 30, production of gold from the Chatree Mine increased by 11% to 4,357 kilograms (kg) (reported as 140,071 troy ounces) in 2006 from 3,936 kg (reported as 126,550 troy ounces) in 2005; production of silver from the Chatree Mine increased by 30% to 14,300 kg (reported as 459,701 troy ounces) from 10,988 kg (reported as 353,275 troy ounces) in 2005. However, production of gold for the 6 months that ended on December 31, 2006, was only 1,438 kg (reported as 46,225 troy ounces), which was a decrease of 36.6% from the same period in 2005. According to the company, the sharp decline was largely owing to a lower ore grade of 1.5 g/t gold compared with 2.8 g/t in the previous half-year. The company expected to produce between 2,800 kg (90,000 troy ounces) and 3,110 kg (100,000 troy ounces) for the second half-year that ended on June 30, 2007 (Kingsgate Consolidated Ltd., 2006a, b).

According to Kingsgate Consolidated, exploration during the past 3 years has continued to increase resources by 31,100 kilograms per year (kg/yr) (about 1 million troy ounces per year) of gold. Mineral resources at the Chatree Mine and the Chatree North deposit totaled 74.6 Mt at grades of 1.6 g/t gold and 13 g/t silver. Ore reserves, which included proven and probable reserves at Chatree and Chatree North, as of May 31, 2006, were estimated to be 29.7 Mt at grades of 1.8 g/t gold and 17 g/t silver (Kingsgate Consolidated Ltd., 2006a).

**Iron Ore and Iron and Steel.**—Mine production of iron ore increased by 14.4% to 264,289 t in 2006 compared with 230,946 t (revised) in 2005 and 135,600 t in 2004. In September 2005, P.T.K. Mining Company Ltd., which was established in June 2004, was authorized by the Siam Iron and Steel Co., Ltd., which was one of the member companies of the Siam Cement Group, to develop a new mine and build a processing plant by February 2006 to mine and process iron ore at the Phu Ang iron ore deposit in Loei Province. Siam Iron and Steel had been granted a 25-year (July 2005 to July 2030) mining right for two mining concessions at the Phu Ang deposit by DPI&M in 2005. The iron ore mining operations at the Phu Ang Mine reportedly started in March 2006 at the initial rate of between 50,000 and 60,000 metric tons per month. The rated capacity was 720,000 metric tons per year (t/yr). The proven and probable reserves at the Phu Ang Mine were estimated to be 10.9 Mt. The ore grade averaged about 65.9% iron (P.T.K. Mining Company Ltd., 2006a, b).

To meet the iron and steel industry's raw material requirements, Thailand relied heavily on imports of ferroalloys,

pig iron, and steel scrap. In 2005 (the latest year for which data were available), Thailand imported 1,683,042 t of iron and steel scrap, 967,640 t of pig iron, and 79,975 t of ferroalloys with a total import value of \$908.5 million (Department of Primary Industries and Mines, 2006, p. 13). In 2006, Thailand's iron and steel scrap imports decreased by 18.4% to 1,373,000 t from 1,683,042 t in 2005. The major suppliers of iron and steel scrap in 2006 were the United States (30.4%), Australia (19.1%), Russia (9.8%), and the Philippines (8.4%) (Tex Report, The, 2007).

Thailand's crude steel production increased by about 3.7% to an estimated 5.35 Mt in 2006 from 5.16 Mt in 2005 (Southeast Asia Iron and Steel Institute, 2007). To meet the demand for steel, Thailand also imported more than 5.5 Mt of steel billet, ingot, and slab for consumption by the domestic steel-rolling mills and more than 4.2 Mt of steel mill products (long- and flat-steel products). In 2005, imports of billet, ingot, and slab totaled about 5.7 Mt and were valued at about \$2.5 billion; imports of long products totaled about 1.3 Mt and were valued at about \$572 million; and imports of flat products totaled about 2.9 Mt and were valued at \$2.2 billion (Department of Primary Industries and Mines, 2006, p. 13).

Domestic demand for steel remained weak in 2006 mainly because of slowing economic growth and volatile world oil prices, and despite the country's steady real estate construction activity and increased demand for steel by the auto industry. Thailand's major infrastructure projects, such as the extension of Bangkok's mass transit network, however, were still awaiting the new Government's final spending decision. According to a forecast by Thailand's Kasikorn Research Center, domestic demand for steel would be between 13 and 14 Mt in 2007 compared with between 12 and 13 Mt in 2006 and 13.8 Mt in 2005 (Steel Business Briefing, 2006).

In April 2006, Tata Steel Ltd. of India purchased a 67.11% equity interest in Tata Steel (Thailand) Plc, (formerly Millennium Steel Plc) from the Siam Cement Group for about \$185 million. Tata Steel (Thailand) planned to invest between \$90 million and \$95 million to develop an iron ore smelting plant to create a fully integrated iron and steel production operation. The blast-furnace iron smelter, which would be located in the Bo Win Industrial Estate near the capital city of Chonburi Province, would have a capacity of 500,000 t/yr. If the Board of Investment were to approve the proposed investment plan, construction could start in the first quarter of 2007 and be completed in the third quarter of 2008 (Bangkok Post, 2006b).

**Tin.**—Mine production of tin rebounded to 225 t of tin concentrate from 188 t of tin concentrate in 2005 mainly owing to higher tin prices in 2006. To meet its sole tin smelter's feedstock requirement, Thailand imported a much smaller quantity of tin concentrate—about 6,500 t in 2006 compared with more than 20,018 t in 2005 (World Bureau of Metal Statistics, 2007, p. 127). According to DPI&M, Thailand's refined tin production decreased by 12.8% to 27,540 t in 2006. Exports of refined tin decreased by 20.1% to 19,857 t in 2006. The major buyers of Thai refined tin were Belgium (22.2%), Japan (21.5%), and the Netherlands (17.6%). Thailand domestic consumption of refined tin increased by 23.8% to 5,714 from 4,614 t in 2005 (World Bureau of Metal Statistics, 2007, p. 127).

Tongkah Harbour PCL, which was one of Thailand's major tin producers in 2004, had temporarily stopped tin mining operations in the Phuket Bay owing to the high royalty rate on tin. Tongkah Harbour believed that the royalty rates would be reduced by the DPI&M in the near future. In January 2006, Tongkah Harbour increased its equity share holdings in Sea Minerals Ltd., which was one of Tongkah Harbour's subsidiaries engaged in offshore tin mining, to 83.7% for tin mining prospects farther offshore. Sea Minerals, which controlled extensive offshore tin resources north of Phuket Island, which is located in the Andaman Sea about 25 kilometers (km) off the west coast of Thailand, reportedly had applied for a tin mining lease; the property was estimated to have economic resources of about 64,320 t at a cutoff grade of 0.10 kilogram per cubic meter. The company planned to produce at a rate of 6,000 t/yr of ore (Tongkah Harbour PCL, 2005, 2006b).

**Tungsten.**—In February 2006, Amanta Resources Ltd. of Canada signed a joint-development agreement with Mae Fah Mining Ltd. to acquire exploration and development rights for up to four formerly producing tungsten mines in Thailand. In June 2006, the company announced that it had reached an agreement with the owner of the Mae Lama tungsten mine to acquire 100% of the mining and development rights for the Mae Lama mining claims in return for a net smelter royalty fee of 2% and cash payment of about \$150,000<sup>1</sup> (in Thai baht) with an additional payment of \$150,000 payable only if Amanta Resources makes a positive production decision (Amanta Resources Ltd., 2006a, d).

In September 2006, Amanta Resources announced that it had begun drilling on the Doi Ngom tungsten project in northern Thailand. The initial drilling was to confirm the location and the scale of the breccia and to test the contact between the breccia and the granite. The company planned to drill 5 to 7 holes during the initial phase of drilling. The program called for a total of up to 5,000 m of core drilling at Doi Ngom (Amanta Resources Ltd., 2006b, f).

**Zinc.**—Mine production of zinc ore increased by 5% to the highest level since 1995. According to Padaeng Industry Public Co. Ltd. (PDI), the Mae Sot Mine's silicate ore production increased by 14% to 536,000 t, of which 75,000 t was high-grade ore and 463,000 t was low-grade ore. As of December 31, 2006, the remaining mineral resource at the Mae Sot Mine was estimated to be 4.283 Mt at a grade of 9.2% zinc, of which 1.206 Mt at a grade of 9.3% zinc was measured resource, 2.982 Mt at a grade of 9.2% zinc was indicated resource, and 95,000 t of mined low-grade ore at a grade of 8.4% zinc was stockpiled at the mine site. Ore reserves, which had been updated using a mining cutoff grade of 3% zinc, were estimated to be 3.675 Mt at a grade of 9.1% zinc. According to the company, these ore reserves were sufficient for 8 more years of mining at the 2006 production rate. Additionally, the zinc sulfide mineral resources at the Hualon deposit of the Mae Sot Mine were estimated to be 295,000 t at a grade of 6.0% zinc plus 44,000 t of secondary zinc mineral resources at a grade of 7.1% zinc. Mineral resources at the Hualon deposit, however, had not been mined since 2000 (Padaeng Industry Public Co. Ltd., 2007, p. 9-11).

<sup>1</sup>Values have been converted from Thai baht (Bt) to U.S. dollars (\$) at a rate of Bt37.93=US\$1.00.

During 2006, PDI conducted a diamond drilling program in the Mae Sot area. Twenty-four holes for a total of 2,106 m were completed. According to the company, every hole intersected zinc silicate mineralization. The best hole intersected 22.7 m of high-grade zinc mineralization at a grade of 33.2% zinc between 0 m and 22.7 m depth. During 2006, the company signed a 5-year exploration agreement with Laos' Department of Mines and Geology for an 800-km<sup>2</sup> area in the Kasi District of northern Vientiane Province to explore for zinc oxide and sulfide (Padaeng Industry Public Co. Ltd., 2007, p. 12-14).

During 2006, PDI's zinc smelter in Tak received 156,032 t of zinc silicate ore and concentrate (which contained 38,078 t of zinc) from the Mae Sot Mine. PDI purchased a total of 100,486 t of zinc concentrate (zinc sulfide), most of which was imported from Australia and South America. Zinc concentrates purchased locally were in the form of oxide ore produced by small local miners. The imported zinc sulfide concentrate was delivered to the roaster in Rayong, the capital city of Rayong Province (Padaeng Industry Public Co. Ltd., 2007, p. 9).

In 2006, PDI's zinc refinery in Tak produced 91,220 t of cathode zinc compared with 99,708 t of cathode zinc in 2005 owing to the lower grade of the 2006 mine production. For the production of zinc alloy products, PDI also imported a total of 9,637 t of zinc ingots in 2006. PDI's production of zinc products totaled 96,469 t, of which 67,767 t was zinc ingots and 28,702 t was zinc alloys (Padaeng Industry Public Company Ltd., 2007, p. 10). Domestic demand for zinc slab declined to 117,100 t from 124,400 t in 2005 (World Bureau of Metal Statistics, 2007, p. 130).

### *Industrial Minerals*

**Cement.**—In 2006, cement production increased by 4.1% to 39.4 Mt and clinker production increased by 4.9% to 40.8 Mt. The slower growth in cement production in 2006 was in response to a smaller increase in demand for cement by the construction sector. Some of the strong growth momentum had been lost in residential housing projects after tax incentives for homebuyers expired in 2004. Domestic demand for cement by the construction industry was weaker in 2006 than in 2005 mainly owing to delays and scaled-back expansion of major infrastructure projects, such as Bangkok's light-rail mass transit system, and to a saturated housing market. The number of office building and factory investment projects, however, continued to increase slowly in 2006 (Bangkok Post, 2006a).

Because of a slowdown in the domestic cement market, Siam Cement Industry Co. Ltd., which was the country's top cement producers in 2006, planned to expand its international business by up to 20% of its total sales in the next 5 years. The company was expected to expand its international business when its new 1-million-metric-ton-per-year (Mt/yr)-capacity cement plant in Cambodia starts operation in late 2007 or early 2008. Siam Cement Industry had invested \$92.3 million in the cement plant in Cambodia. It planned to build two cement plants (one in Indonesia and one in Vietnam) with a total investment budget of \$7.9 million in 2007. The company also planned to increase its exports by 12% to 7 to 7.5 Mt, mainly to Bangladesh, Sri Lanka, the United States, and countries of the Middle East and Southeast Asia (Nation, The, 2006).

According to an analysis by the Kasikorn Research Center, the Thai cement industry relied heavily on public investment projects in 2006, especially on the building of mega projects, which included roads, subways, and a water treatment system. If the Government finds it necessary to delay major infrastructure projects because of a lack of sufficient funds, then Government investment in construction may be greatly reduced (Business Day, 2005). According to Siam Cement Industry, domestic cement demand fell by 2.7% during April and May compared with the same period during the previous year owing to a prolonged political crisis that caused a delay in public sector construction. The company expected domestic cement sales in 2006 to remain at the same level as that of 2005 but planned to export 7.5 Mt in 2006, which was about 12% more than the amount exported in 2005 (Reuters Ltd., 2006).

**Potash.**—On March 17, 2006, Asia Pacific Resources Ltd. (APR) announced that it had reached a pre-acquisition agreement with SRMT Holdings Ltd., which was a subsidiary of Italian-Thai Development Public Co. Ltd. (ITD) of Thailand. According to APR, the \$85.3 million takeover deal would allow the Udon Thani potash mining project in Thailand to move forward; the company indicated that obtaining a mining license for this project in Thailand would apparently require a degree of local knowledge and financial capability that a company such as ITD possessed (Canadian Press, The, 2006).

On June 2, 2006, SRMT Holdings Ltd. announced that it had completed its takeover of APR, which owned 75% of the Udon Thani potash project, by taking up 546,767,485 common shares and 101,979,730 warrants of APR for \$14.25 cents per common share and \$1.75 cents per warrant in cash. The \$85.3 million deal represented 86% of APR's outstanding common shares and 98% of APR's outstanding warrants as of May 25, 2006. Other partners of the Udon Thani potash project were Wildemere Ltd. (15%) and the Government of Thailand (10%) (Fertilizer Week, 2006; Resource Investor, 2006)

### *Mineral Fuels*

**Coal.**—Coal was an important component of Thailand's energy supply. In 2006, coal accounted for about 14% of the country's total primary energy consumption. Coal (lignite) production decreased by 11% to 19 Mt in 2006 from 21.4 Mt in 2005. To meet its overall coal requirements, Thailand imported about 11.2 Mt of coal in 2006 compared with 8.6 Mt in 2005. The major coal suppliers were Australia, China, and Indonesia. Of the total coal imports in 2006, bituminous steam coal accounted for 95% (10.6 Mt); anthracite, 5% (553,490 t); coking coal, 0.4% (45,480 t); and peat and briquets 0.04% (4,430 t) (Energy Policy and Planning Office, 2007a).

In 2006, EGAT produced about 15.8 Mt of lignite, or about 83% of the country's total lignite production. The Mae Moh Mines in the Province of Lampang in northern Thailand produced 15,764,000 t, or 99.7% of EGAT's total lignite production, and the Krabi Mine in the Muang District of Krabi Province in southern Thailand produced 51,000 t, or 0.3% (Energy Policy and Planning Office, 2007b). The remaining 3.2 Mt of lignite was produced mainly by Banpu Mineral Co. Ltd. from the Chiang Muan Mine in Phayao Province and the Li

Mine in Lampang Province (Energy Policy and Planning Office, 2007c, d).

Consumption of domestically produced lignite totaled 18.9 Mt in 2006, of which 15.8 Mt was consumed by EGAT in power generation at the 2,625-megawatt Mae Moh lignite-fired powerplant and 3.1 Mt was consumed as fuel by manufacturers of cement, fiber, lime, and paper; by tobacco curers; and by other users. Consumption of imported coal (mostly anthracite, bituminous, and coking coal) totaled 11.4 Mt in 2006, of which about 8 Mt was consumed in the industrial sector by manufacturers of cement, iron and steel, and nonferrous metals; 2.1 Mt, by small power producers; and 1.3 Mt, by independent power producers (Energy Policy and Planning Office, 2007b).

**Natural Gas and Petroleum.**—Natural gas production increased by 2.7% to an average of 66.6 million cubic meters per day in 2006 from 64.9 million cubic meters per day in 2005 owing mainly to increased output from the Funan/Jakrawan and the Bongkot fields. In 2006, natural gas was produced from 19 gasfields, most of which were located offshore. About 52% of Thailand's natural gas was produced by Unocal Thailand Ltd. (UT) from offshore gas and condensate fields; the remaining 48% was produced by PTTEP (a wholly owned subsidiary of PTT), Chevron Corp., and other companies from offshore and onshore gasfields (Energy Policy and Planning Office, 2007e).

Following the signing of a gas sales agreement with PTT in July 2005, Hess Corp. of the United States started construction of the Phu Horm gasfield production facilities in December 2005. In December 2006, Hess Corp., which owned a 35% interest in the Phu Horm field with partners APICO LLC of the United States (35%), PPTEP (20%), and ExxonMobil Corp. of the United States (10%), announced that natural gas production from the Phu Horm gasfield in northeast Thailand had started on November 30, 2006. The Phu Horm's natural gas production was approximately 1.7 million cubic meters per day from two wells. Production was expected to increase to more than 2.83 million cubic meters per day after additional wells are completed during 2007. According to the 2005 gas sales agreement with PTT, more than 14.16 billion cubic meters of natural gas during a period of 15 years would be supplied to a power station at Nam Phong in Thailand (Hess Corp., 2006; Platts, 2006).

Production of crude petroleum increased by 13.2% to an average of 128,950 barrels per day (bbl/d) in 2006 from 113,890 bbl/d in 2005 as a result of increased production from the Jusmin and the Tantawan oilfields. In 2006, crude petroleum was produced from more than 12 oilfields. The largest onshore oilfield, the Sirikit oilfield, which was operated by Thai Shell Exploration and Production Co. Ltd., averaged 18,775 bbl/d and accounted for 14.6% of the total crude petroleum output in 2006. The largest offshore oilfield, the Benjamas oilfield, which was operated by Chevron Offshore Ltd., averaged 50,004 bbl/d and accounted for 38.8%. To meet the raw materials requirements of its seven oil refineries, Thailand imported a total of 302.7 million barrels or 829,300 bbl/d of crude oil in 2006. More than 80% of imported crude oil was from the Middle East (Energy Policy and Planning Office, 2007g).

Production of condensate increased by 8.3% to an average of 75,250 bbl/d in 2006 from 69,487 bbl/d (revised) in 2005; this was mainly the result of increased output from the Funan/

Jakrawan, the Pailin, and the Trat gasfields. In 2006, condensate was produced from more than 11 gasfields, of which about 34% was produced from the Pailin gasfield; 24%, from the Bongkot gasfield; 15%, from the Erawan gasfield; and the remaining 27%, from more than seven smaller fields (Energy Policy and Planning Office, 2007f).

## Outlook

During the next 4 to 5 years, the Thai mineral sector is expected to expand and contribute more to the country's GDP because of the likely development of the Puthep copper deposit in the Province of Loei and the Udon South and the Udon North potash deposits in the Province of Udon Thani, and the development and expansion of new and existing offshore gasfields and oilfields in the Gulf of Thailand. During the next 2 years, the mineral industry of Thailand is expected to continue to be dominated by the production of coal, gold, gypsum, and limestone.

The International Monetary Fund projects that the Thai economy, as measured by the GDP, will grow at a rate of 5% in 2007 (International Monetary Fund, 2007). As a result, demand for cement, nonferrous metals, and steel is expected to grow in 2007 at slightly slower rate than in 2006 mainly because of delays in the country's major infrastructure projects that were the result of the 2006 political crisis.

## References Cited

Amanta Resources Ltd., 2004a, Langu special prospecting licenses issued: Vancouver, British Columbia, Canada, Amanta Resources Ltd., news release, August 10, 1 p.

Amanta Resources Ltd., 2004b, Option to acquire exploration and development project in northern Thailand: Vancouver, British Columbia, Canada, Amanta Resources Ltd. news release, August 31, 1 p.

Amanta Resources Ltd., 2005a, Amanta successfully completes initial exploration program at Langu gold project: Vancouver, British Columbia, Canada, Amanta Resources Ltd. news release, September, 2 p. (Accessed February 15, 2006, at <http://www.amantaresources.com/2005-09-15.htm>.)

Amanta Resources Ltd., 2005b, Commence exploration programs at the Langi gold prospect, Southern Thailand: Vancouver, British Columbia, Canada, Amanta Resources Ltd. news release, March, 1 p. (Accessed February 15, 2006, at <http://www.amantaresources.com/2005-03-16.htm>.)

Amanta Resources Ltd., 2005c, Gold mineralization trend of over 2000 meters indicated at Langu: Vancouver, British Columbia, Canada, Amanta Resources Ltd. news release, May, 2 p. (Accessed August 3, 2006, at <http://www.amantaresources.com/2005-08-15.htm>.)

Amanta Resources Ltd., 2006a, Amanta announces tungsten joint development agreement: Vancouver, British Columbia, Canada, Amanta Resources Ltd. news release, February 13, 2 p. (Accessed September 19, 2007, at [http://www.amantaresources.com/news/index.php?&content\\_id=21](http://www.amantaresources.com/news/index.php?&content_id=21).)

Amanta Resources Ltd., 2006b, Amanta begins drilling at Doi Ngom tungsten project: Vancouver, British Columbia, Canada, Amanta Resources Ltd. news release, September 21, 1 p. (Accessed September 19, 2007, at [http://www.amantaresources.com/news/index.php?&content\\_id=29](http://www.amantaresources.com/news/index.php?&content_id=29).)

Amanta Resources Ltd., 2006c, Amanta granted two additional special exploration licenses at its Langu gold project: Vancouver, British Columbia, Canada, Amanta Resources Ltd. news release, November, 1 p. (Accessed September 19, 2007, at [http://www.amantaresources.com/news/index.php?&content\\_id=31](http://www.amantaresources.com/news/index.php?&content_id=31).)

Amanta Resources Ltd., 2006d, Amanta Resources Ltd. acquires Mae Lama tungsten mine in Thailand: Vancouver, British Columbia, Canada, Amanta Resources Ltd. news release, June 8, 2 p. (Accessed September 19, 2007, at [http://www.amantaresources.com/newa/index.php?&content\\_id=24](http://www.amantaresources.com/newa/index.php?&content_id=24).)

Amanta Resources Ltd., 2006e, Amanta Resources Ltd. completes geophysical programme at Langu gold project: Vancouver, British Columbia, Canada, Amanta Resources Ltd. news, release, August, 2 p. (Accessed September 19, 2007, at [http://www.amantaresources.com/news/index.php?&content\\_id=25](http://www.amantaresources.com/news/index.php?&content_id=25).)

Amanta Resources Ltd., 2006f, Large tungsten anomaly identified at Amanta's Doi Ngom Prospect: Vancouver, British Columbia, Canada, Amanta Resources Ltd. news release, August, 2 p. (Accessed August 3, 2006, at <http://www.amantaresources.com/2005-08-15.htm>.)

Anusorn Nuangpholmak, 2006, An overview of the de-regulations, process and opportunities for foreign investors, in Second Annual Asia Mining Congress 2006, Singapore, March 28-30, 2006, Proceedings: Singapore, Terrapinn Ltd.

Bangkok Post, 2006a, Better year ahead—Year-end 2006 economic review—Property: Bangkok Post, November. (Accessed October 1, 2007, at <http://bangkokpost.net/yearend2006/page38.html>.)

Bangkok Post, 2006b, Tata steel investing in Thai smelter: Bangkok Post, December 13, p. 1.

Bank of Thailand, 2007a, Economic data—Real sector, Table 82, Gross national product by industry at 1988 prices: Bank of Thailand. (Accessed September 4, 2007, at <http://www.bot.or.th/bothomepage/databank/EconData/EconFinance/tab82e.asp>.)

Bank of Thailand, 2007b, Economic data—Thailand key economic indicators, 4 external account (in billion of US\$): Bank of Thailand. (Accessed September 11, 2007, at [http://www.bot.or.th/bothomepage/databank/EconData/Tai\\_Key/Thai\\_KeyE.asp](http://www.bot.or.th/bothomepage/databank/EconData/Tai_Key/Thai_KeyE.asp).)

Business Day, 2005, Future of cement industry relies on megaproject: Business Day, December 25. (Accessed October 1, 2007, at [http://www.thailandoutlook1top\\_menu/investor\\_news/Daily\\_News\\_Summary?DATEDAILY=Wednesday](http://www.thailandoutlook1top_menu/investor_news/Daily_News_Summary?DATEDAILY=Wednesday).)

Canadian Press, The, 2006, Asia Pacific Resources announces \$85 million takeover deal: Toronto, Ontario, Canada, The Canadian Press, March 17, 1 p. (Accessed September 10, 2007, at <http://www.cbc.ca/business/060317/b031722.html>.)

Department of Mineral Resources, 1998, Review on mineral resources in Thailand: Bangkok, Thailand, Department of Mineral Resources, 23 p.

Department of Mineral Resources, 2001, Petroleum and coal activities in Thailand, Annual Report: Bangkok, Thailand, Department of Mineral Resources, 54 p.

Department of Mineral Resources, 2004, Policy, legislation, rules and regulations on minerals trade, mining and mineral investments as formulated by the Government or state authority: Department of Mineral Resources. (Accessed January 19, 2005, at <http://www.dmr.go.th/arsom/wp.9.htm>.)

Department of Primary Industries and Mines, 2006, Thailand metal statistics Year 2006: Bangkok, Thailand, Department of Primary Industries and Mines, Statistical reports, BPI 8/2006, 51 p.

Energy Policy and Planning Office, 2007a, Coal imports: Energy Policy and Planning Office. (Accessed August 28, 2007, at [http://www.eppo.go.th/info/stat/T04\\_02\\_01.xls](http://www.eppo.go.th/info/stat/T04_02_01.xls).)

Energy Policy and Planning Office, 2007b, Consumption of lignite and coal classified by sector: Energy Policy and Planning Office. (Accessed August 28, 2007, at [http://www.eppo.go.th/info/stat/T04\\_01\\_02.xls](http://www.eppo.go.th/info/stat/T04_01_02.xls).)

Energy Policy and Planning Office, 2007c, Imports of crude oil classified by sources: Energy Policy and Planning Office. (Accessed August 28, 2007, at [http://www.eppo.go.th/info/stat/T02\\_01\\_03-2.xls](http://www.eppo.go.th/info/stat/T02_01_03-2.xls).)

Energy Policy and Planning Office, 2007d, Production and consumption of lignite: Energy Policy and Planning Office. (Accessed August 28, 2007, at [http://www.eppo.go.th/info/stat/T04\\_01\\_01.xls](http://www.eppo.go.th/info/stat/T04_01_01.xls).)

Energy Policy and Planning Office, 2007e, Production and import of natural gas: Energy Policy and Planning Office. (Accessed August 28, 2007, at [http://www.eppo.go.th/info/stat/T03\\_01\\_01\\_2.xls](http://www.eppo.go.th/info/stat/T03_01_01_2.xls).)

Energy Policy and Planning Office, 2007f, Production of condensate: Energy Policy and Planning Office. (Accessed August 28, 2007, at [http://www.eppo.go.th/info/stat/T02\\_01\\_02-2.xls](http://www.eppo.go.th/info/stat/T02_01_02-2.xls).)

Energy Policy and Planning Office, 2007g, Production of crude oil: Energy Policy and Planning Office. (Accessed August 28, 2007, at [http://www.eppo.go.th/info/stat/T02\\_01\\_01-2.xls](http://www.eppo.go.th/info/stat/T02_01_01-2.xls).)

Fertilizer Week, 2006, Deal complete—ITD completes takeover of Asia Pacific Resources: Fertilizer Week, v. 20, no. 7, May 26.

Hess Corp., 2006, Phu Horm field starts production: New York, N.Y., Hess Corp. press release, December 5, 1 p.

- International Copper Study Group, 2007, Copper bulletin: Lisbon, Portugal, International Copper Study Group, v. 14, no. 5, July, 56 p.
- International Monetary Fund, 2007, Thailand, *in* World economic outlook database: International Monetary Fund. (Accessed September 12, 2007, at <http://www.imf.org/external/pubs/ft/weo/2007/01/data/weorept.aspx>.)
- Kingsgate Consolidated Ltd., 2006a, Annual report 2006: Kingsgate Consolidated Ltd., 104 p. (Accessed September 20, 2007, at [http://www.kingsgate.com.au/AnnualReport/2006\\_KCN\\_Annual\\_Report](http://www.kingsgate.com.au/AnnualReport/2006_KCN_Annual_Report).)
- Kingsgate Consolidated Ltd., 2006b, Half year report for the six months ended 31 December 2006; Kingsgate Consolidated Ltd., 17 p. (Accessed September 19, 2007, at [http://www.Kingsgate.com.au/sx\\_releases/half\\_yearly\\_reports/december06/page\\_1.htm](http://www.Kingsgate.com.au/sx_releases/half_yearly_reports/december06/page_1.htm).)
- Nation, The, 2006, Building materials—Siam Cement Industry aims to dominate Asean: The Nation, December 18. (Accessed September 12, 2007, at [http://www.nationmultimedia.com/2006/12/18/business/business\\_30021783.php](http://www.nationmultimedia.com/2006/12/18/business/business_30021783.php).)
- Padaeng Industry Public Co. Ltd, 2007, Annual report 2006: Padaeng Industry Public Co. Ltd., 86 p. (Accessed August 16, 2006, at [http://www.padaeng.com/pdf/2006\\_AnnualReport.pdf](http://www.padaeng.com/pdf/2006_AnnualReport.pdf).)
- Pan Australian Resources Ltd., 2006, Concise annual report 2006: Pan Australian Resources Ltd., 70 p. (Accessed September 25, 2007, at [http://panaustralian.com.au/news\\_word\\_docs/ConciseAnnualReport\\_06.pdf](http://panaustralian.com.au/news_word_docs/ConciseAnnualReport_06.pdf).)
- Platts, 2006, Thailand's Phu Horm field begins producing natural gas: Platts, November 30, 2 p. (Accessed December 1, 2006, at [http://www.platts.com/Natural\\_Gas/News/7910832.xml?p=NaturalGas/News&sub=Natural Gas](http://www.platts.com/Natural_Gas/News/7910832.xml?p=NaturalGas/News&sub=Natural%20Gas).)
- P.T.K. Mining Company Ltd., 2006a, Phu Ang Deposit: P.T.K. Mining Company Ltd., 3 p. (Accessed July 13, 2006, at <http://www.ptkmining.com/product.asp>.)
- P.T.K. Mining Company Ltd., 2006b, P.T.K. Today: P.T.K. Mining Company Ltd., 4 p. (Accessed July 13, 2006, at <http://www.ptkmining.com/ptktoday.asp>.)
- Resource Investor, 2006, Asia Pacific Resources announces \$85 million (in Canadian dollars) takeover deal: Resource Investor, 4 p. (Accessed September 10, 2007, at <http://www.resourceinvestor.com/pebble.asp?relid=17980>.)
- Reuters Ltd., 2006, Thai Siam Cement Q2 seen down on costs, weak demand: Reuters Ltd., July 25. (Accessed October 1, 2007, at <http://asia.news.yahoo.com/0600725/3/2nkvr.html>.)
- Southeast Asia Iron and Steel Institute, 2007, Quarterly crude steel production 2002-2006: Southeast Asia Iron and Steel Institute, 1 p. (Accessed September 25, 2007, via <http://www.seaisi.org>.)
- Steel Business Briefing, 2006, Thai steel market to bounce back to 7-8% growth: Steel Business Briefing, 1 p. (Accessed September 24, 2007, at [http://www.seaisi.org/newsletter/article\\_view.asp?article\\_id=2583](http://www.seaisi.org/newsletter/article_view.asp?article_id=2583).)
- Tex Report, The, 2007, Thailand's scrap imports total 1.3 M tons in CY 2006: Tokyo, Japan Tex Report, The, v. 39, no. 9190, February 26, p. 8.
- Thai Copper Industries, PCL, 2006, News—TCI has started producing copper cathode again: Rayong, Thailand, Thai Copper Industries, PCL December 9. (Accessed September 18, 2007, at <http://www.thaicopperind.com/en>.)
- Tongkah Harbour PCL, 2005, Company profile and general information: Tongkah Harbour PCL, 1 p. (Accessed January 17, 2006, at <http://www.tongkahharbour.com/thll/profileth1news.html>.)
- Tongkah Harbour PCL, 2006a, Business—Gold, mining and processing: Tongkah Harbour PCL, 1 p. (Accessed September 19, 2007, at <http://www.tongkahharbour.com/thi1/index.aspx>.)
- Tongkah Harbour PCL, 2006b, Business—Tin mining: Tongkah Harbour PCL. 1 p. (Accessed September 19, 2007, at <http://www.tongkahharbour.com/thil/index.asp>.)
- World Bureau of Metal Statistics, 2007, World metal statistics: Ware, United Kingdom, World Bureau of Metal Statistics, April, 150 p.

TABLE 1  
THAILAND: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Commodity	2002	2003	2004	2005	2006
<b>METALS</b>					
<b>Antimony:</b>					
<b>Ore:</b>					
Gross weight	3	83	110	754 <sup>r</sup>	2,980
Sb content	1	38	52	356 <sup>r,c</sup>	1,409
Metal, smelter	--	12 <sup>r</sup>	2	460	544
<b>Copper, metal, refined:</b>					
Primary	--	--	18,100	13,000 <sup>r</sup>	18,700
Secondary	--	--	1,900	2,000	1,300
Total	--	--	20,000	15,000 <sup>r</sup>	20,000
Gold kilograms	4,950	4,269	4,500	4,400	3,500
<b>Iron and steel:</b>					
<b>Iron ore:</b>					
Gross weight	570,110	9,675	135,580	230,946 <sup>r</sup>	264,289
Fe content <sup>c</sup>	285,000	4,800	68,000	116,000 <sup>r</sup>	132,000
Crude steel thousand metric tons	2,538	3,572	4,533	5,161	5,350 <sup>e</sup>
<b>Lead:</b>					
<b>Ore:</b>					
Gross weight	6,500	--	--	--	--
Pb content	3,200	--	--	--	--
Metal, refined, secondary	42,900	45,300	57,500	61,100 <sup>r</sup>	61,160
<b>Manganese ore:</b>					
Metallurgical-grade, gross weight, 46% to 50% MnO <sub>2</sub>	--	--	4,550	88,500	1,000
Mn content <sup>c</sup>	--	--	2,180	42,400	480
Silver kilograms	18,018	12,496	10,700	14,100 <sup>r</sup>	11,400
Tantalum, metal and oxide powder	102	168	317	150 <sup>r</sup>	230
<b>Tin:</b>					
<b>Concentrate:</b>					
Gross weight	1,384	980	724	188	225
Sn content	1,130	793	586	158 <sup>r,c</sup>	190 <sup>e</sup>
Metal, primary	18,600	15,400	20,800	31,600	27,540
<b>Tungsten concentrate:</b>					
Gross weight	53	390	337	622 <sup>r</sup>	546
W content <sup>c</sup>	31	208	180	430 <sup>r</sup>	380
<b>Zinc:</b>					
<b>Ore:</b>					
Gross weight	151,876	148,297	199,477	203,810 <sup>r</sup>	214,023
Zn content <sup>c</sup>	33,600	37,100	43,400	30,572 <sup>r</sup>	32,100
Metal, primary	72,502	69,600	68,300	60,866	67,767
Alloy, Zn content	32,646	44,086	46,800	40,320	28,702
<b>INDUSTRIAL MINERALS</b>					
Barite	137,469	115,600	211,278	3,989 <sup>r</sup>	4,549
Cement, hydraulic thousand metric tons	31,679	32,530	35,626	37,872	39,408
<b>Clays:</b>					
Ball clay	450,818	579,404	610,193	393,935 <sup>r</sup>	1,003,267
<b>Kaolin, marketable:</b>					
Beneficiated, washed	127,132	184,562	200,671	156,853 <sup>r</sup>	157,900
Nonbeneficiated, unwashed	168,883	373,811	430,364	580,376 <sup>r</sup>	675,886
Filler	3,150	950	--	9,031 <sup>r</sup>	9,326
Diatomite	780	1,288	1,372	990 <sup>r</sup>	1,344
Feldspar	783,733	824,990	1,001,053	1,149,717 <sup>r</sup>	1,067,684
Fluorspar, crude, metallurgical-grade	2,270	2,368	2,375	295	3,240
Gemstones thousand carats	1,597	716	911	699 <sup>r</sup>	81
Gypsum thousand metric tons	6,326	7,291	7,619	7,113 <sup>r</sup>	8,355
Perlite	7,600	5,700	6,000 <sup>e</sup>	5,500 <sup>e</sup>	6,000 <sup>e</sup>
Phosphate rock, crude	3,680	13,870	2,580	3,020 <sup>r</sup>	900
<b>Salt:</b>					
Rock	908,968	892,243	1,031,200	1,074,214 <sup>r</sup>	1,008,251
Other <sup>c</sup>	100,000	100,000	100,000	100,000	100,000
Sand, silica, glass	781,014	1,293,929	587,655	718,320 <sup>r</sup>	861,847

See footnotes at end of table.

TABLE 1--Continued  
THAILAND: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Commodity	2002	2003	2004	2005	2006
<b>INDUSTRIAL MINERALS--Continued</b>					
<b>Stone:</b>					
Calcite	172,760	232,025	436,628	692,850 <sup>r</sup>	625,950
Dolomite	933,209	865,708	992,907	795,466 <sup>r</sup>	899,512
<b>Granite:</b>					
Dimension stone	7,597	9,866	10,000 <sup>e</sup>	9,500 <sup>e</sup>	10,000 <sup>e</sup>
Industrial rock	3,370	3,107	3,500 <sup>e</sup>	3,000 <sup>e</sup>	3,200 <sup>e</sup>
<b>Limestone:</b>					
For cement manufacture only	54,214	46,868	63,196	55,584 <sup>r</sup>	61,583
Construction and other uses	56,226	66,073	70,000	75,000 <sup>e</sup>	75,000 <sup>e</sup>
Marble, dimension stone and fragment	461,272	339,166	236,643	267,797 <sup>r</sup>	547,582
Marl for cement manufacture only	83,135	80,405	184,750	196,500 <sup>r</sup>	68,700
Quartz	32,954	65,559	19,216	2,604 <sup>r</sup>	2,897
Shale for cement manufacture only	5,017	2,982	3,622	3,695 <sup>r</sup>	5,590
<b>Talc and related materials:</b>					
Pyrophyllite	103,496	73,556	108,691	177,684 <sup>r</sup>	131,843
Talc	1,702	8,501	12,592	10,270 <sup>r</sup>	4,374
<b>MINERAL FUELS AND RELATED MATERIALS</b>					
Coal, lignite	19,572	18,830	20,038 <sup>r</sup>	21,429 <sup>r</sup>	19,056
Natural gas, gross production	20,528 <sup>r</sup>	21,674 <sup>r</sup>	22,360 <sup>r</sup>	23,689 <sup>r</sup>	24,317
<b>Petroleum:</b>					
Crude	27,582 <sup>r</sup>	35,158 <sup>r</sup>	31,299 <sup>r</sup>	41,570 <sup>r</sup>	47,067
Natural gas condensate	19,609	22,872 <sup>r</sup>	24,963 <sup>r</sup>	25,363 <sup>r</sup>	27,466
<b>Refinery products:</b>					
Liquefied petroleum gas	37,069	38,872	41,520	45,241	45,475
Gasoline	51,896	54,342	56,339	58,072	57,172
Jet fuel	29,373	26,778	29,127	30,421	35,240
Kerosene	3,457	4,386	7,041	6,395	6,548
Distillate fuel oil	37,610	38,248	42,277	38,740	39,681
Residual fuel oil <sup>c</sup>	22,000	23,000	24,000	25,000	26,000
Unspecified <sup>e, 2</sup>	3,500	3,500	3,600	3,600	3,600
Total <sup>e, 3</sup>	185,000	189,000	204,000	207,000	214,000

<sup>c</sup>Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. <sup>r</sup>Revised. -- Zero.

<sup>1</sup>Table includes data available through September 27, 2007.

<sup>2</sup>Includes refinery fuel and refinery gains or losses.

<sup>3</sup>Data are rounded to three significant digits; may not add to totals shown.

Sources: Department of Mineral Resources, Mineral Statistics of Thailand; Department of Primary Industries and Mines; Ministry of Energy, Energy Policy and Planning Office; and U.S. Geological Survey Minerals Questionnaires, 2003-2006.

TABLE 2  
THAILAND: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Antimony	metric tons	Peak Union		1,800
Do.	do.	New Siam Mineral Resources		1,000
Barite		Asian Mineral Resources Co. Ltd.	Loei, Mae Hong Son, Nakhon Si Thammarat, and Satun Provinces	60
Do.		P & S Barite Mining Co. Ltd.	Loei and Nakhon Si Thammarat Province	60
Cement		Asia Cement Co. Ltd.	Pra Phutthabath, Saraburi Province	4,800
Do.		Jalaprathan Cement Co. Ltd. (Cement Francais S.A., 37%; Veatprapat Holding Co. Ltd., 19%; others, 44%)	Takli, Nakhorn, Sawarn Province; and Cha-Am, Petchburi Province	2,350
Do.		Samukee Cement Ltd.	Pakchong, Nakhon Ratchasima Province	125
Do.		Saraburi Cement Co. Ltd. (CEMEX Asia Holdings Ltd. of Mexico, 99%)	Chalerm Phrakiat, Saraburi Province	700
Do.		Siam Cement Industry Co. Ltd. (Bureau of the Crown Property, 30%; Thai Security Depository Co. Ltd., 6.94%; CPB Equity Co. Ltd., 5.6%; other financial Institutions and general public, 57.46%)	Kaeng Khoi, Phabudhabat, and Khao Wong, Saraburi Province; Chae hom, Lampang Province; Thung Song, Thammarat Province; and Ta Luang, Ayutthaya Province	23,200
Do.		Siam City Cement Co. Ltd. (Holcim Ltd. of of Switzerland, 33.7%; Rattanak family, 27%; other investors, 39.3%)	Kaeng Khoi, Saraburi Province	14,500
Do.		TPI Polene Co. Ltd.	Kaeng Khoi, Saraburi Province	9,900
Coal, lignite		Electricity Generating Authority of Thailand	Mae Moh, Lampang Province;	20,000
Do.		Banpu Public Co. Ltd.	Lampang (LP-2), Lampang Province and Chiang Muan, Phayao Province	3,400
Do.		Lanna Lignite Public Co. Ltd.	Ban Pakha, Lamphun Province	1,000
Copper, refined		Thai Copper Industries Plc (Thai Asset Management, 36%; Thai Film Industry, 27%; Aker Kvarmer, 28%; Industrial Corporation of Thailand Plc, 7%; and others, 2%)	Rayong, Rayong Province	165
Feldspar, concentrate		Asia Mineral Processing Co. Ltd.	Provinces of Nakhon Si Thammarat and Trang	500
Fluorspar, concentrate		Asian Mineral Resources Co. Ltd.	Mae Hong Son Province	14
Gas, natural	million cubic meters per day	Esso Exploration and Production Khorat Inc.	Namphong, Khon Kaen Province	4
Do.	do.	TOTAL Exploration and Production (Thailand)	Bongkot in the Gulf of Thailand	15
Do.	do.	Unocal Thailand Ltd.	Baanpot, Erawan, Funan, Kaphong, Pladang, Satun, Pailin, Trat, all in the Gulf of Thailand	33
Gold	kilograms	Akara Mining Ltd. (Kingsgate Consolidated N.L. of Australia, 100%)	Chatree, Pichit Province	5,000
Gypsum		Thai Gysum Products Pcl. (Thaigips Holdings Ltd., 40.75%; BPB Gypsum B.V., 30%; others, 29.25%)	Nong Bau, Nakhon Sawan Province and Ban Munnak, Pichit Province	2,000
Do.		Vanich Gypsum Co. Ltd.	Khlong Prab, Mai Rieng, Thoong Yai Mai in Provinces of Nakhon Si Thammarat and Surat Thani	2,000
Iron ore, gross weight		P.T.K. Mining Co. Ltd.	Phu Ang, Loei Province	720
Lead, in concentrate		Kanchanaburi Exploration and Mining Co. Ltd.	Song Toh, Nong Phai, and Bo Ngam in Kanchanaburi Province	30
Petroleum, crude, including condensate	thousand 42-gallon barrels per day	Chevron Offshore (Thailand) Ltd.	Benjamas, Tantanwan, offshore in the Gulf of Thailand	35
Do.	do.	Tah Shell Exploration and Production Co. Ltd.	Sirikit in Kamphaenghet Province	24
Do.	do.	TOTAL Exploration and Production (Thailand)	Bongkot, offshore in the Gulf of Thailand	12
Do.	do.	Unocal Thailand Ltd.	Baanpot, Erawan, Funan, Gomin, Jakrawan, Kaphong, Pailin, Platon, Satun, Surat, Trat Plamuk, offshore in the Gulf of Thailand	38

TABLE 2--Continued  
THAILAND: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Steel, rolled		The Bangkok Iron and Steel Works Co. Ltd.	Phrapradaeng, Samutprakarn Province	120
Do.		Bangkok Steel Industry Public Co. Ltd.	do.	300
Do.		Tata Steel (Thailand) Plc (Tata Steel Lt. of India, 67.11%; McDonald Investment, 6.5%; and other investors, 26.39%)	Map Ta Phut, Rayong Province; Sriracha, Chonburi Province; Ban Mon, Saraburi Province	1,700
Do.		Namheng Steel Co. Ltd.	Lopburi Province	300
Do.		Sahaviriya Group Corp. Ltd.	Bang Saphan, Prachuap Khiri Khan Province	2,400
Do.		Siam United Steel Co. Ltd.	Rayong Province	1,000
Do.		G-Steel Plc (formerly Siam Ystrip Mill Plc)	Map Ta Phut, Rayong Province	600
Tantalum, metal powder and oxides	metric tons	H.C. Starck (Thailand) Co. Ltd. (H.C. Starck GmbH, 94.98%, and others, 5.02% )	do.	250
<b>Tin:</b>				
Concentrate		Numerous small companies	Nakhon Si Thammarat, Phangnga, Phuket, and Ranong Provinces	3
Refined		Thailand Smelting and Refining Co. Ltd. (Amalgamated Metal Corp., 75.25%, and other, 24.75%)	Phuket, Phuket Province	30
Tungsten, in concentrate	metric tons	SC Mining Co. Ltd. (Som Chai family owned 100%)	Ban Pin, Chiang Mai Province	650
<b>Zinc:</b>				
In concentrate		Padaeng Industry Public Co. Ltd. (Umicore SA of Belgium, 44.77%; Ministry of Finance, 13.81%; others, 41.42%)	Mae Sot, Tak Province	65
Refined		do.	Tak, Tak Province	115