

THE OUTLOOK FOR ENERGY DEMAND GROWTH IN THE MIDDLE EAST AND NORTH AFRICA

REGIONAL SUPPLY AS A CRITICAL DRIVER OF DEMAND

COLBY CONNELLY

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Colby Connelly

**Middle East Institute
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ABOUT THE AUTHOR

Colby Connelly is the director of MEI's Economics and Energy program. He is also a senior analyst at Energy Intelligence, where he works with the firm's research and advisory practices. His key areas of focus include oil and gas/LNG markets, aboveground risk, corporate strategy, and the impact of the energy transition on oil and gas producing states.

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Cover photo: The national flag of the United Arab Emirates near the Hassyan power and water production complex in Dubai. [Photo by Christopher Pike/Bloomberg via Getty Images.](#)

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Photo above: Windmills at Zaafarana wind farm south of Suez, Egypt. Photo by Khaled Desouki/AFP via Getty Images.

Introduction

The Middle East and North Africa is typically viewed from afar as a region of major energy exporters rather than consumers. Consumption patterns vary significantly within the region itself, but a variety of factors warrant giving its energy demand much closer attention than it generally receives on an international level. The range of factors that will determine the changes in demand from every country in the region, each with their respective intricacies, are far too numerous to examine in the space of this study. However, many of the key drivers that are expected to have a broad impact on shaping the evolution of regional demand to the end of the current decade deserve critical review.

As increased attention is given to the impact of the availability of local oil and gas supply, this dynamic warrants continued discussion as a central driver of total energy demand across the region, in addition to the ways in which availability of various forms of supply will impact the overall trajectory and composition of demand. Abundant resources do not guarantee efficient or effective governance of the energy sector, and as a result the presence of domestic resources can often drive demand to such an extent that the over-exploitation of these resources begins to act as a constraint. The term “energy security” has been used far more frequently since Russia’s invasion of Ukraine in 2022 resulted in a sweeping reconfiguration of many aspects of the global energy trade. Yet even before this monumental event took place, governments across the MENA region have sought to guarantee the security (and increasingly the efficiency) of cost-effective energy supplies through a variety of strategies.

In the Gulf Cooperation Council (GCC) sub-region, this has primarily taken the shape of investment in increased natural gas output to ensure stable electricity supplies for citizens as well as to guarantee low-cost feedstocks that anchor significant swathes of the region’s economic growth plans in both oil and non-oil industries. Progress in developing renewable power resources has been less consistent but remains a key feature of efforts to promote the security of energy supply and shift hydrocarbon resources toward exports or higher-value applications, as they are expected to remain the economic lifeblood of

the Gulf for at least the remainder of the present decade. Elsewhere, investing in natural gas supply in countries like Egypt, Algeria, and Israel is clearly a priority, but faces a more mixed outlook despite relatively well-assured demand prospects.

As a result, this study will place strong emphasis on reviewing prospects for the balance of energy supply and demand across much of the region, though it will not be limited to examining supply as a critical driver of demand and will also review other potential demand drivers and constraints. Yet when considering future demand prospects in a resource-rich region, it is impossible to decouple supply dynamics from the trajectory of overall demand, especially when development of national resources is frequently viewed as a strategic priority across the region’s capitals and among its national oil companies (NOCs).

The study will also devote special attention to the prospects for natural gas demand growth in the region, as gas is expected to be the form of energy that will see the most significant demand growth out to 2030 and beyond, in addition to the fact that most available forecasts also suggest that MENA will be one of the top regions for gas demand growth worldwide. Once supply dynamics have been reviewed, the sections examining prospective demand growth by segment will begin with an outlook for the region’s current trajectory until 2030 (and in some cases beyond, depending on the forecast period used by various organizations), and will then delve deeper into key countries central to much of the region’s demand growth, reviewing what major demand drivers are likely to look like, as well as where potential constraints may emerge.

Individual country cases in this study will not receive equal attention in a deliberate approach designed to highlight the wide and complex varieties of consumption across the MENA region. Some of the most energy-intensive economies, such as Saudi Arabia, the United Arab Emirates, and Qatar in the GCC region as well as Egypt and Algeria in North Africa, will receive greater focus. Within this area of concentration, the availability of various energy demand forecasts may also lead to some areas of analysis being more robust than others. Economies that do not account for significant portions of regional energy demand, such as Tunisia and Bahrain, will receive less attention due to the fact that, while

their respective consumption patterns will doubtlessly evolve in their own ways, they are unlikely to have major implications for the regional demand outlook as a whole. Finally, a series of regional states designated as “wildcards” will be reviewed to indicate why the drivers of demand in each country are typically unclear, as their unique and often volatile circumstances due to political upheaval, conflict, or economics make forecasting demand difficult or in some cases almost futile. Included in this section will be Iran, Libya, Yemen, Sudan, and Lebanon, among others.

Speculation on regional energy demand across oil, natural gas, and electricity is a complicated, mammoth task. Unfortunately, it is often the case that since MENA is frequently thought of as more of an energy-producing region than a consuming one, industry-leading demand outlooks have not generally devoted significant attention to the complexities of regional energy consumption, although in recent years a wider range of forecasters in multilateral organizations, academic institutions, and firms within the energy industry itself have placed greater focus on a more granular projection of demand for the region. Energy consumption throughout MENA will continue to evolve based on national policy, economic developments, new energy technologies and sources of supply, and perhaps most critically of all, on the availability of said supplies themselves. While this study is not an exhaustive account of every demand driver taking place in each country, it will attempt to provide context for the MENA region’s broad direction of future demand trends for the remainder of the current decade, and to suggest where some of the developments currently expected to take place may deviate from this path.

Review of Major Non-Energy Indicators

Although this study will emphasize the availability of supply in the region as a major driver — or in some cases a constraint — impacting energy demand growth, this is of course far from the only factor that will determine the trajectory of energy demand. As a result, a brief overview of non-energy indicators likely to impact this direction of travel is certainly warranted.

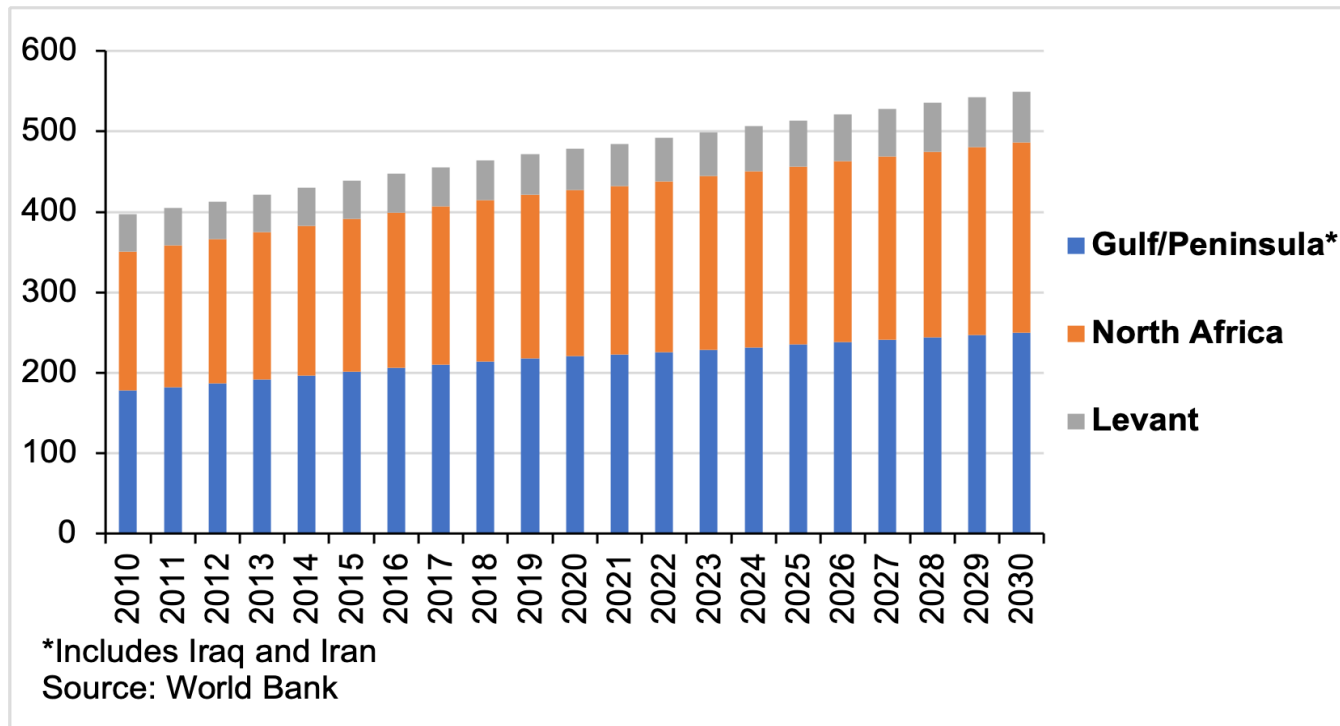
Population growth is highly likely to be among the main variables driving increases in demand across the MENA region before the end of this decade. This is due in large part to the fact that expectations for economic growth are mixed from country to country, and even vary significantly within sub-regions. Additionally, these growth prospects are far from certain due to variables that are more difficult to anticipate, such as the outbreak of conflicts or the impact of sanctions across the region in countries such as Libya and Iran. Additionally, many expectations for growth in the GCC region are partly linked to major economic diversification initiatives, especially in Saudi Arabia and the UAE. As the ability of each state to fund mega-projects and economic diversification initiatives is closely linked to hydrocarbon export revenues, developments in global oil and gas markets — which experienced extreme volatility in 2020 and 2022 — may have notable impacts on the trajectory of these goals. Strong policy and fiscal support from Gulf states currently points to low levels of downside risk, but future market developments still hold the potential to force significant revisions to this outlook.

Projections from the World Bank point to a 15% increase in the region’s estimated population from 2020 to 2030, translating into a total population increase of about 69 million people. Somewhat surprisingly, the two countries underpinning a significant portion of this outlook are Iraq and Syria, which have been wracked by conflict for much of the previous decade. Though Syria’s population declined after the start of its civil war in 2011, it returned to growth in 2019 and is expected to add more than 9 million people to its population by 2030. By contrast, Iraq has seen consistent population growth since 2010, and this is expected to continue through the end of the decade, resulting in its population increasing by nearly 25% from 2020 to 2030, adding just over 10 million people.¹

In fact, more than half the countries in the MENA region are expected to see population increases of 10% or more by 2030, with most others expecting at least 5% growth. Countries in the Levant and North Africa appear likely to make the largest contributions to regional

1. Databank, "Population Estimates and Projections," World Bank, Accessed September 27, 2023, <https://databank.worldbank.org/source/population-estimates-and-projections>.

Figure 1: MENA population growth outlook (million people)



growth, although as mentioned above Iraq is a notable exception. In the Gulf region, Saudi Arabia and Oman are the only two countries projected to experience population growth of more than 10% this decade, with expectations slightly lower for the UAE, Bahrain, and Kuwait. Qatar is expected to see the slowest growth at just 3%. Overall, population growth in the Gulf region is expected to be the lowest contributor to overall growth in the region.

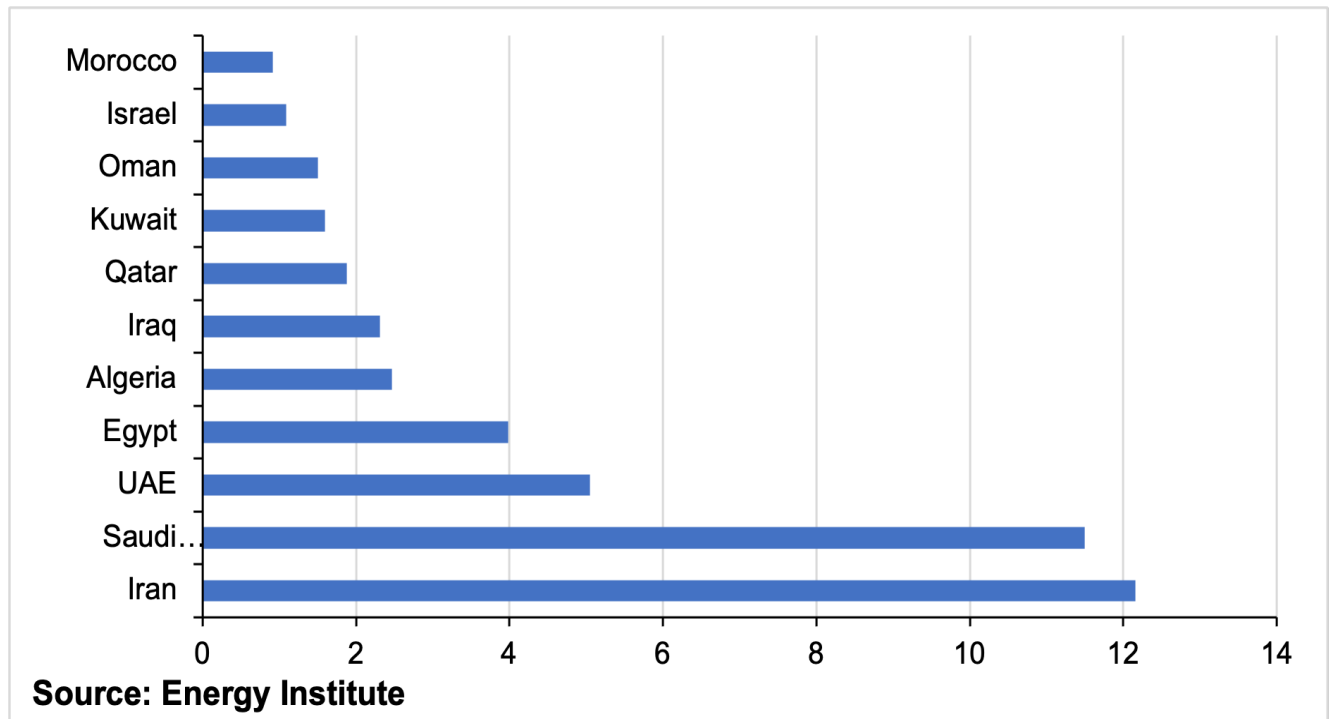
Yet there are important caveats to the impact of population growth on regional energy demand. The first of these is that, while population growth does act as a critical demand driver, a plethora of other factors affect per capita energy consumption, such as national policy, a state's fiscal position, and the availability of resources. Although the populations of the Arab Gulf states (aside from Saudi Arabia) are by no means the largest in the region, per capita energy consumption in these countries is among the highest in the region and in some cases, the world. As of 2019, Qatar was the highest per capita consumer of energy worldwide at an average of 723

million British thermal units (MMBtu) per person.² The only country in this sub-region with a smaller population is Bahrain, which ranked third globally. In fact, four out of the top ten per capita energy consumers worldwide in 2019 were GCC states, with Saudi Arabia and Oman (the remaining two in the bloc) taking places 12 and 13, underscoring the importance of per capita consumption relative to population growth. Data from the United States Energy Information Administration (EIA) indicates that despite its somewhat smaller population, in 2021 the GCC accounted for 55.8% of the region's total primary energy consumption, followed by North Africa at 21.5%. Iran was the largest individual consumer in the region with 12.8% of the total primary consumption.³

2. "Energy Consumption per Capita," CIA - The World Factbook, Accessed September 27, 2023, <https://www.cia.gov/the-world-factbook/field/energy-consumption-per-capita/country-comparison/>.

3. "International - Primary Energy," US Energy Information Administration, Accessed September 27, 2023, <https://www.eia.gov/international/data/world/total-energy/total-energy->

Figure 2: Primary energy consumption in 2022 (Exajoules)



Another key item for consideration is national energy policy, specifically energy subsidies, the sustainability of which may become a concern if population growth continues without corresponding fiscal and economic growth. Although subsidized sales of energy and other commodities are frequently associated with resource-rich states like those in the GCC, the practice of subsidizing energy sales is common across the MENA region, regardless of whether or not it is something a state can realistically afford. This has the effect of keeping energy prices, be they for electricity, natural gas, or transportation fuels, artificially low, causing demand to grow at rates often exponentially higher than they likely would if prices were set using a market-based system.

As an example, Egypt effectively abolished its electricity subsidies in 2016 and saw household electricity consumption fall the following year, although moderate growth has continued since 2019 and total power demand reached record levels in 2022, illustrating the limited ability of subsidy reform to act as a demand management measure when population

consumption.

growth remains strong.⁴ Egypt's population is expected to continue growing rapidly, with an additional 15 million people added to its population over the course of this decade.⁵

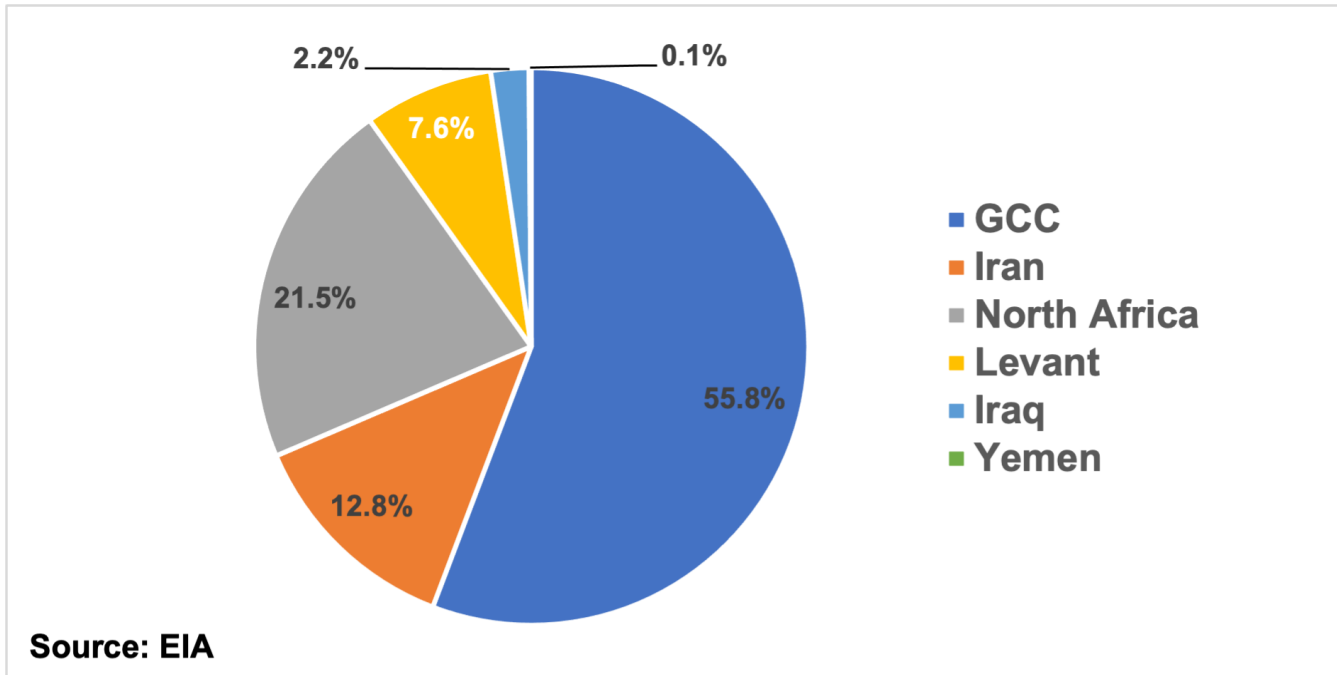
Another critical example of this dynamic is Algeria, where subsidized gas and power sales have led demand growth to surge, with domestic natural gas consumption exceeding 51% of the country's total production in 2020.⁶ While it has since moderated somewhat, this type of unchecked demand growth may be strongly detrimental to the country, as its large gas reserves and proximity to Europe have led it to be seen as one among several regional producers that might provide the continent with additional gas resources via existing pipeline connections as a part of the search for alternate supplies to Russian gas, providing

4. "Egypt Power Consumption Hits Record 167TWh for 2022," MEES, Vol. 66, Issue 12, March 24, 2023, <http://archives.mees.com/issues/1998/articles/61951>.

5. Databank, "Population Estimates," World Bank, 2023.

6. "Country Analysis Brief: Algeria," US Energy Information Administration, March 2, 2023, https://www.eia.gov/international/content/analysis/countries_long/Algeria/algeria.pdf.

Figure 3: Primary energy consumption by sub-region in 2021 (Quadrillion Btu)



Algeria with a critical economic lifeline that few other sectors can match. Critically, this also holds the potential to reinvigorate upstream interest in Algeria’s oil and gas sector, but the sort of domestic demand growth described above may be viewed as a risk by international oil companies (IOCs). Though Algeria has little precedent of redirecting supply away from exports to the domestic market in times of a shortage, a similar trend that first emerged in Egypt in 2012-13 has reemerged a decade later, illustrating the very real operational risks posed by the subsidy policy.⁷

Finally, one of the more difficult, non-energy variables to predict in this study will be the impact of climate change and extreme weather, both for their effects on energy demand and on the availability of specific energy supplies, such as renewable energy powered by solar and wind resources. Temperatures throughout the region are expected to keep rising year after year, subjecting the region’s inhabitants to some of the most extreme heat conditions on the planet. While this will certainly place upward pressure on electricity demand, more vulnerable

7. Aldo Liga, "From Dark to Light, to Dark? Egypt's Energy Sector in Times of Uncertainty," ISPI, December 11, 2023, <https://www.ispionline.it/en/publication/from-dark-to-light-to-dark-egypts-energy-sector-in-times-of-uncertainty-156268>.

states have already demonstrated that factors brought about by climate change may actually have the ability to constrain demand due to the damage potentially caused to infrastructure and economic activity.⁸ Additionally, the dependency of renewable energy on either solar irradiance (the power from the sun that reaches a surface unit per area) or minimum wind speeds to generate power may be affected by changing weather patterns in ways that are currently unforeseeable.⁹

Regional Supply Outlook

Most of the region’s major economies — and thus drivers of demand growth — are net exporters of hydrocarbons. Where there are exceptions to this general rule, countries such as Egypt still boast large domestic oil and gas industries. While Egypt still exports crude oil, refined products, and liquefied natural gas (LNG), difficulties managing its domestic

8. "Iraq’s Electric Grid Hit by Fire, Explosions amid Scorching Heat," Al-Jazeera, July 30, 2023, <https://www.aljazeera.com/news/2023/7/30/iraqs-electric-grid-hit-by-fire-explosions-amid-scorching-heat>.

9. "Frequently Asked Questions," Global Solar Atlas, Accessed January 29, 2024, <https://globalsolaratlas.info/support/faq>.

energy markets have required it to import incrementally greater volumes of hydrocarbons, particularly natural gas via pipeline linkages to neighboring Israel.

As a result, a brief survey of the outlook for supply growth on a regional level is a necessary part of examining the overall trajectory of demand drivers, as the relative health of these industries will have profound impacts on a country's energy demand in multiple ways. Developing new sources of supply or investing in the preservation of existing production will be crucial to ensuring that exporters retain global market share, which in turn funds national budgets that are in many cases closely linked to non-oil growth prospects, as well as subsidized domestic energy sales. Additionally, development of domestic resources and associated capacities contributes, in theory, to each country's own energy security.

Perhaps the most important of the above is the ability of exporters to use these new sources of supply and their competitive advantages in global markets as an attempt to ensure long-term market share for these exports, which has also been termed "security of demand" by some scholars.¹⁰ For exporters, external demand security is linked to a steady flow of revenue that enjoys a greater degree of predictability. Where revenues can be reinvested in new production, be this traditional oil and gas production or development of renewable energy capacity, domestic energy security may receive considerable support. For oil exporters, these arrangements may take a variety of shapes. For example, the NOC of Saudi Arabia, Saudi Aramco, has long maintained a strategy of investing in overseas firms with sizeable downstream capacity, or partnering with them for greenfield refining and petrochemical projects. This is notable for the fact that these transactions are usually accompanied by agreements to supply a key asset with crude oil exports from Saudi Aramco, thereby locking down long-term demand in significant quantities.¹¹ These agreements have enabled

10. Nikolay Kozhanov, "Gulf Energy Security During the COVID-19: From the Security of Supply to the Security of Demand," *GCC Hydrocarbon Economies and COVID*, Palgrave MacMillan, January 22, 2023, pp. 201-224, https://link.springer.com/chapter/10.1007/978-981-19-5462-7_9.

11. "Aramco Completes Three Transactions with PKN ORLEN in Poland," *Aramco*, November 30, 2022, <https://www.aramco.com/en/news-media/news/2022/aramco-completes-three-transactions-with-pkn-orlen-in-poland>.

the NOC to secure between 1.01 million barrels per day (bpd) and 1.3 million bpd in long-term crude offtake.

Oil Supply

Primary considerations for the availability of oil supply across the region will be both ongoing upstream expansions in the major producing countries of the Gulf sub-region and the potential for more minor upstream growth in other parts of the wider MENA region. Naturally, the main project to consider is the Abu Dhabi National Oil Company (ADNOC) plan to complete its expansion from 4 million bpd to 5 million bpd in 2027.¹² Of the potential 4.28 million bpd in liquids supply growth from the Middle East identified by Energy Intelligence between late 2023 and mid-2028, Saudi and Emirati capacity gains are expected to account for 63% of this total figure, heavily underscoring the importance of these producers to global supply, and by extension to the security of supply across the broader Middle East. While supply growth in Saudi Arabia and the UAE will account for most of the region's oil production capacity additions before 2030, discussion around the outlook for this additional supply is generally limited. Upstream work in both countries is proceeding on schedule at the time of writing, and in some cases has reached completion ahead of schedule.¹³ Both countries and their NOCs enjoy fiscal positioning that leaves little doubt as to their ability to fund these expansions, and in the case of Abu Dhabi, strong investor confidence in the oil sector leaves ADNOC with no shortage of willing international partners to support capacity growth.

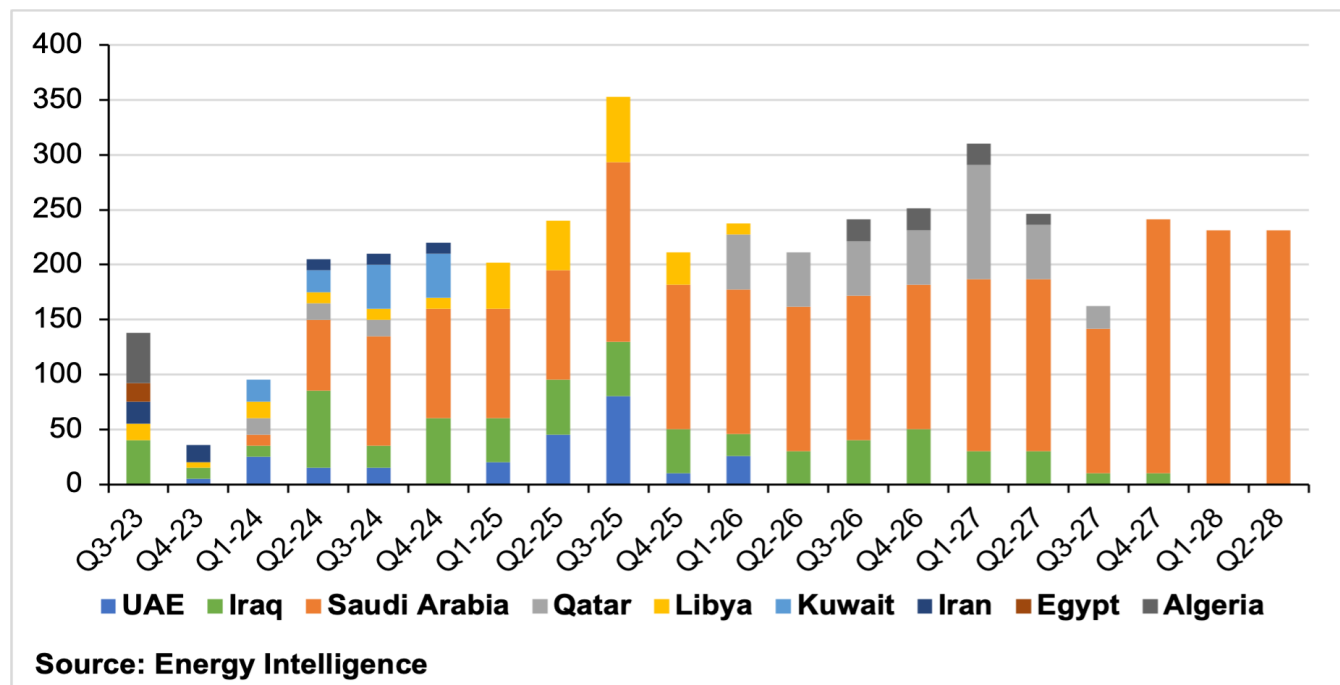
Nearby, QatarEnergy (formerly Qatar Petroleum) is mostly focused on its upstream natural gas expansion,

[com/en/news-media/news/2022/aramco-completes-three-transactions-with-pkn-orlen-in-poland](https://www.aramco.com/en/news-media/news/2022/aramco-completes-three-transactions-with-pkn-orlen-in-poland).

12. "Our Strategy: Responsible Growth," Abu Dhabi National Oil Company, Accessed January 29, 2024, <https://www.adnoc.ae/en/ourstrategy/responsible-growth>.

13. Amina Bakr, "Aramco Keeps Capacity Push at Forefront," *Energy Intelligence*, August 3, 2023, <https://www.energyintel.com/00000189-b74b-d835-abbb-ff7bdea90000>; Oliver Klaus, "Abu Dhabi's Adnoc Quietly Ramps Up Capacity," *Energy Intelligence*, September 2023, <https://www.energyintel.com/0000018a-6f66-d1d3-adeb-7f7744fb0000>.

Figure 4: Upstream capacity growth ('000 bpd)



which will be covered in a subsequent section. Although the company is less focused on its liquids' output, its expanded gas production is expected to provide a substantial increase to its output of condensates. Both phases of its North Field Expansion project are expected to add over 375,000 bpd in condensates to total production, pushing total output above 1.1 million bpd.¹⁴ Condensate production typically receives less attention than crude oil production, but its use as a feedstock for the production of jet fuel makes it highly valuable to the region's massive civil aviation industry.

A recent example of this is QatarEnergy's 10-year agreement with the Dubai-based Emirates National Oil Company (ENOC) to supply it with condensate volumes of up to 33,000 bpd.¹⁵ ENOC's condensate splitters are mostly focused on jet fuel production to service demand from the civil aviation sector in Dubai, which is home to one of the world's busiest airports, thereby making its status as a commercial hub critically

dependent on its ability to ensure the security of its jet fuel supply.¹⁶ This dynamic is not limited to Dubai alone, and while intra-regional politics previously made such an arrangement untenable, recent diplomatic progress in this realm has improved the outlook for the regional trade in oil and refined products.

The majority of additional oil and gas production capacity will likely facilitate continued exports to what producers view as key growth markets across Asia. The economic growth across the MENA region itself, combined with the potential for production declines in other regional states, would likely mean that the intra-regional oil trade and broader trade in liquids will increase. It is also true that the aforementioned agreement between ENOC and QatarEnergy is likely to be an early example of at least one way that regional trade can both broaden and deepen. Data from commodities intelligence firm Kpler suggest that the regional liquids trade surged in 2017 and has remained elevated since, with flows of crude, condensate, and refined products remaining above 1.2 million bpd

14. Rafiq Latta, "Qatar Assembles Dream Team for LNG Expansion," Energy Intelligence, June 23, 2022, <https://www.energyintel.com/00000181-8c20-d443-a9db-8eaa02d20000>.

15. "QatarEnergy and Enoc Sign 10 Year Condensate Deal," MEES, Vol. 66, Issue 28, July 14, 2023, <http://archives.mees.com/issues/2014/articles/62304>.

16. "Company Profile: Dubai's Enoc Focuses on Chasing Jet Barrels," MEES, Vol. 60, Issue 19, May 12, 2017, <http://archives.mees.com/issues/1694/articles/54842>.

for the better part of five years, with 2020 being a significant exception.¹⁷

Other states in the region are seeking to expand upstream oil production capacity, yet their ability to achieve this is less certain than the expected gains coming from Saudi Arabia and the UAE. Formidable and consistent government cohesion in the aforementioned countries, combined with strong state backing for upstream growth and a highly attractive and competitive resource base, all support the strong supply growth outlook. Yet in other major regional producers, the trajectory of targeted supply growth is much less certain.

Elsewhere in the Gulf, Kuwait's oil sector is frequently viewed as something of a laggard relative to those of its regional peers. Despite having one of the largest oil production capacities within the Organization of Petroleum Exporting Countries (OPEC) and OPEC+ (10 additional oil-producing countries), Kuwait's sector is notorious for chronic project delays and, until recently, significant losses to its production capacity, amounting to a staggering ~570,000 bpd in 2021.^{18 19} However, progress has reportedly been made in reversing these losses, with officials claiming an upstream rebound from a low point of 2.6 million bpd back to 2.9 million bpd, with a further 300,000 bpd in growth expected to push capacity to 3.2 million bpd by 2025.

This is perhaps why more recent targets are notable for their modesty relative to previous goals, which were often highly ambitious and involved lengthy time horizons.²⁰ Relative to these unrealized aspirations, targets such as increasing oil production by about 450,000 bpd in a four-year period seem much more

likely to be realized. If these targets can be reached, they may pave the way for further incremental growth in years to come. However, the likelihood of Kuwait reaching its stated goal of 4 million bpd by 2035 will be highly contingent on its ability to successfully post near-term oil sector growth.²¹ Energy Intelligence's upstream project tracker has identified just one sanctioned project that will likely result in 120,000 bpd in liquids gains, though the balance of Kuwait's targets may be accounted for by projects whose details are yet to be disclosed.²²

Such near-term progress is less contingent on the ability of those working in Kuwait's oil sector than on the structural factors that have prevented realization of previous goals and precipitated capacity losses. These factors very much remain present in Kuwait, forcing most analysts to adopt something of a "wait and see" approach when it comes to progress in the oil sector. Political volatility is a key consideration, as this has resulted in high turnover among oil sector leadership. Kuwait reappointed its oil minister three times in 2023, and appointed Emad al-Atigi to the role in early 2024, although he was retained after the dissolution of parliament later that year.^{23 24}

A possible justification for cautious, near-term optimism has been recent progress in the downstream segment. Long-delayed refining and petrochemical projects, such as the major 615,000 bpd al-Zour refinery, have recently been completed.²⁵ While these projects are managed by separate state-owned subsidiaries in the oil sector, their completion ostensibly frees up capacity at the Kuwait Petroleum

17. "Flows," Kpler Terminal, Accessed September 27, 2023, <https://terminal.kpler.com/analytics/flows?mZones=593&sZones=593&products=1328%2C1400&dir=import&granularity=years&split=origin--country&dates=all>.

18. Sean Hill, Owen Comstock, "What is OPEC+ and how is it different from OPEC?" US Energy Information Administration, May 9, 2023, <https://www.eia.gov/todayinenergy/detail.php?id=56420>.

19. Rafiq Latta, Noah Brenner, "Kuwait Eyes Capacity Hike to 3.2 Million b/d by 2025," Energy Intelligence, July 5, 2023, <https://www.energyintel.com/00000189-272f-d19f-a7fd-7f2f11fe0000>.

20. Ibid.

21. Kit Million Ross, "Kuwait Targets Daily Oil Production of 3.2 Million Barrels by 2024," Offshore Technology, July 7, 2023, <https://www.offshore-technology.com/news/kuwait-targets-3-2m-bpd-oil-production/>.

22. "World Crude Oil Data," Energy Intelligence, 2023.

23. "Kuwait: Another Cabinet, Another New Oil Minister," MEES, Vol. 60, Issue 25, June 23, 2023, <http://archives.mees.com/issues/2011/articles/62239>.

24. "Kuwait's Emir Suspends Parliament; Can He Quell Tumultuous Divisions?" MEES, Vol. 67, Issue 20, May 17, 2024, <http://archives.mees.com/issues/2059/articles/63347>.

25. Rafiq Latta, "Kuwait's Al-Zour Refinery Ramps Up," Energy Intelligence, March 7, 2023, <https://www.energyintel.com/00000186-bc9f-da40-af97-fcbf7f3c0000>.

Corporation (KPC), the umbrella organization that oversees the entirety of the country's oil operations. Yet other structural obstacles will remain; cuts to KPC's budget in 2023 may still cast some shadow of doubt on Kuwait's ability to reach these goals, which hold the potential to limit gas supplies that Kuwait would then need to import, or turn to liquid fuels to ensure sufficient generation capacity, thus illustrating further how supply factors seemingly unrelated to national demand in a major oil-exporting country may affect demand trajectories.²⁶

While Saudi Arabia and the UAE have strongly positioned themselves to lead most of the region's crude supply growth over the course of this decade, other producers have exhibited chronic difficulties increasing their production for a variety of reasons. Kuwait's political volatility, combined with an upstream sector that is closed to international investment, can hardly be viewed as a formula for success, and there is little likelihood of significant change to this model on the horizon. Kuwait's Emir Sheikh Mishal Al Ahmad Al Sabah, who ascended the throne in late 2023, is widely seen as a guardian of the status quo that has ostensibly resulted in many of the difficulties now faced by the country's oil sector.²⁷

Iraq's status as OPEC's second-largest producer behind Saudi Arabia is a distinction it has been able to retain against seemingly significant odds, despite the usual challenges associated with its ability to expand oil production. The Iraqi oil sector has been wracked by over a decade of armed conflict and struggles to attract new upstream investment due to commercial terms that are notoriously unattractive to IOCs. The string of attempts to exit the country by major IOCs like ExxonMobil has cast something of a dark shadow over the sector, though the recent closure of a deal for an integrated mega-project operated by French major TotalEnergies may signal a reversal in fortunes, if the projects can be implemented.²⁸ Baghdad's long-term,

lofty targets are mostly unlikely to be realized; its 2027 target of between 7 million and 8 million bpd would require a massive level of investment that is highly unlikely to materialize without a drastic change of circumstances throughout both the Iraqi oil sector and the wider Iraqi operating environment itself.²⁹

Yet the recent vote of confidence from Total, which envisions an oil production increase of 125,000 bpd, in addition to a long-delayed project that would supply 5 million bpd of seawater for injection at maturing fields (a technique used to reverse production declines) holds some potential, albeit limited, to at least slow declining investor interest in Iraq's oil sector. While this is critical for Iraq due to its extremely high dependency on the revenues it earns from oil exports, it is perhaps more critical to reinvigorate interest in its downstream sector. Iraq's refining fleet has long produced excess volumes of fuel oil, which does not attract high value once exported. The inability to produce sufficient quantities of transportation fuels from its domestic industry has somewhat ironically forced Iraq to import refined products, especially gasoline, at international market rates, which it then sells domestically at subsidized prices (and thus at a loss).³⁰ As the majority of these imported volumes are sourced from the UAE and Oman, this also emphasizes previously made points on the importance of supply growth to the intra-regional trade in oil and refined products.³¹

Iraq's struggle to secure the investment needed to spur oil production growth comes from its reliance on IOC

com/00000180-d307-d84d-add4-ff2fe9d30000; Staff, "Political Shifts Unlock New Model in Iraq," Energy Intelligence, April 6, 2023, <https://www.energyintel.com/00000187-527e-dcab-af9f-f27e10c70000>.

29. Rowena Edwards, Maha El Dahan, and Ahmed Rasheed, "Iraq's Ambition to Match Saudi Oil Output Is Out of Reach," Reuters, March 27, 2023, <https://www.reuters.com/business/energy/iraqs-ambition-match-saudi-oil-output-is-out-reach-2023-03-27/>.

30. "Iraq Expands Refining Capacity to Reduce Oil Product Imports," Al-Monitor, November 12, 2022, <https://www.al-monitor.com/originals/2022/11/iraq-expands-refining-capacity-reduce-oil-product-imports>.

31. "Iraq Monthly Imports (Clean Products, DPP, by Origin Country)," Kpler Terminal, Accessed September 27, 2023, <https://terminal.kpler.com/analytics/flows?mZones=457&products=1328%2C1400&dir=import&split=origin--country>.

26. "Kuwait's KPC Suffers Steep Budget Cuts" MEES, Vol. 66, Issue 6, February 10, 2023, <http://archives.mees.com/issues/1992/articles/61808>.

27. Oliver Klaus, Rafiq Latta, "Kuwait Gets a New Ruler, Faces Old Problems," Energy Intelligence, December 18, 2023, <https://www.energyintel.com/0000018c-7c85-d61c-a7cc-7db70aa10000>.

28. Simon Martelli, "Exxon Exits Iraqi Kurdistan," Energy Intelligence, May 17, 2022, <https://www.energyintel.com>.



Photo above: Iraqi oil tanker anchored near the Zaharani power plant off coast of Lebanon. Photo by Mahmoud Zayat/AFP via Getty Images.

partnerships with state-owned firms. Other producers in the region such as Egypt and Algeria (though the latter has seen something of a reversal of fortunes since 2022) have similarly struggled to attract investment that has either led to production declines or difficulties maintaining current capacity levels. What each of these three states has in common with respect to difficulties growing oil production is that their fiscal terms have for years been viewed as unattractive for IOCs, leading to consistent declines in production, or have eroded investor confidence in the country's upstream to such a degree that significant declines appear imminent without a near-term influx of investment in the oil sector.³²

This may in turn have the potential to exert downward pressure on demand for refined products in some countries, particularly in the event that high volumes of crude or refined products may themselves need to be imported. As mentioned above, this dynamic has already emerged in Iraq, with the devaluation of the Iraqi dinar exacerbating the problem due to high-

32. "Egypt Receivables Soar, Threatening Oil Output Rebound," MEES, Vol. 66, Issue 26, June 30, 2023, <http://archives.mees.com/issues/2012/articles/62259>; "Iraq's LR5 Licensing Round Faces Headwinds," MEES, Vol. 66, Issue 30, July 28, 2023, <http://archives.mees.com/issues/2017/articles/62347>.

priced, dollar-denominated fuel imports.³³ Although Egypt's downstream sector has fared better than Iraq's, it oscillates between being a net importer and net exporter of refined products, and the sinking value of the Egyptian pound in combination with state subsidies for fuel sales has the potential to considerably erode state finances and foreign exchange reserves.³⁴ Egypt nominally moved to eliminate subsidies on transportation fuels like gasoline and diesel in 2019, but implementation of a pricing mechanism intended to move retail fuel rates closer to market prices has been sluggish in practice. This effectively means that, despite significant increases in prices, Egyptians still purchase transportation fuels at a significant discount, with the difference being borne by Cairo's balance sheet.³⁵

33. "Iraq 2021 Budget: Record Deficit," MEES, Vol. 63, Issue 52, December 24, 2020, <http://archives.mees.com/issues/1883/articles/59189>.

34. "Egypt Subsidy Bill Set to Rise as Fuel Prices See Only Minor Hike," MEES, Vol. 65, Issue 16, April 22, 2022, <http://archives.mees.com/issues/1951/articles/60806>.

35. "Egypt's Financial Woes Mount: Record Debt & Deficit as Devaluation Looms," MEES, Vol. 60, Issue 50, December 15, 2023, <http://archives.mees.com/issues/2038/articles/62835>.

Natural Gas Supply

The outlook for upcoming gas supply is mixed, though the MENA region's share of global gas production is only expected to grow, likely through ongoing major upstream expansions. Accordingly, the GCC states that are expanding their upstream gas production are doing so in a manner consistent with policies that seek both the security of domestic supply and the demand security mentioned at the outset of the study. Saudi Arabia, which is already self-sufficient in natural gas, continues to support development of unconventional and non-associated gas reserves to ensure the ongoing security of domestic supply, but will additionally seek to direct gas resources toward higher-value applications like petrochemical production, and to a lesser extent, production of blue hydrogen and ammonia.

For MENA states outside of the Gulf, prospects for significant growth in regional gas suppliers are less linked to the more secure, state-backed investment underpinned by NOCs with world-beating balance sheets and are more dependent on the abilities of host governments to attract significant new levels of upstream investment from IOCs. Despite expectations that the Russia-Ukraine war would facilitate greater upstream investments in North Africa and the Eastern Mediterranean, significant supply growth, or commitments to support it, has been fairly slow to materialize. Algeria is likely to benefit the most from this dynamic, due in part to reforms made to its hydrocarbons law that have been implemented in phases beginning in 2019. In Egypt, issues with managing local demand and high decline rates at major gas projects have resulted in a much greater degree of apprehension from IOCs, despite persistent interest in using Cairo's offshore infrastructure and liquefaction capacity to facilitate exports from gas production in neighboring countries like Israel and Cyprus.³⁶

These dynamics point to a stark contrast in outlook for demand growth between those countries in the region that appear poised to successfully develop their local resources, and in most cases, those that have already done so.

36. "Cyprus Rejects Chevron's Modified Aphrodite Development Plan," MEES, Vol. 66, Issue 34, August 25, 2023, <http://archives.mees.com/issues/2021/articles/62449>.

The supply of associated gas in Saudi Arabia and the UAE will increase along with each state's respective upstream oil expansions, in addition to non-associated and unconventional resources that each plans to develop. Saudi Aramco, which, as in the case of oil production, dominates the kingdom's upstream gas sector, has stated that it plans to grow production by between 50% and 70% by 2030, with most of its gains to be sourced from the Jafurah unconventional gas project, where it expects production to reach 2 billion cubic feet per day (Bcf/d) by 2030.³⁷ Other gains in associated gas production are expected to come from oil capacity expansions currently underway at its offshore fields.

The UAE is targeting "self-sufficiency" in natural gas by 2030, and while it does not specify the exact production level at which it expects to accomplish this, there is little doubt among industry observers that it will be able to achieve this goal.³⁸ The UAE currently imports LNG at a floating storage and regasification unit (FSRU) in Dubai on a seasonal basis, while approximately 25% of its total demand is met by imports from Qatar via the Dolphin pipeline.³⁹ It is unlikely to be a coincidence that the agreement for these imports will expire in 2032.⁴⁰

Development of non-associated and unconventional gas resources is a strategic priority for Saudi Arabia and the UAE due to their major production role in OPEC/OPEC+, which sees the spare capacity of each country occupy a critical position in the alliance's market

37. Amena Bakr, "Aramco Sets Out Project Plans for Next Three Years," Energy Intelligence, February 3, 2023, <https://www.energyintel.com/00000186-1741-d0a2-a3e7-17f5765b0000>.

38. Oliver Klaus, "Adnoc Drilling Eyes Growth From Abu Dhabi Shale Gas," Energy Intelligence, May 24, 2023, <https://www.energyintel.com/00000188-4e9e-ddc5-ab9e-ef6c390001>.

39. "Excelerate Energy Extends Time Charter Agreement with Dubai Supply Authority," Excelerate Energy, March 2, 2023, <https://excelerateenergy.com/news/excelerate-energy-extends-time-charter-agreement-with-dubai-supply-authority/>; "International - United Arab Emirates," US Energy Information Administration (EIA), August 28, 2023, <https://www.eia.gov/international/analysis/country/ARE>.

40. Rafiq Latta, "UAE, Oman Spearhead Gulf's Gas Golden Age," Energy Intelligence, August 2, 2022, <https://www.energyintel.com/00000182-599f-d351-abb3-f99f9bf90000>.

balancing strategies. OPEC+ cuts have played a major role in oil markets in the space of the last decade, and output reductions are typically led by Saudi Arabia and to a lesser extent the UAE. Yet a frequently overlooked consideration is that the availability of associated gas, which is extracted from oil reservoirs, is reduced in tandem with oil production cuts. This had previously linked the security of each country's gas supply to OPEC/OPEC+ policy, and in the 1980s even resulted in gas shortages in Saudi Arabia.⁴¹ As a result, developing non-associated gas resources has worked to decouple the link between either country's oil production levels and available gas supply, thereby supporting energy security with greater assurance that gas supplies will not be interrupted.

Of course, it would be impossible to discuss expanding natural gas production in the region without mention of Qatar's North Field expansion project, which is being managed by QatarEnergy. Upon completion in 2030, it will catapult Qatari liquefaction capacity from its 2023 size of 77 million tons per annum (mtpa) to 142 mtpa and ensure that the small Gulf state remains a major player in global LNG markets for the foreseeable future.^{42 43}

Although there are few LNG consumers in the MENA region, Qatar's expansion still enables it to play an important role as a regional supplier by ensuring security of supply for the Dolphin pipeline, which exported 20 billion cubic meters (bcm) to the UAE and on to Oman in 2022.⁴⁴ Additionally, the startup of operations at Kuwait's 22 mtpa al-Zour LNG terminal in 2021 allowed Kuwaiti LNG imports to rise to 1.5% of total volumes imported on a worldwide basis the following year, almost 50% of which it sourced from

41. "Saudi Aramco Gas Output Leaps in Q2," MEEES, Vol. 66, Issue 32, August 11, 2023, <http://archives.mees.com/issues/2019/articles/62396>.

42. Youssa Samaha, "Qatar LNG Expansion Progresses With Baker Hughes Deal," Energy Intelligence, April 4, 2023, <https://www.energyintel.com/00000187-4b97-d893-a9cf-6fd71a5f0000>.

43. Pooja Kapoor, "QatarEnergy's \$17 Billion North Field West Expansion," Oil & Gas Middle East, August 16, 2024, <https://www.oilandgasmiddleeast.com/exploration-production/epc-contracts/qatar-north-field>.

44. "Statistical Review of World Energy," Energy Institute, 2023.

Qatar at a level of 3.9 bcm.⁴⁵ Although importing LNG as a major oil and gas producer may be far from ideal, Kuwait's exposure to a nearby, friendly, and low-cost LNG source will certainly support its energy security and provide some insulation from gas market volatility when its import needs are high.

Greater availability of supply from Qatar may lead to further growth in the regional LNG trade. It is unlikely that countries like Egypt, which was previously a seasonal LNG importer, are viewed by Qatar as a target market, with QatarEnergy instead likely to prefer buyers with better prospects of steady, long-term growth such as India and others in South Asia. Yet Egypt has become ever-more reliant on neighboring Israel to service its demand growth, and without any major domestic projects that will raise gas production in the near term (examined in the next section), turning to other regional suppliers may eventually become one of Cairo's best options. As recently as 2022, Iraq, which has never imported LNG in its history, expressed possible interest in importing Qatari LNG as well.⁴⁶

The outlook for gas supply in the Levant and North Africa varies significantly from country to country. While the offshore gas resources of the Eastern Mediterranean have generated significant enthusiasm in recent years, especially in the aftermath of Russia's invasion of Ukraine and the push by many European states to replace imported volumes of Russian pipeline gas and LNG, the pace of development in this region has been somewhat underwhelming. Still, further integration of regional gas markets remains a distinct possibility, given the unclear prospects for long-term gas demand in Europe. Additionally, the reluctance of some IOC operators to rely on Egyptian liquefaction capacity, given Cairo's history of diverting gas to its domestic market in times of shortage, may also stall exports from the region. The development of new LNG export capacity is a time- and capital-intensive process, and options for building new

45. Yesar Al-Maleki, "Kuwait's Al Zour LNG: Full Operations," MEEES, Vol. 65, Issue 8, February 25, 2022, <https://www.mees.com/2022/2/25/news-in-brief/kuwait-al-zour-lng-full-operations/43656080-964e-11ec-be2a-f105a3a62fe1>; "Statistical Review of World Energy," Energy Institute, 2023.

46. Yesar Al-Maleki, "Iraq Seeks To Import Qatari LNG, But How?" MEEES, Vol. 65, Issue 8, February 25, 2022, <https://www.mees.com/2022/2/25/power-water/iraq-seeks-to-import-qatari-lng-but-how/0e586e60-964d-11ec-bde7-13ff8c48da79>.

capacity outside of Egypt are highly limited, constraining the options for new, alternate export routes from the region.

Israel currently holds the most potential to continue delivering new gas supply on a regional basis.⁴⁷ While the prospects for substantially greater volumes of LNG exports from the region to European markets are currently questionable, this has done little to dampen international enthusiasm for entry into the Israeli upstream. Chevron's 2020 acquisition of US-based Noble Energy marked the inaugural entry of a major Western IOC into Israel's offshore gas sector, and an agreement between Israel and the UAE to normalize ties with one another the same year paved the way for Abu Dhabi sovereign wealth fund Mubadala to clinch a 22% stake in the Tamar gas field, although this was later halved to 11%.⁴⁸

Security risks are likely to remain a consideration with respect to Israel's upstream operating environment, especially following the outbreak of a major war between Israel and Hamas in the Gaza Strip after Oct. 7, 2023, which was still ongoing as of December 2024. But the conflict has not yet presented a fundamentally different set of risks aside from those that were already known, meaning that the outlook for upstream growth in Israel (and by extension the potential for supply to neighboring Egypt and Jordan) has been minimally affected by the war.⁴⁹ The results of Israel's fourth offshore bid round (OBR4) were announced in late October 2023, with several new major IOC entries into the Israeli gas sector.⁵⁰ Although the bids would have predated the conflict and no exploration activity is officially required to start for at least three years, there have not been any public statements

47. Tom Pepper, "Israel Attracts More Majors to Upstream," Energy Intelligence, July 20, 2023, <https://www.energyintel.com/00000189-6dfc-dd15-a389-effd51790000>.

48. "UAE's Mubadala Takes Stake in Israeli Gas Field," Energy Intelligence, September 1, 2021, <https://www.energyintel.com/0000017b-ad8b-dc26-ab7b-edcb850c0000>.

49. Colby Connelly, "How Has the Gaza War Impacted the East Med Gas Sector?" Middle East Institute (MEI), November 15, 2023, <https://www.mei.edu/publications/how-has-gaza-war-impacted-east-med-gas-sector>.

50. "The Ministry of Energy and Infrastructure Announces Results for Two Zones in the 4th Offshore Bid Round," Israeli Ministry of Energy and Infrastructure, October 29, 2023, <https://www.gov.il/en/departments/news/news-291023>.

from the consortia receiving the awards indicating these firms are deterred from future exploration activity in the Israeli offshore. Although ADNOC had also been in negotiations to enter the Israeli upstream through a partnership with BP to acquire a 50% stake in NewMed Energy (formerly Delek Drilling), which holds stakes in major Israeli gas fields as well as other assets in Cyprus, no such agreement has materialized.⁵¹ This may be an indicator that the conflict will serve as an obstacle to further regional integration of the oil and gas industry between Israel and Arab states with which it has signed normalization agreements, but it is also highly likely that political considerations ultimately added to obstacles the parties were already facing in commercial negotiations.⁵²

While Egypt has long boasted the presence of major IOCs both on and offshore, it has struggled to retain interest in recent years, and fairly bearish sentiment on exploration prospects in Lebanon (addressed in a later section) places enthusiasm for Israel's upstream sector in stark contrast to its neighbors. This level of interest certainly does not guarantee massive volumes of new supply, which would be unlikely to materialize at a significant level before the end of the decade, assuming future exploration successes.

Yet even without new discoveries, new supply from Israel is essentially a foregone conclusion at the time of writing. The Chevron-led consortium that operates the Leviathan gas field — the largest in Israel — took a final investment decision (FID) on an expansion that will see the field's output rise 200,000 cubic feet per day by 2025, while the consortium that operates the Tamar field has sought to boost production to 1.6 Bcf/d by the same year, although the outlook for this project is slightly less certain as it is geared toward higher export volumes to neighboring countries.⁵³ Israel's current export policy essentially reserves 60% of available

51. Oliver Klaus, "Adnoc Steps Up International Growth Push," Energy Intelligence, August 17, 2023, <https://www.energyintel.com/00000189-feca-de73-a1cb-fefe142a0000>.

52. Tom Pepper and Oliver Klaus, "\$2 Billion Adnoc-BP East Med Gas Deal in Limbo," Energy Intelligence, October 13, 2023, <https://www.energyintel.com/0000018b-2a15-dd01-a9df-feb760f50003>.

53. "Israel's Leviathan: FID For 1.4bn Cfd Expansion, But FLNG Plans Stall," MEES, Vol. 66, Issue 27, July 7, 2023, <http://archives.mees.com/issues/2013/articles/62280>.



Photo above: Egyptian using a laptop by candlelight during a blackout in 2023. Photo by Islam Safwat/Bloomberg via Getty Images.

supply for domestic consumption, while the remaining 40% will be exported. Proposed changes to this policy would essentially reverse the current ratio, allowing for export of up to 60% of supplies, for which the operators in Israel's upstream appear enthusiastic.

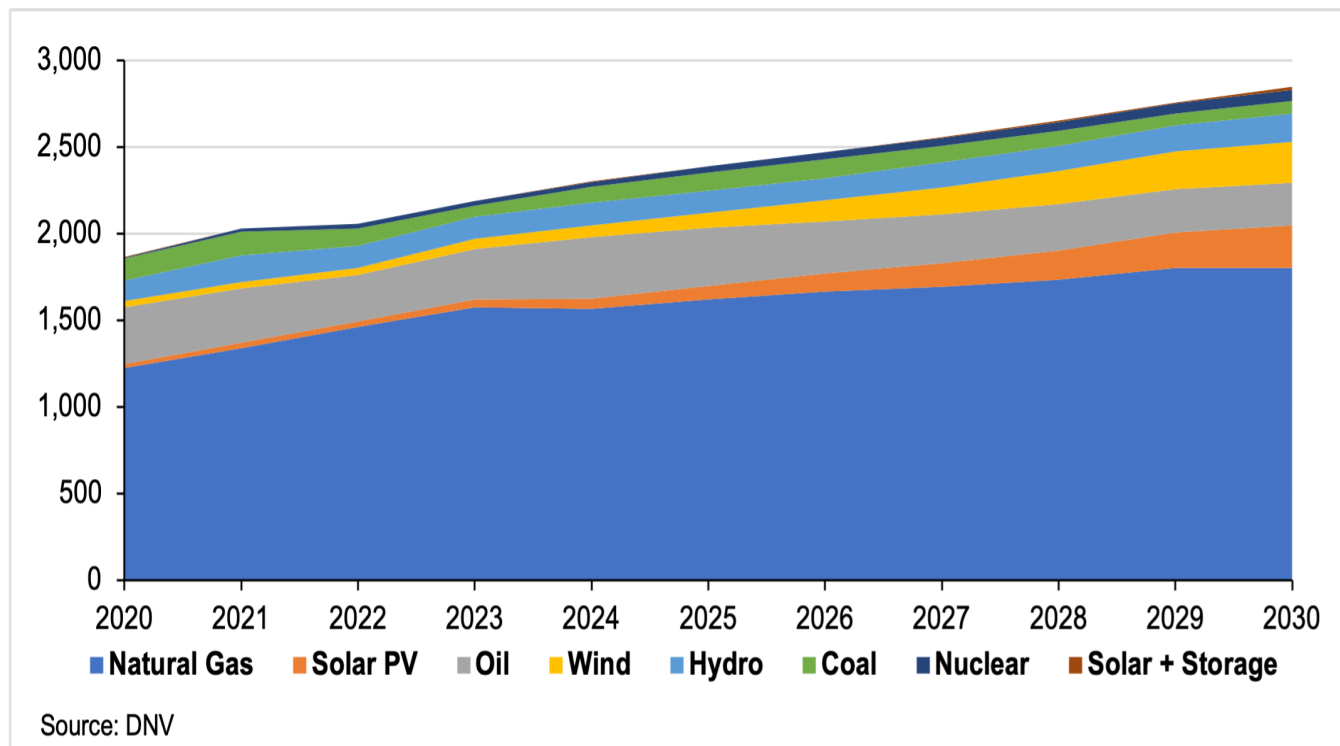
One obstacle to further integration of regional gas markets supported by Israeli supply may come in the form of the composition of Israel's current government. Some cabinet members have previously raised questions about changes to export policy, and the ongoing debate essentially sees those in favor of higher export volumes fearful of stranded asset risks and erosion of the strong enthusiasm for investment in Israel's gas sector.⁵⁴ Opposition to a relaxed export policy generally centers around energy security concerns and arguments that lower supply would raise domestic energy prices, though this dynamic is somewhat more nuanced as a reduced appetite for upstream investment would also have the potential to result in lower volumes of supply. Political volatility stemming from Israeli anger over the security failures that preceded the attacks of Oct. 7, 2023, and the ongoing hostage crisis may also generate uncertainty

54. Tom Pepper, "Israel's Gas Export Debate Heats Up," Energy Intelligence, June 29, 2023, <https://www.energyintel.com/00000189-0922-dbc1-a5dd-5d6aedc50003>.

within Israel's energy policy landscape, which had already persisted due to the number of elections the country had held in recent years.

Yet most industry observers expect a broadly amenable approach to higher export volumes from Israel, as its industry demonstrably continues to attract new interest, and as discussed in the central section of the study covering demand, natural gas demand prospects in the region are almost universally bullish well beyond the end of the current decade. A key indicator that is particularly supportive of this dynamic was the impact of the Tamar gas field shutting down for nearly a month at the outset of the conflict, which initially resulted in a collapse in gas flows to Egypt. The ensuing shortfall underscored Cairo's dire need for Israeli pipeline gas in the absence of new domestic supply, as its only alternative would be to turn to more expensive LNG imports. Likewise, Jordan has also been insulated from the need to import LNG due to its access to Israeli supply, although between the two, Egypt by far represents greater potential demand growth. While it is quite likely that domestic politics may produce opposition to greater imports of Israeli gas, neither Cairo nor Amman currently has imminently available, cost-effective alternatives, pointing to a near-term

Figure 5: MENA power mix evolution (TWh/yr)



trajectory in which Israeli supply likely has a growing role to play in servicing this demand growth.

While Algeria is not a major exporter of natural gas to other countries in the MENA region, its domestic consumption is a significant driver of wider MENA demand, and being self-sufficient in gas means that the security of its domestic supply is paramount to the outlook for Algerian demand growth in the remainder of this decade. Algeria emerged as one of the most likely alternative sources of gas supply for the European market in the aftermath of the Ukraine crisis, and this factor combined with its reformed hydrocarbon law has been advantageous to its ability to attract new upstream investment.⁵⁵ In 2022 its NOC, Sonatrach, signed major agreements with the large operators already present in the country, which chiefly consist of Eni, TotalEnergies, and Occidental Petroleum.⁵⁶ In mid-

55. Nnenna Amobi, "Algeria Proves Key to Europe Hitting 90% Full Gas Storage," BloombergNEF, August 31, 2023, <https://www.bloomberg.com/professional/blog/algeria-proves-key-to-europe-hitting-90-full-gas-storage/>.

56. Tom Pepper, "Crisis May Spur Revival in Algeria's Upstream," Energy Intelligence, May 12, 2022, <https://www.energyintel.com/00000180-b818-d343-a583-be386a030000>.

2023, it signed further agreements with Indonesia's Repsol and Pertamina, signaling that the interest in developing Algerian supply appears set to continue.⁵⁷ Sonatrach plans to allocate 75% of its \$40 billion, five-year spending plan to upstream exploration and production, which mainly focuses on natural gas.⁵⁸

Algeria had previously announced plans to hold a new bid round in 2023, which would likely be the most serious gauge of international interest in its upstream sector to date, and would reveal important indicators on future prospects for greater gas supply from the country.⁵⁹ To be sure, recent agreements that will provide fresh investment in Algeria's oil and gas sector do much to brighten the outlook around Algerian gas

57. Tom Pepper, "Sonatrach Signs Oil Deal with Pertamina, Repsol," Energy Intelligence, June 15, 2023, <https://www.energyintel.com/00000188-c022-d38d-a58b-de331ec80000>.

58. "Algeria's Sonatrach Targets 'Rapid New Output': Exclusive Mees Interview with CEO Toufik Hakkar," MEES, Vol. 66, Issue 1, January 6, 2023, <http://archives.mees.com/issues/1987/articles/61677>.

59. "Algeria Prepares Oil & Gas Bid Round," MEES, Vol. 65, Issue 44, November 4, 2022, <http://archives.mees.com/issues/1979/articles/61484>.

supply, but announcements carrying such a degree of significance that are not met with any subsequent action somewhat depress the outlook for substantial supply growth, as well as more generally proactive announcements in areas such as badly needed development in the renewable power sector (for which many of the same authorities are responsible) and growing concerns around the country's ability to manage surging gas demand growth year-to-year.

The Energy Institute figures pointed to Algerian gas production reaching 9.5 Bcf/d in 2022, and despite representing a 2.9% decline in production from the previous year, this was attributable partly to the tapering of OPEC+ cuts in 2022.⁶⁰ Algeria reinjects a portion of its natural gas production for enhanced oil recovery (EOR) purposes, and as a result the need to produce more oil in compliance with its OPEC+ quota therefore reduced its available gas supply. The effects of this were also visible in gas consumption, which fell 7.2% in the same year to 4.3 Bcf/d. However, this does highlight a growing problem for Algeria. Consumption in 2022 represented 45% of its total production, whereas a decade ago in 2012 this ratio was closer to 38%. Supply growth ostensibly represents a strong energy security guarantee for the Algerian gas market in the coming years, but Algeria's relative complacency in managing demand growth holds strong potential to seriously constrain exports (in a similar manner to what has taken place in Egypt). Given the centrality of hydrocarbon exports to the Algerian economy, a limited ability to export gas to key markets holds the prospect to limit economic and thus energy demand growth in Algeria years into the future. Incremental new gas supply may mitigate this impact prior to 2030, but a lack of long-term steps to manage rapidly growing demand will only see this problem worsen going forward.

Electricity and Renewables

As with many other variables examined in this study, renewable energy growth across the region is widely varied despite almost all countries having strong

renewable power potential, especially in the field of solar photovoltaic (PV) power but also, to a lesser extent, onshore and offshore wind. However, according to the International Renewable Energy Agency (IRENA), investment in fossil fuel energy was 28 times higher than investments in renewable energy during 2022, which points to a significant lag in regional investment despite progress during the last decade. From 2015 to 2020, most investment in the region was, unsurprisingly, geared toward upstream oil and gas, with downstream investments running in second and fossil fuel power generation accounting for the remainder. Even though fossil fuel power generation represented the smallest category for investment in the hydrocarbon sector, it was still significantly greater than that for renewable power.

IRENA points to fossil fuel subsidies, which make up 1.56% of MENA GDP on average, as a critical driver of this dynamic.⁶¹ MENA countries' ability to, in most cases, continue providing low-cost or locally produced feedstock for this method of power generation is likely viewed as something of the "path of least resistance" to support energy security despite the long-term implications of highly subsidized energy sales. Yet the same report also notes that 39% of capital directed toward renewable energy investment in the MENA region from 2013 to 2020 originated from international sources. This dependency somewhat blurs the outlook for external financing in the region, which is more likely to impact countries outside the GCC, such as Egypt, where external financing for renewable power has been critical to Cairo's progress developing its capacity. By contrast, Gulf capitals have shown signs of marshalling ever-greater state resources to support energy strategy targets, which include developing renewables and more conventional power generation sources.

Notably, projections from Det Norske Veritas (DNV) do point to exponential regional growth for onshore wind and solar PV for 2020-30, especially in the second half of the decade.⁶² The same figures suggest power generation from renewable sources will reach close to 23.7% of the

60. "Global Landscape of Renewable Energy Finance 2023," International Renewable Energy Agency, February 2023, <https://www.irena.org/Publications/2023/Feb/Global-landscape-of-renewable-energy-finance-2023>.

61. Ibid.

62. "Energy Transition Outlook 2022," DNV, October 13, 2022, <https://www.dnv.com/publications/energy-transition-outlook-2022-232649/>.

region's power mix by 2030. The majority of this is made up of solar PV and wind sources, although around 24% of total renewable power generation in this scenario is represented by hydroelectric power generation.

Similar to that of the wider MENA region, the pace of renewable energy development across the GCC has been somewhat uneven. Saudi Arabia, the UAE, Qatar, and Oman have all made varying degrees of progress in developing renewable power capacity, while Kuwait and Bahrain appear to lag significantly by comparison. Though economic and fiscal positioning also varies across the GCC, its member states all share relatively similar incentives for developing their capacity, not least of which is access to abundant and low-cost solar power resources, in addition to wind resources in the cases of Saudi Arabia and Oman. The development of low-cost solar resources on a scale that displaces as many hydrocarbons from the regional power mix as possible would undoubtedly benefit Gulf producers due to the fact that subsidized electricity sales are still common in the GCC sub-region. The initial cost of developing utility-scale power projects has fallen considerably in recent years, and the lack of any associated fuel cost with this form of power generation would in theory help Gulf policymakers avoid the need to drastically increase the rates at which power is sold to domestic consumers. This would potentially mitigate the need for unpopular subsidy reforms that would translate into increased living costs for citizens long accustomed to artificially low electricity prices.

Additionally, recent adoption of highly ambitious targets for "clean" hydrogen production is very likely to see targets around renewable power capacity increase. While there is substantive, necessary debate around what constitutes "clean hydrogen," for the purposes of this study these will be viewed as both blue and green hydrogen, given the categorization regional producers are expected to use in determining their targets.

Where green hydrogen and its impact on power demand is concerned, a key question surrounding this issue pertains to the ways in which states plan to tender or otherwise plan the development of green hydrogen production capacity. Thus far, it appears likely that Gulf states will tender both renewable power and electrolyzed capacity either in tandem or in an arrangement similar to the hydrogen "valley" or "oasis" framework that was revealed in Abu Dhabi's draft hydrogen strategy during

2022.⁶³ This essentially entails electrolyzed capacity being developed in a designated plot of land that will then be supplied with power and water by captive renewable energy and desalination capacity developed for each specific site. This would provide a clearer outlook for emerging supply sources given that associated infrastructure would function independently from the UAE's power grid and water infrastructure. Though this has not yet been finalized as an official policy, the UAE's updated energy strategy from 2023 does mention hydrogen "oases."⁶⁴

Oman has taken a somewhat similar approach with the development of specific areas of the country designated as regions for green hydrogen production using both wind and solar resources. Its national target of up to 1.5 mtpa in green hydrogen production is expected to require up to 20 gigawatts (GW) of renewable power capacity and 15 GW of electrolyzed capacity being tendered for green hydrogen projects.⁶⁵ Although some awards had been made before the development of its current strategy and regulatory framework, most projects are likely to be developed from auctions held by Hydrom, a state-owned firm that has been set up to manage Oman's nascent hydrogen sector.⁶⁶

As with much of the rest of the region, progress developing renewable energy capacity in North Africa has been uneven. While Egypt and Morocco stand out as regional leaders in deploying renewables with a considerable pipeline of upcoming wind and solar projects, Algeria and Libya have some of the region's greatest solar power potential due to high solar

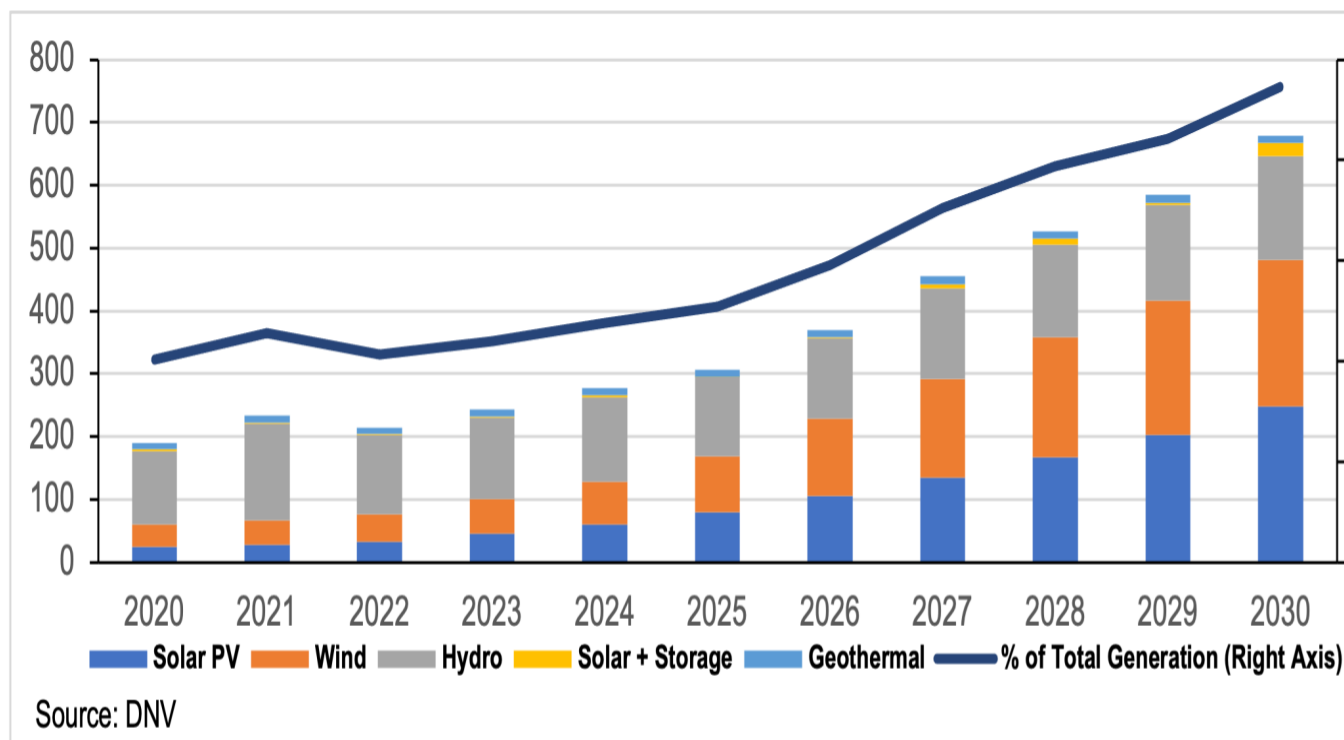
63. "Abu-Dhabi Public Policy on Low Carbon Hydrogen," Department of Energy, Abu Dhabi, 2022, <https://doe.gov.ae/-/media/Project/DOE/Department-Of-Energy/Media-Center-Publications/Policy/Abu-Dhabi-Public-Policy-on-Low-Carbon-Hydrogen.pdf>.

64. "UAE Energy Strategy 2050," Official Portal of the UAE Government, May 7, 2024, <https://u.ae/en/about-the-uae/strategies-initiatives-and-awards/strategies-plans-and-visions/environment-and-energy/uae-energy-strategy-2050>.

65. "Oman's Hydrom Markets Second Hydrogen Auction," MEES, Vol. 66, Issue 36, September 8, 2023, <http://archives.mees.com/issues/2023/articles/62492>.

66. "Hydrom - About Us," Hydrom Oman, Accessed September 27, 2023, <https://hydrom.om/Hydrom.aspx?cms=iQRpheuphYtJ6pyXUGiNqiQQw2RhEtKe#vision-mission>.

Figure 6: MENA renewable power growth (TWh/yr)



irradiance and large surface area, much of which is uninhabited and ideal in many ways for large-scale solar power capacity. In the case of Libya, the country’s long-running conflict and political volatility are clearly the main obstacles to renewable energy growth, in addition to the continued monopoly its state utility holds on the entire electricity value chain (covered in a subsequent section).

As with Algeria’s oil sector, struggles attracting foreign investment are a key contributor to the lack of renewable power capacity in the country, although there are some limited signs of this dynamic changing. In the long term, Algeria sees itself eventually becoming a major supplier of green hydrogen to Europe using its vast solar power potential and existing natural gas pipeline connections to European markets.⁶⁷ Yet these designs should not be viewed as highly likely to materialize in the long term, given questions about the development of global hydrogen markets, the ability of Algerian pipelines to transport hydrogen gas on a technical basis, and most

67. Andrew Farrand, "Renewed Energies: How the EU Can Persuade Algeria to Join in the Green Transition," European Council on Foreign Relations, May 15, 2023, <https://ecfr.eu/article/renewed-energies-how-the-eu-can-persuade-algeria-to-join-in-the-green-transition/>.

importantly, Algeria’s lack of almost any substantial solar or other renewables capacity at the time of writing. Still, if Sonelgaz (the state utility firm) can successfully award and advance the tender it has issued for 2,000 megawatts (MW) in solar capacity, it may signal a jump-start to what has otherwise been an underwhelming renewables program thus far.⁶⁸

Demand Outlook

Overview

On a broad scale, forecasters expect the countries that make up the MENA region to post significant growth in primary energy demand by 2030. Demand for oil products, addressed in the subsequent section, is expected to undergo moderate growth until the end of the decade, but primary energy demand will be driven most strongly by consistent increases in natural gas consumption. Final energy consumption looks set to

68. "Algeria: Chinese Firms Queue Up for Huge Sonelgaz Solar Project," Africa Intelligence, September 25, 2023, <https://www.africaintelligence.com/north-africa/2023/09/25/chinese-firms-queue-up-for-huge-sonelgaz-solar-project,110056863-bre>.

receive much of its support from higher electricity demand, although much of this segment will be accounted for by gas-fired sources of power generation. This section conducts a major review of the anticipated trends in overall demand growth from the MENA region across oil, natural gas, and electricity. As many of the factors driving demand growth differ by sub-region and individual countries, especially in relation to overall scale, a subsequent section will attempt to give a closer review of demand growth on a country-by-country basis.

According to BP's 2023 Energy Outlook, the Middle East was predicted to see primary energy demand growth of less than 1.0% per year for the period 2019-50, which is down from more rapid growth of over 4% per year during the past two decades. Its outlook expects this to result in cumulative primary energy demand growth of between 20% and 30% by 2050.⁶⁹ Yet it should also be noted that none of the scenarios in BP's outlook reveals when it expects most of this growth to take place, obscuring its views on demand growth during the remainder of the current decade relative to that of the 2030s and 2040s.

The International Energy Agency (IEA) anticipates that the region's final energy consumption will grow by 22% between 2020 and 2030, and by segment most of this increase is expected to come from buildings at 37%, followed by industry at 31%, and transportation at 21%. This constitutes an overall rise of 5.1 exajoules, but despite the building segment posting the largest percentage gain during the forecast period, the industrial sector is expected to account for the majority of the increase at 3.0 exajoules, or nearly 60% of total expected growth.⁷⁰ ExxonMobil's energy outlook foresees a fairly similar growth rate, with a 22.8% total increase in final energy consumption by 2030 across the region, a number which is inclusive of 37% growth in electricity demand — significantly more

bullish than the IEA's expectations of a 29% increase.⁷¹ Nonetheless, while the forecasts considered in this study contain divergent outlooks on the sources and levels of growth used in their various scenarios, their views tend to converge around the strong trajectory of electricity demand growth fueled by natural gas and renewable generation sources.

These increases will likely be supported by highly ambitious economic growth strategies across the GCC sub-region, especially in Saudi Arabia and the UAE, combined with anticipated population growth and continued energy subsidies around the MENA region as a whole. Oil demand is expected to continue rising at a more modest pace, with most of its gains attributable to the transportation sector, though expansion in the petrochemicals industry will be a crucial driver. Oil-fired power generation is expected to experience a major decline by 2030, although it will still account for a considerable share of the region's generation mix.

Additionally, investment in renewable energy resources is expected to grow, with solar PV resources and to a lesser extent onshore wind set to post exponential growth during the remaining years of the current decade. While growing power demand will not act as a specific driver of renewable power growth, renewable energy enjoys significantly greater policy support across the region than it has in the recent past, although there are still significant hurdles remaining to many countries exploiting the extent of their regional renewable power potential. In some cases, gains have been slow to materialize even in countries that ostensibly have adequate resources to support additional capacity, and in spite of solar PV boasting some of the lowest generation costs worldwide in the MENA region.⁷² The delay in advancing more significant development of the sector is likely to explain forecasts that do not see renewable power generation growing to account for a major share of the generation mix until after the current decade.

69. "BP Energy Outlook 2023: Insights from the Accelerated, Net Zero and New Momentum Scenarios - Middle East," BP, Accessed September 27, 2023, <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/energy-outlook/bp-energy-outlook-2023-region-insight-middle-east.pdf>.

70. "World Energy Outlook 2022," International Energy Agency, October 2022, <https://www.iea.org/reports/world-energy-outlook-2022>.

71. "ExxonMobil Global Outlook: Our View to 2050," ExxonMobil, August 26, 2024, <https://corporate.exxonmobil.com/sustainability-and-reports/global-outlook#Projectionsandkeytakeaways>.

72. "Levelized Cost of Energy: Regional," Energy Intelligence, January 10, 2024, <https://www.energyintel.com/0000018c-d174-d61c-a7cc-f9f650220002>.

The diversity of governance structures and practices as well as the range of economic circumstances found throughout the MENA region require a differentiated approach to exploring the major factors driving or constraining energy demand growth, as a variety of unique variables will alter demand prospects to the up or downside. On a region-wide basis, however, primary energy consumption is broadly expected to make significant gains by 2030, but growth is likely to be slower than during the previous decade.

On a country-by-country basis in 2023, Iran is the largest total primary energy consumer in the region, though it is closely followed by Saudi Arabia, whose economy is not subject to economic sanctions or the same level of political and economic isolation that Tehran is currently experiencing. Perhaps unsurprisingly, the UAE occupies third place, though its consumption is approximately half that of Iran and Saudi Arabia. Most data point to the vast majority of the region's primary consumption being sourced from oil products and natural gas.⁷³

Throughout the region, the subsidized sale of refined oil products, natural gas, electricity, and water are some of the foremost drivers of energy demand. The ability to provide these subsidies is also closely linked to cheaply available local supply. As the GCC resource base enjoys some of the lowest production costs worldwide, it should perhaps be no surprise then that in an IEA list of the top 15 countries for per capita fossil fuel subsidy spending from 2021, the first five countries are GCC states.⁷⁴ Though the data points to a wide range of subsidy spending, Qatar topped the list at over \$2,300 per person, while all other GCC states (with the exception of Oman, which was not included due to lack of data availability) spent over \$1,000 per person on fossil fuel subsidies. The other MENA countries on the list were Libya, Iran, and Algeria, which ranked 7th, 9th, and 14th, respectively. Outside of the low-cost, abundant resources available in the GCC region, it is no coincidence that these three other producers are

73. "Statistical Review of World Energy," Energy Institute, 2023.

74. Ginar Eskandar, "Missed Opportunities: The Billions Sacrificed Annually to Generate Electricity in the GCC," Middle East Institute (MEI), March 27, 2023, <https://www.mei.edu/publications/missed-opportunities-billions-sacrificed-annually-generate-electricity-gcc>.

countries that, despite some constraints, are typically able to guarantee abundantly available local supply.

Oil and Liquids Demand

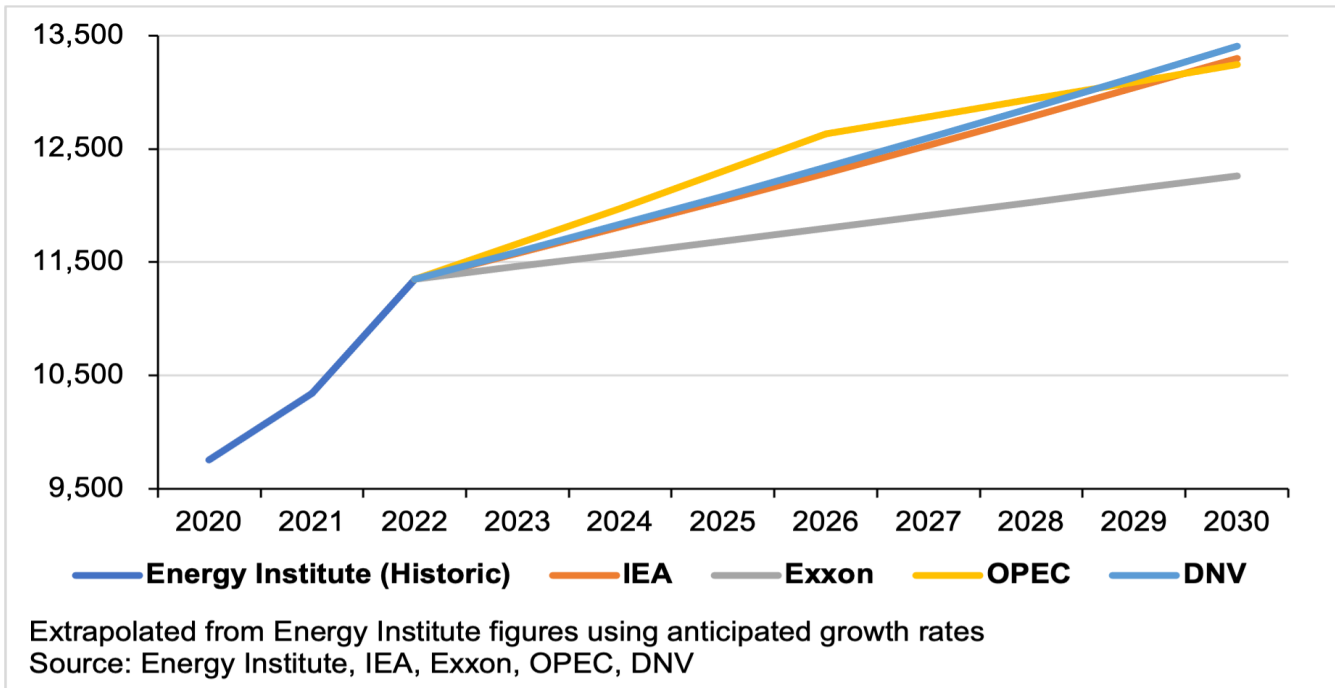
Most forecasts for regional oil demand point to a moderate growth trajectory, which is likely due to an increasing reliance on natural gas for power generation (covered in a subsequent section). However, it does appear likely that regional demand for oil and refined products will continue to grow until the end of the decade in a signal that the region's consumption patterns will likely deviate from global trends that expect to see declining use of oil toward 2030. Along with energy subsidies, the aforementioned growth in regional supply is also likely to support this trend. Although long-term, global market share anchors much of the logic surrounding massive upstream oil growth, regional consumption patterns suggest that security of local supply will doubtlessly represent an added benefit consideration for the MENA region.

Figures from DNV suggest oil demand growth of about 16% from 2021 to 2030, which is relatively consistent with figures from OPEC that currently project 20% growth in oil demand for non-Organization for Economic Cooperation and Development (OECD) states at just under 4.5 million barrels of oil equivalent per day (boe/d) over the course of this decade, although the latter figure includes a wide range of countries outside of the MENA region. It should also be taken into consideration that OPEC generally supports a more bullish long-term view of oil demand than many other forecasters.

IEA projections fall in line similarly, forecasting growth of about 20% for the period 2020-30 at close to 1.5 million bpd across the region. ExxonMobil's outlook is, curiously, much lower than others, expecting just 5.8% in liquids demand growth with 5.6% growth in oil for 2021-30. However, its forecast for natural gas demand growth is much more bullish at nearly 24% over the course of this decade, which may partly explain its less optimistic outlook for oil.

By segment, data from OPEC suggest that of the 2.07 million bpd in demand growth expected between 2021 and 2030, road transportation will account for the majority at about 41%, while petrochemicals will follow at 26%. Critically, the petrochemical segment will also

Figure 7: Oil demand growth forecasts ('000 bpd)



see the most growth during this period, with demand rising 46% from 2021 levels. Although aviation fuel will technically see the largest increase with demand growing 136% by 2030, this segment represents the third smallest share of overall demand by 2030 at just 13%, with only marine bunkers and power generation posting smaller gains. As a result, the likely combination of ongoing subsidies for transportation fuels, population growth, and the impact of industrial growth on demand from the petrochemical sector appear to be key drivers of regional oil demand gains.

Anticipated demand from the road transport sector points to a more bearish prospect for greater electric vehicle (EV) penetration across the region. DNV data points to EV sales in the total MENA region remaining below 1% of market share until the mid-decade point for both passenger and commercial vehicles. Additionally, it is likely that EV sales in the region may be concentrated in wealthier markets depending on the overall affordability of these vehicles as well as access to charging infrastructure. Yet this is not to suggest that EVs do not play a role in the evolving energy mix of the region, as the UAE has projected sales of over 370,000 EVs by 2030 in its 2023 energy strategy update.⁷⁵

75. "UAE Energy Strategy 2050," UAE, 2024.

Figures used in that strategy point to the UAE currently representing the largest regional EV market, making up 1.1% of the total fleet, whereas in Saudi Arabia, a much larger economy and energy consumer, EVs purportedly make up 0.2% of the total fleet, with the GCC-wide figure at 0.4% in 2022. Aspirations on the penetration of EVs relative to the total passenger fleet in the UAE are less clear, as its 2030 target includes both EVs and hybrid vehicles in its goal of 13% of the total fleet, with electric and hybrid buses targeting a similar 14%, and with an aim of reaching 879 charging stations in the same year.

Saudi Arabia is also likely to play a role in regional growth through its investment in the EV industry, with its Public Investment Fund (PIF) having taken a majority stake in Lucid Motors and planning to localize part of its manufacturing operation to the kingdom in addition to launching Ceer, a Saudi EV brand.⁷⁶ Riyadh has also committed to purchasing 100,000 Lucid vehicles over the next decade, likely to be deployed for government use. Recent moves point toward Riyadh

76. Adam Grimes, "Fueling the Future: Saudi Arabia's Race for Electric Vehicle Dominance," Wilson Center, January 26, 2023, <https://www.wilsoncenter.org/article/fueling-future-saudi-arabias-race-electric-vehicle-dominance>.

providing greater policy support for EV deployment across Saudi Arabia as well, with the PIF moving to establish a joint venture with the Saudi Electricity Company (SEC).⁷⁷ The Electric Vehicle Infrastructure Company, which is 75%-owned by the PIF with SEC holding the remaining stake, plans to install over 5,000 fast chargers across the kingdom by 2030. This would represent a significant improvement in the availability of charging infrastructure in Saudi Arabia; while no official data on the number of charging stations exists, one service designed to help EV owners locate chargers indicates that Saudi Arabia had only 101 charging stations installed nationwide as of November 2024.⁷⁸

Yet in the case of Saudi Arabia, Riyadh's plans to localize production of Lucid and Ceer brand EVs raise critical questions around the affordability of EVs. Setting issues with underdeveloped charging infrastructure aside, it is unclear as to how major investments in EV production inside Saudi Arabia may impact Riyadh's policies toward imports of EVs produced elsewhere that may be more affordable than those made locally. Should Saudi policymakers move to limit the range of EVs available to Saudi consumers, overall EV uptake may be reduced in the near term if internal combustion engine (ICE) vehicles are seen as more economical by the majority of Saudis. The scale of Saudi investment in EVs is likely to result in more clearly articulated policies and targets around this segment in the coming years, but such policies will surely need to balance the desire to support local manufacturing against the degree to which it intends to promote EV uptake among its citizens.

Even in wealthier economies like those of the GCC, the cost of EVs remains an obstacle to greater rollout, similar to issues frequently cited in other economies. A study carried out in Kuwait in 2022 found that attitudes toward purchasing an EV generally improved with the possibility of policy support from the government, presumably in the form of a subsidy, that would reduce the cost of buying an EV or that made it comparable

to that of an ICE vehicle.⁷⁹ Other factors affecting attitudes included availability of charging infrastructure as well as the potential availability of EV-designated "fast lanes" on major highways.

Another area that is likely to sustain limited support for oil demand is the power sector. Although DNV figures anticipate demand for oil-fired power to peak before the mid-decade point, the same data indicates that solar PV is expected to overtake oil-fired power by volume only in 2030.⁸⁰ Yet its decline seems assured, with data pointing to a 25% decrease by the end of the decade. Wealthier states, like those in the GCC sub-region, are generally expected to significantly phase down or phase out oil-fired power generation entirely based on current targets. While some liquids use in the power sector may remain, GCC states are generally seen as intent on redirecting liquids toward exports or higher-value sectors, as mentioned elsewhere in the study. Saudi Arabia — the only GCC state whose oil use in the power sector warranted mention in the Energy Institute's review of 2022 data — generated 131.4 terawatt-hours (TWh) from oil in 2022.⁸¹ It appears this figure likely peaked in 2015, and despite some fluctuation, the general trend points toward decline, most likely due to the development of non-associated gas resources and the expansion of renewable power capacity.

Yet the persistent share of oil-fired power in the MENA region's generation mix underscores the ability of regional energy supply dynamics to continue impacting the composition of each demand segment moving forward. Countries that continue to rely on oil-fired power capacity are most likely to do so due to constrained natural gas supplies, as well as the relatively easier process of transporting oil and refined products compared to that of gas and LNG. For instance, although Iranian use of oil-fired power declined since 2020, it remains higher than it did toward the end of the previous decade, when by 2018 generation from oil had declined to 27.6 TWh, versus

77. "Saudi Arabia Forms Company to Develop EV Charging Infrastructure," Arab News, October 8, 2023, <https://www.arabnews.com/node/2387536/business-economy>.

78. "List of Charging Stations for Electric Vehicles in Saudi Arabia," Electromaps, Accessed November 26, 2024, <https://www.electromaps.com/en/charging-stations/saudi-arabia>.

79. Andri Ottesen, Sumayya Banna, and Basil Alzougool, "Attitudes of Drivers towards Electric Vehicles in Kuwait," Sustainability, September 26, 2022, <https://www.mdpi.com/2071-1050/14/19/12163>.

80. "Energy Transition Outlook 2022," DNV, 2022.

81. "Statistical Review of World Energy," Energy Institute, 2023.

31.2 TWh in 2022. Looking ahead, Iran's ability to maintain natural gas production in line with local demand is likely to be an important variable in its oil-fired power use, especially as its ability to export oil remains questionable due to international sanctions. Egypt tells a similar story, as its rising natural gas demand has outstripped its ability to maintain production, leading oil-fired generation to reach a five-year high in 2022 at 17.6 TWh after falling to just 7 TWh in 2020.⁸²

As petrochemical products are expected to be one of the few segments of oil demand that do not see significant declines for decades to come, the region's existing petrochemical capacity and planned expansions are likely to be a key factor propping up regional oil demand to the end of the decade and beyond. Growth in the petrochemical industry is viewed as a primary way that oil-exporting countries can diversify their hydrocarbon sector beyond the extraction and export of crude oil and associated liquids. Demand forecasts from OPEC see ethane, liquid petroleum gas (LPG), and naphtha — all of which are crucial feedstocks for petrochemical production — each experiencing more than 50% demand growth between 2021 and 2035 (nearly 70% in the case of ethane), which is supportive of the assertion that petrochemical production will be a significant driver of demand for oil and other associated feedstocks.⁸³ Advances in crude-to-chemicals (C2C) technology, which is a central area of focus for Saudi Aramco, will also be a supporting segment as the NOC seeks to allocate an additional 1.6 million bpd of its crude production to in-kingdom chemicals processes.⁸⁴ The majority of added petrochemicals production capacity is likely to come from the GCC region, although other projects in Egypt and Algeria may see the North African sub-region also providing greater support for oil demand from the petrochemicals segment.

82. Ibid.

83. "World Oil Outlook 2045: Chapter 3 - Oil Demand," OPEC, Accessed October 1, 2023, <https://publications.opec.org/woa/archive/chapter/112/1784>.

84. Amena Bakr and Freddie Yap, "Aramco Puts Faith in Crude-to-Chemicals Tech," Energy Intelligence, December 20, 2022, <https://www.energyintel.com/00000185-1abe-dbb8-abad-3ebff2510000>.

The need to diversify revenue streams within the oil sector has also led many regional states and their respective NOCs to pursue downstream expansions that place greater emphasis on petrochemical production. Growth in this segment is currently underway — with varied degrees of scale — in Saudi Arabia, the UAE, Qatar, and Oman. These projects, along with upcoming advances in C2C technology, are likely to see the most growth in Saudi Arabia. Notably, figures used by ADNOC in 2023 suggest that its downstream growth will drive most of the UAE's gas demand before the end of this decade.⁸⁵ While this will be covered in more detail in the section specifically examining the UAE's demand drivers and constraints, this data point holds importance for the rest of the region, especially where significant downstream growth is being targeted.

Natural Gas Demand

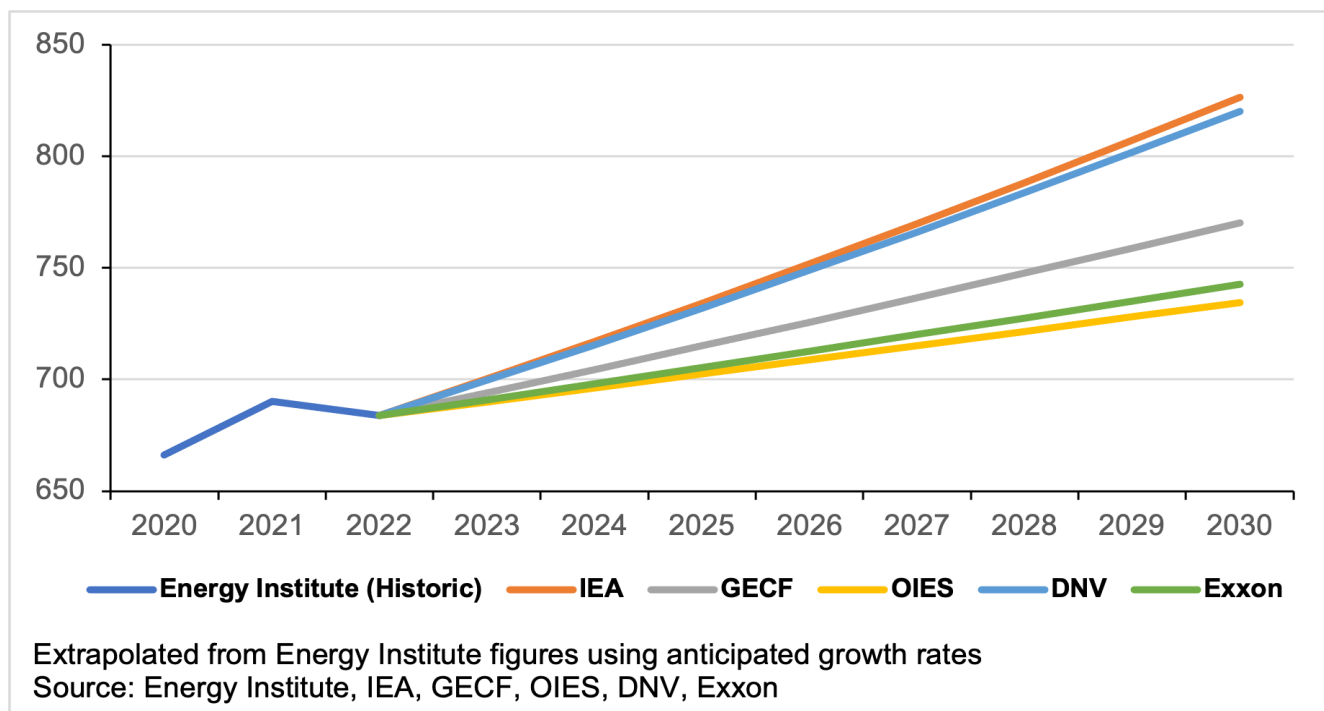
Natural gas is by far expected to experience the most significant demand growth across the MENA region to the end of 2030 and beyond. Support for such an increase will come from continued efforts to provide security of supply as countries develop their domestic resources, turn to LNG imports, invest heavily in expanding the petrochemical industry, and promote other gas-intensive industrial growth. Forecasters expect the MENA region to account for a significant share of global gas demand growth over the course of the next several decades, and projections are generally in alignment.

The Gas Exporting Countries Forum (GECF) expects an average annual demand growth rate of 1.6% per year out to 2050 from a level of 545 bcm in 2021.⁸⁶ This rate points to region-wide demand growth of about 84 bcm by 2030. Notably, GECF figures do not take much of North Africa into account, where Egypt and to a lesser extent Algeria are expected to represent much of this sub-region's demand; North African gas consumption

85. "Prospectus for the Public Offering of Shares in ADNOC Gas Plc," ADNOC Gas, February 17, 2023, https://static.mubasher.info/File.Mix_Announcement_File/313C042E-427E-4F8D-A921-2CC4362AEB0E.pdf.

86. "Global Gas Outlook 2050," Global Exporting Countries Forum, January 29, 2023, <https://www.gecf.org/insights/global-gas-outlook?d=2024&p=1>.

Figure 8: Gas demand growth forecasts (bcm/yr)



represented about 18% of the MENA region’s total in 2022. However, supply constraints may limit Egyptian demand growth in the near term, which will be examined more closely in a section below. As a result, it is distinctly possible that demand growth in Algeria, where gas supplies are much more abundant relative to the size of the local market, will outstrip that of Egypt despite the latter being a significantly larger consumer.

Trends from the previous decade up until 2022 would point to this as a likely outcome, with Energy Institute data indicating 4% average growth in annual gas consumption in Algeria for 2012-22, with Egyptian demand growing just 1.8% per year over the same period.⁸⁷ Egypt’s mid-decade energy crisis — another instance of energy shortages spurred by the lack of local supply — will have seriously affected this figure as actual consumption was significantly limited by rapidly growing demand across the country.

ExxonMobil’s 2023 outlook anticipated a similar growth rate across the region at 1.3% per year, while a recent report by the Oxford Institute for Energy Studies (OIES) is slightly more bearish, anticipating 1.0% annual demand

growth. However, as the OIES considers North Africa separately from the “Middle East,” this may account for the lower figure as its total demand numbers point to much more growth in the North African sub-region than in the Middle East.⁸⁸ This is also a possible explanation for the lower projections from ExxonMobil, as some forecasters tend to group North African countries with the wider African region rather than what is traditionally thought of as MENA. Projections from the IEA, as well as DNV, are somewhat more bullish, expecting annual demand growth of 2.4% and 2.3%, respectively. DNV figures on energy demand for power generation point to gas retaining its dominant position in the sector until 2030, adding 577.6 TWh across the region by the end of the decade and posting 47.2% growth from 2020.⁸⁹ Although solar PV will undergo a higher growth rate, its low starting point relative to gas-fired power explains this and thus makes the two difficult to compare.

88. Mike Fulwood, "A New Global Gas Order? (Part 1): The Outlook to 2030 after the Energy Crisis," Oxford Institute for Energy Studies, July 2023, <https://www.oxfordenergy.org/wpcms/wp-content/uploads/2023/07/NG-184-A-New-Global-Gas-Order-Part-1.pdf>.

89. "Energy Transition Outlook 2022," DNV, 2022.

87. "Statistical Review of World Energy," Energy Institute, 2023.

Ambitious targets from several countries in the GCC region around blue hydrogen and/or ammonia production and exports are currently somewhat more questionable sources of gas demand for a variety of reasons. First, the trajectory of the global hydrogen market is currently the subject of considerable debate, and while clean hydrogen demand is expected to grow, numerous unanswered questions around transportation, its associated costs, and policy support for greater use of hydrogen remain. Europe is expected to emerge as a key demand center for clean hydrogen but is widely expected to provide significantly greater policy support for green hydrogen than its “blue” counterpart produced using natural gas. Additionally, the highly volatile and dangerous nature of hydrogen in its gaseous state currently makes conversion to ammonia the most viable option for long-distance transport, thereby increasing costs for hydrogen importers due to the need to “crack” or convert ammonia back into hydrogen.⁹⁰ Without the need to crack ammonia, this may hold significant potential to aid in the decarbonization of the fertilizer industry, where the IEA estimates 70% of global ammonia production is currently used. Although incentives would be required for significantly greater uptake of clean ammonia than is presently available, lower-cost alternatives will still be needed to support underpinning this demand.⁹¹

These factors may result in blue hydrogen or ammonia production targets in the GCC being downgraded in the long term, but they may also provide low-cost, domestically produced hydrogen that holds the potential to be used in “hard to decarbonize” sectors like oil refining, or in other industrial applications such as steelmaking.⁹² Although most hydrogen projects in the Gulf region are currently geared toward exports to

markets in Europe and Asia, the present lack of major off-takers for these projects may inadvertently contribute to the development of a domestic or regional clean hydrogen market in which Gulf countries supply the wider MENA region. Yet if this type of market should also fail to develop, it will have a significant, downward impact on gas demand in the industrial sector. Estimates from DNV point to the majority of hydrocarbon-based hydrogen supply in the region as being the most likely source of supply this decade, and while hydrogen produced from electrolysis (green hydrogen) will see more significant growth in the 2030s, its overall supply may remain below that of blue hydrogen.⁹³

There is a strong tendency to focus on power demand as the main driver of gas demand growth, and not unjustly so, but too heavy a concentration on this linkage risks ignoring the premise that attempts to diversify the oil and gas sector and wider regional economy (most importantly in the GCC but certainly not limited to this sub-region) into petrochemicals and other forms of production will require significant volumes of natural gas. These are likely to represent some of the longer-term drivers of this demand segment, especially as a greater number of MENA countries continue building out their renewable power capacity or seek to diversify their generation mix by other means. As previously mentioned, gas is expected to remain in a dominant position in the power sector for years to come, but growing deployment of renewable power capacity may mean that the segments most supportive of gas demand would continue to shift with time.

Electricity Demand and Renewable Energy

Demand for electricity is expected to increase substantially across the region to the end of the decade and beyond. The IEA has projected an increase of 448 TWh in total generation between 2020 and 2030, a 37% increase over the course of the decade, along with a 29% total increase in power demand.⁹⁴ Notably, gas-

90. George Thomas and George Parks, "Potential Roles of Ammonia in a Hydrogen Economy," US Department of Energy, February 23, 2006, <https://www.energy.gov/eere/fuelcells/articles/potential-roles-ammonia-hydrogen-economy>.

91. Ibid.

92. Energy Transition Research, "Technology Monitor: Hydrogen Costs Are Falling but Challenges Remain," Energy Intelligence, October 25, 2022, <https://www.energyintel.com/energy-transition-research/?q=hydrogen%20costs%20are%20falling%20but%20challenges%20remain%2F&f1=00000178-ecd9-da34-a57f-fedb8e560001>.

93. "Energy Transition Outlook 2022," DNV, 2022.

94. "World Energy Outlook 2023," International Energy Agency, October 2023, <https://www.iea.org/reports/world-energy-outlook-2023>.

fired power generation is expected to match this rate of growth, accounting for 325 TWh of the anticipated increase, with solar PV generation making up another 79 TWh. As discussed in the previous section, growing power demand will be a critical factor in driving increased usage of natural gas across the MENA region.

However, IEA figures for the MENA region do not include North Africa, essentially guaranteeing a major shortfall in this projection due to the absence of two major power consumers, namely Egypt and Algeria, as well as other regional states. Energy Institute figures indicate that, from 2012 to 2022, Algeria's total electricity generation rose 4.8% (an increase less than 1% larger than its gas demand growth), while Egyptian generation grew 2.1%.⁹⁵ Together, the two generated just below 300 TWh of electricity in 2022, a figure placing them below total generation only in Iran and Saudi Arabia, underscoring that the trajectory of power demand growth in the two countries will almost certainly be a major driver of regional growth, so long as each country is able to ensure security of supply. In 2023, Egypt provided an example of what may lie in store when this extra demand cannot be met, as a late-summer heatwave combined with shortages of adequate natural gas supplies left Cairo scrambling to import fuel oil while imposing power cuts across the country.⁹⁶ The effects of this outcome should not be understated, as extreme levels of heat are not simply a matter of discomfort but can lead to fatalities that may in turn promote civil unrest due to the inability of utility providers to meet demand.

A number of countries across the region, particularly those in the Gulf, have adopted highly ambitious renewable energy targets that somewhat obscure the outlook for the deployment of these technologies in the coming years, primarily due to the fact that, despite some progress, rollout has generally been slow. In 2022, Egypt led the region in renewable power generation, followed by the UAE and Israel. However, this figure is arguably misleading, as 58% of renewable power generated in Egypt during 2022 came from its hydroelectric dams, some of which have been in

95. "Statistical Review of World Energy," Energy Institute, 2023.

96. "Egypt Braces for Prolonged Power Cuts," MEES, Vol. 60, Issue 31, August 4, 2023, <http://archives.mees.com/issues/2018/articles/62369>.

operation since the 1970s and may face difficulty sustaining this output due to water scarcity issues, not the least of which those stemming from its ongoing dispute with Ethiopia over the latter's construction and filling of the Grand Ethiopian Renaissance Dam (GERD).⁹⁷ Egypt has inked a range of agreements to develop new renewable power capacity in the form of both wind and solar generation — which only a handful of countries in the region are able to exploit — but near-term issues with Egypt's economy are likely to cause volatility in its renewable energy outlook, as project finance may become a significant barrier to completing projects and meeting its targets.

Demand for air conditioning or other forms of cooling is also a critical driver of electricity consumption in the region, which pushes regional demand to its peaks during the sweltering summer months. Regional observers are well aware of this phenomenon, but it is often understated by analysts who focus less specifically on the MENA region. Climate change is a critical factor — if not the most critical — that is expected to support growth in this segment as the region's temperatures continue to rise year after year. The level at which they will do so, however, is less certain, and the use of air conditioning should therefore not be understated as a significant segment of power demand. Saudi Arabia and Egypt present two critical examples of this dynamic. Saudi Arabia frequently ramps up direct burning of crude oil in its power sector during periods of peak power demand in the summer months as a result of massive increases in air conditioning use, with the use of crude that could otherwise be exported or directed to downstream operations being a key variable enabling the extra demand to be met.⁹⁸ This is also likely to be a motivating factor in the development of non-associated gas resources, such as the Jafurah field, that will enable Riyadh to meet peak demand with gas-fired plants instead.

97. "Statistical Review of World Energy," Energy Institute, 2023; "Egypt Water Scarcity Expedites Desalination Plans," MEES, Vol. 64, Issue 34, August 27, 2021, <http://archives.mees.com/issues/1918/articles/59994>; Editors, "Aswan High Dam," Encyclopaedia Britannica, Accessed 27 September, 2023, <https://www.britannica.com/topic/Aswan-High-Dam>.

98. "Saudi Oil Burn Falls Year-On-Year for May," MEES, Vol. 66, Issue 29, July 21, 2023, <http://archives.mees.com/issues/2016/articles/62328>.



Photo above: Saudi women in electric vehicle manufactured by US automaker Lucid Group. Photo by Amer Hilabi/AFP via Getty Images.

An additional factor that is not unique to the MENA region but fundamental to its growth is the demand for water, and the impact this is likely to have on development of desalination capacity, particularly in the GCC. Almost all new desalination capacity built in the region uses reverse osmosis (RO) technology, which is more efficient and does not require direct use of natural gas or liquid fuel feedstocks.⁹⁹ Still, RO use requires a significant amount of power, and anticipated population growth will push water demand continually higher across much of the region. Additionally, this demand will not just be accounted for by potable water, but water for industrial uses and other applications that may require desalination.

Demand by Sub-Region

As noted at the beginning of the previous section, individual countries within the MENA region display a considerable variation in drivers of demand growth, which are impacted by the availability and affordability of supply in addition to a range of national policy programs. Whereas the previous section explored the

broadly anticipated trends in overall regional demand growth across oil, natural gas, and electricity, this section will take a country-by-country approach to these growth patterns to provide a more granular focus on key demand drivers at the national level. This will provide further detail on factors supporting or inhibiting growth in major demand centers, in addition to using a geographic focus to highlight areas where the overall trajectory of demand growth is less certain.

Gulf Cooperation Council and Iraq

As in some other parts of the MENA region, overall energy demand in the GCC enjoys significant support from generous state subsidy programs, which themselves benefit from access to low-cost domestic resources. As the GCC will lead regional supply growth for the remainder of the decade, subsidized consumption points to a near-guarantee that the Gulf states will make some contributions, if not the most substantial, to primary energy demand across the region.

Economic growth is mostly cyclical and closely linked to global oil markets, and revenue from energy exports supports subsidies on other commodities, most critically food products, which have also supported strong population growth among local populations.

99. Department of Reverse Osmosis, Saudi Water Authority, Accessed September 27, 2023, <https://swcc.gov.sa/en/ResearchInstitute/ReverseOsmosisDepartment>.

Additionally, a major influx of foreign workers bolsters energy demand, and expatriates benefit from indirect subsidy spending due to transportation fuels and electricity being sold at below-market rates, even in countries such as the UAE, where utilities charge higher rates for consumption by non-citizen residents.

Additionally, incremental growth in the availability of natural gas supplies, covered in the previous section, is likely to displace oil demand on a significant level due not only to the displacement of crude oil for power generation but also to the gradual phase-out of liquid fuels in the power sector. Even with demand for water supplies expected to grow significantly, which will in turn require further expansion of water desalination capacity, it is likely that both natural gas and nuclear power (in the case of Saudi Arabia and the UAE) will continue to account for a greater share of the region's power generation mix, thus offsetting considerable oil demand growth.

The GCC is likely to follow the broad expectation of natural gas and renewable power generation leading demand growth across much of the region. While some setbacks will doubtlessly appear at various points in time due to unforeseen factors, the GCC region's overall fiscal position makes it quite likely that this sub-region's major energy consumers will shift away from oil-fired power generation more successfully than many of their peers elsewhere in the MENA region. As noted in a previous section, NOCs in the GCC sub-region are devoting significant amounts of capital spending to development of natural gas resources, and the strong fiscal position and creditworthiness of Gulf states will enable the expansion of gas-fired power generation where necessary, as well as investment in more efficient (and thus capital-intensive) forms of gas generation.

Much of the same logic may be applied to the outlook for renewable power development due not only to the aforementioned fiscal strengths of many GCC states, but also to the strong policy backing renewable energy targets are receiving from governments. Further, the development of renewable resources holds a strong energy security component for many GCC states. In the case of the UAE, further deployment of utility-scale solar plants (in addition to use of nuclear power generation) is helping to decrease the need for pipeline gas imports from Qatar, which currently satisfy

around 25% of the UAE's annual demand. For Saudi Arabia, greater use of renewables in its power mix will ostensibly help to displace the burning of crude and refined oil products in its power sector, which are sold to generators at below-market rates and would fetch exponentially higher prices were these volumes to be exported instead.

Saudi Arabia

Primary energy consumption in Saudi Arabia is second only to that of Iran, which has a significantly larger population and whose overall prospects for demand growth are far less clear. The kingdom was the fastest-growing economy in the G20 during 2022 thanks to high oil prices, and major investments in economic diversification initiatives will require massive amounts of energy regardless of their outcome.¹⁰⁰ The upstream expansion being carried out by Saudi Aramco will ensure abundant supplies of refined products for the Saudi population in the years to come, and it is likely that Saudi Arabia will be a major contributor to the increases in oil demand expected to come from the transportation segment, as well as via its designs to support greater deployment of crude-to-chemicals technology discussed in a previous section. Yet the kingdom's plans to grow its upstream gas production capacity are arguably positioned to serve as an anchor for its future economic growth, given both its centrality to the petrochemicals industry as well as its availability at low cost to supply cheap electricity to its citizens. Further, pooling low-cost gas with more expensive unconventional resources from the Jafurah project and elsewhere will help keep the cost of gas consumption in Saudi Arabia low, allowing Riyadh to supply key industries with low-cost feedstocks that will place them at a distinct advantage compared to global competitors in regions where natural gas is less abundant and more expensive.

Industrial demand, population growth, and by extension power demand growth are likely to be the key supporting factors in Saudi Arabia's increases in natural gas demand. As previously outlined, these factors are expected to be well-met by strong state support for investment in

100. "IMF Executive Board Concludes 2023 Article IV Consultation with Saudi Arabia," International Monetary Fund, September 6, 2023, <https://www.imf.org/en/News/Articles/2023/09/05/pr23302-saudi-arabia-imf-exec-board-concludes-2023-art-iv-consult>.

domestic resources, especially in the realm of non-associated gas production. Industrial demand will receive much of its support from expanding petrochemicals production, which relies heavily on gas-based feedstock. Although Saudi Aramco has reiterated its target of 11 mtpa of blue ammonia production by 2030, the outlook for this target faces significant headwinds due to reported challenges in signing long-term offtake agreements for prospective blue ammonia exports.¹⁰¹ Still, there are a range of potential uses for blue hydrogen as a means of decarbonization, particularly in oil refining applications, that may see adoption of domestic clean hydrogen use that is currently unaccounted for.

Additionally, the aforementioned expectations around a growing population together with industrial demand will likely result in concurrent increases in water demand. This will likely require construction of new water desalination capacity, and while there have been ambitious plans floated to power desalination processes with renewable energy, most Saudi desalination capacity is powered directly by oil or natural gas, where thermal processes are used, or by electricity generated from hydrocarbons in the case of RO technology.

Riyadh's target of running its power sector on a 50:50 split between natural gas and low-carbon energy sources by 2030, along with anticipated increases in power demand, will see gas consumption increase significantly. Yet this is contingent on Saudi Arabia meeting specific targets in expanding its use of renewable and nuclear power, where there is considerable potential for goals to shift. Saudi renewable power usage is currently low; data from IRENA places total installed renewables capacity at just 0.5% of total capacity in 2022, and while Saudi Arabia has tendered projects that would expand this exponentially, progress in this regard has a record of lagging behind stated goals.¹⁰² Energy Institute data suggests that generation from renewables in 2022 stood at 800 gigawatt hours (GWh), compared to 401.6 TWh of generation nationwide.¹⁰³

101. Rafiq Latta, "Saudi Arabia Reaffirms Commitment to Hydrogen," Energy Intelligence, May 11, 2023, <https://www.energyintel.com/00000188-0b75-d863-ad8e-db7d7e710000>.

102. "Renewable Energy Statistics 2023," International Renewable Energy Agency, July 2023, <https://www.irena.org/Publications/2023/Jul/Renewable-energy-statistics-2023>.

103. "Statistical Review of World Energy," Energy Institute, 2023.

Further, the timeline around Saudi Arabia's expected development of nuclear power generation is obscured by political factors.¹⁰⁴ Though ongoing talks with the US reportedly include prospective civilian nuclear assistance, Riyadh insists that it holds significant deposits of uranium and is highly likely to view domestic enrichment as a prime opportunity for economic diversification that simultaneously bolsters its energy security, a measure that would create friction with Washington's policy around nuclear technology transfers. Although Section 123 of the US Atomic Energy Act does not categorically prohibit enrichment as a precondition for cooperation, its civil nuclear agreement with the UAE contains a provision enabling Washington to terminate the deal if Abu Dhabi engages in enrichment activity.¹⁰⁵ Yet it is well established that Riyadh is entertaining proposals for assistance from other countries, namely China, that would not require it to forego ambitions around domestic uranium enrichment.¹⁰⁶ To be sure, none of these sticking points are likely to see Riyadh abandon its nuclear ambitions. To the contrary, the establishment of a Saudi civilian nuclear program is a matter of "when" not "if," but the question of timing will still have a considerable impact on the kingdom's nuclear sector.

Saudi Arabia's population is expected to grow by about 12% by the end of the decade, although exogenous factors may play a role in this process.¹⁰⁷ In contrast to the rest of the GCC region, Saudi nationals outnumber expatriates. If expectations around economic growth in Saudi Arabia do not meet their potential, this may slow population growth somewhat, but it is highly unlikely to result in a reversal of this trend.

United Arab Emirates

Primary energy consumption in the UAE is lower than that of Saudi Arabia by several orders of magnitude, but it remains the third-largest consumer in the region and one of the most energy-intensive economies worldwide,

104. Muhammad al-Madhaji, "Saudi Arabia's Nuclear Ambitions: US Apprehensions and China's Allure," Wilson Center, December 13, 2023, <https://www.wilsoncenter.org/article/saudi-arabias-nuclear-ambitions-us-apprehensions-and-chinas-allure>.

105. "Prospectus," ADNOC, 2023.

106. Madhaji, "Saudi Arabia's Nuclear Ambitions," Wilson Center, 2023.

107. Databank, "Population Estimates," World Bank, 2023.



Photo above: Offshore drilling platform at Aramco's Manifa oilfield, Saudi Arabia. Photo by Simon Dawson/Bloomberg via Getty Images.

and its consumption of most forms of energy is only set to grow. Energy Institute figures show that total liquids consumption in the UAE grew by 13.8% for 2012-22, which is second only to Egypt across the MENA region.¹⁰⁸ While its consumption of natural gas has actually fallen in recent years, this is not as a result of an overall decline in energy consumption. Although GDP growth is forecast to moderate toward the mid-decade point after a windfall year of high oil prices in 2022 that pushed Emirati growth to 7.4%, its economic progress is expected to remain solid.¹⁰⁹ The UAE remains a preferred investment destination in the GCC sub-region, and although it faces increasing competition from nearby Saudi Arabia, its strong record of attracting foreign investment is likely to serve it well for the remainder of the decade, pointing to limited downside risks in energy demand growth.

Natural Gas in the UAE

The UAE represents something of a unique case within the GCC sub-region as its natural gas demand is expected

to be much more moderate than the rest of the region, despite continuing to rise. This is mostly influenced by its status as the only regional state to develop nuclear power capacity. Data from the Energy Institute points to a 1.3% decline in UAE gas consumption during 2022, which is mostly attributable to startup of nuclear reactors at the Barakah power plant, where its fourth and final reactor began commercial operations in late 2024.¹¹⁰ However, demand drivers in the UAE are unique compared to the rest of the region, and bear closer examination as its early signs of success in managing its supply and demand balance may be viewed as worthy of emulation.

Figures used by ADNOC Gas in its initial public offering (IPO) prospectus from 2023 are likely to provide considerable insight into the outlook for gas demand in the UAE.¹¹¹ Though the data is sourced from Wood Mackenzie, its use by ADNOC likely points to some degree of accuracy given ADNOC's own insight into the UAE's gas market. The prospectus states that gas demand in the country is expected to grow at a

108. "Statistical Review of World Energy," Energy Institute, 2023.

109. "Regional Economic Outlook: The Middle East and Central Asia," International Monetary Fund, May 2023, <https://www.imf.org/en/Publications/REO/MECA/Issues/2023/04/13/regional-economic-outlook-mcd-april-2023>.

110. "UAE's Barakah Nuclear Power Plant's Unit 4 Starts Operations," Zawya, September 5, 2024, <https://www.zawya.com/en/business/energy/uaes-barakah-nuclear-power-plants-unit-4-starts-operation-ywksnri1>.

111. "Prospectus," ADNOC, 2023.

rate of 0.5% year-on-year until 2040, well below the average of the wider MENA region. Using this growth rate to extrapolate from Energy Institute data points to UAE demand reaching just 7.07 Bcf/d by 2030, an increase of less than 1 Bcf/d from 2022 levels.¹¹² Notably, it bears re-emphasizing that this is likely due to significant volumes of gas being displaced from the power sector by nuclear and solar generation sources, meaning that, while new industry operations such as LNG exports will require substantial volumes of gas, demand will grow less significantly in the UAE because this gas is simply being redirected from demand segments that no longer require the same volumes.

Notably, ADNOC sees its own operations as the largest source of gas demand growth nationwide between 2020 and 2040, with the majority of this being accounted for by growing LNG exports beyond 2027, when its greenfield LNG plant at Ruwais is scheduled for completion. As a result, the UAE's demand for gas is projected to undergo a compound annual growth rate (CAGR) of 5.3% during the forecast period. It is somewhat debatable as to how much of this growth truly constitutes an increase in Emirati "demand" for natural gas given that the entirety of this figure will go toward exports.¹¹³

Yet other growth from ADNOC outside its LNG business still represents the second-largest growth segment; for the period 2023-27, Wood Mackenzie sees ADNOC-owned ventures posting a CAGR of 14.8%, which is almost entirely attributable to downstream operations at the Ruwais refinery as well as other petrochemical projects expected to start operating during this period, such as the Borouge IV project.¹¹⁴ ADNOC-linked demand is then expected to plateau prior to the end of this decade and remain relatively flat out to 2030 and beyond.

Gas demand in the power sector is expected to decline by around 2.6% per year during the forecast period cited in the prospectus. It is likely that the bulk of this decline will take place after the final Barakah reactor is fully operational. The UAE's growing renewable power sector is also likely to displace gas-fired power, with IRENA estimating renewable capacity at 9.4% of total installed

capacity in 2022, with more growth projected.¹¹⁵ Data from UAE utilities suggests that nuclear and renewable power use represented slightly more than 25% of total power generation in 2022, though the overwhelming majority of this figure comes from nuclear power.¹¹⁶ Although the trajectory of gas demand in the UAE is highly likely to maintain a downward trend, much of this will be contingent on economic growth during the remainder of the decade, which is expected to keep power demand growing. It is important to note that despite its advances in nuclear and renewable power, Abu Dhabi still envisions natural gas to account for 50% of its power mix by 2050, pointing to an enduring role for gas in the UAE's power sector over a multi-decade period.¹¹⁷

Outside of the power sector, demand will be driven primarily by industrial growth. As in Saudi Arabia, diversification of the oil sector will see an expansion in petrochemicals capacity growth. Figures cited by ADNOC Gas (sourced from Wood Mackenzie) point to industrial gas demand sustaining a CAGR of 1.3% between 2020 and 2040, with steel and cement production representing the largest growth segments. Aluminum production is still expected to make up the largest single source of demand at 53% of the total volume, but demand here is expected to stay somewhat flat during the two-decade period, with a CAGR of only 0.3%.¹¹⁸

The UAE is also targeting 25% of the world hydrogen market by 2030, although prospects for the size of this market by the end of the decade vary significantly. Additionally, the production of blue hydrogen in the UAE is expected to be dominated by ADNOC, which produces most of the country's gas and is targeting a significant expansion of its carbon capture and storage (CCS)/carbon capture, utilization, and storage (CCUS) capacity.¹¹⁹ The most recently released Emirati energy

112. "Statistical Review of World Energy," Energy Institute, 2023.

113. "Prospectus," ADNOC, 2023.

114. Ibid.

115. "Renewable Energy Statistics 2023," IRENA, 2023.

116. Jamie Ingram, "UAE Eyes Economic Gains from Industry Decarbonization," Arab Gulf States Institute in Washington, July 25, 2023, <https://agsiw.org/uae-eyes-economic-gains-from-industry-decarbonization/>.

117. "UAE Energy Strategy 2050," UAE, 2024.

118. "Prospectus," ADNOC, 2023.

119. Risk Research, "Risk Review: United Arab Emirates," Energy Intelligence, August 16, 2022, <https://www.energyintel.com/risk-research/?q=risk+review+united+arab+emirates>.

strategy expects ADNOC's blue hydrogen production to reach 400,000 tons per year by 2030, but as mentioned in previous sections of the study, prospects for development of the global clean hydrogen market, as well as local consumption of clean hydrogen, are currently highly uncertain.

Yet with economic policy in the UAE heavily centered on localization of key industries, its ability to continue attracting investment as one of the region's preferred destinations will be contingent on keeping pace with competition from neighboring Saudi Arabia.¹²⁰ Thus far, the UAE appears on course to remain a robust competitor with regional peers seeking to attract foreign investors.

Electricity and Renewable Energy in the UAE

The UAE is widely known as one of the most active developers of renewable energy capacity in the GCC sub-region, along with its status as the only MENA country currently generating nuclear power other than Iran. The impacts of its nuclear power use on gas demand were discussed in the previous section, and its updated energy strategy targets a power mix of 50% natural gas, 44% renewables, and 6% nuclear power by 2050, pointing to an enduring role for gas, in addition to healthy demand for renewable power from its green hydrogen production targets.¹²¹ However, its strategy of developing hydrogen "oases" is likely to rely on captive solar PV capacity that is not connected to the grid in Abu Dhabi or elsewhere, meaning that this capacity is unlikely to be counted toward total power mix targets.

Demand forecasting from the Emirates Water and Electricity Company (EWEC) and the Dubai Electricity and Water Authority (DEWA) indicate that, between customers of the two utilities, peak power demand is expected to grow nearly 40% by 2030, based on 2022 demand levels.¹²² This is not a comprehensive figure for

the entirety of the UAE, but it does account for demand growth in Abu Dhabi, Dubai, and some growth in other emirates, which represents the vast majority of the UAE's power market.

Data from EWEC shows that considerable increases will come from linking ADNOC's onshore operations to the Abu Dhabi grid, followed by ADNOC offshore operations in 2026. Perhaps surprisingly, these operations are not the largest demand segments anticipated in EWEC's 2030 forecast. ADNOC's operations are expected to undergo the most growth of any segments with the exception of the industrial sector, where demand is expected to grow 126% from 2022 to 2030, likely a reflection of the UAE's goal to significantly expand its domestic industrial base by the end of the decade and beyond. Still, industry will represent only 11% of peak electricity demand for EWEC in 2030. The distinction of highest expected demand belongs to the residential sector, followed closely by the commercial sector, which together will represent 53% of peak demand by 2030.¹²³ While this figure arguably points to lofty expectations around commercial growth and activity in the regions served by EWEC, it also ostensibly indicates continued high per capita energy consumption in the UAE given the amount of demand expected to come from the residential sector. Population growth forecasts for the UAE are at the lower end of expectations for the region, with only about 8% total growth anticipated over the course of this decade. With the UAE being one of the most energy-intensive economies in the region, demand growth from the residential sector likely points to a bullish economic outlook along with limited expectations for major reforms targeting demand management among this segment.

Although DEWA does not provide a similar, segment-by-segment breakdown of its expectations around peak demand growth, its data points to a similar dynamic; in 2022 the residential segment consumed 15.7 GWh of electricity.¹²⁴ This made up just over 30% of DEWA's total demand, which was second only to the commercial sector at 25.7 GWh. While the UAE

120. Hudhaifa Ebrahim, "Saudi Arabia, UAE's Rivalry Intensifies in Race for Foreign Investments," *Jerusalem Post*, June 4, 2023, <https://www.jpost.com/business-and-innovation/all-news/article-745121>.

121. "UAE Energy Strategy 2050," UAE, 2024.

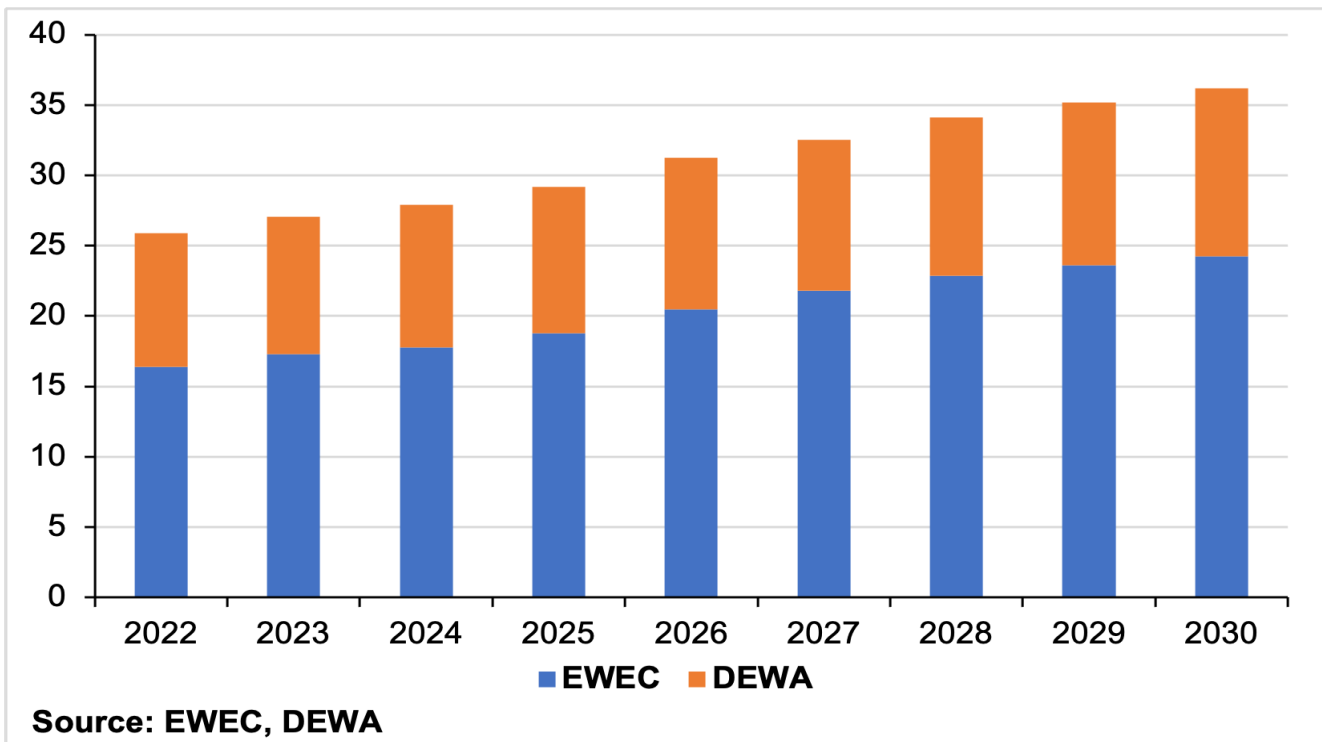
122. "Statistical Reports 2022," Emirates Water & Electricity Authority, Accessed November 14, 2024, <https://www.ewec.ae/en/media/statistical-reports>; Dubai Electricity & Water Authority, "DEWA Sustainability Report 2022," Government of Dubai, June

14, 2024, <https://www.dewa.gov.ae/en/consumer/sustainability/sustainability-reports>.

123. "Statistical Reports 2022," EWEA, 2024.

124. "DEWA Sustainability Report 2022," Government of Dubai, 2024.

Figure 9: Peak demand forecast from major UAE utilities (GW)



has considerable aspirations around clean energy and industrial decarbonization, few of the energy policies articulated at the national or emirate level reveal a major range of measures to develop an economy that will be significantly less energy-intensive than it is in its current state.

Both the intent and the ability of the UAE to continue delivering growth in the renewable power sector are quite reliable, given strong state support for renewable power growth, creditworthiness of state-owned firms involved in developing this capacity, and a track record of tendering and completing utility-scale solar projects. As discussed in the section above, the outlook for power demand in the UAE is strong, with Emirati authorities envisioning renewable sources as playing a growing role in satisfying this demand. Should the UAE take somewhat of a similar approach to Oman in its strategy to develop a local green hydrogen industry, it seems reasonable to assume that it will likely succeed in attracting both foreign and domestic investment to the nascent sector. However, global hydrogen demand prospects, as mentioned elsewhere in the study, remain a perennial factor that clouds the outlook for the scale of renewable energy development that is likely to take place for green hydrogen production.

Qatar

The gas and power markets in Qatar are most relevant to the country's energy consumption due to both its small size and dependence on gas for energy-intensive industries located at key strategic industrial hubs. Similar to the UAE, Qatari demand for natural gas fell by 8.3% in 2023, likely due in part to the startup of the al-Kharsaah solar project. Qatar does have a sizeable petrochemical industry that is set to add capacity during the current decade, although the scale of its total growth is likely to be smaller than in neighboring states like Saudi Arabia and the UAE, due partly to QatarEnergy's plans to locate further petrochemical projects outside of Qatar.¹²⁵

Petrochemicals have been highlighted as an important component of regional gas demand growth, and in this regard Qatar is not much of an exception. As a gas-rich country, the potential uses of its resource base extend beyond the expansion of its LNG export

125. "Chevron Phillips Chemical and Qatar Petroleum Announce Plans to Jointly Develop U.S. Gulf Coast Petrochemical Project," Chevron Phillips Chemical, July 9, 2019, <https://www.cpchem.com/media-events/news/news-release/chevron-phillips-chemical-and-qatar-petroleum-announce-plans-jointly>.

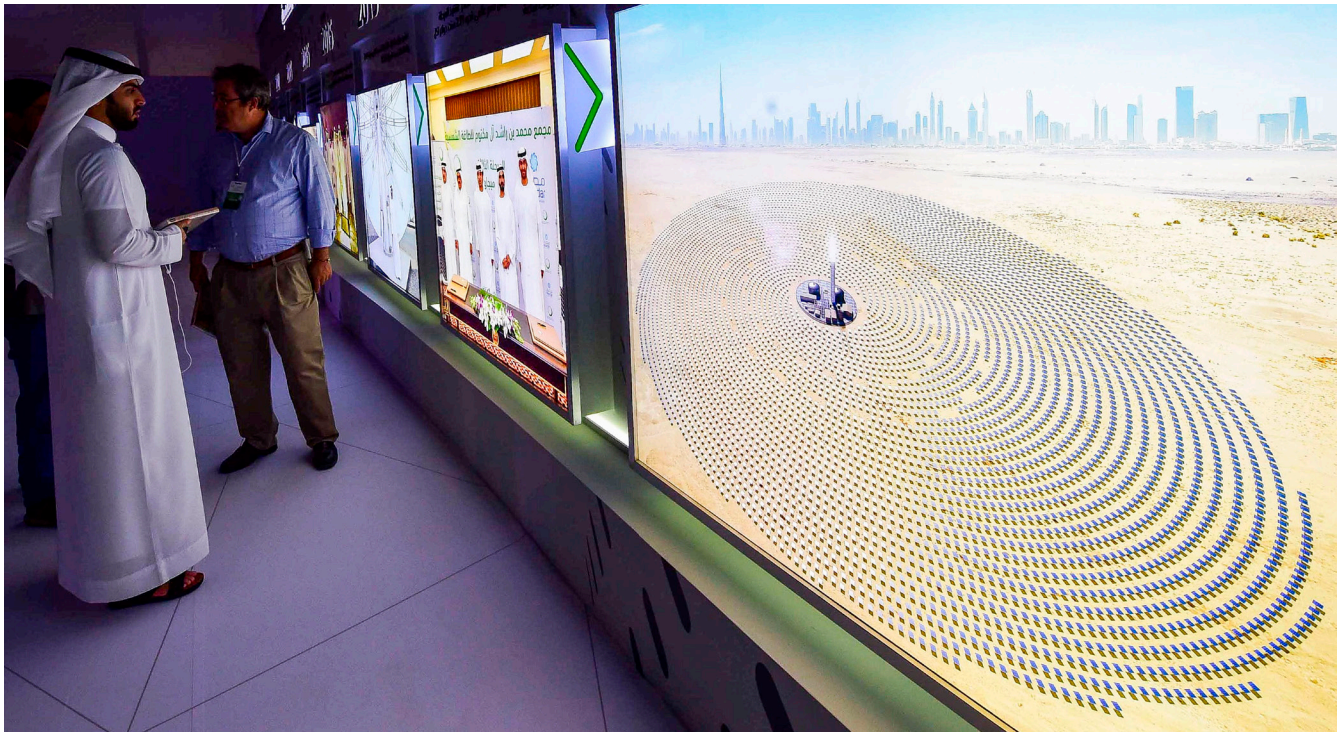


Photo above: Mohammed bin Rashid Al-Maktoum Solar Park in Dubai. Photo by Stringer/AFP via Getty Images.

capacity. This likely led to the early-2023 FID on a 2.08 mtpa ethane cracker, which will be the largest in the MENA region once completed.¹²⁶ This project currently represents the only expansion taking place in the Qatari petrochemical industry, though the size of the country's existing capacity and its upcoming addition are not to be understated. Looking ahead, petrochemicals and other industries, such as metals, are more likely to represent significant segments of gas demand growth than the power sector.

Despite the high energy intensity of the Qatari economy, its overall power demand is fairly small when compared to the rest of the region. Energy Institute figures point to roughly 50 TWh of total power generation in Qatar during 2022, with only Oman and Morocco posting lower generation figures (aside from smaller countries represented in aggregate groups).¹²⁷ As a result, displacing gas from the power mix by using renewable power technology is a much easier task for Qatar than for larger, neighboring economies with significantly higher, growing power demand. QatarEnergy became wholly responsible for

126. "Qatar Takes FID on Huge Petrochemicals Complex," MEES, Vol. 66, Issue 2, January 13, 2023, <http://archives.mees.com/issues/1988/articles/61704>.

127. "Statistical Review of World Energy," Energy Institute, 2023.

developing renewable power capacity in Qatar after its acquisition of Siraj Energy and its subsequent conversion into QatarEnergy Renewable Solutions, which is now working to develop two additional solar projects at industrial hubs in Qatar.¹²⁸ This will be covered in greater detail in a subsequent section, yet the integration of Qatar's gas-focused NOC with a fledgling, national renewables champion is likely to provide the dual benefit of freeing up gas resources for export or use in higher-value applications, such as petrochemicals or blue ammonia production, while also allowing QatarEnergy to use renewable power as a method of decarbonizing its operations.

QatarEnergy Renewable Solutions is also one of the lead developers for the country's flagship blue ammonia project, which will see added gas supply and CCS capacity in Qatar combined to support Ammonia-7, a 1.2 mtpa project at the Mesaieed industrial hub.¹²⁹ Assuming a conversion factor of 33 MMBtu per single ton of ammonia applies to this project, production at nameplate

128. "Qatar Inaugurates Al Kharsaah Solar PV Plant," MEES, Vol. 65, Issue 42, October 21, 2022, <http://archives.mees.com/issues/1977/articles/61444>.

129. "QAFCO-7 Announcement," Qatar Fertilizer Company, Accessed September 27, 2023, <https://www.qafco.qa/content/qafco-7-announcement>.

capacity would result in an additional 1.12 bcm per year of additional gas demand in Qatar when Ammonia-7 starts commercial operations in early 2026.¹³⁰ Yet as mentioned in the introductory section on natural gas, the commercial prospects for these ventures are currently very unclear, and thus the total contribution made to Qatari gas demand cannot currently be treated as an absolute certainty.

Oman

Primary energy consumption in Oman is among the lowest in the Gulf region, with the exception of Bahrain, with a key difference between the two being that Bahrain is arguably not a major energy producer, while Omani liquids production exceeds 1 million bpd and the country is the second-largest LNG exporter in the GCC. Oman's efforts to develop unconventional gas resources have provided it with a surplus of gas (although this is complemented by minor imports from Qatar via the Dolphin pipeline).¹³¹

Additionally, Oman is likely to be one of the strongest regional drivers of renewable energy demand due to its highly ambitious targets to produce between 1 and 1.5 mtpa of green hydrogen by 2030, in addition to tripling its installed capacity of renewable power by 2025. Yet among GCC states, Oman may be the most likely to face significant demand constraints, depending on the trajectory of oil markets for the remainder of the decade. Muscat has made considerable progress with fiscal reforms that have led to several upgrades to its creditworthiness, which will be a boon to its efforts to attract greater international investment. The results of the first phase of its hydrogen awards program attracted considerable interest from a range of international players and may be an early indication that its reform packages are beginning to bear fruit.¹³²

130. Wen-yuan, Huang, "Impact of Rising Natural Gas Prices on U.S. Ammonia Supply," Economic Research Service, US Department of Agriculture, August 6, 2007, <https://www.ers.usda.gov/publications/pub-details/?pubid=40460>.

131. "Statistical Review of World Energy," Energy Institute, 2023.

132. James Marriott, "Oman Starts Work on 500MW Solar in Bid to Triple Renewables Capacity by 2025," MEES, September 22, 2023, <https://www.mees.com/2023/9/22/power-water/oman-starts-work-on-500mw-solar-in-bid-to-triple-renewables-capacity-by-2025/87bc0ca0-5943-11ee-8738-633552e54d972>.

Despite this, the country remains structurally vulnerable to significant oil market fluctuations in spite of the fiscally prudent approach it has taken since the ascent of Sultan Haitham, and in the face of windfall oil revenues in 2021 and 2022.¹³³ While it does not encompass the entirety of Oman's vulnerabilities, oil exports continue to be its main source of revenue and are by far overexposed to Chinese demand; in 2022 just under 73% of its total crude and condensate exports were destined for China.¹³⁴ This proportion has more or less remained constant for nearly a decade, and as of 2023, Chinese demand prospects looked uncertain.¹³⁵ A major downturn in Chinese oil demand along with competition from discounted Iranian and Russian barrels could have an outsized impact on Omani revenues against which producers with more diversified marketing strategies are better insulated. This type of downturn, or other exogenous shocks to the oil market, hold strong potential to derail economic growth in Oman and keep demand growth subdued for the remainder of the decade.

Iraq

Over a decade of conflict has, perhaps nearly incalculably, stunted Iraq's economic potential and preserved the dominance of the state in most economic affairs. A combination of these factors along with its high oil production capacity and generous subsidy policies have kept its oil demand growing consistently. Its upstream sector fared considerably better during the country's most recent period of conflict, due in large part to the industry's concentration in Iraq's southern region, which was not an epicenter of conflict at the time. In fact, it managed to post production growth throughout the late 2010s before production fell drastically with the OPEC+ cuts in 2020 that were

133. Robert Mogielnicki, "Oman Gets Economic Policymaking Right – For Now," Arab Gulf States Institute in Washington, June 13, 2023, <https://agsiw.org/oman-gets-economic-policymaking-right-for-now/>.

134. "Oman Annual Exports (Crude/Co, by Destination Country)," Kpler Terminal, Accessed 27, September 2023, <https://terminal.kpler.com/analytics/flows?mZones=677&products=1370&granularity=years&split=destination--country&dates=all>.

135. Ben Cahill, "Oil Market Tightens but China Looms Large," Center for Strategic and International Studies, August 22, 2023, <https://www.csis.org/analysis/oil-market-tightens-china-looms-large>.

implemented in response to worldwide pandemic-induced demand destruction.¹³⁶

Iraqi gas demand growth is likely to remain constrained for much of the rest of this decade. This is not due to a lack of existing demand for gas in Iraq, but the combination of a lack of gas processing capacity and poor access to regional imports has led to a consistent supply shortfall, and as a result power cuts have become a regular feature of life across Iraq when electricity demand peaks during the country's incredibly hot summer months. Sadly, Iraq likely possesses most or all of the gas resources it would need to satisfy its domestic demand, but a lack of adequate processing capacity means that almost half of the gas Iraq's oil sector operators produce at the wellhead is flared. Data from the World Bank's Global Gas Flaring Reduction Partnership ranked Iraq as the largest flaring country in the MENA region and the second only to Russia worldwide in 2023.¹³⁷

The current Iraqi government has prioritized several projects that would add gas processing capacity of roughly 1.5 Bcf/d by 2027.¹³⁸ The TotalEnergies Gas Growth Integrated Project, mentioned in the earlier supply outlook section, would contribute to over one-third of these anticipated processing gains. While this would not eliminate Iraq's gas deficit, completion of these projects would constitute welcome progress in addressing both the shortfall in much needed gas supply, as well as the negative environmental impacts of gas flaring, which have caused cancer rates to skyrocket among populations that live close to flare stacks.¹³⁹ Additionally, political and security risks remain a perennial factor impacting the Iraqi oil sector,

136. "Statistical Review of World Energy," Energy Institute, 2023.

137. Global Gas Flaring and Methane Reduction Partnership, "Global Gas Flaring Tracker Report," World Bank, Accessed September 27, 2023, <https://www.worldbank.org/en/programs/gasflaringreduction/global-flaring-data>.

138. Risk Research, "Iraq: Budget Raises Aboveground Risks, but Clarifies Kurdish Oil Exports," Energy Intelligence, July 13, 2023, <https://www.energyintel.com/risk-research/?q=Iraq%3A+Budget+Raises+Aboveground+Risks%2C+but+Clarifies+Kurdish+Oil+Exports>.

139. Merlyn Thomas and Owen Pinnell, "Father Challenges BP at Meeting after Son's Death," BBC, August 27, 2023, <https://www.bbc.com/news/world-middle-east-65414431>.

and as a result the timely completion of these projects – or their completion at all – is something that cannot be estimated, let alone guaranteed, thus making the trajectory of gas demand growth within Iraq highly uncertain. While Iraq has also turned to imports from neighboring Iran to make up for its shortfall, Iran's own supply constraints and issues with international sanctions have regularly led Tehran to cut gas flows to Iraq, further constricting demand growth in both gas and power.¹⁴⁰ The ability to expand processing capacity currently remains the most distinct variable in determining potential outcomes for Iraqi gas demand growth, and by extension much of its ability to provide electricity to its population.

North Africa

Egypt

As the region's most populous country, which is expected to grow by just under 15 million people out to 2030, it might stand to reason that Egypt would be expected to make a significant contribution to the region's demand growth during the course of the 2020s. However, repeated instances of energy shortages in the country raise serious questions about this dynamic, and these may place constraints on demand growth. The natural gas shortages Egypt experienced at the time of writing, which in turn led to scheduled blackouts across the country, are occurring almost a decade after a collapse in natural gas output forced Egypt into similar circumstances in the early 2010s.¹⁴¹ Although oil output in Egypt has recovered somewhat after years of decline, its natural gas production has again contracted despite its record levels of imports from nearby Israel. The growth in power demand mentioned in a previous section is somewhat responsible for the blackouts, although other factors in Cairo's management of its gas sector, in addition

140. Bilal Wahab and Dennis Ross, "Iraq's Power Problem (Part 2): Implications of the New Oil-for-Gas Deal with Iran," Washington Institute for Near East Policy, July 19, 2023, <https://www.washingtoninstitute.org/policy-analysis/iraqs-power-problem-part-2-implications-new-oil-gas-deal-iran>.

141. Aidan Lewis and Hatem Maher, "Egypt Blackouts Become Symbol of Malaise a Decade after Sisi's Rise," Reuters, August 16, 2023, <https://www.reuters.com/world/middle-east/egypt-blackouts-become-symbol-malaise-decade-after-sisis-rise-2023-08-16/>.

to structural factors in the Egyptian economy, are converging to exacerbate the current crisis.

Despite insufficient gas supply to meet power demand, Egypt technically sits on a surplus of generation capacity.¹⁴² To this end, Cairo has announced plans to import fuel oil that it will direct toward use in its power sector, but this alternative comes at its own cost as fuel imports are typically paid for in dollars, which may further erode Egypt's already plummeting foreign exchange reserves.¹⁴³ While it no longer imports LNG via an FSRU at Ain Sokhna, resumption of LNG imports would present similar issues for Egypt due to the need to secure long-term supply agreements or spot LNG sales that would also likely require dollar-denominated transactions, thus illustrating the advantages of domestic resource development and management.

This is likely to be a heavy contributor to sentiments expressed to the author by one figure within the Israeli gas industry, who was far more enthusiastic on prospects for greater exports to Egypt (and to a lesser extent, Jordan) than on the potential for exports to European gas markets.

Power demand is not the only factor playing a role in Egypt's gas supply crunch. Without a doubt, supply constraints are a primary factor; natural gas consumption fell 2.3% in 2022 after rising to record levels in 2021. In the same year, gas production also fell by 4.9%, making a supply shortfall the most likely reason for a lower level of demand and logically extending its decline into 2023 when LNG exports were halted. Other structural factors also play a role; gas is sold to power generators at a very low rate of \$3.00 per MMBtu, while prices for other forms of industrial consumption are considerably higher. Residential consumers, however, have also represented a fast-growing segment of gas demand due to the expansion of Egypt's gas grid. Rates per cubic meter depend on overall levels of consumption, but households that consume 60+ cubic meters in a month pay just \$0.12 per unit.¹⁴⁴

142. "Egypt Blackouts Led by Heatwave, Gas Shortages," MEES, Vol. 66, Issue 30, July 28, 2023, <http://archives.mees.com/issues/2017/articles/62356>.

143. "Falling Israel-Egypt Gas Flows Put Squeeze On LNG Exports," MEES, Vol. 66, Issue 33, August 18, 2023, <http://archives.mees.com/issues/2020/articles/62437>.

144. "Natural Gas Pricing," Gas Regulatory Authority of Egypt, Accessed November 5, 2023, <https://www.gasreg.org.eg/natural->

The fact that Egypt once again finds itself in a similar situation to what it experienced a decade ago raises questions about the trajectory of its demand growth. Constraints will emerge when supplies become scarce or unaffordable, but this makes it unclear which fuel source it will use to replace supply losses, if it is able to do so at all. Adding to the uncertainty around this outlook is the complicated nature of the gas industry in the Eastern Mediterranean, which, despite considerable enthusiasm and significant potential as a major-gas exporting region, has made relatively minimal progress to this end. Egyptian demand prospects could receive a considerable boost from IOC plans to link producing assets or yet-undeveloped discoveries, such as the Aphrodite field in Cyprus, to existing offshore gas infrastructure in Egypt.¹⁴⁵

While these designs primarily revolve around linking these assets to Egyptian liquefaction capacity, further integration with the region's gas markets would hold the potential to secure incrementally greater volumes for Egypt's domestic market. Ironically, Cairo has a precedent of diverting gas supplies away from its LNG plants at Damietta and Idku in order to service domestic demand when gas supplies tightened, and this has been a major obstacle to its ability to pursue this type of integration. Nonetheless, Chevron's recent development plan for the Aphrodite field still envisions tieback to Egyptian gas infrastructure. Although this plan is currently in limbo because it was rejected by the government of Cyprus (where the Aphrodite field is located), it does signal that IOCs still see Egypt as the most likely pathway for gas exports from the region, despite some of these aversions.¹⁴⁶

Algeria

Most outlook questions for Algeria revolve around its rapid gas demand growth, which has been mentioned at

gas-pricing/.

145. "Cyprus' Aphrodite: More Talks, More Delays," MEES, Vol. 66, Issue 49, December 8, 2023, <http://archives.mees.com/issues/2037/articles/62803>.

146. Stuart Elliot, "Aphrodite gas project faces renewed uncertainty after Cyprus plan rejection," *S&P Global*, May 10, 2024, <https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/natural-gas/051024-aphrodite-gas-project-faces-renewed-uncertainty-after-cyprus-plan-rejection>.

various points in the study already. Although incremental supplies from new upstream investment appear to be materializing, the degree to which this impacts Algeria's ability to continue to heavily subsidize gas consumption without sufficient exports to fund said subsidies is a critically important question for the governance of its energy sector. Algiers' stated goal of developing 15,000 MW of solar power by 2035 is deeply questionable on its own, and even if this target can be reached, the absence of any real demand management measures raises further questions as to how much any new renewable capacity may offset gas demand.¹⁴⁷

Despite holding some of the most abundant gas reserves in North Africa and being well-positioned as an alternate supplier to European markets seeking to wean themselves off Russian volumes, Algeria's demand growth still has significant potential. This is largely due to the fact that its domestic gas demand is highly subsidized, with Algiers having limited success in attracting renewable power investment, in addition to seeming mostly uninterested in efforts to manage demand growth. One Algerian regulator projects a staggering 25 bcm per year in demand growth between 2020 and 2030. Perhaps even more shockingly is that this estimate represents a downside scenario, with even higher figures for base-case and upside projections.¹⁴⁸

As noted in the case of the UAE, downstream growth in Algeria is likely to drive a significant portion of demand. However, most projects are managed by Sonatrach, which has become notorious for delays to downstream projects. As a result, the inability to complete these projects on schedule (or at all, as may be the case for the long-stalled Hassi Mesaoud refinery) could act as a potential constraint to demand growth.¹⁴⁹ As an example, TotalEnergies' decision to withdraw from the Arzew petrochemicals project, despite new commitments to upstream investment in the country,

147. Farrand, "Renewed Energies," ECFR, 2023.

148. "Country Profile: Algeria," Energy Intelligence, Accessed May 22, 2023.

149. "Spotlight Algeria: Future of Hassi Massaoud Refinery in Doubt as Samsung and Técnicas Reunidas Clash with Sonatrach," Africa Intelligence, April 14, 2023, <https://www.africaintelligence.com/north-africa/2023/04/14/future-of-hassi-massaoud-refinery-in-doubt-as-samsung-and-tecnicas-reunidas-clash-with-sonatrach,109945300-eve>.

signal some of the ways in which the mixed appeal of Algeria's investment environment may serve as an obstacle to greater gas demand.¹⁵⁰

Morocco

As with several of its other North African peers, Moroccan primary energy consumption is on the lower end of the region as a whole. It does not produce significant amounts of oil or gas, a critical factor in its demand outlook given that the country has no real ability to make substantial investments in a domestic natural resource base that would provide a higher degree of energy security on the same scale as many other regional states. Yet what Morocco does share with peers in the MENA region is a strong potential for use of renewable energy resources. The evolution of Morocco's energy consumption is likely to be among the most interesting in the region to 2030 and beyond, given its unique energy mix and lack of a domestic resource base aside from its renewable power potential.

While most of the region's renewable energy potential is limited to the solar segment, Morocco boasts much higher wind power potential. Energy Institute data indicates that 13% of Morocco's total 41.2 TWh of electricity generated in 2022 was sourced from its wind farms, making it the regional leader in wind power generation. Its Integrated Wind Project was completed in early 2023 with the start-up of a new 300 MW wind farm at Boujdour.¹⁵¹ The somewhat uncertain trajectory of renewable capacity growth in Morocco will be discussed below, but its national targets point to a strategy that sees renewables making up 52% of total installed power generation capacity by 2030, with wind and solar each representing 20% of this figure.¹⁵²

Yet despite the region's uneven distribution of wind potential, Morocco might not be as much of an anomaly as it may seem. Across MENA, data from DNV actually points to wind power already surpassing solar as a source of generation and maintaining this lead for the rest of the decade. Although its relative

150. Ibid.

151. "Morocco Steps Up Pumped Storage & Transmission to Balance Growing Renewables," MEES, August 4, 2023, <http://archives.mees.com/issues/2018/articles/62379>.

152. "Statistical Review of World Energy," Energy Institute, 2023.



Photo above: Port of Algiers, Algeria. Photo by Dukas/Universal Images Group via Getty Images.

success in developing wind resources might suggest that Moroccan demand will result in much greater penetration of wind power in the country for the remainder of the decade, economic factors may prevent it from sustaining the renewable power momentum it has developed thus far. External financing has been key to the development of its renewables sector, leaving some open questions about where the remainder of its planned \$12 billion spend on new power capacity from 2021-25 may come from, as according to IRENA 61% of these investments target growth in the renewables sector.¹⁵³

Critically, another aspect of Morocco's energy mix that makes it stand out from the rest of the region is that the majority of its power is generated at coal-fired plants. Notably, its use of coal-fired power generation has increased in recent years, reaching its highest-ever level in 2022. Figures from DNV expect regional coal demand to grow until 2026, before declining 13% by 2030, suggesting that the region's demand will

peak early in the second half of the decade.¹⁵⁴ While Morocco is often lauded for making strong progress increasing the share of renewables in its power mix, its use of coal singles out the importance that states are likely to place on energy security in the coming years, either due to initial challenges with the intermittency of renewables or the cost of imported fuels and their impact on state finances.

Despite notable progress in the renewables sector, coal accounted for 68.5% of total power generation in 2021, with renewables (including hydropower) at 21% of total generation in the same year. Hydropower may constitute a significant area of growth in Morocco, with one estimate asserting that its resources may hold an additional 31 GW in potential. However, further hydropower development in Morocco is likely to be limited; its 2030 renewable energy targets envision hydro accounting for 12% of its installed power capacity, and in 2021 it exceeded this proportion at about 16%.¹⁵⁵ One component of Moroccan energy

153. "Planning and Prospects for Renewable Power: North Africa," International Renewable Energy Agency, January 2023, <https://www.irena.org/Publications/2023/Jan/Planning-and-prospects-for-renewable-power-North-Africa>.

154. "Energy Transition Outlook 2022," DNV, 2022.

155. "Morocco Gets Delayed Renewables Boost but Coal Burn Rises in the Meantime," MEES, Vol. 66, Issue 7, February 17, 2023, <http://archives.mees.com/issues/1993/articles/61835>.

strategy that may provide greater insight on its demand growth prospects is that Rabat is seeking to reduce its national energy consumption by an ambitious 20% by 2030 as a part of its National Energy Efficiency strategy.¹⁵⁶

Regional Outliers and Wildcards

There are also a range of regional states whose near-term demand growth prospects show varying degrees of certainty on their overall direction of travel but are vulnerable to a number of either internal or external factors impacting this demand that have demonstrated considerable volatility in the past decade. Constrained oil and gas supplies or lack of investment in the power sector and development of renewables are symptoms of wider systemic issues that are often unique to individual countries, although subsidized sales of energy and artificially driven demand are often a common thread resulting in a lack of energy security.

Libya

Libya is treated as something of a regional outlier in this study due to the fact that it has more or less been in a state of de-facto partition since the outbreak of civil war in 2011. Although the Tripoli-based government of Prime Minister Abdul Hamid Dbeibeh enjoys more international recognition than its eastern rival, in addition to the backing of the United Nations, Gadhafi-era general Khalifa Haftar commands considerable support from armed factions in the country's east as well as international support from countries such as Russia and the UAE. Remarkably, Libya has maintained oil production capacity in excess of 1 million bpd since the war broke out, but the overwhelming dependency of the Libyan state and economy on oil revenues has naturally led to the politicization of the sector. This has resulted in periodic blockades that lead to shut-ins at key oilfields or halt operations at coastal oil export terminals. These shut-ins have also had acute impacts on available energy supplies, as in 2020 when oil blockades led to widespread blackouts and fuel shortages, and reemerged later in 2024.¹⁵⁷

156. "Planning and Prospects," IRENA, 2023.

157. Angus McDowell, "What's behind Libya's Oil Shutdown?" *Reuters*, August 28, 2024, <https://www.reuters.com/world/africa/whats-behind-libyas-oil-shutdown-2024-08-28/>.

Despite abundant reserves of oil and gas,¹⁵⁸ primary energy consumption in Libya is low. Neither its oil nor gas demand rose to quantities significant to merit an individual line item in the Energy Institute's review, which included the country with "Other North Africa," essentially meaning it was grouped in with Tunisia, another relatively minor consumer. However, EIA data for 2021 places Libya at 0.65 quadrillion Btu. Over a decade of conflict has prevented any significant reform to either the country's subsidized fuel sales or the General Electricity Company of Libya (GECOL), which, according to a 2023 report by the Center for Strategic and International Studies (CSIS), is one of the last remaining total monopolies on a national power sector in Africa.¹⁵⁹

Impacting the outlook for Libya's demand growth is the fact that its economy is almost entirely dependent on the oil sector. While prospects for upstream investment have improved somewhat recently, with several IOCs lifting force majeure declarations on investment and Italy's Eni signing new development deals, the country has essentially no plans to develop its small, underperforming non-oil sector.¹⁶⁰ Libyan GDP growth is excluded from historic and projected data used in previous graphics due to the fact that the base effect from the lifting of oil blockades leads growth to appear deceptively high; GDP growth in 2021 was 28%, followed by an estimated contraction of 12.8% in 2022 due to the lifting and subsequent reimposition of oil export blockades.¹⁶¹ Without significant political progress, the circumstances that have allowed oil blockades to take place remain fundamentally unresolved. The reunification of the Central Bank of Libya (CBL) in 2023 initially warranted cautious optimism, but disputes over governance of the

158. Tala Ramadan, Ayman Werfali, and Ahmed Elumami, "Libya's Central Bank Reunifies after Almost a Decade," *Reuters*, August 20, 2023, <https://www.reuters.com/world/africa/libyas-central-bank-reunifies-after-almost-decade-2023-08-20/>.

159. Will Todman, Jon B. Alterman, and Lubna Yousef, "Powering Recovery: Reform, Reconstruction, and Renewables in Conflict-Affected States in the Arab World," Center for Security and International Studies, March 3, 2023, <https://www.csis.org/analysis/powering-recovery-reform-reconstruction-and-renewables-conflict-affected-states-arab-world>.

160. Tom Daly, "Eni Restarts Libya Exploration After Nine-Year Break," *Energy Intelligence*, August 3, 2023, <https://www.energyintel.com/00000189-bc07-dbd9-a9df-fc5fc15b0000>.

161. "Regional Economic Outlook," IMF, 2023.

bank in 2024 resulted in yet another set of short-term blockades. Significant political progress is required for the outlook on Libyan energy demand to be clearer.

Lebanon

Where many of the countries situated in the Levant are on the receiving end of considerable attention in the geopolitical space, particularly Syria and Lebanon, the three countries covered in this section are on the lower tier in terms of their primary energy demand. In Syria, this is largely attributable to more than a decade of internal conflict and civil strife, while Lebanon represents a somewhat more complex case as years of issues with governance and economic stagnation have exerted acute downward pressures on its overall energy demand.

To some extent, Lebanon represents a case in which accurate or even approximate data on its energy consumption and demand is difficult to ascertain due to grey and black-market activities such as government corruption and smuggling. The country is in the midst of its worst economic crisis since the establishment of the modern Lebanese state, and it is now dealing with the devastating impact of several months of war between Israel and Hezbollah. As a result, its outlook is highly unlikely to improve in the near term and Lebanon's contribution to overall energy demand in the MENA region by 2030 is likely to be negligible. As it stands, the IMF does not currently have projected GDP figures for Lebanon, nor does it even publish estimated figures for the country's performance beyond 2020.

One of the most high-profile recent examples of the impact of corruption on Lebanese energy demand was the "dirty fuel" scandal, in which fuel oil destined for two major power plants in Lebanon was blended with cheap additives that damaged the country's power infrastructure while much of the original fuel intended for delivery was sold illegitimately.¹⁶²

The scandal came to be viewed as illustrative of both the problems in Lebanon's market and the wider issues with corruption that plague much of the country beyond the energy sector. Widespread and lasting power outages are common throughout the country, whose power sector has no independent regulator and

operates with Electricite du Liban (EDL), the national utility, holding a near-total monopoly over the entire electricity value chain. This not only exposes the sector to the country's endemic corruption but essentially places it under the remit of a state-owned body that lacks the capacity to manage its operations. Data on Lebanon from the IEA stops after 2020 (similar to IMF data), but by all indications electricity consumption peaked in 2019 at 19.5 TWh before declining to 16.4 TWh.¹⁶³ While demand figures for 2020 generally indicated declines across segments for a multitude of countries, it is highly probable that Lebanese consumption has not surpassed this figure in the last several years for which no data is available.¹⁶⁴

However, the lack of reliable power supplies in Lebanon has reportedly led to a notable increase in use of off-grid solar generation, most likely in the form of rooftop solar panels. A similar trend emerged in Yemen after the first several years of its civil war in the 2010s due to the lack of reliable fuel supplies for both power and agricultural uses (see next section).¹⁶⁵ Yet, as with other indicators on Lebanon, data scarcity remains a perennial issue. IRENA figures indicate that off-grid solar use in Lebanon totaled 7.89 MW, although this was essentially reached by 2018, suggesting that recent increases have probably not been captured.¹⁶⁶

Although moves to eliminate fuel subsidies in 2021 might have been welcome developments in other countries throughout the region, this resulted in a surge in fuel prices that placed significant strains on Lebanese consumers. While the precise impact of this policy change is unclear due to lack of reliable data, economic conditions that include the collapse of the Lebanese pound mean that further downward pressure on demand for refined products is highly likely. According to data analytics firm Kpler, imports of liquid

163. "Lebanon - Countries & Regions," International Energy Agency, Accessed September 27, 2023, <https://www.iea.org/countries/lebanon>.

164. Ibid.

165. Laure Delacloche, "How Solar Power Is Keeping Lebanon's Lights On," BBC, May 17, 2023, <https://www.bbc.com/future/article/20230517-how-solar-power-is-keeping-lebanons-lights-on>.

166. "Planning and Prospects," IRENA, 2023.

162. Todman, "Powering Recovery," CSIS, 2023.

fuels into Lebanon prior to 2020 were fairly consistent, averaging about 163,000 bpd from 2017-19 (data availability from this source began in 2017) before beginning a precipitous decline from 2020 onwards, dropping below 100,000 bpd in 2022 and averaging around 98,000 bpd in the first six months of 2023.¹⁶⁷

In mid-2023, exploration at Lebanon's Qana gas prospect began in offshore Block 9, which is operated by TotalEnergies (35%), Eni (35%), and QatarEnergy (30%). Drilling activity was made possible by a highly praised maritime boundary demarcation agreement reached with Israel via proxy diplomacy.¹⁶⁸ While the discovery of recoverable, domestic gas resources would in theory hold the potential to bring welcome relief to Lebanon's strained energy sector, members of the Block 9 consortia have expressed a lack of enthusiasm for the Qana prospect. There has been considerable enthusiasm from Lebanese officials that Beirut might join the ranks of other Eastern Mediterranean countries that have discovered commercially viable gas resources within their maritime borders, but for the moment this appears somewhat misguided. Even if exploration yields commercially viable reserves, the country's economic misfortune, corruption and governance issues, and the devastation caused by the recent war make the prospects for developing these resources highly uncertain.

Another effort to support Lebanon's energy security is a US-backed initiative to deliver gas from Egypt (though it will more likely originate in Israel) to Lebanon via a pipeline that transits several regional states, including Syria. As with offshore exploration in Lebanon, however, the outcome faces highly uncertain prospects. Although an agreement was reached between Lebanon, Syria, and Egypt in 2023 to tap unused pipeline capacity that would send gas to the Deir Ammar power plant, Washington's ability to continue backing the initiative is contingent on the terms of a loan from the World Bank to Lebanon. Additionally, a section of pipeline to be used transits Syria, which poses significant challenges for the project's US backers due to potential exposure

167. Ibid.

168. Yousra Samaha, "Rig Arrives to Drill Total Block Offshore Lebanon," Energy Intelligence, August 16, 2023, <https://www.energyintel.com/00000189-fdfb-de73-a1cb-fff35140000>.

to Caesar Act sanctions.¹⁶⁹ Although "in-kind" payments have been proposed as a solution, legislation in the US House of Representatives intended to challenge normalization efforts with Damascus specifically targets this type of transaction in a move ostensibly intended to undermine the initiative, whose primary backer is the Biden administration.¹⁷⁰ In addition, the upcoming change in government in Washington in January 2025 raises further question marks around the initiative.

Iran

For the purposes of this outlook, Iran is viewed as a regional outlier due to years of international sanctions that have stifled economic growth and demand, along with the uncertain outlook for the sanctions regime and Tehran's efforts to build economic links with other sanctioned nations like Russia and Syria.

With some of the largest natural gas reserves in the world, Iranian demand is expected to grow steadily for the rest of the decade. Low domestic gas prices are expected to be a key driver of this, although the security of supply will remain a long-term question despite recent demonstrations that Iran is able to continue developing its own resources in spite of international sanctions. Prior to the US withdrawal from the Joint Comprehensive Plan of Action (JCPOA) – colloquially termed the Iran nuclear deal – TotalEnergies was expected to serve as Iran's main partner in developing Phase 11 of the South Pars gas project. The offshore field that Iran shares with Qatar (where it is known as the North Field) is the largest non-associated gas field in the world, and Tehran was able to beat skepticism that it could complete the project without an international partner when it announced that production began in August 2023.¹⁷¹ Still, continued upstream work at the field is likely to remain a challenge,

169. Yousra Samaha and Emily Meredith, "US Adviser Upbeat About Gas Supplies for Lebanon," Energy Intelligence, March 16, 2023, <https://www.energyintel.com/00000186-e5bf-df95-adaf-fbfc20a0000>.

170. "U.S. to Assess if Egypt to Lebanon Gas Deal Violates Sanctions after Terms Agreed - U.S. Official," Reuters, June 15, 2022, <https://www.reuters.com/business/energy/us-assess-if-egypt-lebanon-gas-deal-violates-sanctions-after-terms-agreed-us-2022-06-15/>.

171. Simon Martelli, "Iran Launches South Pars Phase 11 Alone," Energy Intelligence, August 29, 2023, <https://www.energyintel.com/0000018a-4242-d7bd-a7fb-427b86a90000>.



Photo above: The South Pars gas field in Assalooyeh on Iran's Persian Gulf Coast. Photo by Morteza Nikoubazi/NurPhoto via Getty Images.

with Iranian energy officials admitting as much at the start of production.

As a result, there is a significant likelihood that Iran will remain a supply-constrained gas market up to 2030, and this may prompt Tehran to enact policies aimed at better managing demand growth in the country. Additionally, the prospect of international investment in the Iranian upstream, either by other sanctioned countries like Russia or due to relief from international sanctions, would hold strong potential to reverse many of the constraints and the impacts that continue to loom over the horizon.

Additionally, the outlook for Iran's overall economy is mixed. Although headline indicators paint a somewhat positive picture, other numbers point to a more dire situation. Iranian inflation has remained persistently above 40%, with World Bank 2023 estimates for youth unemployment reaching 23%.¹⁷² While Iran's notoriously low fuel prices have previously supported artificially high demand and even smuggling to neighboring countries,

172. World Bank, "Iran Economic Monitor, Spring/Summer 2023: Moderate Growth amid Economic Uncertainty - With a Special Focus: The Gendered Impact of the COVID-19 Crisis on the Labor Market in Iran," World Bank Open Knowledge Repository, August 22, 2023, <https://openknowledge.worldbank.org/entities/publication/74c96e38-4cfd-4f78-a89e-b60a3c497a7c>.

difficulty sustaining this dynamic has led to cases of extreme violence in previous years.¹⁷³ The policy direction of the Iranian government, therefore, in addition to its ability to maintain supply (prospects for natural gas are more questionable than that of oil), will likely continue pushing this situation toward highly uncertain outcomes, even if this does ultimately ensure strong near-term demand. In addition, a potential change in US policy toward Iran under the incoming Trump administration, especially if it attempts to reimpose its previous "maximum pressure" campaign against Tehran, is another variable that could have a major impact on Iran's economy and its energy demand growth.

Yemen

Like Iran, Yemen is viewed as a regional outlier for the purposes of this outlook due to years of conflict and relatively low overall energy consumption. After nearly a decade of devastating civil war that drew in powerful neighboring countries, the prospects for economic recovery remain unclear. Even prior to the outbreak

173. "Iran Says 230 Killed in November Protests after Petrol Price Hike," Al-Jazeera, June 1, 2020, <https://www.aljazeera.com/news/2020/6/1/iran-says-230-killed-in-november-protests-after-petrol-price-hike>.

of the recent conflict, domestic instability due to its internally fractious politics was a perennial factor in Yemen. It is the poorest country in the region and among the poorest countries worldwide. Consequently, its energy consumption is also the lowest in the region, coming in at 0.1% of regional primary energy consumption in 2021.¹⁷⁴

Curiously, the lack of available fuel supplies as a result of the conflict has led to a significant uptake in distributed solar generation in Yemen for both domestic and agricultural purposes. As previously mentioned, its primary energy consumption is low due to conflict, and while it was similarly depressed prior to the outbreak of war in 2014, consumption plummeted after the conflict began. While the most recent available IEA data on Yemeni energy consumption is from 2020, solar PV had actually outstripped natural gas as a source of electricity generation by 2018 and made up 17% of total power generation by 2020, although oil-fired power still accounted for the overwhelming majority of the generation mix.¹⁷⁵

Conclusion

While renewable power growth is forecast to make significant gains across MENA by 2030, most of the region's countries are expected to remain large consumers of hydrocarbons well beyond the current decade. As in many other regions of the world, national governments can generally be seen as prioritizing the security of supply over climate-related concerns, despite many countries in the region now setting net-zero emissions targets or investing heavily in renewable power programs and other forms of clean energy technology. Concerns over the future trajectory of worldwide energy demand are especially prescient for major hydrocarbon exporting countries, and ensuring national energy security by continuing to develop the domestic resource base is a cornerstone of policies that, somewhat ironically, relate to diversification away from non-oil industries.

For this reason, the GCC sub-region as a whole is likely to have the most reliable trajectory of demand growth across multiple segments. Oil market volatility will remain a major near-term variable for its ability to influence each country's fiscal positioning and the growth of its wider economy, but the presence of ample domestic resources and major investments in their continued development will be critical factors supporting this dynamic. Other major oil and gas producers, such as Algeria, Egypt, and Iraq, face more uncertain prospects for their energy demand due to a somewhat wider variety of factors. However, supply constraints will be a decisive factor for the demand outlook in all three countries, though Algeria's prospects will be more impacted by the degree to which demand growth affects its ability to sustain its market share as an exporter. Finally, among regional outliers, it is distinctly possible that the region's energy outlook may be altered to some degree by either a major resurgence of new demand, or by demand destruction in existing segments. This may materialize in a country such as Libya, but given the scale of its current consumption, Iranian demand would likely be the most influential variable in this critically uncertain component of the regional outlook.

There is a range of areas pertaining to the future of energy demand in the region that warrant further research. One area of exploration that might be most relevant to some of the GCC producers would be scenarios for gas demand in countries that have outlined strong blue hydrogen or ammonia targets, given the repeated uncertainties cited in the study pertaining to the trajectory of demand, especially for hydrogen produced from natural gas instead of renewable energy. Relating to this issue, greater research is certainly warranted on the prospects for domestic hydrogen demand in the Gulf region, especially as a driver of decarbonization in strategic industries whose global competitiveness is vital to the national economy and sustained exports. ❁

174. "International - Primary Energy," EIA, 2023.

175. "Yemen - Countries & Regions," International Energy Agency, Accessed September 27, 2023, <https://www.iea.org/countries/yemen>.



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