Global Energy Monitor

BRIEFING: SEPTEMBER 2023

MENA grows renewables by half but clings to risky hydrogen and gas

Renewables capacity increased by 50% since 2022 and is expected to increase another 50% by 2024. But MENA needs 20 times that capacity to replace existing gas-fired generation.

Summary

The nations of the Middle East and North Africa (MENA) region are poised to gain considerably from a renewable energy transition. By some indicators, this transition may be just around the corner: Since May 2022, these countries[1] have added 6.9 gigawatts (GW) to their operating large utility-scale[2] solar and wind capacities, an increase of 57%. With 9 GW of renewable energy under construction and set to be completed by the end of 2024, this growth rate is on course to continue.

The United Arab Emirates, Oman, and Morocco could each be considered potential renewable leaders in the region by a range of metrics, including number of large utility-scale solar and wind projects brought online, prospective project capacity — whether announced, in pre-construction, or under construction — as well as ambitious renewable energy targets. Along with Egypt and Jordan, these countries have demonstrated the ability to follow through on plans to build out their renewable energy infrastructure.

At the same time, the renewables capacity added in the last year is relatively unambitious compared to the region's peers. South America, a region with a similar population size and GDP, has brought online at least four times as much capacity over the same period (32 GW). Brazil alone contributed over 14 GW of large utility-scale solar and wind.

The region boasts a substantial catalog of prospective large utility-scale solar and wind capacity (361 GW). Yet, over half of the MENA region's prospective capacity is earmarked for green hydrogen production, despite the uncertainty and risk involved with this nascent technology. Nearly half of MENA countries are embracing either green hydrogen or direct energy export in a bid to diversify their economies. While Oman and Morocco appear to be threading the needle by planning sufficient solar and wind projects to meet their domestic green electricity targets, in many MENA countries the focus on green hydrogen may undermine efforts to provide ample domestic electricity access or transition national electricity sectors away from fossil fuels.

And gas is still king. Eighteen of the 23 countries analyzed here, including the three potential regional leaders above, intend to expand their gas and oil

1. For a list of countries considered in this brief see the methodology wiki page.
2. GEM catalogs all solar and wind installations greater than 10 MW in the MENA region. Both "Large utility-scale solar" and "utility-scale solar" are used throughout the text to correspond to such projects.

power plant fleets despite comparable costs of utility-scale solar and wind.

Significant progress is therefore critical in order to dethrone gas. Over 500 GW of additional solar and wind would be needed to replace the generation of existing oil and gas power plants in the region. Still, when the questionable hydrogen and export projects subtracted from the region's prospective utility-scale solar and wind capacity, 130 GW remain that, if realized, could make significant progress in displacing oil and gas use for electricity.

Key takeaways

- The MENA region brought 6.9 GW of utility-scale solar and wind projects online in the past year, increasing its operational renewables capacity by half. However, this amount is less than a quarter of the capacity South America has operationalized over the same timeframe.
- Prospective renewables capacity in the region increased by 292 GW, a 400% year-over-year growth since 2022 — enough to power Saudi Arabia, Egypt and Qatar. However, more than half (60%) of these projects are for green hydrogen production or direct export. Green hydrogen may offer a means of economic diversification for these oil and gas-dependent nations, but carries higher risk and will not contribute to decarbonizing local electricity usage.
- All but two of the 23 countries in the region have increased their plans for wind and solar power in the past year, with eight countries having at least three times more prospective capacity than twelve months prior.
- Oil and gas power plants still provide over 90% of electricity within the region. It would take roughly 500 GW of additional solar and wind capacity to match the amount of power generated by oil and gas.
- The region's current solar and wind operating capacity, plus the 9 GW expected to come online in the next year, is still 20 times smaller than what is needed to replace the existing gas and oil-fired power plants in the region. MENA would have to add 19 GW of wind and solar every year in order to fully decarbonize its electricity sector by 2050.

MENA has brought 7 GW of utility-scale solar and wind online in the past year and added plans for nearly 300 GW more

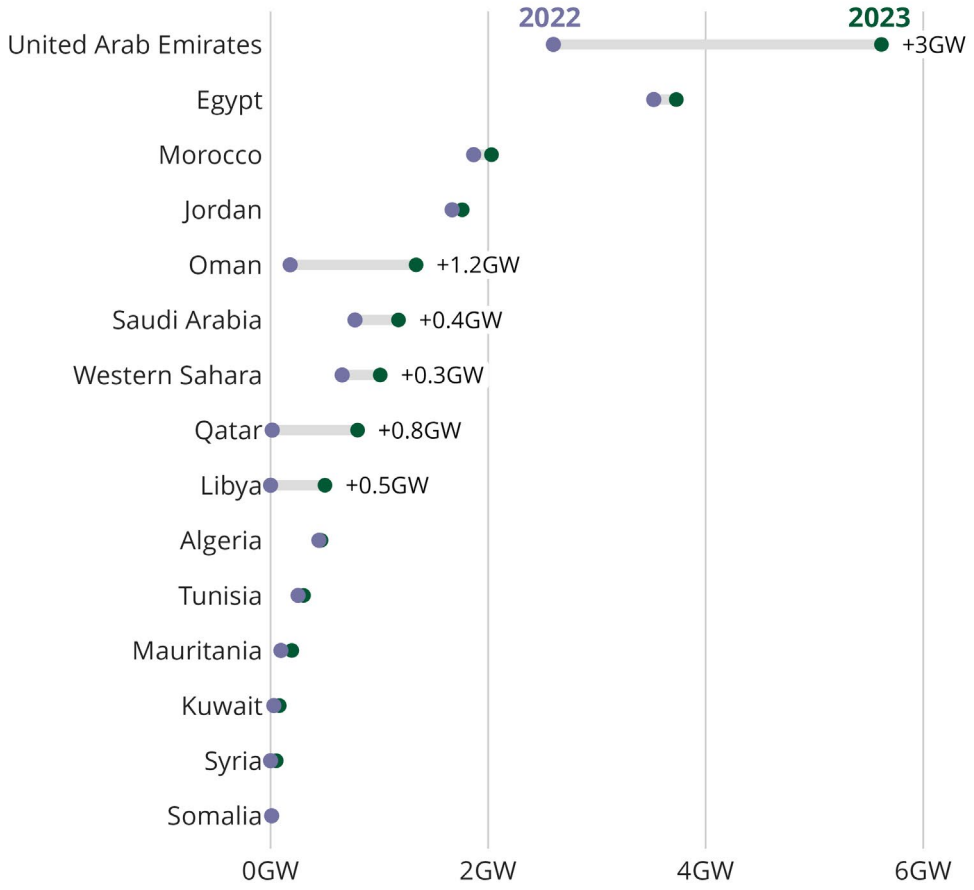
The MENA region has deployed 6.9 GW of large utility-scale solar and wind projects over the past year, growing their operating renewables capacity by 57%. A further 9 GW of renewables are currently under construction with announced start dates before the end of 2024; if those projects are realized in time, the current growth rate will continue. These nations also boast a 400% year-over-year growth of utility-scale solar and wind prospective projects.

Since May 2022, the MENA countries brought online 6.7 GW of utility-scale solar capacity. This figure is perhaps unsurprising; as the host of the 2023 United Nations Climate Change Conference, the United Arab Emirates achieved the largest overall gains by far, launching itself to the head of the regional race by bringing 3 GW of utility-scale solar projects online. Oman also realized sizable gains by adding over 1 GW of operational utility-scale solar capacity in the past year, while Qatar went from zero to 800 megawatts (MW) by completing the Al Kharsaah project.

However, these admirable gains in adding large-scale solar capacity are not similarly reflected in the wind sector. Despite strong wind potential in nearly every nation of the region, only Mauritania and Morocco have expanded their operating wind fleet since May 2022 by bringing a combined 226 MW online. This capacity represents a regional annual growth of only 5%. One-third of the countries analyzed in this study have neither operating wind farms nor project-level proposals to build new wind installations, continuing the trend of underutilizing wind resources in the area.

Incremental utility-scale solar & wind additions in MENA countries

Change in operating capacity for utility-scale solar & wind power in Middle East and North Africa (MENA) countries from mid-2022 to mid-2023, in gigawatts (GW)



Data includes only project phases with a capacity of 10 megawatts (MW) or more
Note: Bahrain, Comoros, Djibouti, Iraq, Lebanon, Palestine, Sudan, and Yemen had no operational capacity in either year.

Source: Global Solar Power Tracker, Global Wind Power Tracker | Global Energy Monitor

Global Energy Monitor

Figure 1

Utility-scale solar & wind power in the MENA region

Country-level total operating and prospective utility-scale solar & wind power capacity in the Middle East and North Africa (MENA), in megawatts (MW)

Country	Operating solar ☀️	Prospective solar ☀️🔮	Operating wind 🌬️	Prospective wind 🌬️🔮	Operating solar & wind ☀️🌬️	Prospective solar & wind ☀️🌬️🔮
Algeria	454	7,002	10	0	464	7,002
Bahrain	0	191	0	0	0	191
Comoros	0	0	0	0	0	0
Djibouti	0	5,030	0	5,059	0	10,089
Egypt	2,089	20,620	1,641	48,575	3,730	69,195
Iraq	0	8,460	0	100	0	8,560
Jordan	1,141	1,163	621	0	1,762	1,163
Kuwait	70	8,010	10	100	80	8,110
Lebanon	0	165	0	220	0	385
Libya	500	27,350	0	0	500	27,350
Mauritania	65	22,134	130	28,100	195	50,234
Morocco	740	29,050	1,291	25,971	2,031	55,021
Oman	1,288	46,464	50	36,600	1,338	83,064
Palestine	0	70	0	0	0	70
Qatar	800	875	0	0	800	875
Saudi Arabia	776	14,972	400	4,300	1,176	19,272
Somalia	10	92	0	0	10	92
Sudan	0	0	0	284	0	284
Syria	52	516	0	0	52	516
Tunisia	50	6,512	253	630	303	7,142
United Arab Emirates	5,616	10,852	0	58	5,616	10,910
Western Sahara*	455	0	553	1,520	1,008	1,520
Yemen	0	190	0	77	0	267

Global Solar Power Tracker, Global Wind Power Tracker, Global Energy Monitor • Data includes only project phases with a capacity of 10 megawatts (MW) or more

* Global Energy Monitor tracks projects located in non-self-governing territories, including Western Sahara, separately. Areas of Western Sahara are administered by Morocco

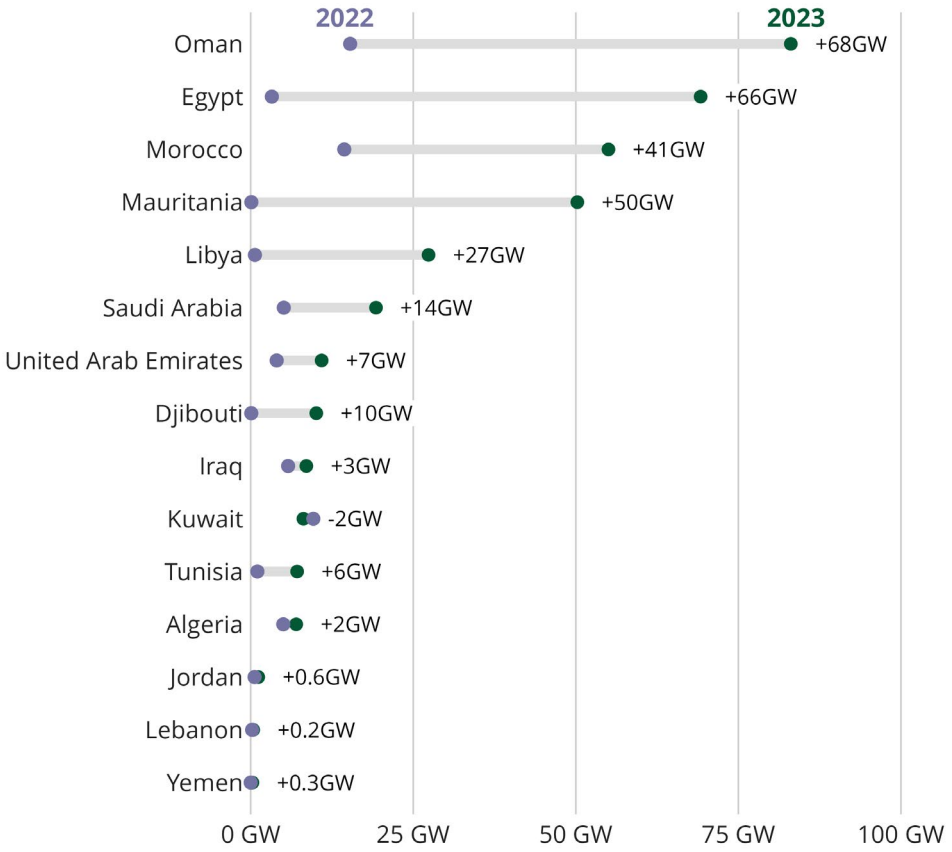
Table 1

Although the progress in bringing renewable projects online was not exceptional and less than a quarter of South America's progress, the MENA region did grow its prospective utility-scale solar and wind by an incredible 292 GW. This is a growth of more than 400% over the 68 GW of prospective projects identified last year and more than the total prospective utility-scale solar and wind capacity in the United States and Canada combined.

In this timeframe, Oman committed to net zero emissions by 2050 and showed interest in becoming a global green hydrogen hub. The result is that Oman added the most prospective utility-scale solar and wind projects in the region with over 68 GW of new prospective capacity. As the host of COP 27, Egypt unveiled a flurry of new renewables projects that vaulted it into second place for new prospective capacity added in the last year with 66 GW. Announcements for green hydrogen projects in Mauritania, Morocco, and Djibouti account for the bulk of the changes seen in those countries.

Several MENA countries with significant prospective solar & wind additions

Change in prospective capacity for utility-scale solar & wind power in Middle East and North Africa (MENA) countries from mid-2022 to mid-2023, in gigawatts (GW)



Data includes only project phases with a capacity of 10 megawatts (MW) or more
Note: Only countries with at least 100MW change from 2022 are shown

Source: Global Solar Power Tracker, Global Wind Power Tracker | Global Energy Monitor

Figure 2

The total prospective utility-scale solar and wind capacity in the MENA region stands at 361 GW, which is roughly the prospective capacity of Western and Southern Europe[3] combined. In no global region, with the possible exception of China, will all of these prospective projects end up becoming operational. Among the 361 GW of prospective utility-scale solar and wind projects, 6% (23 GW) are under construction, and therefore very likely to become operational in the next few years. Forty-seven percent (171 GW) are in pre-construction, meaning these projects have demonstrated either financing, government permitting, land rights, or formal power purchase or offtake agreements. The remainder (46%) of prospective projects have just been announced — it is least likely that all of these will come to fruition.

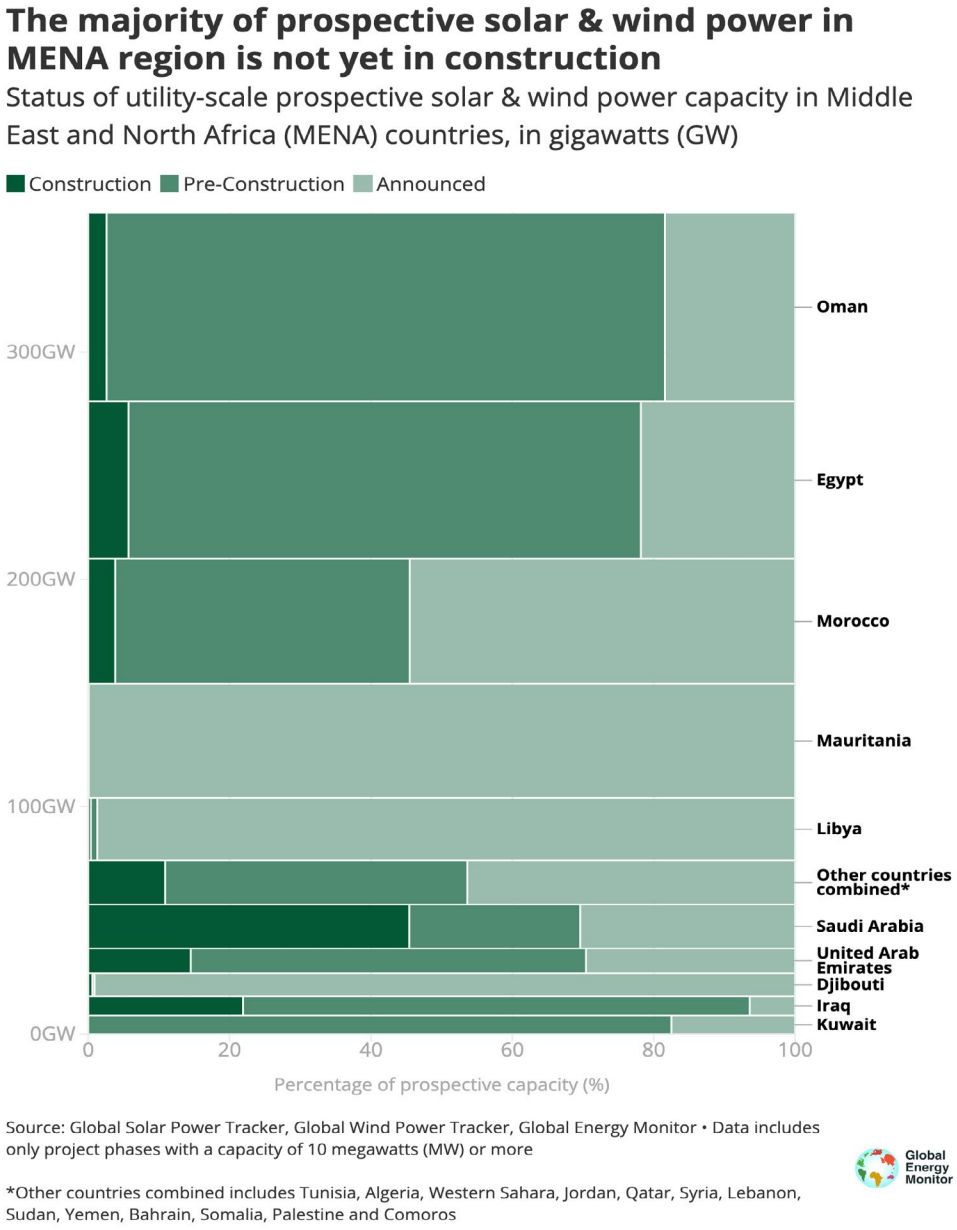


Figure 3

3. The Global Solar Power Tracker and Global Wind Power Tracker use the United Nations Statistics Division's definition of geographic regions.

60% of Prospective Renewable Energy Earmarked for Export as Green Hydrogen

Of the 361 GW of total prospective utility-scale solar and wind capacity across the MENA region, 60% is specifically designated for the production of green hydrogen.[4] These hydrogen projects are massive — averaging 2.6 GW per phase (14 times the global average) — and have distant estimated start years. Additionally, the technology and infrastructure for transporting green hydrogen, especially over long distances, are still being developed.

These attributes, combined with risks in finding buyers, market competition, and higher capital investments, make the likelihood of these projects becoming operational lower than if they were instead being built to supply electricity to the grid. The intention behind the majority of these projects is for export abroad, rather than using them in situ to decarbonize local industry and electricity sectors. Nevertheless, green hydrogen is an essential piece of meeting global climate goals by replacing coal in fertilizer, steel, and cement production. These replacements are most effective if the hydrogen being produced is put to use in close proximity to its production site.

In Oman, where the oil and gas industry make up 25% of GDP, the government is considering a gradual transition of their economy from one highly dependent on fossil fuels to one focused on green hydrogen. It has established a state-owned company, Hydrogen Oman (Hydrom), to execute its green hydrogen strategy which has already led to a $20 billion investment across six green hydrogen projects. 83% of Oman's 83 GW of total prospective large-scale solar and wind capacity is specifically intended for generating hydrogen. If Oman only brought one-third of the remaining 17% (14 GW) of prospective utility-scale solar and wind online, they would meet their 2030 goal of having 20% of their electricity fed by renewables.

Renewables currently make up 19%[5] of electricity generation in Morocco, and the country's goal of having 52% of electricity from renewables by 2030 might be the most credible target in the MENA region. Not considering increasing demand, Morocco would need to add about 3.6 GW[6] of new solar and wind capacity to reach their target. Discounting the 41 GW of utility-scale solar and wind capacity allocated for either hydrogen or direct electricity export to Europe, the remaining 3.5 GW of prospective utility-scale solar and wind capacity in Morocco, if realized, would be very close to achieving this target. Not all identified prospective projects will be built, but as long as the large hydrogen and export projects do not divert resources and financing, and Morocco continues to double down on renewable energy, the country is on track to meet its target.

In Mauritania, a country where less than 50% of the population has access to electricity, three colossal green hydrogen projects have been announced totalling 50 GW. The remaining 34 MW of prospective utility-scale solar and wind capacity, if built, would increase the national electricity capacity by about 5%. By comparison, if each Mauritanian resident were allocated 3000 kilowatt hours per year (kWh/year), approximately the global average power consumption, the country would need to install about 5.5 GW of solar and wind capacity.[7]

Djibouti finds itself in a similar situation, with a 10 GW green hydrogen facility proposed and only 1.3% of that amount (126 MW) of electrical capacity for the entire country. Fully electrifying Djibouti to the

4. For details on definitions and methodology see the methodology wiki page.
5. Wind contributes 12.4%, solar 4.4%, and hydropower 2.9%.
6. For details on definitions and methodology see the methodology wiki page.
7. For details on definitions and methodology see the methodology wiki page.

global per-capita electricity usage would take roughly 1.5 GW of solar and wind capacity.[8]

Both Mauritania and Djibouti have very small power sectors and low electricity access. Green hydrogen might bring green jobs and local investment for these economies, but the multinational energy companies proposing these projects need to recognize they have the potential to fully decarbonize and electrify entire nations with a fraction of the power they are trying to extract for export.

Despite big plans for renewables gas is still king

The MENA region hosts 23% of the world's operating oil and gas power plant capacity totalling over 343 GW. This massive fleet of power plants emits 610 million tons of CO_2 annually. Furthermore, planned gas power plant capacity in the region increased by 38% compared to last year, reaching 92 GW. At the same time, the region has set global records for the lowest levelized cost of energy (LCOE) for solar and wind installations. With renewables costs in decline, building new oil and gas power plants might not be financially advantageous, thereby posing a stranded asset risk.

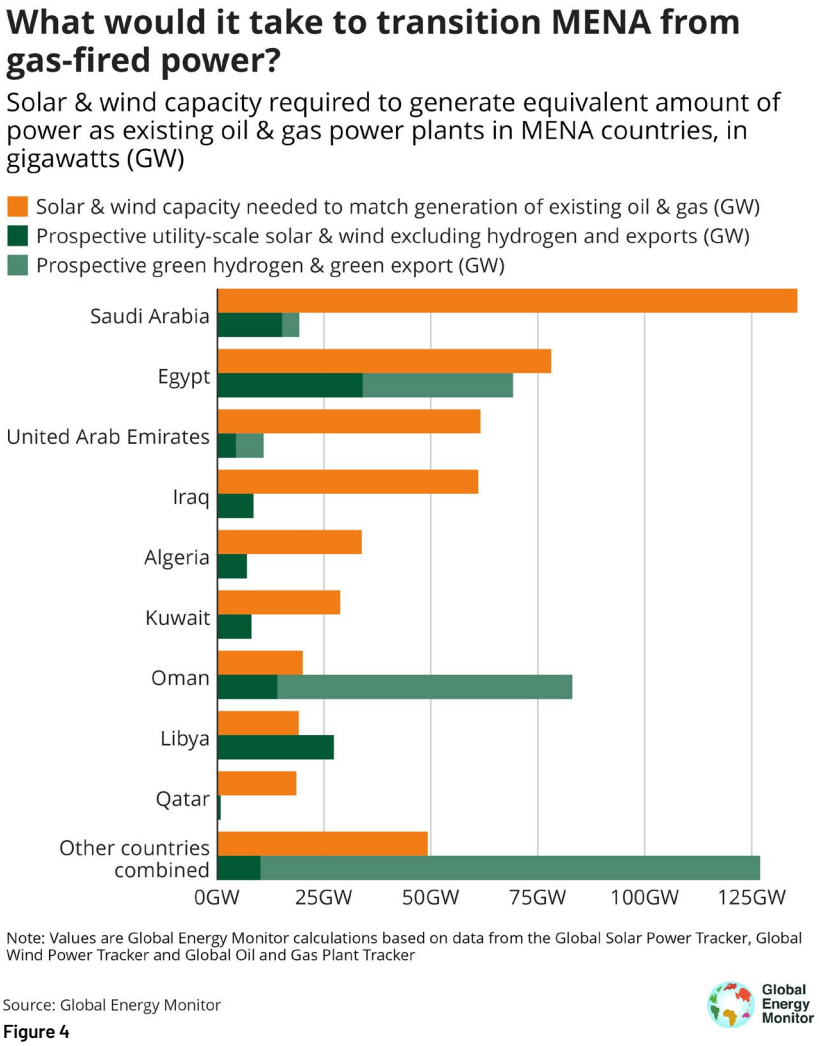


Figure 4

8. For details on definitions and methodology see the methodology wiki page.

Six nations in the region — Iraq, Kuwait, Libya, Oman, Qatar, and Saudi Arabia — earn more than a quarter of their GDP from oil and gas extraction. If the world transitions away from fossil fuels, these nations could face a tremendous economic loss, and it is unsurprising that many are not embracing renewable energy to the same extent as less oil-rich countries in the region, such as Morocco and Egypt. Oman is preparing to transition its economy and setting an example for these other nations to follow. Libya may also be trying to diversify by exporting renewables to Europe, but its one 25 GW project announcement is still in very early stages.

Replacing the electricity generation from the 343 GW of gas and oil power plants in the region would take roughly 500 GW of solar and wind capacity, assuming all of this capacity is dedicated to electricity and not hydrogen production. With 19 GW of utility-scale solar and wind capacity currently in operation, the MENA region could achieve a fully decarbonized electricity sector before 2050, if it brings online an additional 19 GW every year.

The region already benefits from renewable energy by providing economical desalination for drinking water; powering irrigation pumps; providing electricity in remote, rural areas; and reducing poverty. As effects from climate change intensify, transitioning the electricity sector away from oil and gas will increase resilience and economic stability. This transition is a considerable goal, but if MENA can continue the remarkable growth of prospective utility-scale solar and wind projects and follow through by bringing those projects to fruition, then it is certainly achievable.

Two MENA sovereign wealth funds are investing in at least 46 GW of prospective renewables capacity abroad, three times their domestic investments

Globally, clean technology, including solar and wind power projects, are poised to outpace financing for oil and gas for the first time in 2023. However, financing for renewable energy projects in developing countries remains grossly inadequate outside of China.

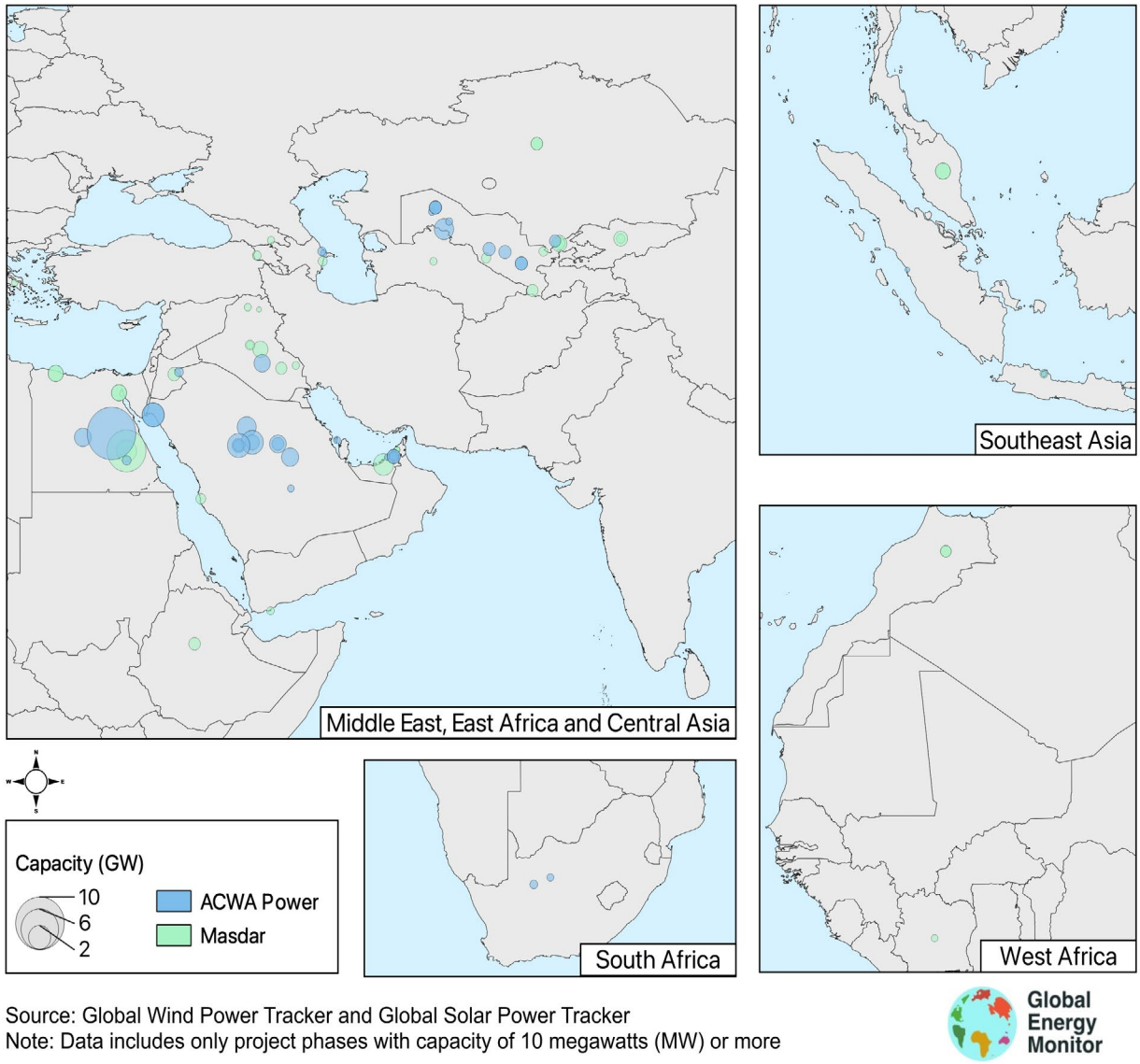
Two companies in the MENA region, Masdar and ACWA Power, owned by the United Arab Emirates and Saudi Arabia sovereign wealth funds, respectively, have already helped operationalize roughly 5 GW of utility-scale solar and wind. They are furthermore actively engaged abroad as developers, operators, or owners of at least 46 GW of prospective utility-scale solar and wind projects across no less than 21 countries in the Global South, with a further domestic involvement of 14 GW.[9] By contrast, Norway's sovereign wealth fund, the largest in the world, has only three direct renewables investments, all in Europe, totalling just over 3 GW of operating capacity.

ACWA Power is involved as an owner or operator in more prospective renewables capacity outside of Saudi Arabia (at least 20.2 GW) than the entire prospective renewables capacity within the country regardless of developer (19.3 GW). Moreover, Masdar launched the Etihad 7 program with a goal to install 20 GW of solar and wind capacity in Africa by 2035, while plans to develop a specific climate fund from the United Arab Emirate's sovereign wealth reserves may be underway. According to IRENA, institutional investors, including sovereign wealth funds, can play a pivotal role in providing capital flows for the energy transition, and in this way ACWA Power and Masdar stand as global examples.

9. For details on the methodology for calculating these figures please see the methodology wiki page.

MENA sovereign wealth funds are helping to build renewables in the Global South

Location and scale of prospective wind and utility-scale solar projects being developed by ACWA Power and Masdar



Source: Global Wind Power Tracker and Global Solar Power Tracker
Note: Data includes only project phases with capacity of 10 megawatts (MW) or more

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Figure 5

Data gaps and future research

The Global Solar Power Tracker and Global Wind Power Tracker are updated annually. However, due to potential lags or gaps in project-level, publically-available data sources, as well as data collection timing compared to data publication date, both trackers may be missing some projects that meet the inclusion criteria. Distributed solar, off-grid installations, and grid-connected utility-scale solar below the Global Solar Power Tracker's 10 MW threshold in the MENA region are not considered. Data to estimate how significant this contribution is to the region are not available, as the Global Solar Power Tracker shows more operating capacity in the MENA region than any other public dataset. Global

Energy Monitor is currently evaluating strategies for incorporating <= 10 MW solar data in future dataset releases. Finally, while it is rare for wind projects to be below Global Energy Monitor's 10 MW wind threshold, we estimate such projects constitute 5%[10] of global capacity.

Acknowledgements

This briefing was written by Kasandra O'Malia, Nagwa Abdallah, Julie Macuga, Shradhey Prasad, Nassos Stylianou, and Ingrid Behrsin. Maps and figures were developed by Shradhey Prasad and Nassos Stylianou. The layout was designed by Carolina Chau; editing contributions were provided by David Hoffman and Stefani Cox.

For additional details see the Global Solar Power Tracker and Global Wind Power Tracker landing pages. Primary data from this report will be available publicly by December, 2023 via the solar and wind download data pages.

Supplementary information on the methodology used in calculations for this report can be found on our methodology wiki page.

10. GEM's global operating wind capacity is 786 GW. IRENA estimates a global total of 898 GW at the end of 2022.