



2011 Minerals Yearbook

UNITED ARAB EMIRATES

THE MINERAL INDUSTRY OF THE UNITED ARAB EMIRATES

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The United Arab Emirates (UAE)¹ was the world's seventh ranked producer of crude oil and accounted for 3.8% of world crude oil production in 2011. The UAE held 97.8 billion barrels of proved crude oil reserves, or 5.9% of the world's total reserves, as well as 6.1 trillion cubic meters of proved natural gas reserves, or 2.9% of the world's total. The UAE accounted for 1.6% of the world's supply of natural gas and was ranked seventh in the world in terms of the volume of its proved crude oil and natural gas reserves. The country was increasingly a significant world supplier of aluminum foundry alloy, extrusion billet, and high-purity aluminum to countries in Africa, Asia, Europe, and North America and accounted for about 3.2% of the world's aluminum smelter output in 2011. In 2011, the UAE commenced large-scale production of direct-reduced iron (DRI) and steel along with its current production of cement, nitrogen fertilizer, refined petroleum products, and sulfur (BP p.l.c., 2012, p. 6, 8, 20, 22; Bray, 2012).

Government Policies and Programs

The Emirate of Abu Dhabi, which is the largest of the seven Emirates that make up the UAE, set forth an ambitious economic diversification target that, by 2015, one-half of the Emirate's gross domestic product (GDP) would come from nonoil economic activity. This target, along with other initiatives, such as the startup of Abu Dhabi Future Energy Co. (Masdar) and Emirates Aluminium Co. Ltd. (Emal), were part of the Abu Dhabi Economic Vision 2030, which aimed to generate new sources of income and enhance the Emirate's knowledge-based economic sectors. Abu Dhabi identified metals as 1 of 12 engines for its future growth and embarked on producing advanced materials, aluminum, iron and steel, and other base metals. Abu Dhabi, which does not have significant ore reserves of any metals, depended on its low energy costs, its transport system, and the infrastructure of its industrial cities to support its downstream metal industries. Abu Dhabi also continued to move forward with oil and gas development projects. The projects were aimed at increasing the volume of the Emirate's crude oil production capacity to 3.5 million barrels per day (Mbb/d) from the current (2011) level of about 2.7 Mbb/d, and natural gas production capacity to 198 million cubic meters per day from the current level of 51.7 million cubic meters per day by the end of 2018 (Government of Abu Dhabi, 2009, p. 113, 116, 123).

Masdar (a subsidiary of Mubadala Development Co. P.J.S.C.) was created as a global company to find solutions to problems related to climate change, energy security, and sustainable energy. Masdar comprised three business units—a

clean energy unit, Masdar City, and a venture capital unit—as well as an independent research-oriented university. Masdar teamed up with academic and business organizations, such as Abengoa Solar Power S.A. of Spain, E.ON AG of Germany, Massachusetts Institute of Technology of the United States, and Mitsubishi Heavy Industries of Japan, to apply the latest technologies in carbon management, solar and hydrogen-based energy, and other clean energy technologies (Abu Dhabi Future Energy Co., 2012, p. 2, 3).

The UAE had been developing its alternative energy resources, including nuclear and solar energy, to meet the increased demand for electricity in Abu Dhabi, Dubai, and the other Emirates. The Emirates Nuclear Energy Corp. (ENEC) was responsible for managing the country's nuclear power program, the goal of which was to produce electricity to meet an expected need for an additional 40,000 megawatts (MW) of capacity by 2020 (Emirates Nuclear Energy Corp., 2010, 2011).

Minerals in the National Economy

In 2011, the UAE's economy grew at a rate of 4.9% in real terms compared with a revised growth rate of 0.9% in 2010. The increased growth rate was mainly attributable to the increase in world oil prices, as well as the increase in petroleum products output. The contribution of the mineral sector, which included quarrying and hydrocarbon extraction, increased to 38.6% of the GDP from 31.5% of the GDP in 2010. The hydrocarbon subsector contributed 38.4% of the GDP, and the quarrying subsector contributed 0.2% of the GDP. The contribution of the manufacturing sector, which included the aluminum, fertilizer, and iron and steel industries, decreased to 8.0% of the GDP from 8.8% of the GDP in 2010. The construction sector contributed 10.5% of the GDP in 2011 compared with 11.6% of the GDP in 2010 (National Bureau of Statistics, 2012, p. 9).

The flow of foreign direct investment (FDI) into the UAE increased by about 40% to about \$7.7 billion in 2011 from \$5.5 billion in 2010. The increase of FDI inflow to the UAE did not follow the trend in other countries in the Middle East, which saw significant decreases in FDI because of political unrest in the region and the global financial downturn. The outflow of FDI from the UAE to the rest of the world increased by 10% to about \$2.2 billion in 2011 from \$2.0 billion in 2010 (United Nations Conference on Trade and Development, 2012, p. 171).

Production

In 2011, crude steel and DRI production increased in tonnage by 300% and 53%, respectively, compared with output in 2010 because Emirate Steel Industries' mill was producing at capacity. Aluminum output increased by 25% in 2011 compared with that of 2010. The increase was attributable to production at capacity at Emal's aluminum smelter. Significant increases

¹The United Arab Emirates is a federation of seven emirates: Abu Dhabi, Ajman, Dubayy (Dubai), Al Fujayrah, Ras Al Khaimah, Ash Shariqah (Sharjah), and Umm Al Qaywayn.

were reported in the outputs of crude oil and refined petroleum products compared with those of 2010; production of natural gas liquids, however, decreased by 56% (table 1).

Structure of the Mineral Industry

The governments of the individual Emirates of the UAE maintained majority interest in the country's mineral industry. The Supreme Council of Petroleum was the highest Government body that made policies and set goals for the hydrocarbon sector. Abu Dhabi Emirate produced 94% of the crude oil and natural gas produced by the UAE and other six Emirates accounted for the remaining 6% of hydrocarbon output.

In Abu Dhabi, Abu Dhabi National Oil Co. (Adnoc) managed all aspects of the hydrocarbon industry through its 14 subsidiaries. Abu Dhabi Company for Onshore Oil Operations (Adco), Abu Dhabi Marine Operating Co. (Adma-Opco), and Zakum Development Co. (Zadco) also carried out exploration for and production of oil and gas. The companies that provided exploration and production services included Abu Dhabi Petroleum Ports Operating Co. (Irshad), Mussafah Offshore Supply Base (Esnaad), and National Drilling Co. (NDC). Oil and gas processing was conducted by Abu Dhabi Gas Industries Ltd. (Gasco), Abu Dhabi Gas Liquefaction Company Ltd. (Adgas), and Abu Dhabi Oil Refining Co. (Takreer). Chemical and petrochemical manufacturing companies included Abu Dhabi Polymers Co. Ltd. (Borouge) and Ruwais Fertilizer Industries (Fertil). The distribution of refined petroleum products was the responsibility of Adnoc-Distribution. Abu Dhabi National Tanker Co. (Adnatco) and National Gas Shipping Company (NGSCO) carried out maritime transportation (Abu Dhabi National Oil Co., 2012a).

The Dubai Supreme Council of Energy and Dubai Petroleum Establishment were in charge of the oil and energy sector in Dubai Emirate. Ajman National Oil Co., RAK petroleum of Ras Al-Khaimah, and Sharjah National Oil Corp. were state-owned companies that operated in Ajman, Ras Al-Khaimah, and Sharjah, respectively. Al Fujayrah Emirate was the site of the UAE's only oil export terminal, which is located on the east coast of the country south of the Strait of Hormuz.

The government of the Emirate of Dubai owned the country's first primary aluminum producer, Dubai Aluminium Company Ltd. (Dubal), and was a partner with Mubadala in Emal. Emal operated the country's second primary aluminum smelter at the Khalifa Port and Industrial Zone (KPIZ) in Abu Dhabi (Dubai Aluminium Co. Ltd., 2012; Emirates Aluminium Co. Ltd., 2012).

General Holding Corp. (GHC) was the UAE's leading industrial investment instrument to implement Abu Dhabi's industrial diversification policy. GHC had a number of subsidiaries, which included Abu Dhabi Basic Industries Corp. (Adbic), Arkan Building Materials Co. (Arkan), Dubai Cable Co. (Pty) Ltd. (Ducab), Emirate Cement Factory, and Emirates Steel Industries. Adbic continued to promote the Government's economic diversification policy by investing and creating partnerships with local and international enterprises in the base-metals (aluminum, copper, and steel), petrochemical, and other industrial sectors. Ducab owned two plants for producing copper and manufacturing wire cable—one at Jebel Ali in Dubai

and one at the industrial city of Mussafah in Abu Dhabi. RAK Minerals and Metals Investments, which was a subsidiary of Ras Al Khaimah Investment Authority, invested in mineral production locally and abroad (Abu Dhabi Basic Industries Corp., 2010; RAK Minerals and Metals Investments, 2010; Dubai Cable Company (Pty) Ltd., 2012).

Thani Emirates Resources Holdings Ltd. (a subsidiary of Thani Group) was based in Dubai and focused on precious metals, uranium, and rare earth-minerals. In 2009, the company established an alliance with AngloGold Ashanti Ltd. of South Africa, Thani Ashanti Strategic Alliance, to explore for gold in the Middle East and Africa. By yearend 2011, Thani Ashanti Strategic Alliance had equity interest in projects at various levels of developments in Djibouti, Egypt, Eritrea, Ethiopia, and Saudi Arabia. Thani Emirates was also trying to win uranium mining concessions in the Middle East and Africa to meet the expected increase in demand for uranium in the region and worldwide (AngloGold Ashanti Ltd., 2009; Neuhof, 2011).

Individual Emirate governments, including the governments of the Emirate of Ras Al Khaimah and the Emirate of Sharjah, owned some of the cement companies. The country's other cement plants were owned by private and joint-venture companies.

Mineral Trade

In 2011, the UAE was ranked 20th (14th when excluding intra-European Union trade) in the world in terms of the value of its exports of goods, which totaled \$285 billion and accounted for 1.56% of the world's total goods exports. The country was ranked 25th (18th when excluding intra-European Union trade) in the world in terms of the value of its imports of goods, which totaled \$205 billion and accounted for 1.11% of the world's total goods imports (World Trade Organization, 2012).

Petroleum product exports, which accounted for 35% of the UAE's total goods exports, increased by about 50% to \$111.6 billion in 2011 from revised \$74.6 billion in 2010. Much of the increase in the value of petroleum exports was owing to the increase in the price of crude oil, which, for the UAE, averaged \$109.60 per barrel in 2011 compared with \$77.00 per barrel in 2010. The value of natural gas exports increased to \$12 billion from \$7.9 billion in 2010. The value of nonhydrocarbon exports increased by 22% to \$62.1 billion from \$51.0 billion in 2010. The value of reexports, which were estimated to account for between 40% and 70% of the UAE's total imports, increased by 22.6% to \$105.6 billion from \$86.1 billion in 2010 (International Monetary Fund, 2012, p. 23–24).

In 2011, the UAE was the 19th ranked export partner with the United States, and it maintained its position as the leading export market for the United States in the Middle East. The United States was the third ranked exporter to the UAE after China and India. U.S. exports to the UAE increased by 36% to \$15.9 billion in 2011 from \$11.5 billion in 2010 and accounted for 7% of the UAE's total imports. Primary imports included chemicals, computer and electronic products, machinery, primary metal, and transport equipment (Office of the United States Trade Representative, 2012).

The UAE was the 65th ranked exporter of goods to the United States in 2011. U.S. imports of goods from the UAE increased by about 115% to \$2.45 billion from \$1.14 billion in 2010. The value of U.S. imports of aluminum from the UAE was \$638 million; hydrocarbons, \$394 million; iron and steel products, \$198 million; and diamond, \$157 million (Office of the United States Trade Representative, 2012).

Dubai Diamond Exchange (DDE), which was a subsidiary of Dubai Multi Commodities Centre (DMCC), was the leading diamond trade center in the world. The value of the diamond trade at DDE in 2011, which included both rough and polished diamond trade, amounted to \$39.1 billion compared with \$35.1 billion in 2010. The volume of the UAE's diamond trade was about 255 million carats compared with about 269 million carats in 2010. The country exported 72.9 million carats of polished diamond valued at \$14.6 billion in 2011 and imported 82.6 million carats of polished diamond valued at about \$13.3 billion. The UAE exported 47.4 million carats valued at \$5.9 billion in 2011 and imported 51.9 million carats of rough diamond valued at about \$3.8 billion. The UAE's top diamond trade partners included India, Belgium, Hong Kong, and Switzerland, and the remaining trading partners were Angola and the Democratic Republic of Congo [Congo (Kinshasa)] (Dubai Multi Commodities Center Authority, 2012).

In 2011, gold trade at the Dubai Gold Center increased to 1,196 metric tons (t) valued at \$55.9 billion from 1,125 t valued at \$41.3 billion in 2010. Gold exports increased to 451 t valued at \$22.9 from 418 t valued at about \$17 billion in 2010. Gold imports increased to 745 t valued at about \$30 billion from 707 t valued at \$24.4 billion in 2010. India remained Dubai's leading gold trading partner (Dubai Multi Commodities Center Authority, 2012).

The UAE was one of the world's top net importers of steel in 2011. It imported 6.6 million metric tons (Mt) of steel and was the world sixth ranked importer of steel. The UAE imported 5.3 Mt of semifinished and finished steel products in 2011 compared with about 6.7 Mt in 2010 and 13.6 Mt in 2008. In 2010 (latest year for which comprehensive statistics were available), the UAE imported 3.1 Mt of iron ore (World Steel Association, 2012).

The UAE was also a hub for scrap metals recycling in the region. The country recycled an estimated 5 Mt/yr of scrap and refined metal and reexported between 840,000 t and 1.2 Mt of nonferrous metals worth about \$4.5 billion. The UAE imported scrap from Africa and Europe, sorted and (or) refined it, and then reexported it to China, India, and Pakistan (GoGreenae, 2011).

Commodity Review

Metals

Aluminum.—Dubal and Emal produced about 1.8 Mt of primary aluminum in 2011. Dubal's smelter produced more than 1 Mt of hot metal whereas Emal's smelter output exceeded 750,000 t. Dubal's product mix included extrusion billet (61%), foundry alloy (30%), high-purity aluminum (6%), and other products (3%). Dubal employed 3,827 people and consumed 1.93 million metric tons per year (Mt/yr) of

alumina, 300,000 metric tons per year (t/yr) of petroleum coke, and 70,000 t/yr of coal tar pitch (table 1; Dubai Aluminium Company Ltd., 2012).

In January, Emal's smelter reached full production capacity of 750,000 t/yr and was officially inaugurated in April. In July, the company announced a \$4.5 billion second phase expansion project, which would double its production capacity to 1.3 Mt/yr of primary aluminum. Construction of Emal's phase 2 project broke ground in September and was expected to be completed in December 2014. Emal's smelter would be the world's largest aluminum smelter in terms of capacity. Emal's aluminum products included a mix of extrusion billet, sheet ingot, sow, standard ingot, and tee ingot. The aluminum complex would include an anode rodding shop, a green carbon plant, and a 3,000-megawatt (MW)-capacity powerplant. Adnoc guaranteed to supply natural gas for the smelter for 30 years (Emirates Aluminium Co. Ltd., 2012).

Antimony.—In July, Tri-star Resources plc of the United Kingdom and Union International Holdings Group created a joint venture, Tri-Star Union FZ LLC, to build an antimony plant at Al Ghail Industrial Zone in Ras Al Khaimah Emirate. The antimony plant that would have the capacity to produce 20,000 t/yr of antimony metal and tri-oxide finished products and would cost \$60 million to build. Tri-Star would treat both Tri-Star concentrates and third party concentrates to produce finished antimony metal. In October, the project received initial environmental clearance from the Government (Tri-star Resources plc, 2011).

Iron and Steel.—Emirates Steel Industries completed the phase 1 expansion project of its integrated steel complex in Abu Dhabi Industrial City at Taweelah at a cost of \$810 million in 2010. The complex included a 1.6-Mt/yr direct-reduction plant, a 1.4-Mt/yr steel melt plant with a 150-metric-ton-per-heat-capacity electric arc furnace (EAF) and a 150-metric-ton-per-heat-capacity ladle furnace, a 1.4-Mt/yr combi-caster, a 620,000-t/yr rebar rolling mill, and a 480,000-t/yr wire coil and rod rolling mill. In 2011, Emirates Steel embarked on construction of a phase 2 expansion project, which was expected to cost \$1.5 billion to build and would be completed in 2012. The project would also include a 1.6-Mt/yr direct-reduction plant, a 1.4-Mt/yr steel melt plant with a 150-metric-ton-per-heat-capacity EAF and a 150-metric-ton-per-heat-capacity ladle furnace, a 1.4-Mt/yr combi-caster, and a 1-Mt/yr heavy section rolling mill (Emirates Steel, 2012).

Hamriyah Steel FZC produced 365,000 t/yr of rebar at its steel rebar plant in Sharjah in 2010 and reached full capacity of 1 Mt/yr in 2011. The plant, which was built by SMS Meer GmbH of Germany, received its feedstock for rebar production from Metalloinvest's steel plants in Russia. Metalloinvest planned to invest \$320 million to build a second plant in the UAE in the next 5 years. The plant would produce DRI for use in steelmaking (Hamriyah Steel FZC, 2010).

Al Nasser Industrial Enterprises LLC (ANIE) had four steel manufacturing subsidiaries in the UAE—Emirates Steel Co. LLC, Emirates Steel Establishment, Gulf Sponge Iron Co. L.L.C., Gulf Steel Industries Co. Ltd. Gulf Steel built a 400,000-t/yr-capacity rebar mill supplied by Siemens VAI in the Musaffah Industrial Zone in Abu Dhabi. Emirates Steel Co.

finished building a steel billet plant at the Industrial City of Abu Dhabi in October. The plant had the capacity to produce 360,000 t/yr of billet. In August, Gulf Sponge Iron Co. completed the construction of a DRI plant with an installed capacity of 250,000 t/yr. The plant included a reactor, a process gas heater, a carbon dioxide (CO₂) removal system, a process gas compressor, a cement coating plant, and utility systems (Al Nasser Industrial Enterprises L.L.C., 2012).

The apparent steel use and apparent steel use per capita for the UAE decreased to 6,369 kilograms (kg) and 1,237 kg, respectively, in 2011 compared with 6,897 kg and 1,386 kg, respectively, in 2010. These indicators had been decreasing considerably since they peaked at 10,217 kg and 2,211 kg, respectively, in 2008. The decrease was attributed to the slowdown of construction projects following the world financial crisis of 2009. The country's imports of ingots and flat, long, tabular, wire rod, and other semifinished steel products has been reduced in the past 2 years as the UAE became a producer and exporter of these products (World Steel Association, 2012).

Industrial Minerals

Cement.—The cement market continued to face capacity oversupply challenges despite increased demand in 2011. The UAE's cement industry had the capacity to produce more than 31 Mt/yr of cement (10 Mt of which was grinding capacity only) because of the wave of greenfield plants and capacity extensions completed between 2007 and 2009 during the construction boom in the UAE and other Gulf countries. Cement producers were looking for ways to reduce production costs and exported 2 Mt of cement to new markets with high demand, mainly Iraq, Kuwait, and Oman, as well as some African countries. According to estimates by the GW Group, the UAE's domestic demand for cement would not use more than one-half of the country's installed production capacity by 2012 (World Cement, 2011, p. 36).

Nitrogen.—Ruwais Fertilizer Industries Ltd. (Fertil) moved forward with expanding the capacity at its ammonia and urea complex at the Ruwais refinery. The expansion project was named Fertil 2 and was being carried out by Samsung Engineering and Construction Co. Ltd. of the Republic of Korea. Fertil 2 would increase the company's capacity to 2 Mt/yr of granulated urea and was expected to be completed in early 2013. The company had the capacity to produce melamine, which contains 67% nitrogen (Abu Dhabi National Oil Co., 2012b; Ruwais Fertilizer Industries Ltd., 2012).

Sulfur.—Production of sulfur, which amounted to about 2 Mt in 2011, was expected to increase by more than threefold following the completion of natural gas production projects from the Bab, the Hail, and the Shah oilfields by 2015. The presence of high levels of hydrogen sulfide (about 30%) in the Bab, the Hail, and the Shah oilfields requires removal of hydrogen sulfide (known as sweetening) from the natural gas, which would result in capturing of sulfur as a byproduct. Adnoc estimated that its sulfur production capacity as a byproduct of oil and gas operations would exceed 7 Mt/yr by 2015 (Arab Fertilizers Association, 2012).

In September, China South Locomotive & Rolling Stock Corp. signed a contract with the UAE railway authority (Etihad Rail) to supply 240 railway wagons to be used to carry granulated sulfur from the Shah and the Habshan oilfields to be exported from Rwais Port. ADNOC and Etihad Rail were building a 266-kilometer railway that would have the capacity to move 22,000 metric tons per day (t/d) of sulfur. Transport of the first freight was expected to begin in 2013 (Railway Gazette, 2011).

Mineral Fuels and Other Sources of Energy

Natural Gas.—Despite being the seventh ranked country in the world in terms of its natural gas reserves, the UAE had been facing a challenging task of supplying sufficient quantities of natural gas to meet its export targets and the increased demand of the local market, which uses natural gas as a feedstock for powerplants and for the aluminum, fertilizer, and other industries. Consequently, the UAE imported natural gas from Qatar through the Dolphin Co. pipeline and liquefied natural gas (LNG) by way of LNG carriers.

Gasco had been carrying out an integrated gas development project, which would build new onshore and offshore gas processing plants at Habshan and Ruwais in Abu Dhabi. The project was expected to cost \$7 billion to build and was scheduled to be completed in 2013. Gas received from the Umm Shaif field would be processed at the Habshan and Ruwais facilities, which would include a natural gas liquids (NGL) train with the capacity to produce 27,000 t/d of NGL and liquefied petroleum gas (U.S. Energy Information Administration, 2011).

In January, Adnoc created a joint venture with Occidental Petroleum Corp. of the United States to develop gas production from the Shah field. Adnoc would own 60% equity share in the project and Occidental would own the remaining 40%. The Shah project would entail installing several gas-gathering systems and constructing processing trains to handle 28.3 million cubic meters per day of gas at Shah, constructing a storing and shipping facility near the plant, and building sulfur-exporting structures at the Ruwais Industrial Complex. The project aimed to produce 14.2 million cubic meters per day of natural gas, 4,400 t/d of NGL, 33,000 barrels per day (bbl/d) of condensates, and 9,200 t/d of granulated sulfur by 2013 (Mirza, 2011).

Nuclear Energy.—The Emirates Nuclear Energy Corp. (ENEC) obtained a construction license to build the country's first nuclear powerplants (Braka 1 and Braka 2), which would be located in the western area of the Emirate of Abu Dhabi. Initial foundation and geochemical work was started by a consortium of companies, led by Korea Electric Power Corp. (KEPCO), that was awarded contracts to design, build, and help operate four 1,400-MW nuclear reactors for the UAE nuclear energy program. The KEPCO-led consortium included Doosan Heavy Industries & Construction Co. Ltd., Hyundai Engineering and Construction, Samsung C&T Corp. (all of the Republic of Korea), and Westinghouse Electric Co. LLC of the United States. The value of the contract with the KEPCO-led consortium was about \$20 billion, and the consortium expected to receive another \$20 billion by jointly operating the reactors for 60 years. The first reactor was expected to begin supplying electricity to the grid in 2017, and the other three reactors were

expected to be completed in 2020 (Emirates Nuclear Energy Corp., 2010).

In July, the ENEC began a nuclear fuel procurement bid for the supply of nuclear fuel for the four proposed energy plants in the UAE. The ENEC would contract for natural uranium concentrate, conversion services, and enrichment services. The enriched uranium would be supplied to KEPCO Nuclear Fuel Co. Ltd. of the Republic of Korea (KNF), which would manufacture the fuel assemblies for use in the UAE plants (Emirates Nuclear Energy Corp., 2011).

Petroleum.—Adco planned to increase Abu Dhabi's onshore crude oil production capacity to 1.8 Mbbbl/d by 2015 from the current (2011) capacity of 1.4 Mbbbl/d. The company was implementing a multibillion-dollar fullfield development program for the Asab, the Bab, the Bida Al Qemzan, the Qusahwira, the Sahil, and the Shah fields. Zadco and Adma-Opco were working on increasing offshore production to 1.75 Mbbbl/d from the offshore Satah, Umm al-Dalkh, and Upper Zakum fields. In 2011, Zadco signed a \$485 million contract to develop the Satah field. The contract was expected to increase production capacity to 25,000 bbl/d. Adma-Opco awarded Larsen & Toubro Ltd. of India an engineering, construction, and procurement contract valued at \$639 million to construct early production structures at the Lower Zakum, Umm Shaif, and Satah Al-Razboot fields (Salisbury, 2011).

Takreer's two refineries, which are located in Abu Dhabi and Ruwais, had a total installed refining capacity of 205,000 bbl/d in 2011. The company was implementing a \$10 billion plan that would include three large expansion projects for the Ruwais oil refinery. Takreer was building Group III base oils production facilities at the Ruwais refinery with the capacity to produce 500,000 t/yr of Group III base oils and 100,000 t/yr of Group II base oils. Group III base oils are advanced formula base oils used as lubricants for automotive engines (Abu Dhabi Oil Refining Co., 2012).

In 2010, Sharjah Emirate, which was the third largest Emirate in the UAE in terms of area, created Sharjah National Oil Corp. The new government-owned but financially independent company took over Crescent Petroleum operations in the Saja field concession and was expected to carry out new operations in downstream and upstream markets in Sharjah Emirate. In April, the Ruler of the Sharjah Emirate decreed the establishment of the Fujairah Zone for Petroleum Industry (FOZ). The FOZ would include hydrocarbon industries and would have a total of 262 tanks that would have the capacity to store 7 million cubic meters of crude oil and petroleum products. In November, RAK Petroleum and DNO International ASA of Norway approved the merger of their oil and gas assets. The merger process was expected to be finalized in 2012 (Emirates 24/7, 2011; RAK Petroleum Co. Ltd., 2011).

Renewable Energy.—According to the Abu Dhabi Economic Vision 2030, the UAE would meet 7% of its energy mix from renewable resources by year 2020. The Masdar renewable energy initiative, which was scheduled to be completed by 2014 at a cost of \$22 billion, moved forward in 2011. Masdar planned to build a hydrogen powerplant at Ruwais that would provide 420 MW of electric power generating capacity, desalinate seawater using reverse osmosis technology to

produce 20 to 25 million gallons per day of water, and have a carbon capture and storage capability. The carbon capture and storage project would involve the building of structures capable of holding carbon dioxide emitted from (a) Emirates Steel's steel rolling mill at Mussafah (up to 800,000 t/yr), (b) the planned \$2 billion hydrogen powerplant joint venture with BP p.l.c. at Shuweihat, (c) Emal's powerplant at Tawheelah, and (d) the independent water and powerplant at Taweelah. Masdar planned to capture and store 5 Mt/yr of carbon dioxide and sell it to Adnoc, which would inject it into its oilfields. Abengoa Solar S.A. of Spain and Total S.A. of France were building a 100-MW-capacity concentrated solar powerplant, called Shams 1, for Masdar in Abu Dhabi at a cost of \$600 million. Shams 1, which would be the world's largest single concentrated solar powerplant, was expected to be completed in early 2013 (Abu Dhabi Future Energy Co. 2012; Laylin, 2013).

Outlook

The economy of the UAE is projected to grow at a modest rate in the next 5 years. The Government of Abu Dhabi planned to invest \$60 billion in the next 5 years to increase the production lifetime of its gas and oil reserves, especially natural gas from the sour gas reserves present in the Shah field. Abu Dhabi had been investing in renewable energy sources and technologies within the UAE and around the world and expected to complete construction of the country's first nuclear powerplant by 2017. Production of primary aluminum in the UAE, which increased to about 1.8 Mt/yr in 2011, is expected to increase further to 2.50 Mt/yr when the construction of Emal's phase 2 expansion project is completed. Iron and steel production by Emirates Steel is expected to reach 5 Mt/yr by 2013. Additional increases are expected in the production of ammonia, crude oil, natural gas, refined petroleum products, sulfur, and urea.

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TABLE 1
UNITED ARAB EMIRATES: PRODUCTION OF MINERAL COMMODITIES¹

(Thousand metric tons unless otherwise specified)

Commodity ²	2007	2008	2009	2010	2011
METALS					
Aluminum, primary	890	945	955	1,400	1,750
Chromite ore	19	34	24	(3)	(3)
Iron and steel:					
Direct-reduced iron	--	--	--	1,180	1,800
Steel, crude	90	100	100	500 ^r	2,000
INDUSTRIAL MINERALS					
Cement, hydraulic	16,000	21,885	18,997	18,000 ^e	18,000 ^e
Gypsum ^e	40	40	40	40	40
Lime ^e	60	120	120	120	120
Nitrogen:					
N content of ammonia	380	380	380	392	386
N content of urea	270	284	284	310 ^r	324
Stone, crushed ^e	100,000 ^r	150,000	150,000	100,000 ^r	100,000
Sulfur ⁴	1,950	2,175	2,175	1,829 ^r	1,885
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural:					
Gross million cubic meters	78,963	80,550	75,840	79,778 ^r	82,433
Dry do.	50,290	50,240	48,800	51,300	52,300
Natural gas plant liquids thousand 42-gallon barrels	91,250 ^r	91,250 ^r	91,250 ^r	78,110 ^r	34,310
Petroleum:					
Crude do.	1,114,345 ^r	1,127,120 ^r	1,003,750 ^r	1,046,455 ^r	1,212,530
Refinery products:					
Liquefied petroleum gas do.	2,044 ^r	3,577 ^r	5,840 ^r	6,570 ^r	8,103
Gasoline do.	19,929 ^r	18,469 ^r	12,994 ^r	15,732 ^r	20,914
Kerosene and jet fuel do.	39,238 ^r	38,836 ^r	35,405 ^r	39,092 ^r	49,202
Distillate fuels do.	31,645 ^r	31,390 ^r	26,682 ^r	29,018 ^r	36,427
Residual fuels do.	7,336 ^r	6,022 ^r	5,584 ^r	5,804 ^r	6,680
Other do.	45,296 ^r	49,822 ^r	34,274 ^r	42,048 ^r	46,640
Total do.	145,488 ^r	148,116 ^r	120,779 ^r	138,264 ^r	167,966

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^rRevised. do. Ditto. -- Zero.

¹Table includes data available through December 31, 2012.

²In addition to the commodities listed, industrial minerals, such as common clays, diabase, gravel, limestone, marble, sand, salt, and shale presumably are produced, but output is not reported, and information is inadequate to make reliable estimates of output.

³Negligible or no production.

⁴Byproduct of petroleum refining and natural gas processing.

TABLE 2
UNITED ARAB EMIRATES: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum		Dubai Aluminum Co. Ltd. (Dubal) (Investment Corp. of Dubai, 100%)	Jebel Ali, Dubai	950
Do.		Emirates Aluminium Co. Ltd. (Emal) [Dubai Aluminum Co. Ltd. (Dubal), 50% and Mubadala Development Co., 50%]	Taweelah, Abu Dhabi, at Khalifa Port and Industrial Zone (KPIZ)	1,400
Cement:				
Portland		Arabian Gulf Cement Company LLC	Ajman	900
Do.		Emirates Cement Factory (General Holding Corp.)	Al-Ain, Abu Dhabi	2,200
Do.		Fujairah Cement Industries P.S.C.	Dibba, Fujairah	2,800
Do.		Gulf Cement Co. (National Investments Co. of Kuwait, 27%, and Government of Ras Al Khaimah, 8%)	Khor Khuwair, Ras Al Khaimah	3,800
Do.		Jebel Ali Cement Co. (Sharaf Industries, 100%)	Jebel Ali, Dubai	840
Do.		Lafarge Emirates Cement L.L.LC.	Fujairah	3,200
Do.		National Cement Company P.S.C.	Dubai	1,500
Do.		National Cement Factory	Abu Dhabi	2,500
Do.		Ras Al Khaimah Cement Co. P.S.C.	Khor Khuwair, Ras Al Khaimah	1,000
Do.		Sharjah Cement and Industrial Development Co. (private, 70%, and Government of Sharjah, 30%)	Sharjah	2,000
Do.		Umm al-Qaywayn Cement Industries Co. P.S.C.	Umm al-Quwain	1,600
Do.		Union Cement Co. (Government of Ras Al Khaimah, 41%, and Abu Dhabi Investment Authority, 20%)	Khor Khuwair, Ras Al Khaimah	4,800
White		Ras Al Khaimah Company for White Cement and Construction Materials	Ras Al Khaimah	450
Gold, refined	metric tons	Emirates Gold (private, 100%)	Dubai	200
Do.	do.	Al Ghurair Giga Gold (private, 100%)	do.	100
Do.	do.	ARY Aurum Plus (private, 100%)	Sharjah	25
Do.	do.	Al Ghaith Gold (private, 100%)	Dubai	100
Iron and steel:				
Iron, direct-reduced		Emirates Steel Industries [General Holding Corp. (GHI), 100%]	Abu Dhabi	1,600
Do.		Al Nasser Industrial Enterprises LLC	do.	250
Steel:				
Billet		Emirates Steel Industries [General Holding Corp. (GHI), 100%]	do.	1,500
Do.		Al Nasser Industrial Enterprises LLC	do.	220
Wire rod		Emirates Steel Industries [General Holding Corp. (GHI), 100%]	do.	480
Rebar		do.	do.	620
Do.		Alam Steel	Dubai	500
Do.		Al Nasser Industrial Enterprises LLC	Abu Dhabi	90
Do.		Essar Steel-India	Hamriyah Free Zone, Sharjah	1,000
Do.		Hamriyah Steel FZC (Metalloinvest, 80%, and Sheikh Sultan Bin Khalifa Al Nahyan, 20%)	do.	1,000
Do.		Union Iron & Steel Company LLC	Abu Dhabi	500
Do.		Conares Metal Supply Ltd.	Dubai	400
Do.		Star Steel International LLC	Jebel Ali, Dubai; Hamriyah Free Zone, Sharjah	360
Do.		Al Ghurair Iron and Steel Co.	Abu Dhabi	350
Natural gas, liquefied		Abu Dhabi Gas Liquefaction Company Ltd. (Adgas)	Das Island	5,149
Nitrogen:				
Ammonia		Ruwais Fertilizer Industries (Fertil) (Abu Dhabi National Oil Co., 66.66%, and Total Group, 33.33%)	Ruwais, Abu Dhabi	460
Urea		do.	do.	800
Petroleum:				
Crude	thousand 42-gallon barrels per day	Abu Dhabi Company for Onshore Oil Operations (Adco) [Abu Dhabi National Oil Co. (Adnoc), 60%; BP p.l.c., 9.5%; Exxon Mobil Corp., 9.5%; Royal Dutch Shell Group, 9.5%; Total S.A., 9.5%; Participations and Explorations Corp., 2%]	Onshore Abu Dhabi oilfields, including the Asab, the Bab, the Bu Hasa, the Jarn Yaphour, the Sahil, the Shah, Abu Al Bukhoosh, and the Arzanah fields	1,300
Do.	do.	Abu Dhabi Marine Operating Co. (Adma-opco) [Abu Dhabi National Oil Co. (Adnoc), 60%; BP p.l.c., 14.67%; Total S.A. 13.33%; Japan Oil Development Corp., 12%]	Offshore Abu Dhabi oilfields, including the Umm Sharif and the Zakum fields	600

See footnotes at end of table.

TABLE 2—Continued
 UNITED ARAB EMIRATES: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum—Continued				
Crude—Continued	thousand 42-gallon barrels per day	Zakum Development Co. (Zadco)[Abu Dhabi National Oil Co. (Adnoc), 63.36%; ExxonMobil Abu Dhabi Offshore Petroleum Company Ltd., 24.64%; Japan Oil Development Corp., 12%]	Offshore Abu Dhabi oilfields, including the Satah, the Umm Al-Dalkh, and the Upper Zakum fields	518
Do.	do.	Dubai Petroleum Establishment (100%)	Dubai oilfields, including the Margham, the Falah, the Fateh, the Rashid, and S.W. Fateh fields	100
Do.	do.	Ras Al Khaimah Gas Commission	Ras Al Khaimah oilfields, including the Saleh fields	1
Do.	do.	BP p.l.c. and Crescent Petroleum Company Inc.	Sharjah oilfields, including the Kahaif, the Saja, the Moveyid, and the Mubarek fields	50
Refined products	do.	Abu Dhabi Oil Refining Co. (Takreer) [Abu Dhabi National Oil Co., (Adnoc), 100%]	Ruwais refinery, Ruwais, Abu Dhabi	120
Do.	do.	do.	Abu Dhabi refinery, Abu Dhabi	85
Do.	do.	Emirates National Oil Company Ltd. (Investment Corp. of Dubai, 100%)	Jebel Ali refinery, Jebel Ali, Dubai	120
Do.	do.	Sharjah Oil Refining Co. F.Z.C. (FAL Group, 100%)	Sharjah refinery, Hamriyah Free Trade Zone	71
Do.	do.	Inactive refinery, formerly operated by Metro Oil Corp.	Fujairah	90
Salt		Alghaith Industries (Al Ghaith Holding PJSC)	Mussafah, Abu Dhabi	110
Silica, glass	metric tons	Guardian Zoujaj International Float Glass Co. LLC (Guardian RAK)	Ras Al Khaimah	255,500
Do.	do.	Emirates Float Glass LLC (Dubai Investment PJSC, 100%)	Industrial City 1 and 2, Abu Dhabi	440,000
Silver, refined	do.	Emirates Gold (private, 100%)	Dubai	100
Sulfur		Abu Dhabi National Oil Co. (Adnoc)	Abu Dhabi	1,800
Do., do. Ditto.				