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The Mineral Industry of Vietnam

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Vietnam's identified mineral resources were antimony, barite, bauxite, bismuth, carbonate rocks (limestone and marble), chromium, coal, copper, natural gas, fluorite, gemstones (ruby and sapphire), gold, graphite, iron ore, lead, manganese, nickel, crude petroleum, phosphate rock (apatite), rare earths, silica sand, silver, tin, titanium (ilmenite and rutile), tungsten, zinc, and zircon. Among those identified minerals, resources of bauxite and tungsten had been assessed as significant by world standards. In 2006, Vietnam remained one of the world's leading producers and exporters of anthracite coal. The country ranked sixth in the production of crude petroleum in the Asia and the Pacific region (Oil & Gas Journal, 2006). Vietnam also was one of the important producers of ilmenite and phosphate rock (apatite) in the region (Le, Van De, 1996; Ministry of Industry, 2002).

With the exception of carbonate rocks, coal, and hydrocarbons, most nonfuel mineral commodities were produced by small-scale miners owing to Vietnam's outdated mining equipment. With the financial and technical assistance of foreign mining companies from Australia, Canada, China, and Japan during the past 3 years, Vietnam completed the development of a copper mining, smelting, and refining complex in Vietnam's northern Province of Lao Cai and a zinc mining and refining facility in Vietnam's northern Province of Thai Nguyen. Vietnam began the development of a large-scale iron ore mine in Vietnam's northern Province of Lao Cai in October 2006 and was scheduled to begin first-phase mining operations in 2008. In 2008, the country also scheduled to start construction of an aluminum hydroxide plant in Vietnam's central highland Province of Lam Dong. It planned to start development of an iron mine, a nickel mine, and a tungsten mine in northern Vietnam by 2008 and could start large-scale bauxite-alumina-primary aluminum projects in southern Vietnam by as early as 2009 or 2010.

Minerals in the National Economy

The mining sector was a very important sector of the Vietnamese economy, and minerals trade also accounted for a large share of the country's overall merchandise trade. In 2005 (the latest year for which data were available), the output of the mining and quarrying sector (which included mineral fuels and nonfuel minerals) accounted for 5.75% (revised) of Vietnam's gross domestic product (GDP); the output value of the mining and quarrying sector in 1994 constant dollars was estimated to be $1.43 billion.[1] The GDP in 1994 constant dollars was estimated to be $24.87 billion.

In 2006, Vietnam's major mineral commodity exports were crude petroleum ($8.32 billion) and coal ($927 million); these commodities accounted for 21.0% and 2.3%, respectively, of total exports ($39.6 billion). Vietnam's major mineral commodity imports were refined petroleum products ($5.86 billion), steel ($2.9 billion), and fertilizers ($673 million), which accounted for 13.2%, 6.5%, and 1.5%, respectively, of total imports ($44.4 billion) (General Statistics Office of Vietnam, 2006b, c).

Government Policies and Programs

All minerals, which include coal, natural gas, petroleum, and all nonfuel minerals located within the land, islands, internal waters, sea territory, exclusive economic zones, and continental shelf of Vietnam, are owned by the people and managed by the state. The Ministry of Natural Resources and the Environment (MONRE) administered all aspects of the country's mining activities. The Department of Geology and Minerals of Vietnam under the supervision of the MONRE managed the country's geology and mineral resources. In Vietnam, all aspects of mining, which include onshore and offshore surveys, exploration, mining, and mineral-processing, are governed by the Law on Minerals of 1996 (Mineral Law), Decree No. 76/2000/ND-CP of 2000, and Decree No. 160/2005/ND-CP of 2005. In January 2006, the MONRE enacted Circular No. 012006/TT-BTNMT, which provides guidance on the implementation of some of the articles of Decree No. 160/2005/ND-CP. The main content of the circular was on guiding the formulation and evaluation of mineral prospecting and exploration projects (Department of Geology and Mineral[s] of Vietnam, 2006a).

In 2006, the Ministry of Industry reportedly had drafted and submitted for final Government approval a list of 11 key industries and policies to encourage their development during the next 5 years (2006-10). Bauxite mining, aluminum processing, and steel manufacturing were among the 11 key industries (VietnamNet, 2006c).

In April 2006, the Ministry of Industry promulgated Circular No. 02/2006/TT-BCN, which provides guidance on conditions and criteria for the export of minerals. This circular, which replaced Circular No. 04/2005/TT-BCN, became effective on May 1, 2006 (Department of Geology and Mineral[s] of Vietnam, 2006b).

Production

Vietnam's production of major mineral commodities included barite, chromite, coal, ilmenite, limestone, crude petroleum, phosphate rock, tin, and zinc. Virtually all chromite, ilmenite, and crude petroleum production was exported. Barite, coal (anthracite), limestone, and zinc production was mostly consumed domestically, but a certain amount of barite, anthracite coal, and zinc concentrates production was exported. In 2006, Vietnam began its copper mining operations with modern mining and mineral-processing technologies. Most

[1]Where appropriate, values have been converted from Vietnamese Dong (D) to U.S. dollars (US$) at the rate of D15,800=US$1.00 for 2005 and D16,000=US$1.00 for 2006.

copper concentrate was to be delivered to a nearby, newly built copper smelter for further processing. Some of the copper ore and concentrate was exported.

Vietnam's major processed minerals were cement, refined copper, fertilizer materials (ammonia, phosphate, and urea), rolled steel, refined tin, and zinc. For cement manufacturing, Vietnam imported a considerable amount of cement clinker during the past 3 years. Cement, fertilizer materials, and rolled steel production were for domestic consumption, but some refined tin was exported to Malaysia for further refining to upgrade its tin purity to more than 99%.

Structure of the Mineral Industry

Vietnam's mineral industry comprised several large state-owned/controlled companies that produced, distributed, and traded such major mineral commodities as cement, coal, fertilizer materials, ferrous and nonferrous metals, oil and gas, and salt; several foreign companies that worked in joint venture with the state-owned companies or local governments to manufacture cement, mine gold, and produce oil and gas; and several foreign companies from Australia, Canada, China, and New Zealand that were exploring for copper, gold, iron ore, nickel, and tungsten. The major state-owned companies were Vietnam National Cement Corp. (VNCC), which controlled 11 cement plants; Vietnam National Chemical Corp., which controlled all state-owned fertilizer-minerals mining and processing companies; Vietnam National Coal Corp. (VINACOAL), which controlled all state-owned coal mining and coal processing companies; Vietnam National Minerals Corp. (VIMICO), which controlled all state-owned nonferrous minerals mining and processing companies; Vietnam National Salt Corp., which controlled all state-owned salt producing companies; and Vietnam National Steel Corp. (VNSC), which controlled all state-owned iron ore mining and steelmaking companies. In 2005, a state-owned holding company called Vietnam National Coal-Mineral Industries Group (VINACOMIN) was established by the merger of VINCOAL and VIMICO; these two state-owned companies became wholly owned subsidiaries of VINACOMIN (Platts.com, 2006a, b).

In 2004 (the latest year for which the Government statistics were available), the number of employees in the mining and quarrying sector totaled 249,321, of which about 31% (77,486) were employed by coal mining companies; about 3% (6,735), by the oil and gas companies; 6% (15,719), by metallic mining companies; and about 60% (149,381), by other mining and quarrying (mostly industrial minerals) companies. The country's total number of employees was 4,932,217; 5% of these were employed by the mining and quarrying sector (General Statistics Office of Vietnam, 2006a, p. 468-469).

Mineral Trade

In 2006, Vietnam's merchandise trade deficit increased by 5.9% to $4.8 billion. The deficit was owing to increased imports of chemicals; machinery, equipment, and spare parts; electronic products, computers, and parts; plastic; and refined petroleum products and occurred despite increased earnings from exports of garments and textiles, electronic products, footwear, and crude petroleum (Vietnam Business Forum, 2007a, b).

In 2006, Vietnam remained a net minerals importer because of its high import bill for nonferrous metal products, refined petroleum products, and steel. The major exported mineral commodities were crude petroleum, which amounted to about 127 million barrels [or about 18 million metric tons (Mt)] and was valued at $8.3 billion and coal, which also amounted to about 18 Mt and was valued at $927 million. Exports of crude petroleum and coal accounted for 23.4% of Vietnam's total export earnings ($39.6 billion) in 2006. The major imported mineral commodities were refined petroleum products, which amounted to about 11 Mt and were valued at $5.8 billion; iron and steel products, which amounted to about 7.6 Mt and were valued at $3.7 billion; and fertilizer materials, which amounted to about 3.7 Mt and were valued at $844 million. Imports of refined petroleum products and iron and steel products accounted for 13.1% and 8.3%, respectively, of Vietnam's total import bill ($44.4 billion) in 2006 (Vietnam Business Forum, 2007a, b).

Commodity Review

Metals

Bauxite and Alumina and Aluminum.—To develop bauxite resources in Vietnam's central highlands Provinces of Dak Nong and Lam Dong, state-owned VINACOMIN, which had obtained a license from the Ministry of Industry to build a 100,000-t/yr alumina plant in 2005, decided to increase the proposed capacity of the plant to 300,000 t/yr. In May 2006, after approval by the Ministry of Industry, VINACOMIN Nhan Co Alumina Joint-Stock Company (a subsidiary of VINACOMIN) announced that a meeting would be held with prospective bidders for its revised alumina project at Nhan Co Commune (Nhan Co Industrial Zone), Dak R'Lap District in Dak Nong (Dac Nong) Province. The Ministry of Industry indicated that, to attract foreign investment for a larger scale project, the 300,000-t/yr plant could be increased to 600,000 t/yr in the future (Platts.com, 2006a).

The Government reportedly also had approved VIMICO (a subsidiary of VINACOMIN) to be the sole investor in the proposed $484 million Lam Dong mining and bauxite processing development project in March 2006. According to VIMICO, the first phase, which would involve infrastructure construction, was expected to start in the first quarter of 2007, and the second phase, which would involve construction of a bauxite processing plant, was expected to start by the end of 2007. The bauxite mine and alumina processing plant project was scheduled to begin operation by the end of 2009. The bauxite mine in Bao Lam would have the capacity to produce 1.7 million metric tons per year (Mt/yr) of bauxite and the alumina plant would have the capacity to produce 600,000 metric tons per year (t/yr) of alumina. According to the Government, most of the alumina produced would be exported (Metals Place, 2006b; Vietnam Economy, 2006c).

In November 2006, state-owned Vietnam National Chemical Corp. and its wholly owned subsidiary Southern Basic Chemical Co. (SBCC) signed a basic agreement with Nippon Light

Metal Company Ltd. and Sojitz Corp. of Japan to undertake the feasibility study for construction of a 550,000-t/yr aluminum hydroxide plant in Bao Loc District, Lam Dong Province. The estimated cost of the project would be about $347 million. The aluminum hydroxide plant would be the largest of its kind in Asia for chemical processing applications. The aluminum hydroxide plant project was expected to be financed primarily by the Japan Bank for International Cooperation (Sojitz Corporation, 2006; Thanhnien News, 2006d).

Copper.—VINACOMIN, through its subsidiary VIMICO (which was the investor in the Copper Complex at Sin Quyen in Lao Cai Province), began its commercial production of copper in mid-April 2006. The construction work for the mining and milling facilities was completed in early April 2006 with a total capital investment of about $82 million. The copper mining and processing complex had the capacity to mine and process 1.2 Mt/yr of ore to produce 41,700 t/yr of copper concentrate at an average grade of 25% copper, more than 113,000 t/yr of iron ore concentrate, and about 19,600 t/yr of pyrite ore as coproducts, as well as 341 kilograms per year (kg/yr) of gold and 40,000 t/yr of sulfuric acid as byproducts (Vietnam News, 2006).

VIMICO established a subsidiary called Lao Cai Copper Complex in 2006 to run the copper mining, milling, smelting, and refining operations with a rated capacity of 10,000 t/yr of refined copper. The copper mining and processing complex, which is located in Lao Cai Province, was funded with Vietnam state credits and a $40.5 million Chinese Government loan to purchase equipment for the project from China (Metals Place, 2006b).

According to the International Copper Study Group, the Sin Quyen copper mine produced 5,200 t of copper in copper ore and concentrate and 4,800 t of refined copper in 2006. According to industry analysts, Vietnam's demand for copper was estimated to be 40,000 t/yr. As Vietnam speeds up its rural areas electrification program, the estimated demand for refined copper in Vietnam was expected to increase at a rate of 10% per year in the upcoming years (Metals Place, 2006a; International Copper Study Group, 2007).

Gold.—In April 2006, Vietnam's first licensed gold mining company, Bong Mieu Holding Co., through Bong Mieu Gold Joint Venture Co., started its gold mining operations at the Ho Gan deposit in Phu Ninh District of Quang Nam Province. The Ho Gan open pit mine was expected to produce 180,000 t of gold ore and 600 kilograms (kg) of gold metal during the first phase of its operations. Ore reserves at the deposit were estimated to be 1 Mt at a grade of 3.85 grams per metric ton gold. The Ho Gan deposit was one of three deposits at the Bong Mieu gold property area. To raise the ore processing capacity of the Bong Mieu gold mining property, the joint-venture company planned to bring onstream the Nui Kem deposit in 2007 and the Ho Ray-Thao Trang deposit in 2008. The Bong Mieu Holding Co. was a joint venture of Olympus Pacific Minerals Inc. (80%) of Canada and two Vietnamese companies, Mineral Development Co. (10%) and Quang Nam Mineral JS Co. (10%) (Mining News, The, 2006; VietnamNet, 2006a; Vietpan.com, 2006).

Other foreign companies that were actively involved in gold exploration and development in Vietnam during 2006 were Axiom Mining Ltd. of Australia, Olympus Pacific Minerals, and Zedex Minerals Ltd. of New Zealand. Axiom Mining held a 35-square-kilometer (km^2) mineral exploration license in southern Quang Binh Province in central Vietnam. Its exploration projects in Vietnam were the Quang Binh gold-silver project, which was focused on the Xa Khia-Mu Me prospects, and the Quang Tri gold-silver project. Olympus Pacific Minerals through its 85% owned subsidiary Phuoc Son Gold Company reportedly had received the mining license from the Government of Vietnam in January 2006 to develop and mine its high-grade Phuoc Son gold project in central Vietnam; the project is located about 74 kilometers (km) from the company's existing gold mining operations at the Bong Mieu Mine in Quang Nam Province. According to Olympus Pacific Minerals, the measured and indicated resources at the North deposit in the Phuoc Son Gold property based on drilling prior to 2006 were reported to be 6,336 kg (203,700 ounces) of gold, of which 2.207 kg (70,950 ounces) was measured and 4,129 kg (132,750 ounces), indicated. A 6,000-meter (m) exploration drill program was begun in April 2006 (Olympus Pacific Minerals, Inc., 2006; Axiom Mining Ltd., 2007). Zedex Minerals Ltd., which had been prospecting in the Binh Dinh area since the early 1990s and had obtained mineral exploration licenses in the Provinces of Lang Son and Song La in northern Vietnam, had teamed up with Binh Dinh Development and Construction Co. to explore for gold in the Tay Son District of Binh Dinh Province in April 2006. In March 2006, Zedex Minerals through its wholly owned subsidiary NP Mining Ltd. teamed up with VIMICO and was awarded an exploration license for an 8.8-km^2 area at Na Pai, which is located about 180 km north-northwest of Hanoi near the Chinese border (Zedex Minerals Ltd., 2006).

Iron and Steel.—Following the signing of a Chinese-Vietnamese joint-venture agreement for the development of an iron ore mine at Qui Sa (Quy Xa) and construction of a 500,000-t/yr steel billet plant in the northern Vietnamese Province of Lao Cai in September 2004, a joint-venture company called Sino-Vietnam Mining and Metallurgical Corp. (SVMMC) was formally established by Kunming Iron & Steel Co. of China (KISCO), Lao Cai Mineral Co. (LCMC), and VNSC in October 2006. According to KISCO, the Qui Sa Mine would have a mine capacity of 1.5 Mt/yr after the first-stage development project was completed. The mine would produce about 1 Mt/yr of iron ore for export to China, and the remaining 500,000 t/yr of iron ore produced from the mine would be delivered to the steel plant to be built in Lao Cai Province. The first-stage development was scheduled to be completed in 2008 and the mining capacity would be gradually increased from 1.5 Mt/yr to between 2.5 and 3 Mt/yr by 2010. The SVMMC was owned 45% each by KISCO and VSC, and 10% by LCMC (Southeast Asia Iron and Steel Institute, 2006a, b).

According to Vietnam Steel Association (VSA), Vietnam's highest priority for the development of the iron and steel industry was the iron ore mining and steelmaking complex project at the Thach Khe deposit in the central Province of Ha Tinh. Iron ore resources there were estimated to be between 500 and 600 Mt, of which at least 300 Mt was claimed to be economically viable. Under the Government's recently announced steel development policy, foreign investors would be allowed to form a 100% foreign-owned company to control

construction of the iron and steel complex with a proposed annual capacity of 4.5 Mt/yr near the Thach Khe deposit if no Vietnamese enterprises prove financially capable of developing the project. In September 2006, according to the Saigon Times Daily, the Vietnamese Government reportedly agreed in principal to a $1.94 billion steel project proposed by Taiwan's Sunsteel Corp., which planned to mine iron ore at the Thach Khe deposit to produce 2 Mt/yr of rolled steel (Reuters Ltd., 2006; Southeast Asia Iron and Steel Institute, 2006c; Vietnam Economy, 2006a; Vietnam Investment Review, 2007).

Crude steel production in 2006 was estimated to have increased by 12% to about 1 Mt. According to the VSA, Vietnam's demand for crude steel was estimated to be 4 Mt, but domestic sources could supply only about 1.5 Mt. To meet the domestic requirements for crude steel in 2006, Vietnam's imports of crude steel and steel scrap were expected to reach 2.5 Mt and 1 Mt, respectively. According to the Vietnam Economic Times, the Ministry of Industry planned in late 2005 for steel enterprises to import up to 2 Mt of steel scrap in 2006 to help meet domestic requirements for crude steel production (Metals Place, 2005; Southeast Asia Iron and Steel Institute, 2006d, e).

To reduce import reliance on steel, VNSC focused on eight projects to be implemented between 2006 and 2010 to boost steel-production capacity, especially production of those steel products that currently were being imported. VNSC planned to launch three projects in 2006 that would be completed in 2008. These projects were 1) the second-phase expansion of Thai Nguyen Iron and Steel to increase steel billet production capacity by an additional 500,000 to 800,000 t/yr; 2) the initial production by VNSC and LCMC (in joint venture with China's Kunming Iron and Steel Co.) of 1.5 Mt/yr of iron ore at the Qui Sa Mine in Lao Cai Province; and 3) the additional production by the same group of between 1.5 Mt/yr and 2 Mt/yr of hot-rolled coil and plate at another joint-venture plant to be located in Ba Ria-Vung Tau Province (Southeast Asia Iron and Steel Institute, 2006c).

According to the VSA, POSCO Steel Group of the Republic of Korea and Tycoons Worldwide Steel Co. of Taiwan both had presented proposals to invest in steel manufacturing projects in Vietnam. POSCO was expected to receive an investment license to build a $1.13 billion hot- and cold-rolled steel plant in Ba Ria-Vung Tau Province. Thailand-based Taiwanese Tycoons Worldwide Steel Co., according to a state-owned newspaper, was licensed to invest $1 billion to build a 2-Mt/yr steel plant in the Dung Quat economic zone in Quang Nam Province (Reuters Ltd., 2006; Vietnam Economy, 2006a; Vietnam Investment Review, 2007).

Lead and Zinc.—In December 2005, the Ta Pan Lead-Zinc Plant started operation at the Lung Vay hamlet of Minh Son Commune in Ha Giang Province. Construction of the plant reportedly was started in early 2004 with a total investment of about $1.08 million, of which $758,100 was provided by a Chinese private firm whose Vietnamese partner was Ha Giang Mineral Exploitation and Engineering Company. The Ta Pan Lead-Zinc Plant has a refining capacity of 300 metric tons per day of ore to produce 5,800 to 6,000 t/yr of lead and zinc for domestic consumption and export (Vietnam Business Forum, 2005).

During 2006, VIMICO reportedly was undertaking a 10,000-t/yr Thai Nguyen zinc refinery plant project. The plant would be owned and operated by VIMICO through its wholly owned subsidiary Thai Nguyen Non-Ferrous Metals Ltd. Co. (Vietnam National Minerals Corp., 2007).

Nickel.—After a feasibility study was completed in 2005, Asian Mineral Resources Ltd. (AMR) of New Zealand, through its 90% owned joint-venture company Ban Phuc Nickel Mines Ltd. (BPNM) moved toward obtaining the required mining license in late 2006. The Ban Phuc nickel deposit is located at the geographical center of the 150-km^2 Ta Khoa Concession in Son La Province about 180 km northwest of Hanoi. According to BPNM, the company had received approval from the Vietnamese Mineral Resources Evaluation Council under the MNRE to establish the company's resource estimation parameters for the Ban Phuc nickel project in April 2006 and had subsequently submitted its environmental impact assessment and management plan to the Vietnamese Government for approval in October 2006. BPNM anticipated that the mining license for the development of the Ban Phuc Greenfield nickel sulfide project could be approved during the first quarter of 2007. The Son La Mechanical Engineering and Industrial Construction Company owned the remaining 10% of BPNM (Asian Mineral Resources Ltd., 2005; 2006a, b).

Titanium (Ilmenite).—According to the Vietnam Economic Review, the Thua Thien Hue Provincial government, which controlled the country's largest titanium reserves, reportedly had ratified a master plan to develop its coastal sands (titanium ore) resources. These resources cover an area from Dien Loc Commune to Chan May Port and include the Ke Sung-Vinh My and the Quang Ngan Mines and four smaller mines. The mines would produce a combined total of about 2.5 Mt of titanium ore between 2006 and 2015 (Thanhnien News, 2006a).

In late August 2006, hundreds of local residents of Nhon Ly Island reportedly stormed four local titanium companies to demand a halt to the companies' mining operations because the operations had depleted water sources and affected the environment. The island also was threatened by landslides because of the mining operation. The four mining companies were Tien Phat Ltd. Co., Truong An Ltd. Co., Trung Viet Ltd. Co., and Tu Luc Ltd. Co.; they had been issued licenses by the Binh Dinh Provincial people's committee to mine titanium ore on Nhon Ly Island. As a result of the protest by local residents, the people's committee decided to suspend the companies' mining operations in September 2006 (Thanhnien News, 2006b, c).

In December 2006, several local ilmenite mining companies had their licenses revoked and extensions terminated. Several dozen companies had conducted illegal operations in the Phu Cat and Phu My Districts and in Quy Nhan City in Binh Dinh Province. As a result of illegal mining operations, about 40% of the Binh Dinh Province's forests had been destroyed (Industrial Minerals, 2007)

In March 2006, the Vietnam-U.S. Titanium Dioxide Joint Venture began construction of a titanium oxide pigment processing pilot plant on a 6-hectare site in the Vietnam coastal Province of Binh Thuan. The titanium oxide pigment pilot plant would have an initial capacity to produce 5,000 t/yr of titanium oxide pigment; the capacity would be expanded to 10,000 t/yr

after the second-phase construction is completed. According to Vietnam News (a local newspaper), the first-phase construction was slated for completion by March 2008. The $25 million project was proposed by Altair Nanotechnologies Inc. and was approved by the Government in 2004. The titanium oxide pigment processing plant would use environmentally friendly technology, which was provided by Avirco USA. About 80% of production reportedly would be exported to the United States (Vietnam Economy, 2006b).

Tungsten.—Because of its 70% interest in the Nui Phao mining project in Vietnam, Tiberon Minerals Ltd. of Canada could become one of the leading and lowest-cost producers of tungsten and an important producer of acid-grade fluorspar and bismuth in the world. The company anticipated production from the Nui Phao Mine to begin in early 2009 and to reach full capacity in the second half of 2009. Ore concentrate production was projected to average 4,788 t/yr of tungsten trioxide, 222,458 t/yr of acid-grade fluorspar, 2,039 t/yr of bismuth, 5,614 t/yr of copper, 71.6 kg/yr (2,302 ounces) of gold, and 852.5 kg/yr (27,408 ounces) of silver during an estimated 16.3 years of mine life (Tiberon Minerals Ltd., 2006a).

During 2006, Tiberon Minerals signed a contract with Ausenco Ltd. of Australia to undertake the detailed engineering, procurement, and construction management of the Nui Phao tungsten-fluorspar project in Vietnam. Tiberon Minerals also awarded a construction contract for the initial infrastructure development of Nui Phao's first resettlement site for local residents at Nam Song Con to a local Vietnamese company (Tiberon Minerals Ltd., 2006c, e).

In June 2006, Tiberon Minerals had received and approved an underwriting commitment letter from Mandated Lead Arranger (which was made up of Bayerische Hypo und Vereinsbank AG, Caterpillar Financial SARL, Export Development Canada, Forttis Bank S.A. /N.V., and Standard Chartered Bank) for up to $210 million to provide a commercial facility and for up to $14 million to provide a cost overrun facility (Tiberon Minerals Ltd., 2006g).

In February 2006, Tiberon Minerals signed an agreement with Osram Sylvania to increase its offtake to up to 100% of the company's projected annual average tungsten concentrate production pursuant to an amended option agreement. The company also signed an offtake agreement with CMC Cometals [a subsidiary of Commercial Metals Company (CMC)] for the purchase of 100% of CMC Cometals' projected acid-grade fluorspar production for the first 3 years of the agreement, followed by a 3-year renewal at CMC Cometals' option and successive 1-year mutual extension options thereafter. Tiberon Minerals also signed an offtake agreement with Sidech S.A. for the purchase of 100% of Tiberon Minerals' projected bismuth production for the first 5 years of the agreement with successive 5-year mutual extension options thereafter (Tiberon Minerals Ltd., 2006b, d, f).

In July, Tiberon Minerals signed a memorandum of understanding (MOU) with Siemens Project Venture GmbH (SPV) of Germany. Under the terms of the MOU, SPV will potentially purchase up to $30 million worth of preferred shares in Tiberon Minerals' Singapore Holding. The proceeds will be used to fund the Nui Phao project equity contributions. The preferred shares will be redeemed from project dividend distributions once the project is in the production stage, for a term not to exceed 6 years (Tiberon Minerals Ltd., 2006h).

Industrial Minerals

Cement.—As a result of the more than 10% annual growth in demand for cement during 2001-05, Vietnam's cement industry's capacity increased considerably during the past 2 years. The ongoing renovation and expansion programs at VNCC (which controlled seven cement plants and a large number of newly planned state-owned and joint-venture cement plants between the local government and private investors in northern and southern Vietnam) would add about 30 new plants and between 27 Mt/yr and 29 Mt/yr of additional capacity by 2010. According to Vietnam Cement Association (VCA), the Vietnamese cement industry's production capacity could reach 60 Mt/yr against a projected 50 Mt/yr of demand for cement by 2010 (Thanhnien News, 2007a; Yahoo.com, 2007).

The VNCC had predicted that the existing cement plants would need to run at full capacity and raise their productivity by 10% to increase cement production sufficiently to meet the 2006 demand for cement by the construction industry. VNCC projected that Vietnamese demand for cement would increase at an annual rate of 8% to 10% between 2006 and 2010. The Ministry of Construction, however, predicted that Vietnam would have between 5 Mt/yr and 10 Mt/yr of surplus cement and would no longer need to import clinker from overseas during 2009 to 2013 because of the larger number of projected cement plants and excess capacity (VietnamNet, 2006b; Yahoo.com, 2007).

According to the Ministry of Construction, Vietnam's cement production increased by about 9% to about 31.5 Mt in 2006 because of the continued growth in the industry's capacity, which was estimated to be about 33 Mt/yr, and in response to strong domestic demand for cement for major infrastructure, private housing, and office building projects. Cement consumption increased by more than 10% to 32.5 Mt in 2006 and was projected to grow at an annual rate of between 10.5% and 11.5% and to reach 50 Mt in 2010. According to the Ministry of Construction's forecast, the Vietnamese cement industry was expected to import about 5 Mt of clinker in 2006 (Thanhnien News, 2007a, b).

During 2006, VNCC undertook projects to build new cement plants and add new production lines by 2010, which would add about 10 Mt/yr of production capacity. Planned construction of new cement plants included the Ha Tien II plant in Kien Giang Province, the Bim Son plant in Thanh Hoa Province, and the Binh Phuoc plant in Binh Phuoc Province; the three plants would have a combined capacity of 5.4 Mt/yr. Installation of new production lines would add 1.4 Mt/yr of capacity to the But Son plant in Ha Nam Province and 1.2 Mt/yr to the Hoang Thach plant in Hai Duong Province. VNCC also planned to upgrade all other existing plants to operate at their designed capacity (VietnamNet, 2006b; BVOM.com, 2007).

Mineral Fuels

Coal.—The Vietnamese coal industry continued on its path of robust growth in 2006. Vietnam coal production increased by 14.1% and coal exports jumped by 65.6% in 2006 owing to the continued expansion in coal production capacity, strong growth in domestic coal demand for power generation, and increased exports to the Asian market, especially to China, Japan, and Thailand. In 2006, coal production reached a record high level of 38.9 Mt compared with 34.1 Mt (revised) in 2005, and coal exports rose to a record high level of 29.8 Mt compared with 18 Mt in 2005. In 2006, Vietnam was one of the major suppliers of anthracite coal in the Asia and the Pacific region (General Statistics Office of Vietnam, 2007; Vietnam Business Forum, 2007a, b).

The main anthracite coal mines were located in the areas of Cam Pha, Cao Son, Coc Sau, Deo Nai, Dong Trieu, Ha Tu, Hong Gai, Khe Cham, Mao Khe, Mong Duong, and Uong Bi. Brown coal mines were located mainly in the Province of Lang Son. VINACOAL owned and operated three main coal preparation (processing) plants that were located in Cam Pha, Hong Gai, and Uong Bi. VINACOAL also controlled three main coal terminals at Cua Ong in Cam Pha, Nam Cau Trang in Hon Gai, and at Dien Cong in Uong Bi. VINACOAL, which became a wholly owned subsidiary of VINACOMIM in 2005, controlled most of the mining, distribution, and export of coal. Most of the coal produced in Vietnam was anthracite mainly from Quang Ninh Province in northeastern Vietnam.

In 2006, VINACOAL controlled about 20 coal producing subsidiaries. The 20 coal producing companies were Vinacomin Cao Son Coal Joint-Stock Company, Vinacomin Coc Sau Coal Joint-Stock Company, Vinacomin Duong Huy Coal Company, Vinacomin Deo Nai Coal Company, Vinacomin Dong Bac Company, Vinacomin Ha Lam Coal Company, Vinacomin Ha Tu Joint-Stock Company, Vinacomin Ha Long Coal Company, Vinacomin Hongay Coal Company, Vinacomin Vang Danh Coal Company, Vinacomin Minerals Corporation, Vinacomin Mao Khe Coal Company, Vinacomin Mong Duong Coal Company, Vinacomin Inland Coal Holding Company, Vinacomin Nui Beo Coal Joint-Stock Company, Vinacomin Quang Hanh Coal Company, Vinacomin South-West Da Mai Joint-Stock Company, Vinacomin Thong Nhat Coal Company, Vinacomin Uong Bi Coal Holding Co. Ltd., and Vinacomin Mine Construction Company. Other coal business-related subsidiaries under VINACOMIN were Vinacomin Cua Ong Coal Preparation Company, Vinacomin Hongay Coal Preparation Company, and Vinacomin Port Company.

Because of the increasing number of large thermal powerplants, cement plants, and iron and steel complexes, according to state-owned VINACOMIN's projection, demand for coal was expected to continue to increase at an annual average rate of 18.2% in the 2006-10 period and at an annual average rate of 8.7% to 10.3% in the 2011-25 period. Domestic demand for coal was projected to reach 51 Mt in 2015, 75 Mt in 2020, and 118 Mt in 2025. Demand for coal by the power and cement industries, which accounted for about 60% of the total coal demand in Vietnam, would be the major driving force for the future growth in coal demand. According to VINACOMIN's projection, Vietnam will become a net coal importer in 2015. Vietnam's coal imports were projected to grow to 3.4 Mt in 2015, 19.7 Mt in 2020, and 57.4 Mt in 2025. Vietnam planned to gradually reduce its coal exports from 29.8 Mt in 2006 to 12 Mt by 2010, and 5 Mt by 2015, and to export no coal beginning in 2015 (VietnamNet, 2006d).

To meet the increasing demand for coal, VINACOMIN was expected to raise its coal production and coal reserves as part of its plan to develop and expand coal production capacity beginning in 2006. According to VINACOMIN, it planned to complete a survey of the Hong (Red) River coal basin. The company was working with a Japanese company to evaluate and assess a 300-meter-deep coal reserve at the bottom of the Quang Ninh coal basin. Early in 2006, VINACOMIN estimated that about 1,768 billion metric tons of coal was located in the Quang Ninh coal basin (VietnamNet, 2006e).

Natural Gas and Petroleum.—Natural gas was produced by VietSovPetro (a joint venture of Vietnam Oil and Gas Corp. and Zarubeznheft of Russia) from the small onshore Tien Hai C Gasfield in the Hanoi Trough (which is part of the Song Hong Basin). Associated gas was produced by VietSovPetro from the larger offshore Bach Ho (White Tiger) and Rang Dong (Dawn) oilfields, which are located in the Cuu Long Basin. A consortium led by BP p.l.c. of the United Kingdom produced associated gas from the offshore Lan-Do and Lan Tay gasfields in the Nam Con Son Basin. In 2006, natural gas production increased by about 7% to 6.766 billion cubic meters from 6.342 billion cubic meters in 2005. Crude petroleum production dropped by about 9% to 119.3 million barrels (16.845 Mt) (General Statistics Office of Vietnam, 2006d, e). In 2006, crude petroleum was produced from the Bach Ho, the Rang Dong, the Rong, the Ruby, and the Su Tu Den (Black Lion) fields in the Cuu Long Basin; the Bunga Kekwa field in the Malay-Tho Chu Basin, which is located off the southern coast of Vietnam between Vietnam and Malaysia; and the Dai Hung field in the Nam Con Son Basin.

In 2006, the country exported 16.6 Mt of its crude petroleum output and earned $8.3 billion of foreign currency. Vietnam, however, needed to import 11 Mt of refined petroleum products to meet most of its requirement in 2006. The import bill for refined petroleum amounted to more than $11 billion in 2006 (Vietnam Business Forum, 2007a, b).

In February 2006, a consortium made up of ConocoPhillips, PetroVietnam, and two companies of the Republic of Korea announced that it had discovered new oil and gas reserves in Su Tu Trang field off the southeastern coast of Vietnam. The newly discovered reserves, which were estimated to contain 300 million barrels of crude petroleum and 3 trillion to 4 trillion cubic feet (about 85 to 113 billion cubic meters) of natural gas, represented about 40% of the Republic of Korea's annual crude oil imports. The field was owned by PetroVietnam (50%), ConocoPhillips (23.25%), Korea National Oil Corp. (14.25%), SK Corp. (9%), and others (3.5%) (Dow Jones Newswires, 2006).

In April 2006, state-owned PetroVietnam announced that a large volume of oil and gas was discovered in the Phuong Dong-4X-15.2 well, at the STT-3X well, and at the TE Giac Trang-2X well. The Vietnam-Russian Oil and Gas Joint Venture Enterprise

also announced in April that the joint venture found an oil stream in Drilling Well 15 at the Central Rong Structure, which is located in the coastal Province of Ba Ria-Vung Tau (United Press International, Inc., 2006; Vietnam Economy, 2006d).

In the domestic market, natural gas was consumed as fuel by powerplants and as raw material by a nitrogen fertilizer plant in the Phu My Industrial Zone in the Province of Ba Ria-Vung Tau; the remainder was consumed as raw material by the liquefied-petroleum-gas (LPG)- and condensate-processing plants at Dinh Co for the production of LPG and gasoline in Vung Tau in the Province of Ba Ria-Vung Tau.

Outlook

For the next 4 to 5 years, Vietnam's mining sector will continue to be dominated by the coal and oil and gas industries. In the energy sector, the coal and oil and gas industries are expected to expand their capacity during the next 2 to 4 years. The mining sector for ferrous, nonferrous, and industrial minerals also is expected to expand. Exploitation of such nonferrous minerals as gold and tungsten (with bismuth and fluorspar as coproducts) is expected to start between 2008 and 2009 and to add new capacity to the mining sector. Development of new capacity for the production of bauxite, iron ore, and nickel could be completed between 2009 and 2010, but development of new capacity for aluminum may take longer because of power supply problems. The existing capacity for production of cement is expected to be expanded by more than 14 Mt/yr during the next 3 to 5 years to meet the growing demand for cement as a result of Vietnam's rapid urbanization.

Vietnam's economy is expected to continue to grow at an annual rate of 7.6% during the next 2 years. According to a forecast by the International Monetary Fund, the Vietnamese GDP is expected to grow at a rate of 8.4% in 2007 (International Monetary Fund, 2006).

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TABLE 1
VIETNAM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2002	2003	2004	2005	2006[e]
METALS						
Bauxite[e]		20,000	20,000	20,000	25,800 [r]	30,000
Chromium ore, gross weight		66,300 [r]	91,000 [r]	82,000 [r]	89,000 [r]	90,000
Copper:						
Mine output, Cu content		1,100	1,200	1,200	1,200	5,200
Metal, refined		--	--	--	--	4,800
Gold	kilograms	2,000 [e]	2,000 [e]	2,065 [r]	2,138 [r]	2,500
Iron and steel:						
Iron ore, Fe content	do.	430,000 [e]	540,000 [e]	495,000 [r]	504,700 [r]	510,000
Metal:						
Pig iron	do.	146	200	187	202	300
Steel, crude	do.	409	544	689 [r]	890 [r]	1,000
Steel, rolled	do.	2,503	2,954	3,280 [r]	3,888 [r]	4,000
Lead, mine output, Pb content		1,100 [e]	1,100 [e]	5,000 [r]	6,000 [r]	6,000
Manganese concentrate, gross weight		68,000 [e]	68,000 [e]	15,000 [r]	18,000 [r]	20,000
Pyrite, gross weight[e]	thousand metric tons	400	450	450	500	500
Tin:[e]						
Mine output, Sn content		1,700	2,100	3,500 [r]	3,500 [r]	3,500
Metal, smelter		1,700	2,100	2,500 [r, 3]	2,500 [r, 3]	2,500
Titanium:						
Ilmenite concentrate, gross weight		180,000	200,000	145,000 [r, 3]	150,000 [r, 3]	150,000
Rutile, gross weight		--	--	400 [3]	500 [3]	500
Zinc:						
Mine output, Zn content[e]		42,000	45,000	45,000 [r]	50,000 [r]	50,000
Metal, powder		--	--	5,000	23,000	23,000
Zirconium, gross weight		11,000 [e]	13,000 [e]	10,000 [r]	10,000 [r]	10,000
INDUSTRIAL MINERALS						
Barite		60,300	81,500	120,000 [r]	130,000 [r, e]	130,000
Cement, hydraulic	thousand metric tons	21,121	24,127	26,153 [r]	27,100 [r]	31,500
Clays, kaolin[e]		600,000	650,000	650,000	650,000	650,000
Fluorspar		3,000 [e]	3,000 [e]	4,000 [r]	4,000 [r]	4,000
Graphite		2,000 [e]	2,000 [e]	2,000	2,000	2,000
Gypsum[e]	thousand metric tons	5,000	5,000	5,000 [3]	5,000	5,000
Lime	do.	1,420 [r]	1,384 [r]	1,464 [r]	1,718 [r]	1,950
Nitrogen, N content of ammonia		58,400	79,700	216,200	220,000 [e]	230,000
Phosphate rock:						
Gross weight	thousand metric tons	779 [r]	821 [r]	902 [r]	1,066 [r]	1,220
P_2O_5 content[e]	do.	234 [r]	246 [r]	271 [r]	320 [r]	366
Pyrophyllite[e]		30,000	30,000	30,000	30,000	30,000
Salt	thousand metric tons	974 [r]	909 [r]	906 [r]	925 [r]	950
Sand and gravel	do.	125,200 [r]	133,000 [r]	145,300 [r]	146,400 [r]	148,000
Silica sand[e]	do.	160 [r]	170 [r]	185 [r]	190 [r]	200
Stone, building stone	do.	95,500 [r]	138,500 [r]	143,400 [r]	184,100 [r]	205,400
Sulfur[e]		22,000	22,000	22,000	22,000	22,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, anthracite	thousand metric tons	16,409 [r]	19,314 [r]	27,349 [r]	34,100 [r]	38,900
Gas, natural, gross	million cubic meters	2,260	3,450	6,266 [r]	6,342 [r]	6,766
Petroleum, crude	thousand 42-gallon barrels	117,753	125,281	141,930 [r]	131,003 [r]	119,300

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. -- Zero.

[1]Table includes data available through July 27, 2007.

[2]In addition to the commodities listed, antimony, bentonite, refractory clay, construction aggregates, gemstones, granite, graphite, marble, rare earths, and silver were mined but not reported. Available information is inadequate to make reliable estimates of output.

[3]Reported figure.

TABLE 1--Continued
VIETNAM: PRODUCTION OF MINERAL COMMODITIES[1]

Sources: Vietnam's General Statistics Office, Statistical Yearbook, 2005; British Geological Survey, World Mineral Statistics, 2002-04; World Metal Statistics, May 2006; South East Asia Iron and Steel Institute, Crude Steel Production, Annual Statistics, 2001-04; The Barytes Association, World Barytes Production 2001-05; International Lead and Zinc Study Group, Lead and Zinc Statistics, Monthly Bulletin of the International Lead and Zinc Study Group, February 2006; U.S. Geological Survey Minerals Questionnaire, 2004-2005.

TABLE 2
VIETNAM: 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
Cement	Chinfong Hai Phong Cement Corp. (Chingfong Group of Taiwan, 70%; Hai Phong Municipal Government, 15.56%; Vietnam National Cement Corp., 14.44%)	Min Duc near Hai Phong City	1,400
Do.	Morning Star Cement Ltd. (Holcim Group of Switzerland, 65%, and Vietnam National Cement Corp., 35%)	Hon Chong, Kien Giang Province	4,500
Do.	Nghi Son Cement Corp. (Taiheiyo Cement Corp., 45.5%; Mitsubishi Materials Corp. of Japan, 19.5%; Vietnam National Cement Corp., 35%)	Nghi Son, Thanh Hoa Province	2,150
Do.	Vietnam National Cement Corp. (100% state-owned)	Bim Son, But Son, Da Nang, Ha Tien I, Ha Tien II, Hai Phong, Hai Van, Hoang Mai, Hoang Thach, and Tam Diep	18,000
Chromite, gross weight	Thai Nguyen Nonferrous Metal Co. (wholly owned subsidiary of state-owned Vietnam National Minerals Corp.)	Nui Nua, Thanh Hoa Province	100
Coal, anthracite	Vietnam National Coal Corp. (100% state-owned)	Cam Pha, Cao Son, Coc Sau, Vang Danh, Dong Trieu, Ha Lam, Ha Tu, Hong Gai, Khe Cham, Mao Khe, Mong Duong, Deo Nai, Cua Ong, Uong Bi in Quang Ninh Province	40,000
Copper:			
Concentrate, Cu content	Lao Cai Copper Complex (wholly owned subsidiary of Vietnam National Minerals Corp.)	Sin Queyen, Lao Cai Province	11
Refined	Tang Loong Lao Cai Copper Smelting Enterprise (wholly owned subsidiary of Vietnam National Minerals Corp.)	Tang Loong Long Commune, Bao Tang District, Lao Cai Province	10
Fertilizer, Apatite, gross weight	Vietnam National Chemical Corp. (100% state-owned)	Lao Cai, Lao Cai Province	1,250
Nitrogen, ammonia	do.	Ha Bac, northern Vietnam Phu My, Ba Ria-Vung Tau Province	375
Superphosphate	do.	Lam Thao, Phu Tho Province	800
Gas, natural million cubic meters per day	VietSovPetro (a joint venture of Vietnam Oil and Gas Corp. and Zarubeznheft, a Russian oil company), and joint venture of PetroVietnam, BP p.l.c. of the United Kingdom, Oil and Natural Gas Co. of India, and ConocoPhilips Co. of the United States	Offshore Bach Ho oilfield, Rang Dong oilfield, and Lan-Tay/Lan-Do gasfield	18
Iron ore, gross weight	Thai Nguyen Iron and Steel Corporation (wholly owned subsidiary of Vietnam Steel Corp.)	Trai Cau and Tein Bo in Thai Nguyen Province; Thach Khe in Ha Tinh Province	850
Petroleum, crude thousand 42-gallon barrels per day	VietSovPetro (a joint venture of Vietnam Oil and Gas Corp. and Zarubeznheft, a Russian oil company)	Offshore Bach Ho, Rong, Rang Dong, Ruby, Bunga Kekwa, Dai Hung, and SuTu Trang oilfields	390
Salt	Vietnam National Salt Corp.	Nam Dinh, Nghe An, and Hai Tin Provinces	12,000
Steel, crude	Vietnam Steel Corp.	Cai Lan, Thai Nguyen Province, and Phu My, Ba Ria-Vung Tau Province	800
Tin, concentrate, Sn content	Cao Bang Nonferrous Metal Co. and Nghe Tinh Nonferrous Metal Co. (wholly owned subsidiaries of state-owned Vietnam National Minerals Corp.)	Pia Oac, Cao Bang Province; Quy Hop, Nghe An Province; and Tam Dao, Tuyen Quang Province	4
Refined	Thai Nguyen Nonferrous Metal Co.	Thai Nguyen, Bac Thai Province	3
Titanium, ilmenite	Bimal Minerals Co. Ltd. (Malaysia Mining Corp. and Syarikat Pendorong Sdn. Bhd., 60%, and Binh Dinh Minerals Co., 40%)	Cat Khanh, Qui Nhon, and Binh Dinh Provinces	70
Do	Ha Tinh Minerals and Trading Co.	Cam Hoa, Ky Annh-Cam, Xuyen, Ky Khan, and Ky Ninh, Ha Tinh Province	130
Do.	Mineral Development Co. No. 4 and No. 5 (wholly owned subsidiaries of Vietnam National Minerals Corp.)	Vinh City, Nghe An Province; Tuy Hoa, Dong Xuan in Phu Yen Province; and Quang Ngan, Vinh My in Thua Thien-Hu Province	50

TABLE 2--Continued
VIETNAM: 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
Zinc, concentrate, Zn content	Thai Nguyen Nonferrous Metal Co. (wholly owned subsidiary of state-owned Vietnam National Minerals Corp.)	Cho Dien, Bac Can Province	55
Refined	The Ta Pan Zinc-Lead Plant (a Chinese private firm, 70.2%, and Ha Giang Mineral Exploiting and Engineering Company, 29.8%)	Lung Vay, Bac Me District, Ha Giang Province	6
Do.	Thai Nguyen Zinc Refinery (wholly owned subsidiary of state-owned Vietnam National Minerals Corp.)	Thai Nguyen City, Thai Nguyean Province	10