



Country Analysis Brief: United Arab Emirates (UAE)

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Overview

Table 1. UAE's energy overview, 2021

	Crude oil and other petroleum liquids	Natural gas	Coal	Nuclear	Hydro	Renewables and other	Total
Primary energy consumption (quads)	1.7	2.8	0.1	0.0		0.1	4.6
Primary energy consumption (percentage)	37%	60%	1%	0%		1%	100%
Primary energy production (quads)	7.7	2.4	0.0	0.0		0.1	10.1
Primary energy production (percentage)	76%	23%	0%	0%		1%	0%
Electricity generation (terawatthours)		127.1	0.0	1.8	0.0	6.7	135.6
Electricity generation (percentage)		94%	0%	1%	0%	5%	100%

Data source: U.S. Energy Information Administration (EIA), International Energy Statistics database

Note: EIA aggregates hydroelectricity and renewables as *Renewables and other* for primary energy production and consumption, and we aggregate crude oil and other petroleum liquids and natural gas as fossil fuels for *Electricity generation*.

Quads=quadrillion British thermal units.

- The United Arab Emirates (UAE) was the seventh-largest total liquid fuels producer in the world in 2022 and the third largest in the Organization of Petroleum Exporting Countries (OPEC). UAE joined in 1967 and is currently one of only two members that has notable spare crude oil production capacity to address potential supply shortfalls.¹
- The UAE has invested heavily in increasing hydrocarbon production capacity and developing midstream and downstream infrastructure to accommodate future growth in hydrocarbon production. At the same time, the UAE has increasingly focused on developing nonhydrocarbon energy sources such as nuclear and renewables and on increasing its influence in environmental leadership and climate action. The UAE is the first country in the Middle East to commit to reaching net zero emissions by 2050 and will be hosting the United Nations (UN) climate change conference, COP 28, at the end of 2023.²
- On June 4, 2023, the members of OPEC and non-OPEC participating countries (collectively known as OPEC+) announced that the group would be extending their crude oil production quotas for participating member countries to the end of 2024. In addition, crude oil production quotas for the participating OPEC and OPEC+ countries would also be adjusted starting in January 2024. In contrast to other member countries whose production quotas were reduced, the UAE's current quota increased by 200,000 barrels per day (b/d), bringing its 2024 crude oil output quota to 3.22 million b/d.³

Figure 1. Map of United Arab Emirates



Data source: U.S. Central Intelligence Agency, [CIA World Factbook–United Arab Emirates](#)

Petroleum and Other Liquids

- The UAE held an estimated 111 billion barrels of proved crude oil reserves at the beginning of 2023, up from 107 billion barrels in the previous year.⁴
- The UAE produces a variety of different crude oil grades; its two main export grades are Murban and Upper Zakum, which are light, relatively sour crude oil grades. Some of the UAE's crude oil grades are included in the collection (or *basket*) of crude oil grades that make up the Dubai/Oman benchmark, an international price marker for medium, sour crude oil from the Middle East. The Dubai/Oman, Brent, and West Texas International (WTI) benchmarks are the three major international benchmarks for crude oil prices, and the spreads (or relative price differences) among these benchmarks or between a benchmark and the price of an individual crude oil grade can provide insight into the relative value of sweet and sour or heavy and light crude oil over time (Table 2).⁵

Table 2. Selected crude oil grades produced in the UAE

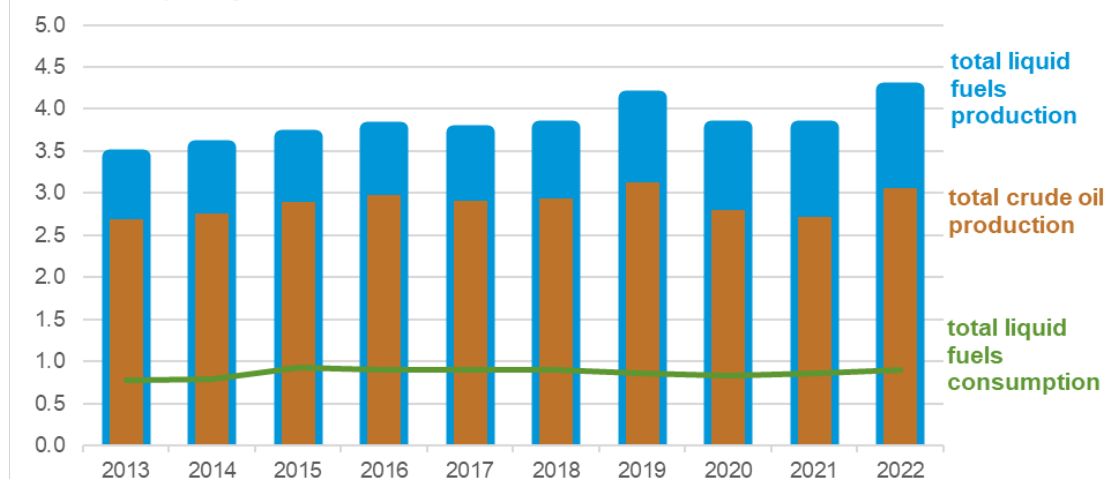
Crude oil grade	API gravity number (degrees)	Sulfur content (percentage)
Das	39.2	1.30%
Dubai	31.0	2.04%
Fateh	30.0	3.00%
Murban	40.4	0.79%
Umm Lulu	38.7	0.70%
Upper Zakum	34.0	1.95%

Data source: McKinsey & Company's Energy Insights and Reuters

- The UAE produced an average of about 2.9 million b/d of crude oil from 2013 to 2022. Production in the UAE had been increasing steadily and reached an annual peak of approximately 3.1 million b/d in crude oil and condensate production in 2019. In 2020, the UAE began to curb its crude oil production following the slowdown in global economic activity caused by the outbreak of COVID-19 and the April 2020 agreement among OPEC+ member countries to significantly limit their crude oil production. The voluntary production cuts outlined in the agreement are in the process of gradually winding down, providing a higher quota that allows the UAE to increase its production. The UAE and Saudi Arabia are the two OPEC producers that have significant crude oil spare capacity and so have the potential to ramp up production (Figure 2).⁶

Figure 2. Total annual liquid fuels production and consumption in the UAE, 2013–2022

million barrels per day



Data source: U.S. Energy Information Administration, International Energy Statistics database and Short-Term Energy Outlook July 2023

Note: 2022 consumption data are EIA estimates.



- The UAE government has set an ambitious target of reaching 5 million b/d of crude oil production capacity by 2027, revised forward from its earlier target of 2030, and to achieve this goal, the government has made efforts to boost upstream exploration and development. In 2018 and 2019, the Abu Dhabi, Sharjah, and Ras Al Khaima emirati governments held a number of licensing rounds for exploration blocks that were offered, for the first time, to both domestic and international oil companies.⁷ ADNOC Drilling, an upstream subsidiary of the larger national oil company, the Abu Dhabi National Oil Company (ADNOC), put up an initial list offering (IPO) in October 2021 for an 11% stake of the company on the country's stock market, the Abu Dhabi Securities Exchange (ADX).⁸ ADNOC also increased planned spending on capital expenditures to \$150 billion from 2023 to 2027 and unveiled expansion plans for increasing production.⁹ According to Energy Intelligence, ADNOC has reported its official production capacity figure to be 4.5 million b/d, which is about 0.5 million b/d higher than our 2023 estimate of 4.0 million b/d; it is also unclear whether it can produce at that level on a sustained basis. Estimates from other sources such as Energy Intelligence and Rystad Energy are higher, placing the UAE's production capacity closer to 4.3 million b/d to 4.4 million b/d.¹⁰
- As of July 2023, the UAE had five refineries in operation. The Ruwais refinery is the UAE's largest in terms of capacity. In February 2019, ADNOC awarded a contract for a proposed 600,000 b/d capacity expansion at Ruwais, but ADNOC canceled the plan in 2021, citing the weak economic feasibility of the project.¹¹ A new 70,000 b/d condensate processing train at the Jebel Ali refinery is under construction, which will increase its total capacity to 210,000 b/d once completed; commissioning of the new train has not yet been announced.¹² ADNOC reportedly decommissioned the Umm Al Nar refinery in December 2021, moving all personnel to its refinery in Ruwais.¹³ Ecomar Energy Solutions is pursuing an expansion project that will increase capacity at its refinery in Fujairah to 62,000 b/d once it is completed. The expansion project includes the construction of an additional crude oil distillation unit and new storage capacity.¹⁴ In February 2023, Uniper Energy agreed to sell its 65,000 b/d refinery in Fujairah to the Fort Energy Refining Middle East joint venture, a group made up of Montfort (a Swiss commodity trading firm) and the private office of Sheikh Ahmed Dalmook Al Maktoum.¹⁵ In November 2021, oil storage company VTTI purchased a 90% stake of the storage facilities and a refinery owned by India's Infrastructure Leasing & Financial Services Prime Terminals FZC (IPTF). The IPTF facilities are located in Fujairah and include a 80,000 b/d refinery and storage facilities with a capacity of approximately 2.3 million cubic meters (or 80.1 million cubic feet) (Table 3).¹⁶

Table 3. Refineries in the UAE

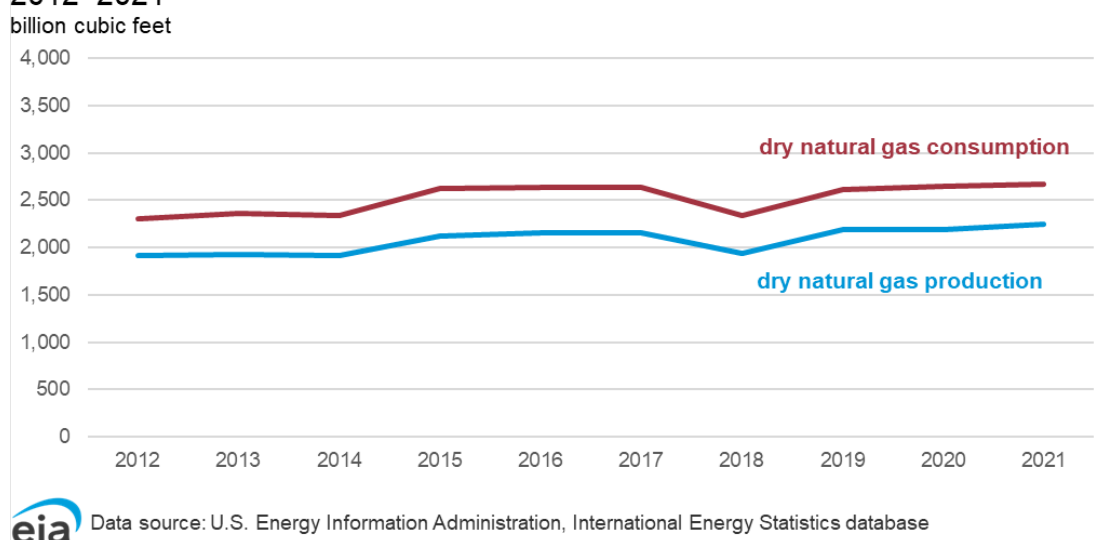
Refinery name	Location	Status	Owner	Nameplate capacity (thousand barrels per day)
Ruwais	Abu Dhabi	Operating	ADNOC	817
Jebel Ali	Dubai	Operating	Emirates National Oil Company (ENOC)	140
Umm Al Nar	Abu Dhabi	Closed	ADNOC	85
Fort Energy (formerly Uniper)	Fujairah	Operating	Fort Energy Refining Middle East	65
Ecomar	Fujairah	Operating	Ecomar	22
VTTI Fujairah	Fujairah	Operating	VTTI	80
Total				1,209

Data source: Hydrocarbons Technology, S&P Global Commodity Insights, Middle East Economic Survey, company websites

Natural Gas

- The UAE held an estimated 290 trillion cubic feet (Tcf) of proved natural gas reserves at the beginning of 2023, up from 273 Tcf in the previous year.¹⁷
- Dry natural gas production averaged about 2.1 Tcf between 2012 and 2021, while dry natural gas consumption averaged about 2.5 Tcf in the same period. Although the UAE exports natural gas in the form of liquefied natural gas (LNG), it is a net importer of natural gas because domestic natural gas consumption exceeds production. The UAE relies on natural gas imports via pipeline or as LNG from other countries, primarily Qatar, to meet its domestic consumption needs (Figure 3).¹⁸

Figure 3. Total dry annual natural gas production and consumption in the UAE, 2012–2021



- The UAE is seeking to raise its natural gas production and become a net exporter of natural gas by 2030. To achieve this goal, it plans to develop some of its natural gas fields and bring them online. However, the country faces challenges in reaching its goal of becoming a net exporter because of rising domestic demand as well as technical and financial challenges to developing some of its natural gas fields, which produce highly sour natural gas. These fields have a relatively high proportion of acidic gases such as hydrogen sulfide, which is toxic and corrosive to certain metals and so must be separated during natural gas extraction and processing. The additional steps in processing sour natural gas makes it more expensive and difficult to exploit these resources (Table 4).¹⁹

Table 4. Selected upcoming natural gas project startups in the UAE

Project name	Location	Estimated start year	Ownership	Peak production level (million cubic feet per year)
Jebel Ali (EPS)	Onshore	2023	ADNOC 50%; Dubai Supply Authority 50%	27
Dalma sour gas project	Offshore	2025	ADNOC 55%; Eni 25%; Wintershall 10%; Lukoil 5%; OMV 5%	78
Umm Shaif (Khuf Gas cap phase 1)	Offshore	2026	ADNOC 60%; TotalEnergies 20%; Eni 10%; PetroChina 6%; CNOOC 4%	168
Hail sour gas project				
Phase 1	Offshore	2026	ADNOC 55%; Eni 25%;	62
Phase 2	Offshore	2028	Wintershall 10%; Lukoil	37
Phase 3	Offshore	2030	5%; OMV 5%	27
Ghasha sour gas project				
Phase 1	Offshore	2026	ADNOC 55%; Eni 25%;	51
Phase 2	Offshore	2028	Wintershall 10%; Lukoil	30
Phase 3	Offshore	2030	5%; OMV 5%	23
Jebel Ali (FFD)	Onshore	2030	ADNOC 50%; Dubai Supply Authority 50%	373

Data source: Rystad Energy

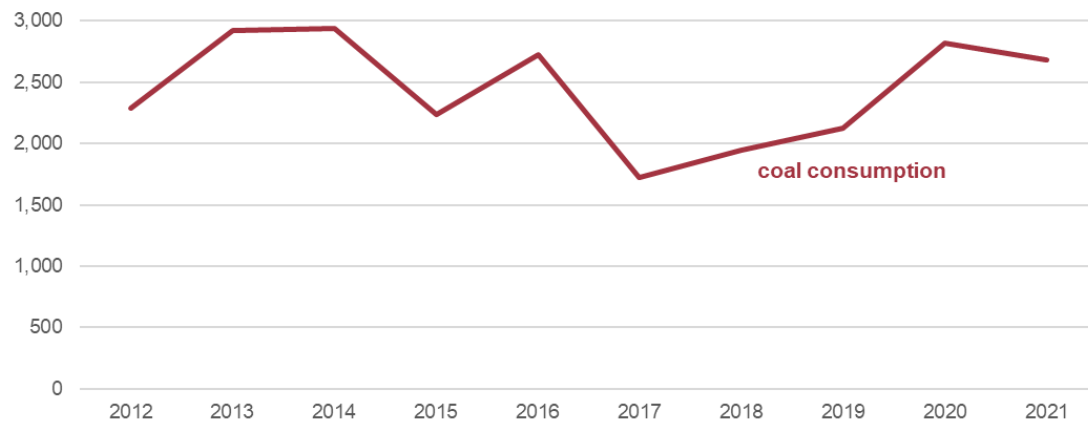
- In March 2023, ADNOC raised approximately \$2.5 billion through an IPO of a 5% stake in its natural gas business, ADNOC Gas, on the ADX. The IPO generated strong investor demand, selling more than 3.8 billion shares. ADNOC Gas is a recently formed entity and the result of a consolidation of ADNOC's natural gas processing and LNG business operations. Through the consolidation of its natural gas business operations and with investor funding from the IPO, ADNOC aims to scale up its operations and capabilities and strengthen its position as a global participant in the natural gas market.²⁰
- According to the most recent data by the World Bank's Global Flaring and Methane Reduction Partnership (GGFR), the UAE flared about 33 Bcf (or 927 million cubic meters) of natural gas in

2022, making the UAE the 27th-largest natural gas-flaring country in terms of annual natural gas-flaring volume for that year.²¹

Coal

- The UAE does not hold any coal reserves and so does not produce any coal. UAE coal consumption averaged about 2.4 million short tons per year from 2012 to 2021, all of which was imported (Figure 4).²²

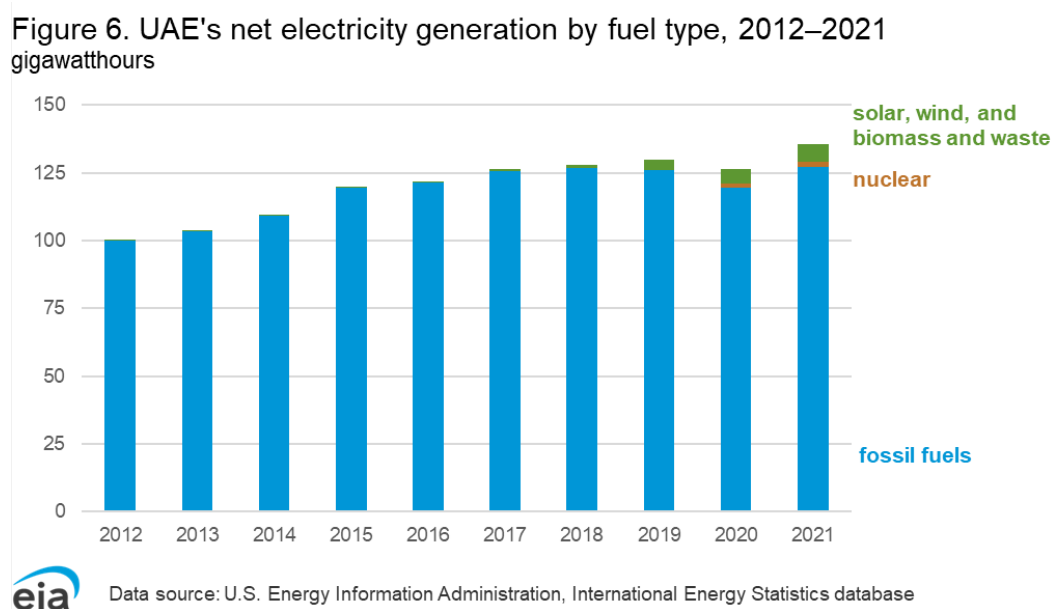
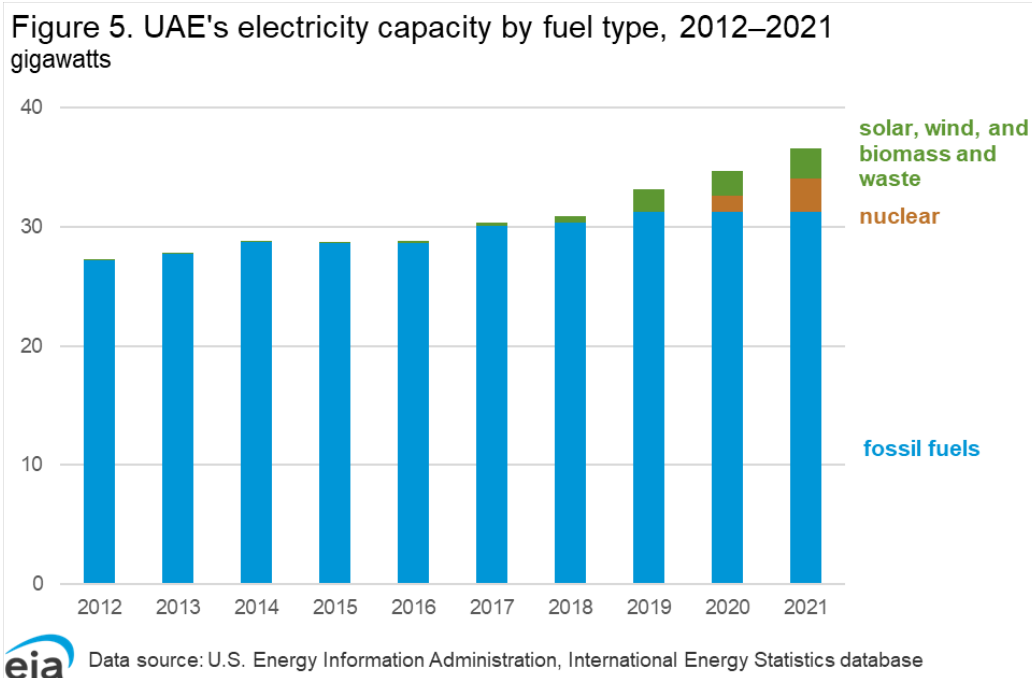
Figure 4. Total coal consumption in the UAE, 2012–2021
thousand short tons



Data source: U.S. Energy Information Administration, International Energy Statistics database

Electricity

- Total electricity capacity in the UAE grew by almost 10 gigawatts (GW) from 2012 to 2021. About 44% of this growth was in capacity derived from fossil fuels. The remainder of the growth in capacity in this period came from nuclear and solar energy sources. As a result of its physical geography, the UAE does not have any hydropower or wind power and is in the process of further developing nuclear and solar energy sources to diversify its power generation mix and reduce emissions (Figure 5 and Figure 6).²³



- The UAE federal government and the country's seven emirate governments signed the Net Zero Charter 2050 in March 2023, becoming the first Gulf country to commit to reaching net zero emissions by 2050. The Net Zero Charter outlines the country's commitment to develop action plans and strategies to address drivers of climate change and achieve net zero emissions. The Charter follows the government's long-term national energy development plan launched in 2017 called Energy Strategy 2050 as well as the Net Zero 2050 strategic initiative announced in October 2021. Energy Strategy 2050 aims to increase the contribution of clean energy from 25% to 50%, reduce the carbon footprint of power generation by 70%, and increase energy efficiency by 40% by 2050. The strategy established a target goal of achieving an energy mix of 44% clean

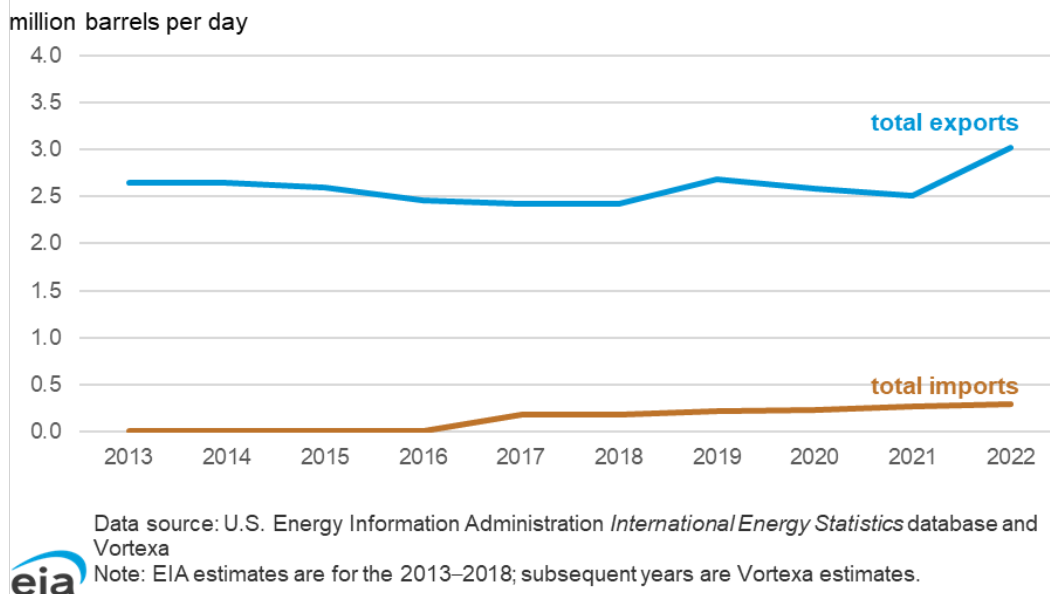
energy, 38% natural gas, 12% clean coal, and 6% nuclear energy by 2050.²⁴ The Net Zero 2050 strategic initiative aims to provide \$163 billion in investment in renewable energy to enable the country to achieve its stated emission reduction goals.²⁵

- The Barakah power plant is the UAE's first commercial nuclear power plant and is part of an effort by the UAE government to diversify its power generation mix and meet its growing domestic power generation needs. The Barakah power plant began commercial operations at its first unit in April 2021 and is located in the Al Dhafra region, which is in the western part of the country. The nuclear power plant currently has three of its four planned units in operation, with each providing 1.4 GW of power capacity. Once completed, the Barakah power plant will provide a total capacity of 5.6 GW.²⁶
- The Mohammed bin Rashid Al Maktoum Solar Park (Maktoum) solar park completed its third of six phases in November 2020 and is currently in its fourth phase of construction. The Maktoum solar park is the world's largest single-site solar park and will have a total capacity of 5 GW once completed. The Maktoum solar park had a capacity of 2 GW at the end of 2022 and is scheduled to be completed by 2030.²⁷
- The Hassyan coal-fired power plant is a 2.4 GW plant under construction in Saih Shuaib, Dubai, and is the first coal-fired power plant in the UAE. Construction of the plant began in 2016, and the plant is scheduled to begin operating by the end of 2023. Once completed, it will have four 600-megawatt (MW) [ultra-supercritical power units](#) in operation, with each unit equipped with an ultra-supercritical boiler, steam turbine, and generator that will enable the units to operate more efficiently, in terms of operating cost and emissions. The power plant is also designed to accommodate carbon capture installations and can operate using either coal or natural gas as a fuel source. The power plant is owned and operated by Hassyan Energy Company, a joint venture between the Dubai Electricity and Water Authority (51%) and a consortium comprised of ACWA Power, Harbin Electric, and the Silk Road Fund (49%).²⁸

Energy Trade

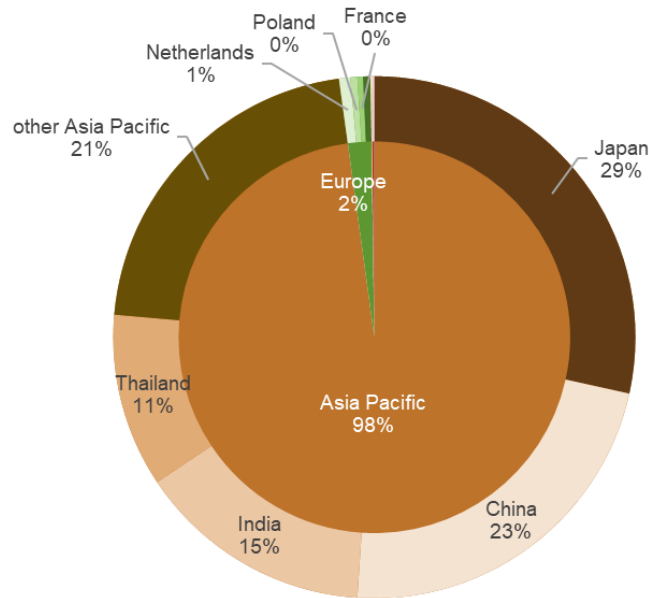
- The UAE is a major exporter of crude oil and condensate, averaging about 2.6 million b/d of crude oil and condensate exports between 2013 and 2022, according to estimates by Vortexa and EIA. The UAE also began importing crude oil and condensate in 2017 to be used for domestic refining and consumption, and imports gradually increased to 291,000 b/d in 2022 (Figure 7).²⁹

Figure 7. UAE's total annual exports and imports of crude oil, 2013–2022



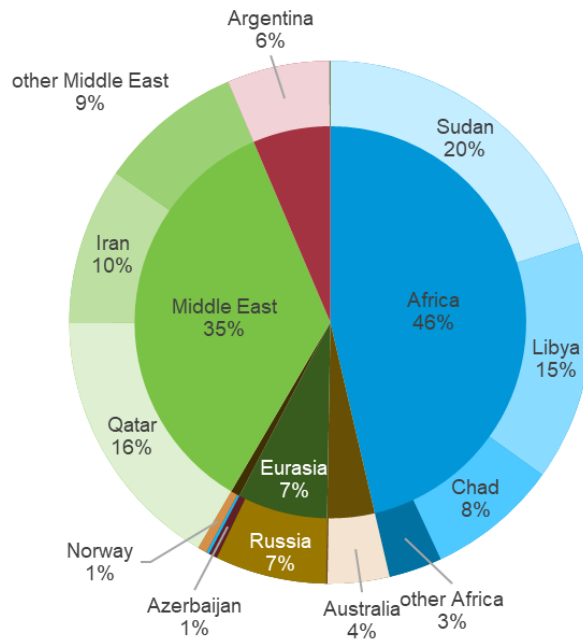
- In 2022, the UAE exported about 3 million b/d of crude oil and condensate, nearly all of it (98%) going to the Asia Pacific region. Japan and China were the top two importing countries by volume. Japan imported 858,000 b/d of UAE crude oil and condensate, and China imported 681,000 b/d. The remainder of UAE's exports went to Europe, Kuwait, and the United States. The UAE's imports of crude oil and condensate came from a wider range of countries, and Africa and the Middle East were the top two regions by volume. Sudan and Qatar were the two top exporters of crude oil and condensate to the UAE by volume for their respective region (Figure 8 and Figure 9).³⁰

Figure 8. UAE's crude oil and condensate exports by destination, 2022



Data source: Vortexa
 Note: 2022 total export volumes exclude export volumes that have a destination territory labeled as "undetermined."

Figure 9. UAE's crude oil and condensate imports by origin, 2022



Data source: Vortexa

- The UAE imports and exports a wide range of petroleum products. According to estimates of trade flows by Vortexa, the UAE exported an average of 1.5 million b/d of petroleum products from 2019 to 2022; just over half of total exports were either liquefied petroleum gas (LPG) or

naphtha. The UAE also imported an average of about 635,000 b/d of petroleum products during the same period, almost half (45%) of which was gasoline or its blending components (Figure 10 and Figure 11).³¹

Figure 10. UAE's total annual petroleum products exports, 2019–2022
thousand barrels per day

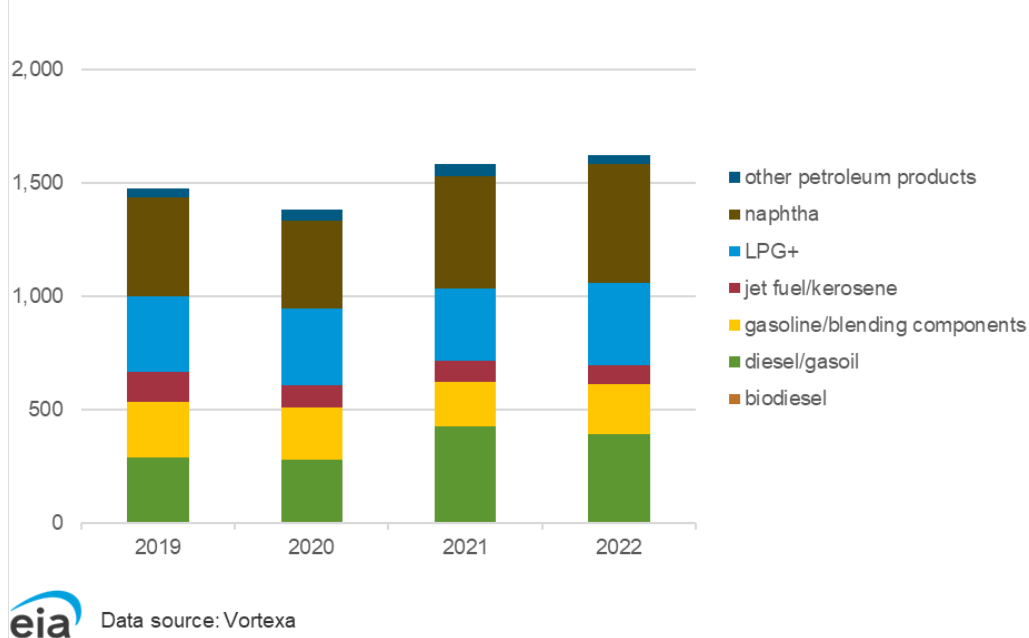
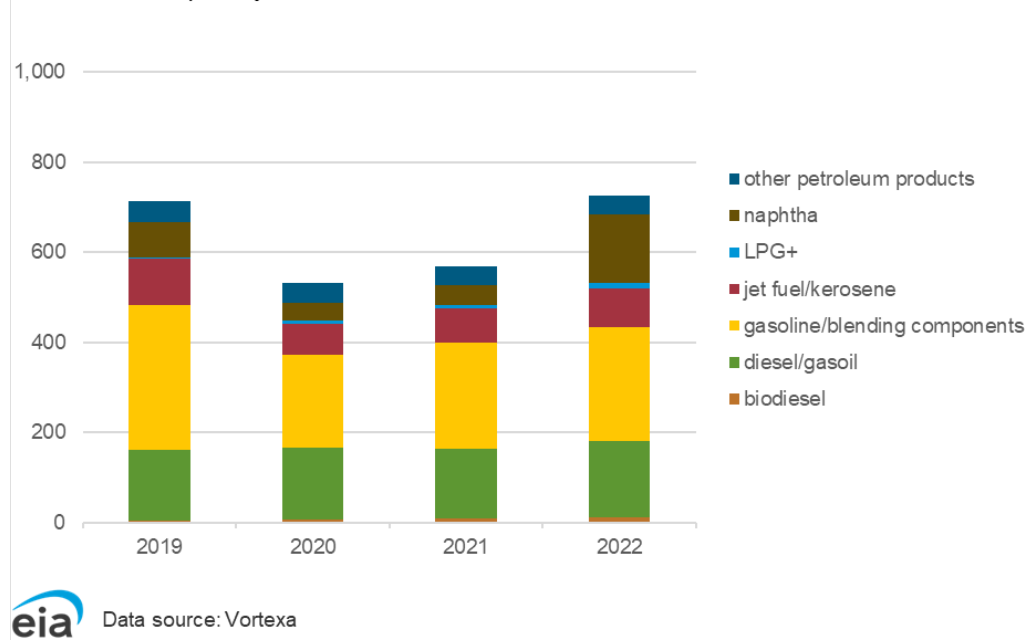


Figure 11. UAE's total annual petroleum products imports, 2019–2022
thousand barrels per day



- The UAE exported an average of about 267 billion cubic feet per year (Bcf/y) of natural gas and imported an average of about 713 Bcf/y from 2012 to 2021. UAE exports all of its natural gas as

LNG, but it imports both LNG through its regasification terminals and piped natural gas from Qatar. The UAE receives piped natural gas imports from Qatar via the Ras Laffen-UAE pipeline (also known as the Dolphin Gas project or the Dolphin Qatar-UAE natural gas pipeline), which began commercial operations in 2006. The pipeline has a capacity of 3.2 billion cubic feet per day (or about 1.2 Tcf/y) and is about 228 miles in length. The pipeline is owned and operated by Dolphin Energy, a joint venture by Mubadala Development Company, TotalEnergies, and Occidental Petroleum, and transports natural gas from Qatar's North Field to UAE's onshore receiving facilities in Taweelah.³²

- The UAE has one operating liquefaction terminal (used for exporting natural gas as LNG) and two operating floating storage regasification units (used for importing LNG), enabling the country to participate in both the export and import of LNG. The liquefaction terminal has been operating since the late 1970s and is owned by ADNOC LNG through a joint venture between the national oil company and private investors. The floating storage regasification units began commercial operations in the 2010s and are owned by Exceleerate Energy. The UAE's national oil company ADNOC is seeking to expand its LNG export capacity by constructing another LNG terminal with a proposed capacity of 461 Bcf/y at the port of Fujairah. The project is still in its early phases of development, and ADNOC is reportedly aiming for a completion date between 2026 and 2028 (Table 5).³³

Table 5. UAE's LNG terminals

Project name	Location	Status	Ownership	Operator	Start date	Number of storage tanks	Storage capacity (million cubic feet)	Nameplate capacity (billion cubic feet per year)
Das Island T1 - T3 liquefaction terminal (ADNOC LNG)	Abu Dhabi	Operating	ADNOC LNG (ADNOC 70%; Mitsui 15%; BP 10%; TotalEnergies 5%)	ADNOC LNG	T1: 1977 T2: 1977 T3: 1994	3	8	279
Jebel Ali FSRU	Dubai	Operating	Exceleerate Energy	Exceleerate Supply Authority	2010			288
Ruwais FSRU	Abu Dhabi	Operating	Exceleerate Energy	Exceleerate Energy	2016			183
Total						3	8	749

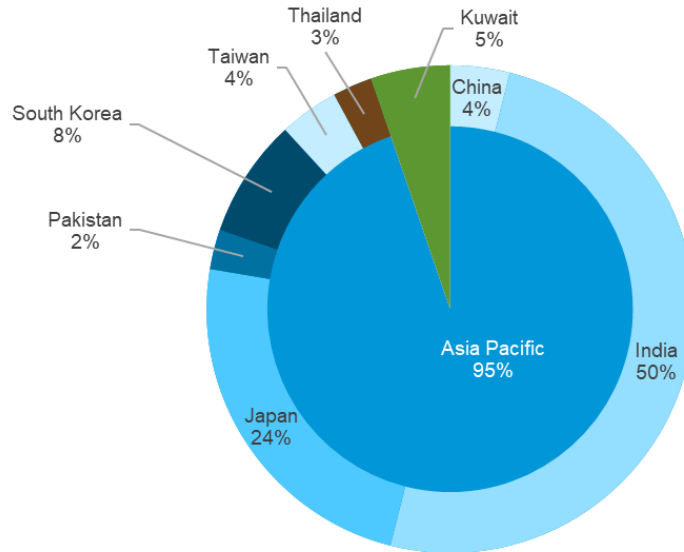
Data source: International Group of Liquefied Natural Gas Importers, *GIIGNL Annual Report, 2022*

Note: FSRU=floating storage regasification units, LNG=liquefied natural gas

- According to estimates in the Energy Institute's 2023 *Statistical Review of World Energy*, the UAE exports its natural gas as LNG, and nearly all of it goes to destinations in the Asia Pacific region. India was the top importing country, taking about 134 Bcf (50%) of UAE's total LNG exports in 2022. Japan also imported significant volumes in 2022, taking about 64 Bcf (24%) of

UAE's LNG. Kuwait was the only non-Asia Pacific importer in 2022, taking about 14 Bcf of LNG (Figure 12).³⁴

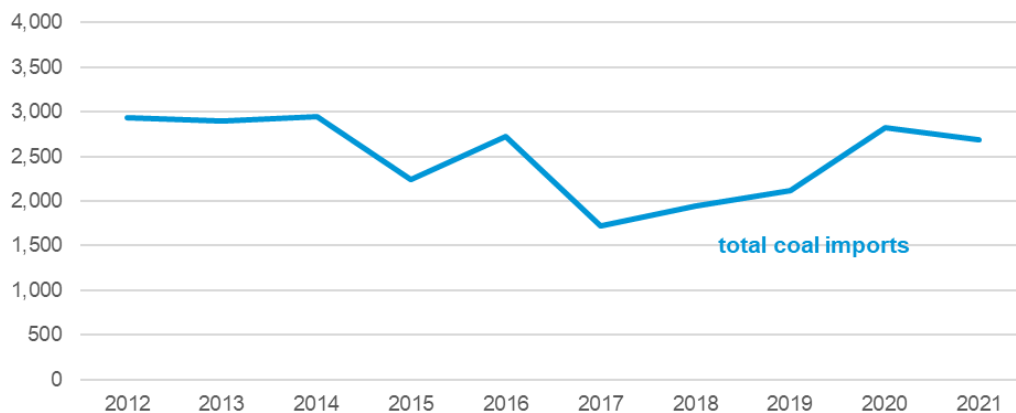
Figure 12. UAE's LNG exports by destination, 2022



Data source: Energy Institute's 2023 Statistical Review of World Energy

- The UAE imports most of its natural gas via pipeline, all of which is piped from Qatar. The country, however, also imports small quantities of natural gas in the form of LNG. In 2022, the UAE imported 32 Bcf of LNG from Qatar.³⁵
- The UAE imports all the coal it consumes, nearly all of which was metallurgical coal. The UAE also imports small quantities of bituminous and subbituminous coal (Figure 13).³⁶

Figure 13. UAE's total annual coal imports, 2012–2021
thousand short tons



Data source: U.S. Energy Information Administration, International Energy Statistics database

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