

Renewable energy markets in North Africa

Briefing | June 2022

Key points

- North Africa has some of the best solar and wind resources on the continent
- Gas is the mainstay of Egypt's power sector, while coal is the single largest source of power in Morocco
- Egypt and Morocco are among the largest solar and wind markets across Africa
- Solar has driven the growth in Egypt's renewable energy market, while onshore wind has been the dominant technology in Morocco
- Morocco is positioning itself to become a large green hydrogen exporter by 2050.

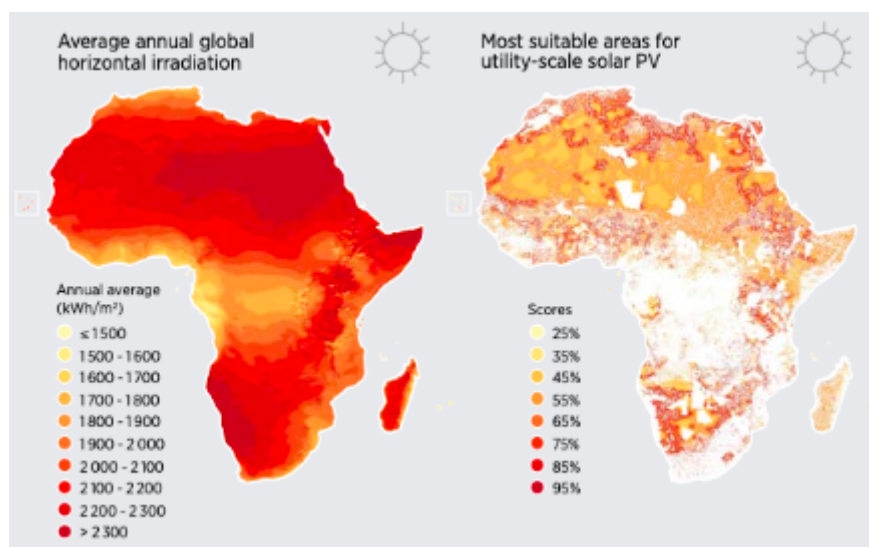
The underlying data for this briefing can be accessed here: [Data: Renewable energy markets in MENA](#)

North Africa's energy system

North Africa is a diverse group of countries that have traditionally been a [mix of importers and exporters](#) of energy. Algeria, Libya, Egypt and Sudan have significant oil and gas reserves and are important fossil fuel exporters. It is due to this domestic supply of oil and gas that biomass and coal, predominant in other emerging market power systems, play a comparatively small role in the generation of electricity. Morocco [is an exception](#) – being [highly dependent](#) on oil and gas imports, it has a significant coal fleet.

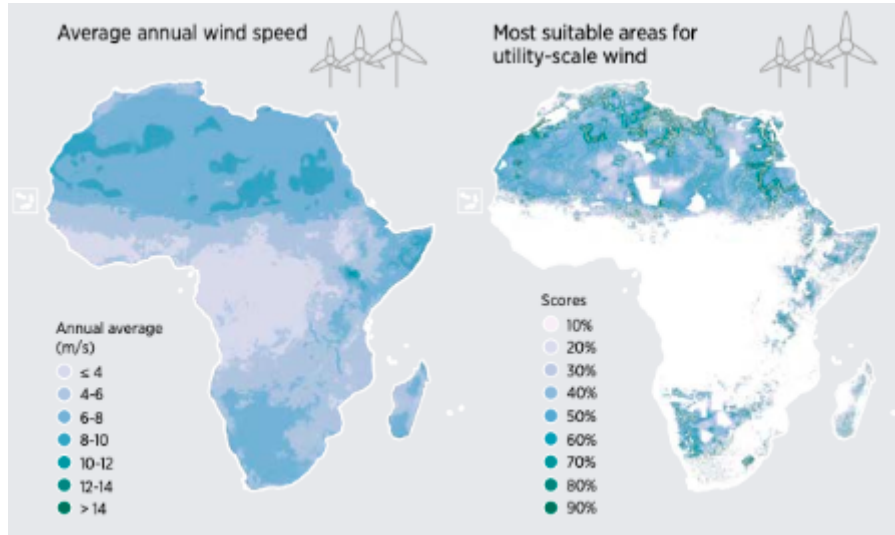
The region also has some of the continent's best renewable resources. Many of the most suitable areas for utility-scale solar PV projects on the African continent are in North Africa, where irradiation levels are high. Around 2,792 GW of solar could [theoretically be installed](#) here, according to the International Renewable Energy Association (IRENA). Currently, there is only 10.4 GW. Similarly for wind, many of the best resources are in North Africa, although they have yet to be properly [exploited](#) – the region has a technical capacity of 223 GW, but has installed less than 6 GW.

Figure 1: African irradiation levels and areas best suited for solar PV



Source: [IRENA](#)

Figure 2: African wind speeds and areas best suited for wind farms



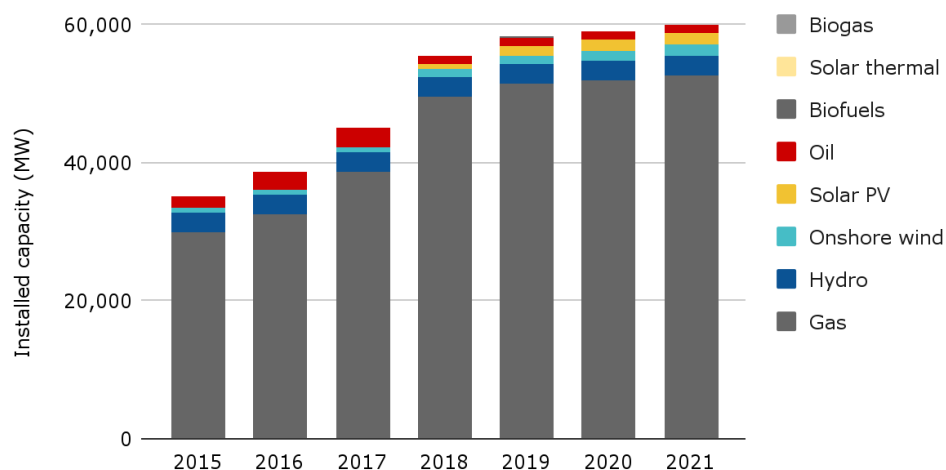
Source: [IRENA](#)

Egypt

Egypt's power system is dominated by gas. The country [has gone](#) from chronic power outages to a surplus of electricity. On a net basis, it added 25.5 GW of power between 2015 and 2019, going from 35 GW to 58 GW.¹ The vast majority of these capacity additions came from fossil fuels - only 1 GW of this was solar and 840 MW was wind.

Figure 3: Egypt's installed capacity (2015-2021)

Source: IRENA

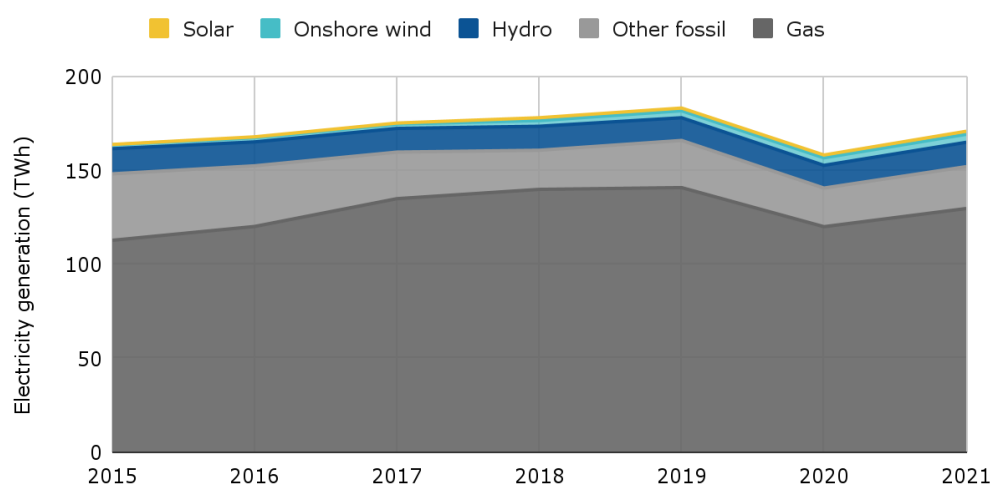


Unsurprisingly, Egypt's generation mix - the share of its electricity generated by different technologies - is dominated by fossil fuels. Around 90% of Egypt's power generation [comes](#) from gas. In fact, the country alone represented 42% of Africa's gas generation in 2020. Wind and solar, meanwhile, only generated 3% of the country's electricity in 2020.

¹ A net basis compares retired capacity to added capacity

Figure 4: Egypt's generation mix (2015-2021)

Source: Ember



Policy focus shifts to renewable energy

The use of fossil fuels remains subsidised. In 2014, the country [began](#) a programme to phase out subsidies, but after the Egyptian pound lost half its value, this five-year plan was extended to 2022 or 2023. In 2020, Egypt [spent](#) approximately USD 77 per capita on energy subsidies, covering about 29% of energy use. This amounted to over 2.2% of GDP.

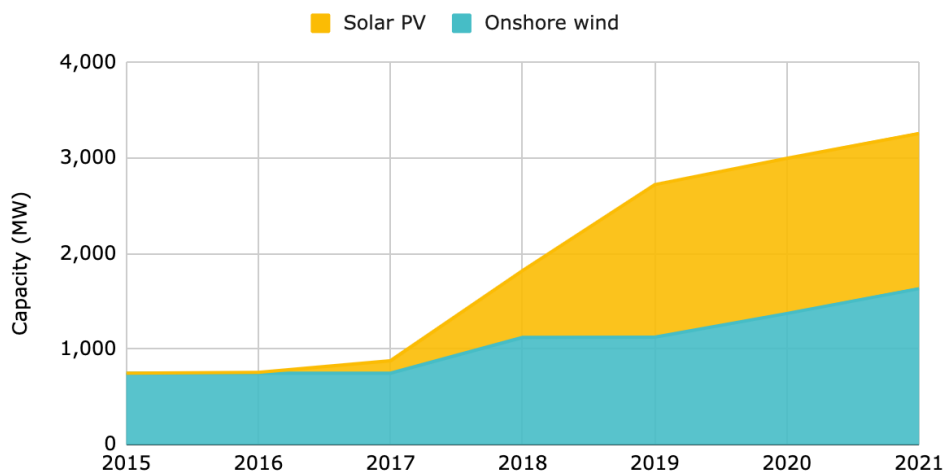
But the country has been increasingly focusing on renewables, with some policy changes enjoying particular [success](#) in spurring growth in the sector. Egypt introduced feed-in tariffs (FiTs) in 2014 and allowed long-term power purchasing agreements (PPAs) in 2017, making investments by independent power producers (IPPs) more attractive. It has also crafted an auction system that has led to the development of large-scale renewable projects, such as the [1.4 GW Benban solar farm](#).

Through its 2035 Integrated Sustainable Energy Strategy (ISES), adopted in 2016, the country [has identified](#) renewables as being central to its own energy security. The ISES aims for renewables to account for 20% of total generation by 2022 and 42% by 2035. In fact, by the end of this year, Egypt wants to have developed an additional 10 GW of solar and wind projects.

The result is that renewable energy installations have grown dramatically and the country has Africa's second and third largest solar and wind markets respectively, [according to IRENA](#). As of 2021, Egypt had installed 1.63 GW of solar, representing 18% of all solar capacity on the continent. Meanwhile, wind capacity has more than doubled, reaching about 1.4 GW. This accounts for 21% of Africa's installed wind capacity.

Figure 5: Egypt's renewable energy installed capacity

Source: IRENA

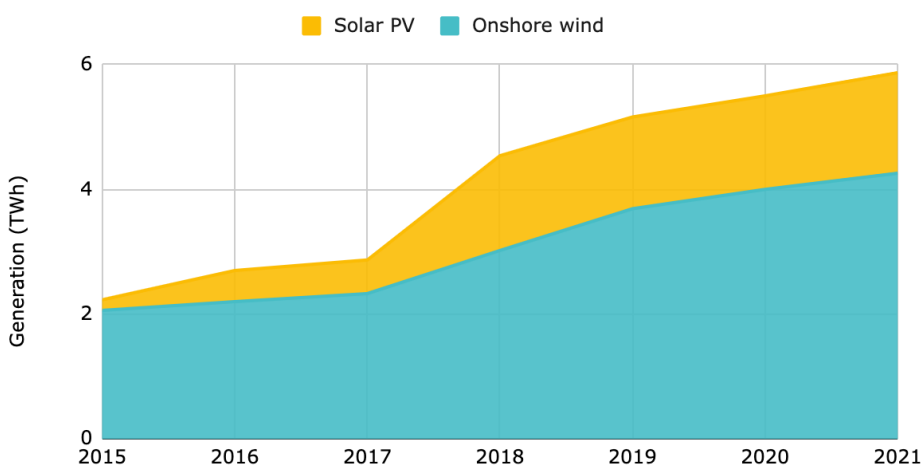


Renewables sector poised for dramatic growth

Solar and wind generation was just shy of 6 TWh in 2021, according to Ember. Between 2015 and 2021, the amount of electricity generated by solar has jumped 847%, while for onshore wind it has increased 107%. Though this still accounts for a small share of the country's overall generation mix, it points to robust growth.

Figure 6: Egypt's renewable energy generation

Source: Ember



Installed renewable energy capacity is set to increase from 3.51 GW in 2020 to 13.7 GW in 2030, a compound annual growth rate of 14.6%, GlobalData [forecasts](#). Solar PV is forecast to increase from 2.02 GW to 7.71 GW over this time. This added capacity will enable Egypt to harness its impressive solar resources. The country [receives](#) on average between 2,800 and 3,200 hours of sunshine a year, making it one of the best locations for solar generation in the world.

For onshore wind, capacity could surge from 1.39 GW to 5.64 GW, according to [GlobalData](#). Around the Gulf of Suez, wind speeds average around 8-10 m/s. The minimum average wind speed to operate a utility-scale onshore wind farm is around 6 m/s, according to [the EIA](#). There are untapped areas to the East and West of the Nile River – Beni Suef Governorates and the El Kharga Oasis, which are attractive locations for wind development.

Notable renewable energy players and projects

Egypt's New & Renewable Energy Authority is by far the largest player in the country's renewable energy market, owning over 1 GW of capacity. Private Equity firm Actis and the Chinese manufacturing firm, TBEA Co Ltd, come in second and third with a 250 MW and 201 MW portfolio respectively.

The country also hosts notable renewable energy projects:

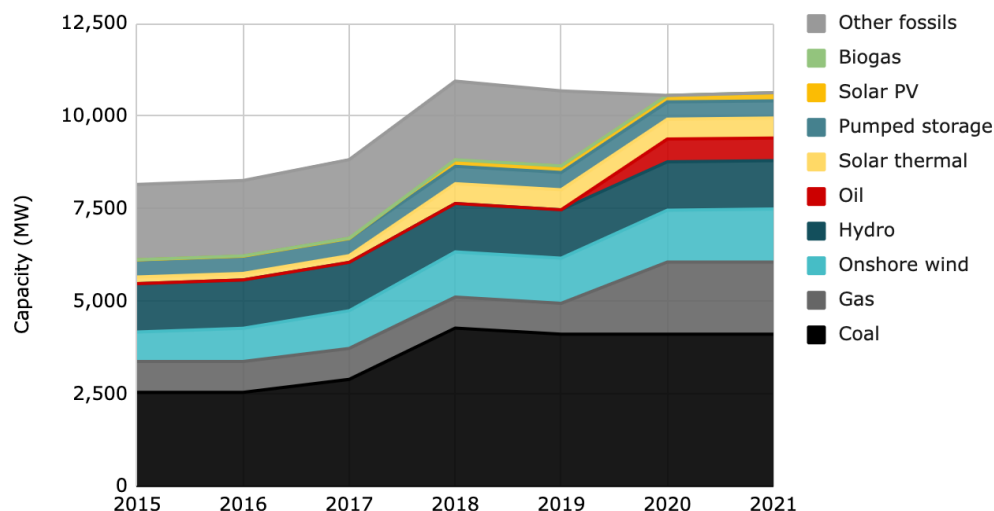
- **The 1.4 GW Benban solar PV project:** When fully installed this will be one of the largest solar facilities in the world. The IFC [helped](#) arrange the financing, arranging USD 653 million in loans from a consortium of nine banks.
- **The 262.5 MW Ras Ghareb Wind Farm:** This [near-shore project](#) is the first IPP project in Egypt. It was developed by Ras Ghared Wind Energy, a project created by Engie (40%), Toyota-Tsusho and Eurus Energy (40%), and Orascom Construction (20%). Costing approximately USD 380 million, it started operating at full capacity in December 2019 and had generated about 1 TWh of energy by July 2020. It was also built with support from the World Bank.

Morocco

Morocco is one of the few countries in North Africa where coal makes up a significant share of the power sector. In 2021, it had over 4 GW of installed coal capacity, having grown 62% since 2016, according to IRENA. Additionally, its installed gas fired capacity has more than doubled since 2015, growing 133% from 834 MW (2015) to 1.95 GW (2021). As a net importer of energy, this made Morocco even more dependent on imports of coal and gas to meet demand.² Coal accounts for around 60% of Morocco's generation mix and fossil fuels together represent over 80%, Ember data show.

Figure 7: Morocco's installed capacity (2015-2021)

Source: IRENA

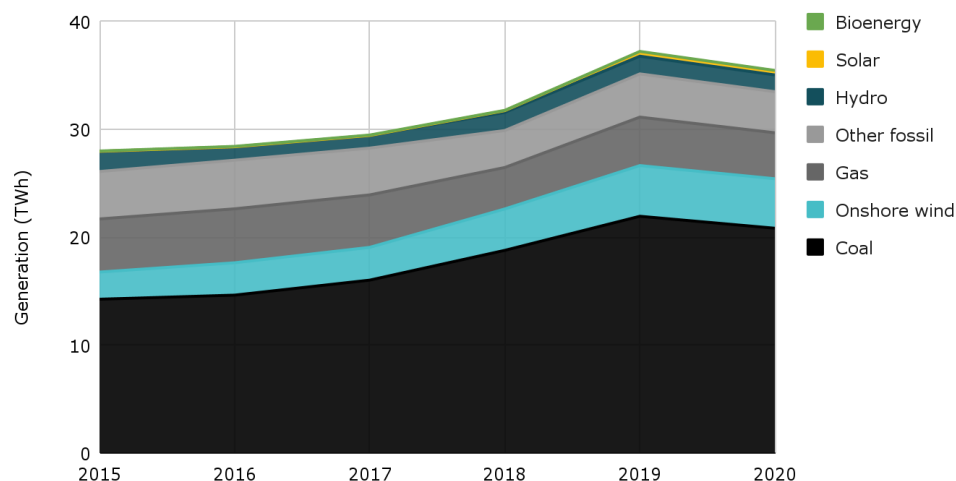


However, the country also [accounted for](#) 75% of growth in renewable energy generation in all of North Africa, and renewables now form an important part of the country's electricity mix. As an early adopter of onshore wind, Morocco sources 13% of its electricity from this technology, making it the second largest electricity generation source in the country. In fact, onshore wind overtook gas generation in 2019. This despite more gas capacity coming online since 2015 than wind. Morocco has also been successful in developing Concentrated Solar Power (CSP) with the Noor Power Station, the world's largest such facility at 510 MW.

² BNEF, "Morocco country profile", 2 February 2022. Accessed via Bloomberg network.

Figure 8: Morocco's generation mix (2015-2020)

Source: Ember



Phasing out fossil fuels

Currently, Morocco targets 52% renewable electricity generation by 2030. But it is possible that it will [increase](#) this to between 60%-65%, according to the IEA.

It has also had more success than Egypt in [phasing out](#) energy subsidies that were a drain on public coffers. In 2012, Morocco embarked on a liberalisation drive. Before doing so, it identified sections of the population that would be most impacted by this shift in order to shield them from price fluctuations during liberalisations. In 2013 and 2014, subsidies on gasoline were phased out. From then on, the government announced prices twice a month before fully deregulating the market.

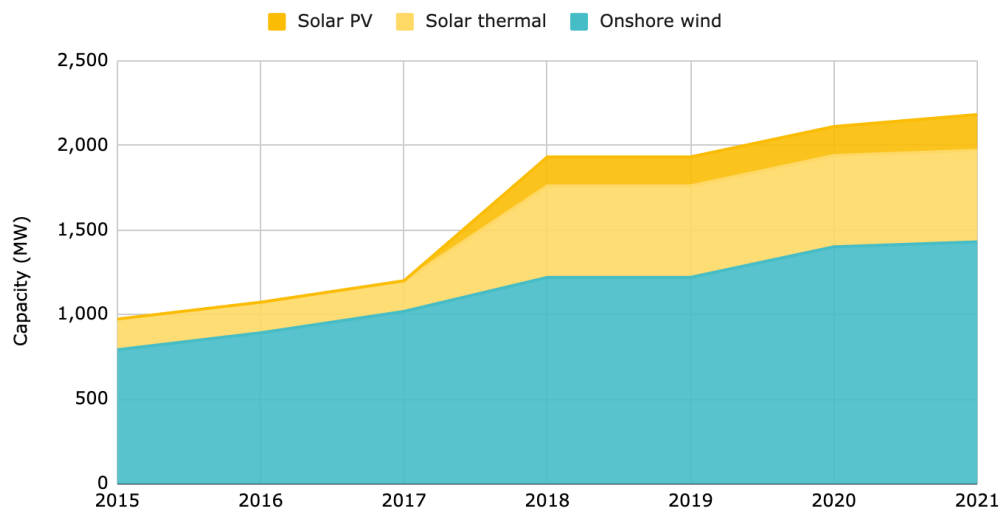
Morocco's unsubsidised electricity costs are also high for its level of development, at around 100 USD/MWh, and a key focus of the current government is bringing these costs down. The focus on cost reduction, and the introduction of planned measures to curb end-user prices including time-of-use tariffs, has been a boon for renewable deployment in other countries.

Renewables seeing rapid growth

The government has established a 'one-stop-shop' for utility-scale solar and wind projects called the [Moroccan Agency for Sustainable Development \(MASEN\)](#). Though the country fell short of its target of installing 2 GW of both solar and wind by 2020, solar PV and onshore wind capacity grew 21,000% and 81% respectively between 2015 and 2021. The discrepancy in growth rate is explained by the fact that solar started from a much lower base. In 2015, there was only 1 MW of solar PV, compared to almost 800 MW of onshore wind. With 1.4 GW of onshore wind and 211 MW of solar, the country has the second and third largest onshore wind and solar markets in Africa, according to [IRENA](#). Unlike Egypt, solar thermal also plays a role in Morocco's power sector. Its capacity increased 200% over the same timeframe.

Figure 9: Morocco's renewable energy capacity

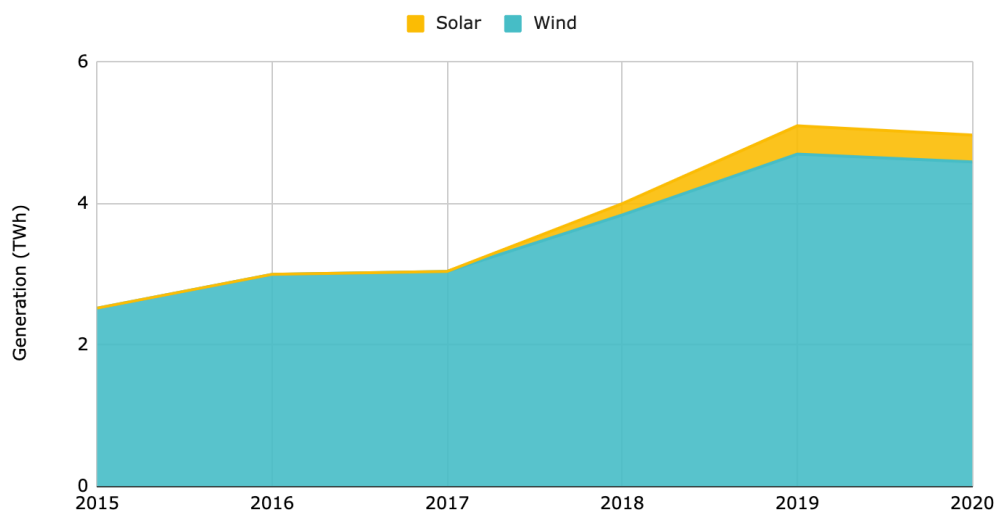
Source: IRENA



Most of Morocco's renewable energy generation comes from wind, according to Ember. Onshore wind electricity generation grew 82% between 2015 and 2020 and hit 4.6 TWh in 2020. Solar generation only began to pick up in 2018, following a series of capacity additions.

Figure 10: Morocco's renewable energy generation

Source: Ember



Morocco is also positioning itself as a leading green hydrogen exporter. The country [has laid](#) out its own roadmap to developing a green hydrogen sector and [has signed](#) an agreement with the EU to produce and export green hydrogen to the bloc. Morocco is a major producer of ammonia and used to be a larger fertiliser manufacturer, though it is still one of the world's main miners of phosphates - a key component of fertilisers. Morocco's agricultural sector provides 15% of its GDP and 60% of Morocco's produce goes to the EU, so replacing its fertiliser imports - now originating from grey hydrogen - with locally-produced green hydrogen is a key focus of scaling up hydrogen in the country. Alongside its rich renewable resources, the country is well positioned to become a leading exporter of green hydrogen globally by 2050, according to a recent [IRENA report](#). Morocco is also a key country of focus of European hydrogen strategies.

Notable renewable energy players and projects

Morocco's renewable energy sector is more dispersed than Egypt's, but remains dominated by public entities. The single largest player is Nareva Holding (fully owned by king Mohammed VI's holding

company), which owns just over 720 MW of capacity, according to BNEF. This is followed by ACWA Power (426 MW) and l'Office National de l'Electricité, the country's state-owned utility (290 MW).

These are a couple of notable renewable energy projects in the country:

- **The 510 MW Ouarzazate (Noor) concentrated solar thermal power station**
- **The 301 MW Tarfaya wind farm**

Investment trends

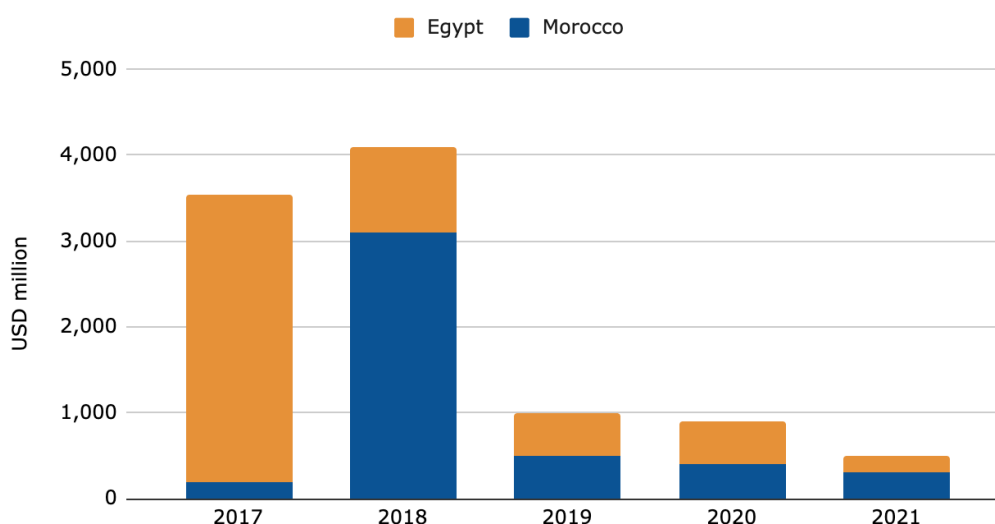
Development banks supply most of the funding

Egypt and Morocco have been key destinations for renewable energy investment. Around USD 18.9 billion [was invested](#) in energy. About USD 10 billion (54%) went to renewables, with most of this money going into Egypt and Morocco. As elsewhere in Africa, bilateral or multilateral development banks (BDB/MDB) are key sources of financing. In Egypt, Germany's Kreditanstalt fuer Wiederaufbau (KfW) is the largest financier, supplying close to USD 2 billion in lending, BNEF data show. Similarly, KfW is the largest lender in Morocco, with USD 2 billion in lending as well. The European Investment Bank and the African Development Bank have both deployed around USD 1 billion in capital in Morocco as well.

Developers are an increasingly important source of financing as well. In North Africa, IPPs [invested](#) approximately USD 13.3 billion in energy between 2010 and 2020. Of this, USD 8.9 billion (67%) went into renewable energy. Egypt and Morocco are home to 82% of IPP investments in the region of North Africa. Renewable energy investment has so far peaked in Egypt in 2017 and 2018 for Morocco, according to BNEF.

Figure 11: Cumulative renewable energy investment

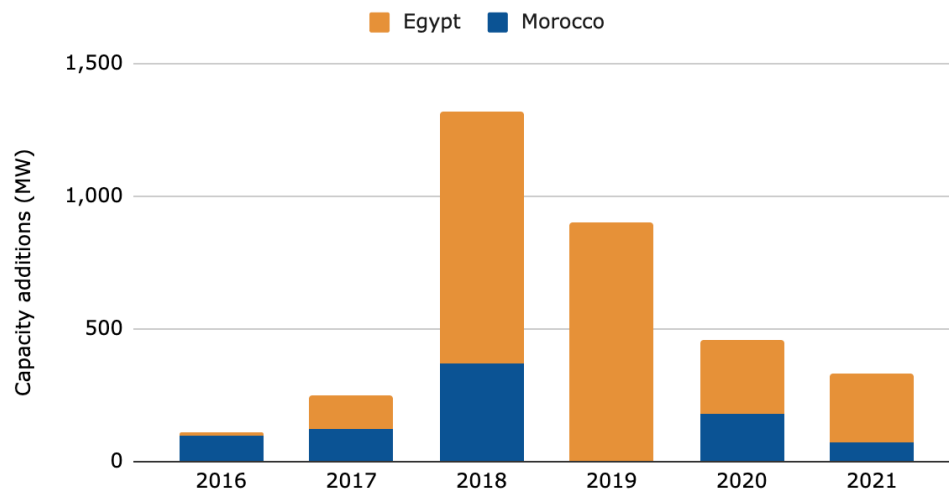
Source: BNEF



But there is a lag between the investment in a project and it being built. Installations in Egypt jumped in 2018 and 2019, while investment peaked in 2017, IRENA data show. Solar has driven its renewable energy installations, explaining why so much capacity has come online so quickly after the initial investment. Conversely, Morocco has yet to experience a surge in installed capacity. The reason for this is that most of its growth has come from onshore wind, which takes longer to deploy than solar. Additionally, COVID-19 has inevitably resulted in the delay of several projects.

Figure 12: Annual renewable energy capacity additions

Source: IRENA



Fossil fuel investments still account for a substantial amount of investments though, and countries will need significantly more to increase their share of renewable energy capacity. To meet its 2030 renewable energy target for instance, Morocco [will need](#) USD 30 billion in investments.