



Renewables in the Arab world: gaining momentum

Renewable-energy developments in the Arab world are gaining momentum. Energy-importing countries and the UAE will continue to accelerate the development of their renewable energy sectors, with Saudi Arabia also finally launching its own programme. They will continue to rely on policies to support their efforts, but other GCC countries will lag behind. The region has again received some of the lowest renewable-energy prices awarded globally for both PV and wind, and with some of the best resources in the world, renewables have great potential in the Arab world. But this requires governments to rise to the challenge and improve the regulatory environment to attract investment in one of the fastest-growing energy markets.

Over the past decade, several Arab countries have announced ambitious renewable-energy targets. With power demand requirements expected to increase at an annual rate of 7.4% until 2021, governments are keen to increase the share of renewables in the power mix. Shortage of gas and increasing reliance on liquid fuels, a key product for export, in some countries such as Saudi Arabia and Kuwait has also added to the urgency of energy diversification, while environmental concerns also increase.

But progress has been mixed, because net energy importers and net energy exporters face different realities. To support their renewable sectors, countries such as Jordan and Egypt introduced feed in tariffs (FiTs), tax exemptions, and power-purchase agreements (PPA). On the other hand, energy-exporting countries – with the exception of the UAE - have done little to incorporate renewables, as they continue to rely on cheap-to-extract conventional sources to meet rising electricity demand. But this is starting to change, notably in Saudi Arabia, which finally looks set to issue tenders for wind and PV projects this year. The falling cost of technology has also given some countries an opportunity to move towards increasingly cost-competitive renewable energy, while government support, like in other parts of the world, will be instrumental in driving growth of renewables in the region.

Morocco, Jordan and the UAE maintain the lead

Reliance on fuel imports to meet domestic demand and rising import bills have pushed Morocco and Jordan to diversify their energy sources. The two countries are leading the way for renewable development in the region. In Morocco, the government's target of 2GW of solar and 2GW of wind power by 2020 is on track, with current wind capacity at over 750MW. A significant driver behind the large increase in wind capacity over the last two years has been the start-up of the 300MW Tarfaya wind project in 2014. The project is a joint venture between GDF Suez and Nareva Holding and was financed by local banks. The last 12 months have also seen other impressive developments in the country. Five wind projects totalling 850MW were awarded with record bids ranging from \$25-30/MWh. As for solar, phase 1 of the Noor CSP project was commissioned in 2016, while Noor-2 and Noor-3 are expected to add a combined 350MW by the end of 2017. Upon completion, Noor will become the largest CSP project in the world. The multi-billion dollar project is financed by international development agencies including the European Investment Bank (EIB) and the African Development Bank (AFDB). Additionally, the country recently awarded the 170MW Noor PV1 to an ACWA-led consortium. The electricity will be sold at \$0.048/kWh and the project will be commissioned in 2018.

Renewable-energy targets by country

| | Wind | PV | CSP | Other | Total | Share of generation | Target |
|-----------|-------|--------|-------|-------|--------|---------------------|--------|
| | (MW) | (MW) | (MW) | (MW) | (MW) | % | |
| Algeria | 5,000 | 13,600 | 2,000 | 1,400 | 22,000 | 27 | 2030 |
| Egypt | 7,200 | 2,300 | | | 9,500 | 20 | 2022 |
| Jordan | 800 | 1,000 | | 50 | 1,850 | 10 | 2020 |
| Morocco | 4,200 | 4,560 | | 1,330 | 10,090 | 52 | 2030 |
| Tunisia | 1,500 | 1,900 | 300 | | 3,700 | 30 | 2030 |
| UAE-AD | | 1,500 | | | 1,500 | 7 | 2020 |
| UAE-Dubai | | 5,000 | | | 5,000 | 25 | 2030 |
| KSA | 9,500 | | | | 9,500 | 10 | 2023 |
| Kuwait | | 4,500 | | | 4,500 | 15 | 2030 |

Source: RCREEE, APICORP Research

Jordan's commissioning of the 117MW Tafila wind project in the second half of 2015 was a milestone for the kingdom. The project had an estimated cost of \$287m and was financed by the International Finance Corporation (IFC), EIB, and other international institutions. The country is also expecting two major wind additions. Korea's Kepco 89MW Fujiej wind project, financed by the Korean export agency and Japan's Mizuho, will come on line in 2018. The second project is the 86MW Al Rajef wind project in Ma'an, financed by the EBRD and expected to come on line in 2019. Both projects operate under the Build, Own, Operate, Transfer (BOOT) model with the Jordanian government guaranteeing to purchase electricity under a 20-year PPA. As for PV, the country will increase its initial target of 600MW by 2020 to 1GW. The 103MW Quweira PV plant will come on line this year in southern Jordan – led by UAE's Enviromena and Spain's TSK. The country also has several small solar plants each with a capacity of around 50MW under development. These projects were also financed by various international institutions and banks. More recently, the UAE's renewables company Masdar announced that it will build a 200MW PV plant, which will be backed by the IFC and is expected to come on line in 2020.

Marubeni (20%) and JinkoSolar (20%). International lenders will provide financing for the project. In Dubai, after the 13MW Phase I of the Dubai Solar Park was completed in 2013, the 200MW Phase II came on line in early 2017, achieving a then world record of \$0.0584/kWh. Phase III was recently awarded to a consortium led by Masdar, after receiving a bid of \$0.0299/kWh, with plans to bring 800MW on line by 2020.

Picture is still unclear in Egypt

Egypt announced plans to develop 2.5GW of wind, 1.7GW PV, and 100MW of CSP capacity by 2020, but has been struggling with its ambitious programme. The country intends to add nearly 400MW of wind capacity in Gebel El Zeit – expected on line in 2017. It recently increased its wind capacity by 35% with the addition of the 200MW Gebel El Zeit, bringing total renewable capacity in the country to over 900MW, of which wind power is around 800MW. Renewable energy plans have also been boosted by the massive contract awarded to Siemens to develop 12 wind farms with a total capacity of 2GW.

Although there is strong interest in the Egyptian market, the country's acute financial situation, low foreign reserves, and weakening pound are all major concerns for international

Major projects to come on line by 2020

| Project | Location | Type | Capacity (MW) | Date | Financiers | Price (\$/kWh) | Contract | PPA |
|-----------------------|----------|------|---------------|------|----------------------|----------------|----------|-----|
| Taza | Morocco | Wind | 150 | 2017 | Local and Int. banks | 0.068 | BOOT | 20 |
| Jbel-Sendouq Khalladi | Morocco | Wind | 120 | 2017 | Local and Int. banks | - | - | - |
| Noor II & III | Morocco | CSP | 350 | 2017 | AFDB/EIB/KfW | 0.157-0.163 | BOOT | - |
| Dubai Solar Park II | UAE | PV | 200 | 2017 | FGB/NCB/Samba | 0.058 | BOOT | 25 |
| Gebel El Zeit | Egypt | Wind | 220 | 2017 | JICA | - | EPC | - |
| Gebel El Zeit | Egypt | Wind | 120 | 2017 | JICA | - | - | - |
| Quweira | Jordan | PV | 103 | 2017 | ADFD | - | EPC | - |
| Fujeij | Jordan | Wind | 89 | 2018 | K-EXIM | - | BOOT | 20 |
| Al Rajef | Jordan | Wind | 86 | 2018 | EBRD | - | BOOT | 20 |
| Noor PV 1 | Morocco | PV | 170 | 2018 | EIB/KfW | 0.048 | BOOT | - |
| Sweihan | UAE | PV | 1177 | 2019 | - | 0.024 | BOOT | 25 |
| Tiskrad | Morocco | Wind | 300 | 2020 | EIB/KfW | 0.025-0.030 | BOOT | 20 |
| Midelt | Morocco | Wind | 150 | 2020 | EIB/KfW | 0.025-0.030 | BOOT | 20 |
| Jbel Lahdid | Morocco | Wind | 200 | 2020 | EIB/KfW | 0.025-0.030 | BOOT | 20 |
| Boujdour | Morocco | Wind | 100 | 2020 | EIB/KfW | 0.025-0.030 | BOOT | 20 |
| Tangier II | Morocco | Wind | 100 | 2020 | EIB/KfW | 0.025-0.030 | BOOT | 20 |
| Dubai Solar Park III | UAE | PV | 800 | 2020 | IDB/NBAD/FGB | 0.030 | BOOT | 25 |

Source: MEED Projects, APICORP Research

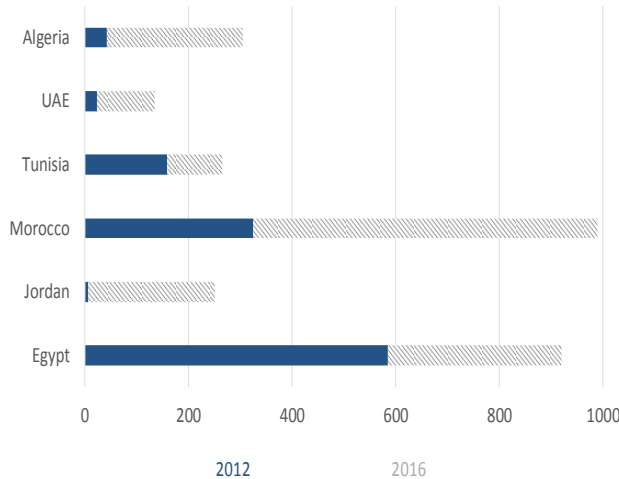
Masdar's investment in Jordan is consistent with the UAE's serious commitment to developing solar energy, both abroad and domestically. The 100MW Shams CSP plant has been operational since 2014 in Abu Dhabi. The cost of the project was \$600m and was financed by a consortium of international banks including BNP Paribas, National Bank of Abu Dhabi and Mizuho. More recently, Abu Dhabi's Sweihan PV project broke the price record previously set by 800MW phase 3 of the Dubai Solar Park, having received the lowest bids from Japan's Marubeni and China's JinkoSolar. Initially planned at 350MW, the consortium submitted a proposal for \$0.024/kWh but increased the plant's capacity to 1.18GW. The project will operate under a BOOT model and will be owned by state utility Adwea (60%),

investors. Financing remains the government's biggest obstacle, and the conditions noted above are forcing international banks to insist on more stringent financing terms. Consequently, the government has little choice but to rely on international lenders like the IFC and EBRD for financing. Both institutions are supporting the second round of the country's FiT programme, having recently pledged \$350m to support the development of 400MW of PV.

In addition to financing challenges, the government's insistence that it will purchase electricity from private generators in the local currency is making potential investors anxious at a time of significant market fluctuations. In terms of payments, a proportion of the tariff will be paid in US dollars, while 60-70%

will be paid in Egyptian pounds, and will be tracked by market exchange rates. To attract more investors in the second round of its 4.3GW FIT programme, the government recently allayed major concerns for potential investors regarding arbitration, which has long been a major obstacle to renewable projects. In the event of disputes, settlements can now take place in Paris court if developers were not satisfied by Egyptian court rulings.

Renewable-energy capacity (MW)



Source: RCREEE, APICORP Research

Saudi Arabia serious about its new programme

The Kingdom recently announced plans to seek \$30-50bn in investments by 2023 to help meet the 10GW capacity target for solar and wind energy. This comes in place of the King Abdullah City for Atomic and Renewable Energy (KACARE) plans in 2012 to invest \$109bn to produce 54GW of renewables and nuclear by 2032. While the main obstacle behind renewable deployment in most countries is financial, the Kingdom's original renewable plan never kicked off due to preferred reliance on conventional power plants to meet the increase in electricity demand and the absence of supporting policy frameworks for renewable programmes to succeed. The government is now starting to address this issue.

The new Ministry of Energy and Industry will take charge of the country's renewable-energy programme. The Renewable Energy Project Development Office (Repdo), a dedicated unit to oversee the programme, will report to a renewable-energy steering committee chaired by the Minister Khalid Al-Falih. Repdo has already shortlisted companies for the first round of projects, aimed at tendering 300MW of PV and 400MW of wind as IPP projects. The ministry will back the projects with 20 and 25-year PPAs for wind and PV. The solar project will be located in the Al-Jawf region while the wind farm will be in Tabuk. The ministry also announced that it will launch a second tendering round at the end of the year for 400MW of wind and 620MW of PV. The government is clearly signalling to the market its strong desire to kick-start its renewable-energy programme, and tenders are expected to be signed in the next few months.

Supporting policies paving the way

Regulatory support is improving as several countries accelerate the expansion of their renewable sectors. Jordan was the first Arab country to introduce FITs in 2012. The first round of tenders in 2013 led to the procurement of 200MW of PV over 12 projects,

of which 11 received a FiT of \$0.160/kWh and the 52.5MW Shams Ma'an project, expected on line by the end of 2016, received \$0.149/kWh. The second round of tenders – concluded in 2015 through competitive bidding – led to the procurement of an additional 200MW of PV divided into four 50MW projects. The offers for the four 40MW plants were \$61.3/MWh, \$64.9/MWh, \$69.1/MWh and \$76.7/MWh, around 50% less than the FITs offered in the previous tender round. The government offered FITs in the first round to attract foreign investment. But there has been a change in strategy as the government offered tenders under competitive bidding, which attracted very low prices. Given the very competitive prices it was able to receive, the government is unlikely to revert back to FITs for future projects.

Egypt also has a FiT programme, but confusion surrounds it. After first offering developers tariffs of \$0.046-0.115/kWh for wind and \$0.09-0.144/kWh for solar, the government recently slashed the tariff for solar to \$0.084/kWh – a near 40% decrease. It is still too early to see how potential investors will

Renewable energy supporting policies

| | Renewable energy law | Targets | Auction schemes | FIT/Feed-in premium | Capital grants | Tax relief | Net metering | Carbon pricing |
|---------|----------------------|---------|-----------------|---------------------|----------------|------------|--------------|----------------|
| Algeria | ✓ | ✓ | - | ✓ | - | ✓ | - | - |
| Egypt | ✓ | ✓ | ✓ | ✓ | - | ✓ | ✓ | - |
| Iraq | - | ✓ | ✓ | - | - | - | - | - |
| Jordan | ✓ | ✓ | ✓ | ✓ | - | ✓ | ✓ | - |
| Lebanon | - | ✓ | - | - | - | - | ✓ | - |
| Morocco | ✓ | ✓ | ✓ | - | ✓ | ✓ | ✓ | - |
| KSA | - | ✓ | ✓ | - | - | - | - | - |
| Tunisia | ✓ | ✓ | - | - | ✓ | ✓ | ✓ | - |
| UAE | ✓ | ✓ | ✓ | - | ✓ | - | - | - |

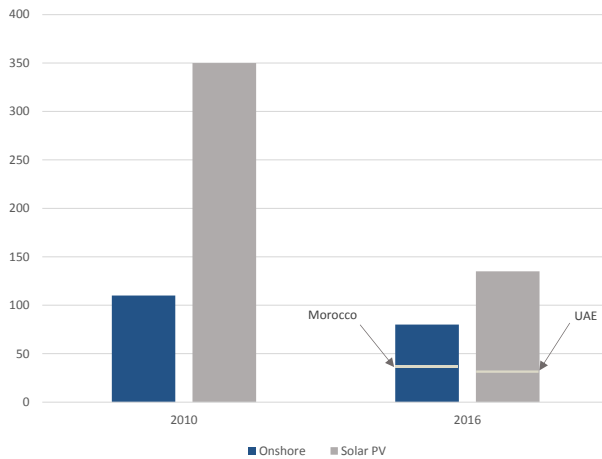
Source: IEA, APICORP Research

respond, and whether they will secure an adequate return on investment. In Morocco, a FiT policy does not exist but a similar scheme called the EnergiPro was launched in 2006. Under this programme, industrial consumers can invest in renewables and the government-owned utility guarantees to buy the surplus electricity at favourable rates. Other economic support mechanisms in the region include tax reliefs, net metering, and capital grants - while regulatory support mechanisms include renewable energy laws and national targets. However, the main incentive for private developers will be government-backed long-term PPAs, which along with price competitiveness in the region, will be the main drivers.

Costs continue to fall

Renewable energy success will ultimately rely on its cost competitiveness. The IEA estimates that global average onshore wind costs decreased by 30% while those for solar PV dropped by 70% from 2010-2015. The agency also expects a further 25% and 15% decline in costs for PV and wind respectively by 2021. These cost savings are mainly attributed to technological advancements and economies of scale due to increased manufacturing activities in Asia. Continuing investments and additional capacities will result in further cost reductions.

Global weighted average LCOE (\$/MWh)



Source: IEA, APICORP Research

The last few years have seen some of the lowest renewable energy prices in history. In 2015, the UAE received a solar PV tender from ACWA of \$0.0584/kWh for the 200MW phase II Dubai Solar Park while Egypt was able to achieve \$0.05/kWh for onshore wind. In 2016, the region broke records again when Morocco received average bids of \$0.03/kWh for five wind projects and the 800MW phase III of the Dubai Solar Park received \$0.0299/kWh. The solar record was recently broken by the 1.18GW Sweihan PV project in Abu Dhabi, which received \$0.024/kWh from Asian companies Marubeni and JinkoSolar.

These prices are very promising for the region, given that Qatar and Algeria to a lesser extent are the only Arab countries with abundant cheap natural gas. Gas supplies in Abu Dhabi and Egypt are estimated to cost in the range of \$5-6/MMBtu and can be more expensive in other countries. Based on these estimates, solar PV and onshore wind are capable of undercutting conventional sources in some countries, despite the widespread perception that renewables are not cost competitive.

But slow progress in other countries

However, other net-exporting countries are struggling to kick start their programmes. Large oil and gas reserves and cheap extraction costs mean that hydrocarbons continue to meet rising demand in countries like Kuwait, Qatar and Algeria. Policy uncertainty and lack of an efficient regulatory framework are mainly responsible for slow progress.

Kuwait declared a 5% renewable-energy target by 2020 but only has the 50MW Al-Shagaya CSP plant under development. In Oman, Masdar will be responsible for building 50MW of wind capacity in Harweel, while the government more recently submitted requests for proposals for the development of 200MW

of PV. Elsewhere, Qatar and Bahrain have made minor investments in renewables, but with no significant additions expected in the short term. In Algeria, the government recently announced plans to develop around 4GW of PV as part of its ambitious programme to develop 22GW of renewables by 2030. The government aims to issue three tenders, each for 1.35GW and operating under the IPP model – with the government entities holding a majority stake of the projects. So far, though, much obscurity surrounds the programme and progress is likely to be slow.

Despite many claims that renewable energy will never reach its potential – unless subsidies are phased out – fuel subsidies are one of the constraints for renewable development and other factors play a more important role. One problem lies in the electricity-market structure in Arab countries. Almost all rely on a state-owned wholesale entity to buy and sell electricity. Government wholesale buyers decide the purchase price of electricity from generators as well as the selling price to consumers. If governments want to keep prices low for end-consumers, there is nothing to prevent them from incentivising renewable-energy sources the same way they subsidise electricity prices from conventional sources – although this will exert more pressure on tight budgets in the current environment.

Nevertheless, there are many reasons to be optimistic about the future of renewables in the region. Net-importing countries such as Morocco and Jordan, driven by their desire to reduce dependency on fuel imports even in the current low oil price environment, will continue to lead the drive for renewable energy in the region. But financing is becoming more challenging in the current environment and these countries need to continue developing their regulatory framework to attract investment into this sector. In net-exporting countries – with the exception of the UAE – the share of renewables in the power mix will remain fairly small as they continue to rely primarily on conventional sources for additional capacity in the coming years and will use demand-side efficiency and price reform as measures to tackle rising electricity demand. However, at last, there are some serious signs that Saudi Arabia has kick-started its scaled down programme. The region has received some of the lowest renewable energy prices awarded globally for both PV and wind, and with some of the best resources in the world, renewables have great potential in the Arab world. But this requires that governments rise to the challenge and improve the regulatory and investment environment to attract investment in one of the fastest-growing energy markets.

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