



# 2014 Minerals Yearbook

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UNITED ARAB EMIRATES

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# THE MINERAL INDUSTRY OF THE UNITED ARAB EMIRATES

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In 2014, the United Arab Emirates (UAE)<sup>1</sup> continued to be a regional industrial center and a global trade and financial hub. Revenue from the country's large hydrocarbon sector was supplemented with revenue from downstream mineral industries. The UAE was the world's fourth-ranked producer of primary aluminum after China, Russia, and Canada, and accounted for 4.6% of the total global output in 2014. The UAE was a major regional producer of industrial minerals and metals, including cement, iron and steel, and nitrogen fertilizers. In 2014, the country was the world's ninth-ranked direct-reduced iron (DRI) producer. The UAE was also the world's 11th-ranked sulfur producer and accounted for about 2.7% of the world's total in 2014. The UAE was the world's sixth-ranked crude petroleum and condensate producer in 2014, and accounted for 4% of the world's total with an average daily production of 3.7 million barrels (Mbbbl). The country was the world's fourth-ranked crude petroleum exporter after Saudi Arabia, Russia, and Iraq in 2014. The UAE ranked seventh in the world in terms of its proven crude petroleum reserves, which totaled 97.8 billion barrels, or about 6% of the world's total. The country ranked seventh in the world in terms of its proven natural gas reserves, which totaled about 6 trillion cubic meters, or 3.3% of the world's total reserves, and accounted for 1.7% of the world's total production in 2014. The UAE continued to be a net natural gas importer to meet its increasing domestic primary energy consumption for electricity generation, which increased by 5.5% to about 103 million metric tons (Mt) of oil equivalent in 2014 compared with about 98 Mt of oil equivalent in 2013 (table 1; BP p.l.c., 2015, p. 6, 8, 20, 22, 40; Midrex Technologies Inc., 2015, p. 8; Organization of the Petroleum Exporting Countries, 2015, p. 8, 52; U.S. Energy Information Administration, 2015; Apodaca, 2016; Bray, 2016).

## Minerals in the National Economy

The UAE's gross domestic product (GDP) increased by 3.6% in real terms in 2014 compared with 5.2% in 2013. The slower growth in the country's GDP was attributable in part to decreased global petroleum prices, which affected the UAE's Murban stream price that decreased by 8% to \$99.45 in 2014 compared with \$108.21 in 2013. The hydrocarbon sector accounted for about 31% of the country's GDP in 2014, which decreased slightly from that of 2013. The mining and quarrying sector (including hydrocarbons) accounted for about 32% of the GDP; of this amount, the quarrying sector accounted for about 1% (International Monetary Fund, 2015, p. 175; United Arab Emirates National Bureau of Statistics, 2015b).

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<sup>1</sup>The United Arab Emirates is a federation of seven Emirates: Abu Dhabi, Ajman, Dubai (Dubayy), Fujairah (Al Fujayrah), Ras Al Khaimah, Sharjah (Ash Shariqah), and Umm al-Quwain (Umm Al Qaywayn).

## Government Policies and Programs

As of yearend 2014, the UAE did not have a specific, comprehensive Federal law covering the mining industry. The Abu Dhabi Emirate, which is the largest of the UAE's seven Emirates in terms of land area, controlled 94% of the UAE's national oil and gas reserves; the Dubai Emirate controlled 4% of the national oil and gas reserves, and combined the other five Emirates controlled the remaining 2%. Article 23 of the UAE Federal Constitution considers each Emirate responsible for managing its own natural resources, including oil and natural gas. The Supreme Petroleum Council (SPC) regulates the extraction of oil and natural gas and sets the governing policies for oil and natural gas extraction in each Emirate. The Federal Ministry of Energy has limited powers for determining the planning priorities; however, it has minimal governing authority (DLA Piper, 2012, p. 85–86; Phakey and Renouf, 2014).

By yearend, the Federal Government was preparing a draft of a new taxation law. The law was expected to introduce a value-added tax (VAT) and other taxes. The process of drafting the law, which would introduce direct and indirect taxes, was expected to be completed by yearend 2015. In addition, a new Federal Government law concerning privately owned companies, which was prepared to replace the existing law No. 8 of 1984, was underway by yearend 2014. The law No. 2, which was scheduled to be enacted in July 2015, was expected to encourage economic diversification and to bring more foreign direct investment (FDI) into the country. The new law requires joint-venture companies to offer 30% of their shares to the public stock market compared with the 55% that was required to be offered previously; however, the law disallows the transfer of any company shares in a manner that could affect the minimum 51% of the company's shares that are supposed to be held by UAE nationals. The law also includes other provisions concerning corporate governance (Abougabal, 2015; Finlayson, 2015; Ministry of Finance, 2015, p. 49; PwC Legal Middle East, 2015, p. 2–5).

## Production

The UAE's mineral production had several notable changes in 2014 compared with that of 2013. Production of natural gas plant liquids (NGL) production increased by 76%; urea, by 58%; ammonia, by 50%; aluminum, by 25%; and cement, by 12%. Increases were also recorded in the production of sulfur, by 20%, and concrete-reinforcing bar (rebar), by 56%. Production decreased for hot-rolled long steel products, by 61%; direct-reduced iron, by 22%, and crude steel, by 17%. The total production of refined petroleum products decreased by 9% in 2014 compared with that of 2013 (table 1).

## Structure of the Mineral Industry

The Abu Dhabi Emirate makes up about 87% of the land area of the UAE; the Emirate controlled and managed the majority of the Nation's petroleum and natural gas resources through the wholly state-owned Abu Dhabi National Oil Co. (ADNOC) (United Arab Emirates Government, 2015). ADNOC operations were run through 16 subsidiaries that carried out most of the exploration, production, transportation, and marketing operations for crude oil, liquefied natural gas (LNG), liquefied petroleum gas (LPG), petrochemicals, and other petroleum industries in the UAE. The Abu Dhabi Company for Onshore Oil Operations (ADCO) operated eight major onshore fields (Abu Al Bukhoosh, Arzanah, Asab, Bab, Bu Hasa, Jarn Yaphour, Sahil, and Shah). The Abu Dhabi Marine Operating Co. (ADMA-OPCO) operated two offshore fields (Umm Shaif and Zakum). The Zakum Development Co. (ZADCO), which was a consortium of ADNOC (60%), ExxonMobil Oil Co. of the United States (28%), and Japan Oil Development Co. (JODCO) of Japan (12%), operated three offshore fields (Satah, Umm Al-Dalkh, and Upper Zakum) (table 2).

Abu Dhabi Gas Industries Ltd. (GASCO) operated three plants (Asab, Bu Hasa, and Habshan/Bab) for natural gas processing and NGL extraction as well as the NGL fractionation plant at Ruwais. The company also operated a pipeline distribution network to route natural gas to domestic industrial companies, including Emirates Aluminium Co. Ltd. and the local power stations. Abu Dhabi Oil Refining Co. (TAKREER) operated the Ruwais and Umm Al Nar refineries, and the National Gas Shipping Co. (NGSCO) conducted oil processing. Abu Dhabi Gas Liquefaction Company Ltd. (ADGAS) operated an LNG plant and carried out natural gas processing on Das Island. ADNOC Linde Industrial Gases Co. (ELIXIER), which operated the Ruwais air separation plant and the Mirfa nitrogen plant, also carried out natural gas processing. The chemical and petrochemical manufacturing companies included Abu Dhabi Polymers Co. Ltd. (BOROUGE) and Ruwais Fertilizer Industries (FERTIL). Support services were provided for exploration and production through the National Drilling Co. (NDC), which conducted onshore and offshore drilling; Abu Dhabi Petroleum Ports Operating Co. (IRSHAD), which undertook marine operations of the Abu Dhabi petroleum ports; and the Mussafah Offshore Supply Base (ESNAAD), which provided facilities, services, and supplies (table 2; U.S. Energy Information Administration, 2015).

Emirates Global Aluminium (EGA) was a 50–50 joint venture of Abu Dhabi Investment Corp. and Mubadala Development Co.; it conducted its operations through its subsidiaries Dubai Aluminium Co. (DUBAL), which operated an aluminum smelter at Jebel Ali, and Emirates Aluminium Co. (EMAL), which operated an aluminum smelter at Taweelah. Other EGA subsidiaries included Guinea Alumina Corp., which was developing a bauxite mine in Guinea in West Africa, and Al Taweelah Alumina, which was planning an alumina refinery at Taweelah in Abu Dhabi (table 2; Emirates Global Aluminium, 2015).

Emirates Steel Industries P.J.S.C. (ESI), which was a subsidiary of SENAAT General Holding Corp., was the leading steel producer in the UAE. It conducted operations at the

integrated steel plant in the industrial city of Abu Dhabi (table 2; SENAAT General Holding Corp., 2015).

## Mineral Trade

The total value of the UAE's foreign trade increased slightly in 2014 compared with that of 2013. The value of the UAE's exports decreased by about 1.2% in 2014 compared with those of 2013. Countries in Asia accounted for about 41% of the total value of net foreign trade with the UAE, followed by Europe, 23.6%; the Americas, 9.6%; the Gulf Cooperation Council (GCC), 9.1%; and other countries, 16.7%. The value of the UAE's imports increased by 1.7% in 2014 compared with those of 2013. Imports of pearls, gemstones, precious metals and their products, and chemical products accounted for most of the country's imports. In 2014, the value of the UAE's nonoil exports decreased by about 11% compared with that of 2013 owing to decreased exports of pearls, gemstones, and precious metals (by 44%), whereas exports of minerals and manufactured metals increased substantially (by 38%). The UAE was the world's ninth-ranked net importer of steel in 2014 with 5.8 Mt. The value of the country's reexports of manufactured goods increased by 5% in 2014 compared with that of 2013 (United Arab Emirates National Bureau of Statistics, 2015c, p. 6–10, 12; World Steel Association, 2015, p. 27).

The value of the UAE's exports to the United States increased by 23% to \$2.8 billion in 2014 compared with \$2.3 billion in 2013. The main mineral and mineral-related commodities were crude oil (\$633 million), bauxite and aluminum (\$622 million), chemical fertilizer (\$253 million), iron and steel products (\$147 million), drilling and oil field equipment (\$21 million), excavation machinery (\$13 million), fuel oil (\$4 million), other petroleum products (\$3 million), and sulfur (\$1 million). The value of the UAE's imports from the United States decreased by about 10% to \$22.1 billion in 2014 compared with \$24.5 billion in 2013. Notable decreases in the value of imports of mineral and mineral-related commodities included the decrease in excavation machinery, fertilizers, fuel oil, gold, drilling and oilfield equipment, finished metal shapes, industrial engines, iron and steel products, and organic chemicals (U.S. Census Bureau, 2015a, b).

The UAE did not produce any mined gold in 2014, although the country was a major global gold trade center. In 2014, the value of gold imports to the UAE decreased by 40% to about \$9.7 billion compared with \$16.1 billion in 2013. The value of gold exports from the UAE decreased by about 28% to \$13 billion in 2014 compared with about \$18 billion in 2013. The decreased value of the UAE's gold trade was attributable to decreased gold exports to India, which ranked first among its gold-trading partners in recent years, by \$9 billion, in 2014 compared with that of 2013. The decrease was owing to India's newly introduced taxes on gold imports that increased fivefold to 10% in 2014 from 2% in 2013. As a result, the total value of bilateral trade between the two countries decreased by 21% to \$59.6 billion in 2014 from \$75.4 billion in 2013 (Trenwith, 2014; International Trade Center, 2015).

The UAE did not produce any diamond in 2014; however, it was a major global trading hub of rough and polished diamond. The country increased its imports of rough diamond

by 17% to 68,133 million carats in 2014 from 57,281 million carats in 2013; it decreased its exports of rough diamond by about 1.7% to 66,784 million carats in 2014 from 67,936 million carats in 2013. The UAE's diamond trading partners included diamond-producing countries in Africa, diamond processing centers in China and India, and diamond consumption markets in Europe and the United States (Dubai Multi Commodities Centre, 2015; Kimberley Process, 2015).

## Commodity Review

### Metals

**Aluminum.**—In 2014, the UAE produced 2,341,000 metric tons (t) of aluminum, which was a 26% increase compared with 1,864,000 t in 2013. EGA was formed through a \$15 billion merger agreement between DUBAL and EMAL. EGA owned DUBAL's and EMAL's smelters in Jebel Ali and Taweelah, respectively. Following the completion of the second phase of EMAL's \$8 billion smelter expansion in mid-2014, EGA's combined production capacity reached 2.4 million metric tons per year (Mt/yr), which made EGA the world's fifth-ranked producer of aluminum. In October, EGA awarded a development contract to a consortium of Petrofac Emirates Co. (a subsidiary of Petrofac Ltd. of the United Kingdom) and Bechtel Corp. of the United States to construct a \$3 billion alumina refinery in Abu Dhabi. EGA's new alumina refinery was expected to be built in two phases and to have the capacity to produce 2.2 Mt/yr of alumina. The refinery was expected to be located near EMAL's smelter at Taweelah in the Khalifa Industrial Zone (Kizad) and was expected to process imported bauxite to produce alumina. EGA's newly developed 12-Mt/yr-capacity bauxite mine in Guinea was expected to supply bauxite to the Taweelah alumina refinery in early 2018. By yearend, EGA had also embarked on a development project at DUBAL's smelter in Jebel Ali that was expected to add 40,000 metric tons per year (t/yr) of aluminum capacity to the smelter's existing capacity of 1 Mt/yr. The project was expected to be completed by 2017 (table 1, 2; Watts, 2014c; Emirates Global Aluminium, 2015; Saadi, 2015; Sharif, 2015).

**Gold and Silver.**—The UAE's output of refined gold and silver decreased to 36.0 t and 45.0 t in 2014 from 37.8 t and 49.0 t, respectively, in 2013. Kaloti Precious Metals operated one of the largest gold refineries in the UAE through the Kaloti Gold Factory LLC; the refinery was located in Sharjah Emirate and had the capacity to produce 450 t/yr of refined gold. By yearend, the refinery was removed from the Dubai Good Delivery (DGD) list of approved gold refiners, which was issued by the Dubai Multi Commodities Centre (DMCC), owing to nonadherence to DMCC's standards of sourcing conflict-free gold. In 2014, the construction of a new \$60 million gold and silver refinery project by the Kaloti Jewellery Group continued at the DMCC location on the outskirts of Dubai. United Engineering Construction LLC carried out construction work on the project, which was being built on an area of 15,000 square meters. The project, which was expected to increase the UAE's silver refining capacity to 600 t/yr from 100 t/yr, was also projected to increase the country's gold-refining capacity to 1,440 t/yr from 800 t/yr when commissioned in late 2015.

The Kaloti Group was expected to submit an application to the DMCC to certify the new refinery upon its inauguration (Watts, 2014b; Kaloti Precious Metals LLC, 2015; van der Walt and Carpenter, 2015).

**Iron and Steel.**—In 2014, the UAE's production of crude steel decreased to 2.4 Mt and that of DRI to 2.4 Mt compared with 2.9 Mt and 3.1 Mt, respectively, in 2013. The decreases were attributable to increased low-cost iron and steel imports from China and Turkey owing to low tariffs and duty exemptions in the UAE. Steel consumption in the UAE was estimated to be 3.5 Mt in 2014, which was a 15% increase in local steel products consumption compared with that of 2013. In 2014, steel billets and wire rod imports from China increased 300% and 112%, respectively, compared with those of 2013. Rebar imports from Turkey increased by 28% to 1.33 Mt in 2014 compared with those of 2013 (table 1; Emirates Steel Industries P.J.S.C., 2015; Gulf News, 2015; World Steel Association, 2015, p. 9, 19).

ESI had the only integrated steel plant in the UAE. The company was expected to continue leading upstream steel development in the UAE during the next few years. ESI produced 1.85 Mt of rebar, 0.55 Mt of structural sections, and 0.4 Mt of wire rod in 2014. The company's production capacity was 3.5 Mt/yr of steel billet, 1.8 Mt of rebar, and 550,000 t of wire rod in 2014. The company sold 61% of its products locally and exported the remaining 39% worldwide. Saudi Arabia accounted for 54% of ESI iron and steel exports, followed by the United Kingdom and the United States (9% each), Mexico (8%), and Germany (5%). Planning for the third phase of ESI's expansion project at Mussafah in Kizad was underway by yearend, and was expected to be commissioned in 2017. This phase of the project was expected to include a new DRI plant with a capacity of 2.5 Mt/yr, a melt shop with a capacity of 2.3 Mt/yr, and a continuous rolling mill with a capacity of 2.1 Mt/yr (Emirates Steel Industries P.J.S.C., 2015; Organization for Economic Co-operation and Development, 2015, p. 31; Trade Arabia, 2015).

### Industrial Minerals

**Cement.**—In 2014, the UAE was estimated to have consumed about 10 Mt and to have produced 28 Mt of cement. Most of the UAE's cement production was exported to neighboring countries. The UAE's cement production capacity was estimated to be about 46 Mt/yr, including cement-grinding facilities. Ras Al Khaimah Emirate accounted for about one-half of the country's cement production capacity, whereas the Abu Dhabi Emirate and the Dubai Emirate combined, accounted for most of the cement grinding capacity. Arkan Building Materials Co. (ARKAN) P.J.S.C., which was 51% owned by SENAAT General Holding Corp., operated the Emirates cement factory at the Al Ain Industrial Area in Abu Dhabi Emirate; the cement factory had the capacity to produce about 1.2 Mt/yr of cement. In November, the company inaugurated a new \$354 million cement plant at Al Ain that had the capacity to produce 4.5 Mt/yr of cement, which increased the company's overall cement production capacity to 5.7 Mt/yr. The plant planned to source its raw materials from quarries at Al-Ain and Oman.

The company added capacity in response to increased activity in the domestic construction sector. About 90% of the new plant's output was expected to be sold locally and the remainder was to be exported to other GCC countries (table 1, 2; Emirates Cement, 2015; Saunders, 2015).

**Nitrogen.**—FERTIL, which was the major nitrogen fertilizer producer in the UAE, was a joint venture between ADNOC (66%) and Total S.A. of France (33%). FERTIL operated two ammonia plants and two urea plants at the Ruwais Industrial Complex. In 2014, the company increased its production of ammonia as a result of resuming production at FERTIL 2, which was a \$1.2 billion expansion project commissioned in the third quarter of 2013. FERTIL had the capacity to produce 1.2 Mt/yr of ammonia and 2.1 Mt/yr of urea by yearend. FERTIL accounted for 10% of the GCC member countries' fertilizer production in 2014. The company sent about 98% of its production to consumers in Africa, Asia, Europe, and Latin America, and the remaining 2% was consumed locally (table 1, 2; Alhadari, 2014).

**Sulfur.**—The UAE produced about 2.4 Mt of sulfur in 2014 compared with 2.0 Mt in 2013. The increase in the UAE's sulfur supply was attributable to the commissioning of GASCO's Habshan 5 natural gas treatment project by yearend 2013 and the commissioning of Al Hosn Gas's new Shah sour gas onshore project by mid-November 2014. The Al Hosn Gas project, which is located 210 kilometers (km) southwest of Abu Dhabi City, was an \$11 billion joint venture between ADNOC (60%) and Occidental Petroleum Corp. of the United States (40%). The project was expected to produce about 4 Mt/yr of sulfur when it reached full capacity in the third quarter of 2015. The Habshan sulfur granulation plant had the capacity to treat liquid sulfur recovered from the Habshan onshore gasfield before storing and transporting it by railway to the Ruwais terminal for export. The construction of the 264-km sulfur transportation railway between the Habshan gasfield, the Shah gasfield, and the Ruwais terminal was completed by yearend 2014 (table 1; Emarat Alyoum, 2014; Watts, 2015a).

### ***Mineral Fuels and Other Sources of Energy***

**Natural Gas.**—Al Hosn Gas planned to extract and process 28.3 million cubic meters per day of natural gas containing about 23% hydrogen sulfide from the Shah sour gas reservoir at Shah's gas development project in Abu Dhabi, which was commissioned in 2014. About one-half of the project's natural gas processing capacity, or 14.2 million cubic meters per day, was expected to supply power generation stations in Abu Dhabi to meet the city's increasing electricity generation requirements. In addition to producing natural gas and sulfur, the project was also expected to produce about 46,000 barrels per day (bbl/d) of NGL and 33,000 bbl/d of condensate (Watts, 2015a).

By yearend 2014, GASCO was expected to award Técnicas Reunidas S.A. of Spain a \$700 million construction contract that would include the installation of natural gas processing units and pipelines for the third phase of the Integrated Gas Development (IGD) expansion project in Abu Dhabi. Técnicas Reunidas was expected to complete the construction of the project by 2018. The first phase of the IGD project, which was an \$11 billion investment, was completed in the third quarter of 2011, followed

by the second phase in 2014. The project was part of the UAE's plan to add 22.6 million cubic meters per day of natural gas production capacity from offshore gasfields to be used by local industries (Watts 2015b).

**Nuclear Energy.**—In recent years, the UAE's energy sector was barely capable of meeting the country's demand for electricity, which had been increasing steadily owing to the addition of new projects in the petroleum and natural gas sector and the nonfuel mineral industry. The increase in domestic energy consumption, which was led by continued economic and demographic growth, encouraged the country to activate plans to add nuclear and renewable electricity generation capacities. In 2013 (the latest year for which data were available), the country had an installed electricity generation capacity of 27.37 gigawatts (GW), generated 109,979 gigawatt hours (GWh) of electricity, and consumed 105,363 GWh. The emirates of Abu Dhabi and Dubai combined accounted for 94% of the electricity generation in the UAE, and the other emirates accounted for the remaining 6%. Most of the UAE's electricity was generated by natural gas fueled powerplants that consumed most of the country's natural gas production and caused the country to continue to import natural gas as LNG by pipelines from neighboring Qatar, as it had done since 2007 (United Arab Emirates National Bureau of Statistics, 2015a; U.S. Energy Information Administration, 2015).

In July, the UAE ratified the International Atomic Energy Agency (IAEA) convention on supplementary compensation for nuclear damage, which was expected to be enacted in the second quarter of 2015. The country was also planning to participate in the nuclear suppliers group and to apply export and import regulations concerning nuclear energy equipment and technologies. The Federal Authority on Nuclear Regulations (FANR), which was established by the UAE's Decree No. (6) of 2009, was responsible for issuing licenses concerning the construction of the Barakah nuclear power generation project. Some of the responsibilities of the Emirates Nuclear Energy Corp. (ENEC), which was established by the UAE's law No. (21) of 2009, included the construction, development, management, maintenance, and operation of nuclear reactors used for energy generation in the country. By yearend 2014, ENEC continued to collaborate with the Korea Electric Power Corp. of the Republic of Korea, which was the primary manager of the \$20 billion Barakah project, to construct a four-unit (Barakah 1, Barakah 2, Barakah 3, and Barakah 4) nuclear powerplant. The project was expected to have 5.6 GW of electricity generation capacity, which would meet nearly 25% of the UAE's electricity demand, and was expected to operate for 60 years. Each unit of the four-unit project was expected to have a generation capacity of 1.4 GW by 2020. The construction of the Barakah 1 unit, which was carried out by Hyundai Engineering and Construction Company Ltd. of the Republic of Korea, was more than 60% completed by yearend 2014 and was expected to begin commercial production by 2017. Construction work also continued on the Barakah 2 unit, which was carried out by Samsung C&T Corp. of the Republic of Korea in 2014, and was expected to be commissioned by 2018. ENEC was expected to submit applications to FANR to issue licenses to operate the Barakah 1 and Barakah 2 units by the beginning

of 2015. FANR was expected to review the applications and to issue licenses for operating units 1 and 2 by 2016. FANR also approved additional construction work for the Barakah 3 and Barakah 4 units, including the reactor containment building and other facilities in 2014 (Lee, 2015; Roscoe, 2015; Wilkinson, 2015).

**Petroleum.**—During the past 5 years, production of crude petroleum had been increasing steadily in the UAE. In 2014, ADNOC produced crude petroleum from onshore fields, including the Murban field, and from offshore fields, including the Lower Zakum, the Umm Shaif, and the Upper Zakum fields. The country used enhanced oil recovery (EOR) technologies to extract crude petroleum and natural gas from many of its oil-producing wells. In October, ADMA–OPCO started crude petroleum production at the Umm Lulu oilfield, which is located 30 km northwest of Abu Dhabi, for the first time. Crude petroleum produced from Umm Lulu, which would have a capacity of 105,000 bbl/d, was expected to be transported through subsea pipelines to Zirku Island in order to be exported to countries in Asia. In July, ADNOC started to produce a new crude stream, termed Das, which was a blend of light and sweet (low sulfur) crude, from the two existing streams of the Lower Zakum and the Umm Shaif fields (table 1; Oil and Gas Journal, 2014; U.S. Energy Information Administration, 2015).

The Upper Zakum offshore field development project, which is located 84 km off the coast of Abu Dhabi, was projected to be sustainable for 25 years. The project, which was managed by ZADCO, was expected to increase Upper Zakum’s output to 750,000 bbl/d by 2016 from the current 590,000 bbl/d. The Lower Zakum offshore field, which is located 63 km off the coast of Abu Dhabi and was operated by ADMA–OPCO, was expected to increase its output to 425,000 bbl/d by 2020 from the current 345,000 bbl/d (U.S. Energy Information Administration, 2015).

In 2014, the UAE had five petroleum refining facilities with a total capacity of 778,000 bbl/d of refined petroleum products, which was to be increased to 1.2 million barrels per day by 2015. The largest UAE refinery was at Ruwais and was operated by TAKREER, which was a wholly owned subsidiary of ADNOC; the Ruwais facility had the capacity to produce 400,000 bbl/d of refined products. By yearend 2014, the Ruwais refinery commissioned a \$10 billion expansion that would add 417,000 bbl/d of refined products capacity. The expansion was expected to bring the refinery’s overall capacity to 817,000 bbl/d by mid-2015. The project was originally planned to be commissioned by mid-2014, but was delayed for unknown reasons. At yearend 2014, work continued on the petroleum-storage expansion project at the Al Fujairah export terminal. The project was expected to reach about 16 Mbbbl of crude petroleum and refined petroleum products storage capacity by 2016 and to include adding three subsea loading lines, an intermediate pumping station, and three offshore buoys designed for deepwater tanker loading (Critchlow, 2014; Crisp, 2015; U.S. Energy Information Administration, 2015).

In 2014, the joint venture of ADNOC (51%) and Abu Dhabi Future Energy Co. (Masdar) (49%) continued the development of a three-component carbon capture, use, and storage facility that would have the capacity to sequester 0.8 Mt/yr of

carbon dioxide (CO<sub>2</sub>). The contract to build the \$122.5 million project was awarded to Dodsal Engineering and Construction Group of India and Alsa Engineering and Construction LLC. The Abu Dhabi Carbon Capture and Sequestration (CCS) project was designed to capture CO<sub>2</sub> at the source at the ESI mill at Mussafah. Then, about 90% of the CO<sub>2</sub> produced at the ESI facility would be compressed, dehydrated, and transported through a 50-km pipeline to ADNOC’s onshore oilfields where it would be reinjected into the Rumaiitha oilfield to enhance the rate of oil recovery. The project, which was expected to be inaugurated by the first quarter of 2016, was intended to free up considerable volumes of natural gas, which was utilized typically to pressurize petroleum wells and to support power generation and water desalination (Watts, 2014a; Massachusetts Institute of Technology, 2015).

**Renewable Energy.**—In 2014, the Abu Dhabi government continued its plans to add renewable energy capacities, including that of solar, to its power grid and to decrease its dependence on natural gas to generate electricity. By mid-November, Shams Power Co. P.J.S.C, which was owned by Masdar (60%), Total S.A. of France (20%), and Abengoa Solar S.A. of Spain (20%), achieved full-production capacity at the Shams-1 solar powerplant in Abu Dhabi. The 100-MW concentrated solar power (CSP) project, which was expected to power nearly 20,000 homes in Abu Dhabi, was commissioned in 2013 and started commercial production of electricity in September 2014. Construction of the \$600 million project, which was built in the Madinat Zayed, which is located 120 km southwest of Abu Dhabi City, started in 2010 and included the installation of 258,000 mirror facets to produce electricity from solar energy (Wilkinson, 2014; Shams Power Co. P.J.S.C., 2015).

In 2014, the Dubai government continued plans to generate 7% of its electricity from solar energy by 2020, and 15% by 2030. The Dubai Electricity and Water Authority (DEWA) continued to manage the development of the \$3.2 billion Mohammed bin Rashid Al Maktoum Solar Park project in 2014. The project, which was expected to cover an area of 48 square kilometers, was located about 50 km southeast of the city of Dubai. The project was expected to have 1 GW of electricity generation capacity when completed by 2030. In October 2013, DEWA commenced the first phase of the project that had 13 MW of electricity generation capacity. In 2014, a consortium of ACWA Power Co. of Saudi Arabia (85%) and TSK Group of Spain (15%) carried out work on the second phase of the project that was expected to have 200 MW of electricity generation capacity. According to the terms of the agreement to develop the second phase, DEWA was expected to own 51% of the project’s shares, and the consortium would own the remaining 49% (Power Technology, 2015).

## Outlook

The UAE’s economy is expected to grow at a rate of 3.2% in 2015 and 2016, and the Government is expected to increase spending by 6.3% to finance large investments in infrastructure and the energy sector. Projects in industrial and trade sectors are expected to diversify UAE’s economy and

reduce its dependence on petroleum resources in the long run (International Monetary Fund, 2015, p. 175; MEED, 2015; Ministry of Finance, 2015, p. 49).

The projected increase in the UAE's sulfur production, resulting from the inauguration of the Shah sour gas project, could make the country one of the world's top producers of sulfur within the next 2 years. The upstream development projects led by ADNOC and its subsidiaries, such as the Ruwais refinery expansion and the Upper Zakum, the IGD, and the Al Hosn Gas projects are expected to sustain the UAE's role in the global hydrocarbon sector. The CCS project is expected to contribute to increasing the availability of natural gas for power generation and reducing CO<sub>2</sub> emissions in the country in the medium term. Al Fujairah's new storage and export terminal offshore the UAE's coast is expected to increase the country's importance in regional energy trade in the long run owing to the terminal's strategic location outside the Gulf (Critchlow, 2014; Oil and Gas Journal, 2014; U.S. Energy Information Administration, 2015; Watts, 2015a, b).

The production capacity of aluminum, cement, and iron and steel is expected to increase during the next few years owing to increased investment in construction and infrastructure projects in member countries of the GCC in preparation for the 2020 Dubai Expo and the 2022 FIFA World Cup™ tournament in Qatar. The UAE's iron and steel industry is expected to continue to be affected by the domestic oversupply, which is owing to low-priced iron and steel imports from China and Turkey, unless the Government improves regulations concerning tariffs on iron and steel imports. The Barakah nuclear project, the Mohammed bin Rashid Al Maktoum Solar Park project, and the Shams-1 solar project are expected to play critical roles in the diversification of the country's energy sources. Further, they are expected to support the Government's objective to decrease the country's dependence on petroleum and natural gas as major sources for energy generation in the long term (Watts, 2014b; Gulf News, 2015; Lee, 2015; Power Technology, 2015; Saunders, 2015; Shams Power Co. P.J.S.C., 2015).

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TABLE 1  
UNITED ARAB EMIRATES: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Thousand metric tons unless otherwise specified)

| Commodity <sup>2</sup>                         | 2010      | 2011                | 2012                | 2013                 | 2014                |
|--|-----------|---------------------|---------------------|----------------------|---------------------|
| METALS   |           |                     |                     |                      |                     |
| Aluminum, primary                              | 1,400     | 1,800               | 1,820               | 1,864                | 2,341               |
| Chromite ore                                   | 25        | --                  | --                  | --                   | --                  |
| Gold, refined kilograms                        | 32,900    | 28,400              | 27,500              | 37,800               | 36,000              |
| Iron and steel:                                |           |                     |                     |                      |                     |
| Direct-reduced iron                            | 1,180     | 2,250               | 2,720               | 3,075                | 2,410               |
| Steel, crude                                   | 500       | 2,000               | 2,408               | 2,878                | 2,400               |
| Hot-rolled long products                       | 1,580     | 1,950               | 2,156               | 2,549                | 1,000               |
| Concrete-reinforcing bars                      | --        | --                  | 1,586               | 1,662                | 2,600               |
| Silver, refined kilograms                      | 36,000    | 45,000              | 47,000              | 49,000               | 45,000              |
| INDUSTRIAL MINERALS                            |           |                     |                     |                      |                     |
| Cement, hydraulic                              | 18,000    | 21,000 <sup>r</sup> | 23,000 <sup>r</sup> | 25,000 <sup>r</sup>  | 28,000 <sup>c</sup> |
| Gypsum <sup>e</sup>                            | 720       | 720                 | 680                 | 700                  | 700                 |
| Lime   | 174       | 340                 | 400                 | 450                  | 430 <sup>c</sup>    |
| Nitrogen:                                      |           |                     |                     |                      |                     |
| N content of ammonia                           | 392       | 386                 | 330                 | 658                  | 988                 |
| N content of urea                              | 310       | 324                 | 289                 | 618                  | 974                 |
| Sulfur <sup>3</sup>                            | 1,829     | 1,885               | 1,900               | 2,000 <sup>r</sup>   | 2,400               |
| MINERAL FUELS AND RELATED MATERIALS            |           |                     |                     |                      |                     |
| Gas, natural:                                  |           |                     |                     |                      |                     |
| Gross million cubic meters                     | 79,778    | 82,433              | 85,613              | 83,796               | 83,706              |
| Dry do.  | 51,300    | 52,300              | 54,308              | 54,600 <sup>r</sup>  | 54,244              |
| Natural gas liquids thousand 42-gallon barrels | 98,550    | 146,000             | 146,000             | 145,000 <sup>c</sup> | 255,000             |
| Petroleum:                                     |           |                     |                     |                      |                     |
| Crude and condensate do.                       | 1,046,455 | 1,212,530           | 1,233,700           | 1,330,790            | 1,354,880           |
| Refinery products:                             |           |                     |                     |                      |                     |
| Liquefied petroleum gas do.                    | 6,570     | 8,103               | 6,606               | 10,928 <sup>r</sup>  | 10,501              |
| Gasoline do.                                   | 15,731    | 20,914              | 23,834              | 20,024 <sup>r</sup>  | 18,265              |
| Kerosene and jet fuel do.                      | 37,120    | 49,202              | 53,947              | 50,042 <sup>r</sup>  | 45,464              |
| Distillate fuels do.                           | 29,017    | 36,427              | 31,317              | 30,185               | 24,477              |
| Residual fuels do.                             | 5,803     | 6,679               | 5,767               | 7,154                | 5,070               |
| Other do.                                      | 42,048    | 49,640              | 50,990              | 42,997               | 43,026              |
| Total do.                                      | 136,289   | 170,965             | 172,461             | 161,330 <sup>r</sup> | 146,803             |

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

<sup>1</sup>Table includes data available through April 28, 2016.

<sup>2</sup>In addition to the commodities listed, industrial minerals, such as common clays, crushed stone, diabase, gravel, limestone, marble, salt, sand, shale, and silica sand, presumably were produced, but output was not reported, and available information was inadequate to make reliable estimates of output.

<sup>3</sup>Byproduct of petroleum refining and natural gas processing.

TABLE 2  
UNITED ARAB EMIRATES: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

| Commodity      | Major operating companies and major equity owners  | Location of main facilities                                     | Annual capacity             |     |
|----------------|--|---|-----------------------------|-----|
| Aluminum       | Emirates Global Aluminium (EGA) [Mubadala Development Co. of Abu Dhabi, 50%, and Investment Corp. of Dubai (Government of Dubai, 100%), 50%] | Smelter at Jebel Ali in Dubai                                   | 1,000                       |     |
| Do.            | do.  | Smelter at Taweelah, Khalifa Industrial Zone (Kizad), Abu Dhabi | 1,320                       |     |
| <b>Cement:</b> |  |   |                             |     |
| Portland       | Aditya Birla Star Cement (Aditya Birla, 80%, and private, 20%)   | Grinding plant at Abu Dhabi                                     | 1,200                       |     |
| Do.            | do.  | Grinding plant at Ajman   | 900                         |     |
| Do.            | do.  | Ras Al Khaimah  | 2,400                       |     |
| Do.            | Al Ain Cement Factory (SENAAT General Holding Corp.)   | Al-Ain  | 3,400                       |     |
| Do.            | Arabian Gulf Cement Company LLC  | Ajman   | 1,100                       |     |
| Do.            | Arkan Building Materials Co. (ARKAN) P.J.S.C. (SENAAT General Holding Corp., 51%)  | Emirates cement plant at Al-Ain                                 | 1,200                       |     |
| Do.            | do.  | Al-Ain cement plant   | 4,500                       |     |
| Do.            | Binani Cement Factory LLC  | Grinding plant at Jabal Ali                                     | 2,000                       |     |
| Do.            | Bin Hamel Nael Cement Co.  | Grinding plant at Al-Ain  | 500                         |     |
| Do.            | Cemex Falcon LLC   | Grinding plant at Dubai   | 1,600                       |     |
| Do.            | Emirates Cement Factory (SENAAT General Holding Corp.)   | Abu Dhabi   | 2,300                       |     |
| Do.            | Fujairah Cement Industries P.S.C.  | Dibba, Fujairah   | 2,300                       |     |
| Do.            | Gulf Cement Co. (National Investment Co., 35.75%; Ras Al Khaimah government, 7.67%; individual investors, 56.58%)                            | Khor Khuwair, Ras Al Khaimah                                    | 2,700                       |     |
| Do.            | Hamriyah Cement Co. FZC (Bin Kamil Investment Group)   | Grinding plant at Sharjah                                       | 1,000                       |     |
| Do.            | Jebel Ali Cement Co. (Sharaf Industries, 100%)   | Jebel Ali, Dubai  | 840                         |     |
| Do.            | KCC Co. LLC  | Grinding plant at Sharjah                                       | 500                         |     |
| Do.            | Lafarge Emirates Cement L.L.C. (Lafarge S.A., 50%, and private, 50%)   | Fujairah  | 3,200                       |     |
| Do.            | Nael Cement Co.  | Grinding plant Al Ain   | 700                         |     |
| Do.            | National Cement Company P.S.C. (Holcim Ltd.)   | Dubai   | 1,500                       |     |
| Do.            | National Cement Co. [Holcim Ltd., 44%, Emirates International Investment Co. (EIIC), 56%]  | Grinding plant in Abu Dhabi                                     | 2,000                       |     |
| Do.            | Pioneer Cement Industries LLC (Raysut)   | Ras Al Khaimah  | 1,700                       |     |
| 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.            | Teba Cement Co.  | Grinding plant at Abu Dhabi                                     | 1,200                       |     |
| Do.            | Umm al-Qaywayn Cement Industries Co. P.S.C.  | Umm al-Quwain   | 1,600                       |     |
| Do.            | Union Cement Co. P.S.C. (Ras Al Khaimah government, 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  | 610                         |     |
| Gold, refined  | metric tons  | Al Etihad Gold L.L.C.   | Al Quoz, Dubai              | 200 |
| Do.            | do.  | Al Etihad Gold Refinery DMCC                                    | Jumeirah Lake Towers, Dubai | 200 |
| Do.            | do.  | Al Ghaith Gold (private, 100%)                                  | Dubai                       | 100 |
| Do.            | do.  | Al Ghurair Giga Gold (private, 100%)                            | do.                         | 100 |
| Do.            | do.  | ARY Aurum Plus (private, 100%)                                  | Sharjah                     | 25  |
| Do.            | do.  | Emirates Gold (private, 100%)                                   | Dubai                       | 200 |
| Do.            | do.  | Kaloti Precious Metals  | Sharjah                     | 450 |

See footnotes at end of table.

TABLE 2—Continued  
UNITED ARAB EMIRATES: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

| Commodity              | Major operating companies and major equity owners  | Location of main facilities   | Annual capacity   |       |
|------------------------|--|---|---|-------|
| <b>Iron and steel:</b> |  |   |   |       |
| Iron, direct-reduced   | Emirates Steel Industries P.J.S.C. (SENAAT General Holding Corp., 100%)  | Abu Dhabi   | 3,000   |       |
| Do.                    | Al Nasser Industrial Enterprises LLC   | do.   | 250   |       |
| <b>Steel:</b>          |  |   |   |       |
| Billet                 | Emirates Steel Industries P.J.S.C. (SENAAT General Holding Corp., 100%)  | do.   | 3,500   |       |
| Do.                    | Al Nasser Industrial Enterprises LLC   | do.   | 220   |       |
| Wire rod               | Emirates Steel Industries P.J.S.C. (SENAAT General Holding Corp., 100%)  | do.   | 600   |       |
| Rebar                  | Alam Steel   | Dubai   | 500   |       |
| Do.                    | Al Nasser Industrial Enterprises LLC   | Abu Dhabi   | 90  |       |
| Do.                    | Emirates Steel Industries P.J.S.C. (SENAAT General Holding Corp., 100%)  | do.   | 1,900   |       |
| Do.                    | Essar Steel Middle East PZE  | Dubai   | 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 and Hamriyah Free Zone  | 360   |       |
| Do.                    | Al Ghurair Iron and Steel Co.  | Abu Dhabi   | 350   |       |
| Lime                   | Emirates Lime factory (Al Jazeera Industrial Group)  | do.   | 350   |       |
| Do.                    | Ras Al Khaimah Lime Co. (Ras Al Khaimah Co. for White Cement and Construction Materials PSC)   | Ras Al Khaimah  | 365   |       |
| <b>Natural gas:</b>    |  |   |   |       |
| Liquids (NGL)          | Abu Dhabi Gas Industries Ltd. (GASCO) (Abu Dhabi National Oil Co. (ADNOC), 68%; Royal Dutch Shell Group, 15%; Total S.A., 15%; and Partex Oil and Gas Group, 2%) | Plants at Asab, Bu Hasa, and Habshan/Bab  | 10,220  |       |
| Liquefied (LNG)        | Abu Dhabi Gas Liquefaction Co. Ltd. (ADGAS) [Abu Dhabi National Oil Co. (ADNOC), 70%; BP p.l.c., 10%; Mitsu Co. Ltd., 15%; Total S.A., 5%]                       | Das Island  | 8,000   |       |
| <b>Nitrogen:</b>       |  |   |   |       |
| Ammonia                | Ruwais Fertilizer Industries (FERTIL) (Abu Dhabi National Oil Co. (ADNOC), 66.66%, and Total S.A., 33.33%)   | Ruwais, Abu Dhabi   | 1,200   |       |
| Urea                   | do.  | do.   | 2,100   |       |
| <b>Petroleum:</b>      |  |   |   |       |
| Crude                  | thousand<br>42-gallon<br>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 Abu Al Bukhoosh, the Arzanah, the Bab, the Bu Hasa, the Jarn Yaphour, the Sahil, and the Shah fields | 1,500 |
| 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   |
| Do.                    | do.  | 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 Umm Al-Dalkh, and the Upper Zakum fields  | 518   |
| Do.                    | do.  | Dubai Petroleum Establishment (Government of Dubai, 100%)   | Dubai oilfields, including the Margham, the Satah, the Falah, the Fateh, the Rashid, and the S.W. Fateh fields Mubarek fields                             | 100   |
| Refinery products      | do.  | Abu Dhabi Oil Refining Co. (TAKREER) [Abu Dhabi National Oil Co. (ADNOC), 100%]   | Ruwais refinery, Ruwais, Abu Dhabi  | 400   |
| Do.                    | do.  | do.   | Umm Al Nar refinery, Abu Dhabi  | 85    |

See footnotes at end of table.

TABLE 2—Continued  
 UNITED ARAB EMIRATES: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

| Commodity                        |  | Major operating companies<br>and major equity owners  | Location of main facilities                 | Annual<br>capacity |
|----------------------------------|--|---|---|--------------------|
| Petroleum—Continued:             |  |   |   |                    |
| Refinery products—<br>Continued: | thousand<br>42-gallon<br>barrels per day | ENOC Processing Company LCC (EPCL) [Investment Corp.<br>of Dubai (Government of Dubai, 100%) 100%]  | Jebel Ali refinery, Jebel Ali, Dubai        | 140                |
| Do.                              | do.                                      | Sharjah Oil Refining Co. F.Z.C. (FAL Group, 100%)   | Hamriyah Free Trade Zone, Sharjah           | 71                 |
| Do.                              | do.                                      | Metro Oil Corp.   | Fujairah                                    | 82                 |
| Salt                             |  | Alghaith Industries (Al Ghaith Holding PJSC)  | Mussafah, Abu Dhabi                         | 110                |
| Sand                             |  | Fujairah Natural Resources Corp. (FNRC)   | Fujairah                                    | 20,000             |
| Silica, glass                    |  | Emirates Float Glass LLC (Dubai Investment PJSC, 100%)  | Industrial City 1 and 2, Abu Dhabi          | 440                |
| Do.                              |  | Guardian Zoujaj International Float Glass Co. LLC<br>(Guardian RAK)   | Ras Al Khaimah                              | 255                |
| Silver, refined                  | metric tons                              | Emirates Gold (private, 100%)   | Dubai                                       | 100                |
| Do.                              | do.                                      | Kaloti Precious Metals  | Sharjah                                     | 450                |
| Sulfur                           |  | Abu Dhabi National Oil Co. (ADNOC)  | Abu Dhabi                                   | 4,000              |
| Do.                              |  | Abu Dhabi Gas Industries Ltd. (GASCO) (Abu Dhabi □<br>National Oil Co. (ADNOC), 68%; Royal Dutch<br>Shell Group, 15%; Total S.A., 15%; and Partex<br>Oil and Gas Group, 2%) | Plants at Asab, Bu Hasa, and<br>Habshan/Bab | 2,370              |

Do., do. Ditto.