

Greening the Energy Mix: Saudi Arabia, the United Arab Emirates, and Qatar

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Introduction

The renewable energy landscape in the Middle East is rapidly evolving and significant developments have taken place recently. While the region remains reliant on crude oil and natural gas (hydrocarbons) for its primary source of economic activity, it has started to view renewables, particularly solar, as a significant opportunity to diversify its energy mix and pursue green diversification.

The region recognizes the socio-economic benefits of renewable energy deployment, which is perceived as an opportunity to generate economic returns, employment, and technology transfer, while addressing climate change and reducing greenhouse gas emissions.

In this article we place the spotlight on Saudi Arabia (KSA), the United Arab Emirates (UAE), and Qatar, and review some of their long-term targets for renewable energy identified in national policies, shift in legislations catering to meet such targets, and recent renewable energy projects.

KSA

Background

KSA is the largest producer and exporter of oil in the region. KSA also has one of the highest per capita energy consumption rates in the world. While KSA predominantly relies on hydrocarbons for power generation, it is accelerating investments into renewable energy. KSA's drive to rely on greener sources of energy stems from a series of initiatives backed by the government.

The Ministry of Energy, Industry and Mineral Resources (**MEIM**) regulates the renewable energy sector in KSA. Recently, in January 2021 the MEIM went through a rebranding which focuses on the principles of transparency, sustainability, cooperation, and inclusiveness and launched a new logo that is circular in shape, representing the globe and expressing the integration, interdependence, and harmony of all the various energy sectors.

In 2010, KSA established the King Abdullah City for Atomic and Renewable Energy (**K.A. CARE**) – a scientific, research and governmental entity, to contribute towards sustainable development of the energy sector by introducing a combination of atomic and renewable energy to KSA's energy system. K.A. CARE's board of directors is headed by the Minister of Energy, Industry and Mineral Resources, and it supports several renewable energy programs.

KSA's drive to focus on renewable energy was reinforced in April 2016 when KSA announced "Vision 2030", which amongst various other economic and social policy overhauls, aims to build KSA's renewables energy market, while setting an initial target to generate 9.5 giga watts (**GW**) of renewable energy by

2023 (without specifying specific quotas for any specific technology be that solar and wind or other technology). KSA further detailed these plans, stating that the 9.5 GW target will be accomplished by 2023 as the “first stage” of the program.

In 2017, KSA launched the National Renewable Energy Program (**NREP**) and the National Transformation Program (**NTP**) (acting as a stepping stone to Vision 2030), both of which are managed and supported by the MEIM. The NREP, through the NTP, targeted the generation of 3.45 GW of renewable energy by 2020 and 9.5 GW by 2023.

The MEIM also established a Renewable Energy Project Development Office (**REPDO**) to function as the office responsible for delivering the NREP.

REPDO forecast a total of six procurement rounds between 2017 and 2023 with each round being procured annually. Rounds 1 to 2 focussed on solar photo-voltaic (**PV**) and wind with a small percentage of concentrated solar power (**CSP**). REPDO anticipates that although solar PV and wind will continue to dominate rounds 3 to 6, these rounds will also feature an increasing percentage of solar CSP and waste-to-energy (WTE). REPDO has forecast that by 2023, PV will account for approximately 5.5 GW, wind will account for approximately 2.5 GW, CSP will account for approximately 1 GW, and WTE will account for approximately 500 MW.

Recent developments

REDDO released round one in 2017, which launched requests for qualifications (**RFQs**), open to any company (or consortium of companies) with the technical and financial capabilities to execute projects of this scale. The sites selected for round 1 include Sakaka, where a 300 MW of Solar PV will be developed, and Midyan, for a 400 MW wind energy project. The projects will be backed by 25-year power purchase agreements (**PPAs**) for Solar PV and 20 year PPA for Wind.

The 300 MW Sakaka PV project, which was also KSA’s first utility scale renewable project, was completed by owners ACWA Power and AlGihaz (the EPC contract was awarded to a consortium of India-based Mahindra Susten and Chint Solar (Zhejiang), a Chinese solar PV modules manufacturer) in November 2019.

The Wind project in Midyan was cancelled and was replaced by the Dumat Al Jandal project. Similar to Midyan, the Dumat Al Jandal project is a 400 MW wind energy project and according to the latest reports key construction milestones have been achieved with the delivery of 20 turbines. Dumat Al-Jandal is being developed by a consortium led by EDF Renewables of France in partnership with Abu Dhabi-based Masdar. Once operational, it will be the largest wind farm in the Middle East

Round two, released by REPDO in August 2019, contained RFQs launched under category A and B targeted 1.5 GW of capacity. Category A is comprised of two Solar PV projects totalling 70 MW, including Madinah PV IPP (50 MW) and Rafha PV IPP (20 MW). Category B consisted of the Al-Faisaliah 600 MW PV project, Jeddah 300 MW PV project, Rabigh 300 MW PV project, and the Qurrayat 200 MW PV project. Bidders were shortlisted for all projects.

Round three, released by REPDO in January 2020, contained RFQs for four solar PV projects with a combined generation capacity of 1.2 GW. Similar to round two, this round would be divided into two categories – category A includes the 80 MW Layla and the 120 MW Wadi Al Dawaser solar PV projects while Category B includes the 300 MW Saad and 700 MW Ar Rass solar PV projects. While it is reported that bid submission dates were extended by REPDO, there is no information if round three bids were finalised.

During the recent 11th session of the General Assembly of the International Renewable Energy Agency (IRENA), held in January 2021, Khalid Al-Sultan – the president of K.A. CARE, identified KSA’s ambitious goal to generate 50 percent of the nation’s power needs using renewable energy by 2030 (i.e. 58.7 gigawatts of

renewable energy.

While there is no doubt that in line with the Kingdom's Vision 2030 the MEIM has approved policies stimulating the participation of the private sector in the renewable energy field, and it has updated regulations for renewable energy projects to achieve the goals of the NREP, nevertheless, analysts seem to be sceptical about KSA's renewable energy progress.

According to the International Renewable Energy Agency, KSA had only installed 397MW of renewable energy by the end of 2019, 394MW of which was solar power. Analyst GlobalData, in January 2021 reported that no megawatt-scale solar projects were commissioned in Saudi Arabia in 2020, even though more than 1GW of installations had been expected.

Despite such concerns on the timely delivery of the projects, KSA's legislative and policy overhauls, focusing on renewable energy, are commendable.

UAE

Background

The UAE has long been recognised globally as an oil and gas-rich nation with expansive reserves of each. Geographically however the UAE is also rich in solar resource and therefore is well primed to take advantage of the high solar irradiation that comes with being located near to the equator.

The UAE has, in recent years, been actively developing its renewable and clean energy strategy with a view to leveraging its resources in order to diversify its energy portfolio beyond the traditional hydrocarbons on which it has become heavily reliant. This is being undertaken in order to help reduce its surging carbon emissions and ensure it has clean, sustainable and secure sources of energy to meet the increasing and costly power consumption demands that come with being a global economic, financial and tourism hub.

As the UAE is comprised of seven Emirates, each with its own leadership, renewable and clean energy strategy and regulation in the country is derived at both a Federal and Emirate-specific level. At present there is no Federal law on renewable energy. Therefore, the legal and regulatory framework for this sector is primarily dictated by the governing authorities in each Emirate.

The Federal Ministry of Energy and Infrastructure (**FMEI**) is the Federal body that regulates the sector in the UAE, establishing policies and procedures for stakeholders. Etihad Water and Electricity (**EWE**) (formerly the Federal Electricity and Water Authority) also plays a key role, however its jurisdiction is generally focussed on the development of electrification strategies in the Northern Emirates (Ajman, Fujairah, Ras Al Khaimah, Sharjah and Umm Al Quwain).

Abu Dhabi and Dubai are widely perceived to be the key players in the renewable and clean energy sectors both in the UAE and globally, primarily because they are considered to be at the forefront of such initiatives. These Emirates have a number of government stakeholders, each of which, play a significant yet distinct role in the advancement of the country's renewable and clean energy ambitions.

In Abu Dhabi, the Department of Energy (**DoE**), controls and supervises participants involved in and generally regulates the planning and direction of the energy sector in the Emirate, including the granting of generation and production licences, developing policies and procedures for the licensing, control and supervision of the energy sector, which includes strategies for the generation, storage, transport, supply, sale and purchase of all forms of electricity, whether traditional or renewable, all while aiming to minimise the negative impact on the environment. The Emirates Water and Electricity Company (**EWEC**) is another

key government stakeholder, with responsibility for ensuring that there are sufficient supplies of electricity and water to meet domestic demand. EWEC also assumes the lead role when contracting with parties for the production and distribution of electricity and water in Abu Dhabi. The Abu Dhabi National Energy Company (**TAQA**), following its recent merger with the Abu Dhabi Power Corporation (**AD Power**), is one of the largest utility companies in Europe, the Middle East and Africa with assets in excess of AED 200 billion. TAQA now owns the majority of AD Power's generation, transmission and distribution assets, and therefore plays an integral role in developing, generating, transmitting and distributing energy and water throughout Abu Dhabi. Finally, there is the Abu Dhabi Future Energy Company (more commonly known as **Masdar**), which plays a leading role in developing and operating utility-scale renewable energy projects, both in the UAE and overseas.

In Dubai, the Supreme Council of Energy (**SCE**) and the Dubai Electricity and Water Authority (**DEWA**) are primarily responsible for regulating the sector and driving forward the Emirates' energy ambitions, through policy development, planning and coordination with the relevant authorities and energy bodies in order to deliver new energy sources while also preserving the environment.

Recent developments

In January 2017, the UAE launched its Energy Strategy 2050. This recognises the risks posed by climate change and the importance of reducing greenhouse gases. It aims to increase the contribution of clean energy in the total energy mix from 25% to 50% by 2050 and reduce the UAE's carbon footprint of power generation by 70%, with a targeted saving of AED 700 billion. The strategy aims to combine an energy mix between renewable energy, gas, clean coal and nuclear, with clean energy to account for 44% of the total energy mix, of which 25% is to come from solar. In doing so it will allocate over USD 163 billion to its goal of increasing the contribution of clean energy sources to its total capacity mix.

The SCE has also developed an implementation plan for the Emirate of Dubai, known as the Clean Energy Strategy 2050, which aims to provide 75% of Dubai's total energy output from clean energy sources by the year 2050.

The UAE is already home to some of the region's most prominent and the world's largest solar power plants- including Shams 1, the Masdar City Solar Photovoltaic Plant, the Al Dhafra Solar Photovoltaic Facility, the Noor Abu Dhabi Solar PV Plant and the Mohammed Bin Rashid Al Makhtoum Solar Park.

One project that is likely to play a significant role in helping the UAE achieve its renewable energy targets, help reduce its reliance on fossil fuels and enhance Abu Dhabi's energy needs, is the Abu Dhabi Al Dhafra Solar PV project. Due to become operational in 2022, it is set to become the world's largest independent solar power plant with a total installed capacity of 2GW which will supplement the existing 1,177MW generated by the Noor Abu Dhabi Solar Plant. The Noor Abu Dhabi Solar Plant entered commercial operation in January 2019 (currently the world's largest single-site solar PV plant), more than doubling Abu Dhabi's total solar power generation capacity to approximately 3.2GW.

In March 2021, as part of its new 2030 strategy, and as a further reaffirmation of the importance the UAE places on renewable energy, TAQA announced plans to further expand its renewable energy portfolio by investing AED 40 billion in developing energy infrastructure with a view to supplementing energy capacity by 27GW by the year 2030. This will primarily be done through developing the Emirates' solar energy infrastructure. In doing so, TAQA plans to increase the total amount of power it generates from renewable energy sources from the current 5% to 30% by 2030. Masdar, alongside the Abu Dhabi Tourism Development and Investment Company, is also planning to develop Abu Dhabi's wind energy capabilities, with plans being made for a 30MW wind farm. This will supplement the region's first wind turbine which was installed on Sir Bani Yas Island in Abu Dhabi. Standing at 65 metres high, with three blades each with a wingspan measuring 52 metres, it is able to produce 850KW of electricity per hour.

In Dubai, significant progress is also being made. In May 2020, DEWA announced that the proportion which clean energy occupied in Dubai's energy mix had exceeded its initial target of 7% (set in the Dubai Clean Energy Strategy 2050), and had increased to 9% of Dubai's total power output. This is, in part, thanks to power generated from the Mohammed Bin Rashid Al Maktoum Solar Park. This record-breaking solar park, the first in the region to use the independent power producer model, has the world's tallest solar tower measuring 850 feet. It uses both CSP and PV solar technologies and is being constructed in five phases, with a planned total capacity of 5000MW by 2030.

Recently we have seen the UAE also place increased emphasis on other alternative forms of clean energy, in particular, the UAE's hydrogen strategy and the contribution that hydrogen can make to reducing its carbon emissions and enhancing the country's clean energy economy. In March 2021, the UAE Cabinet approved a nationwide system for hydrogen fuelled public transportation. This came on the back of the recently formed Abu Dhabi Hydrogen Alliance, comprising the Mubadala Investment Company, the Abu Dhabi National Oil Company and ADQ, who have come together in order to develop and implement a roadmap for the acceleration of a hydrogen based economy in major UAE sectors including utilities, mobility and industry. In one such recent development, in May the UAE's Minister of Energy and Infrastructure, His Excellency Suhail Al Mazrouei, announced that the UAE would be commissioning its first green hydrogen plant which would provide clean fuel for transportation during Expo 2020 in Dubai. In addition, in March this year, TAQA announced plans to expand its clean energy portfolio through the development of further highly efficient water desalination plants. TAQA is currently building the world's largest reverse osmosis desalination plant in Taweelah, Abu Dhabi. This plant will use the membrane-based method of desalination which utilises less energy than the traditional thermal process. The plant is set to enter operation in 2022 and will increase Abu Dhabi's reverse osmosis capacity from 14% to 30%, producing 200 million imperial gallons of water per day. Together, these are seen as further important steps in the country's up-scaling of its clean energy strategy, which will help bring the UAE closer towards it achieving its clean energy targets.

Plans are on the horizon for further large-scale solar, wind and other smaller energy projects, including wide scale residential and commercial rooftop solar initiatives which will complement the existing 1,276 solar panels currently in use, which generate approximately 81MW from the roofs of buildings throughout Dubai. To this will be added floating solar power plants, the potential enhancement of the UAE's hydroelectric power capabilities and an increased emphasis on autonomous, environmentally friendly transport through the Dubai Autonomous Transportation Strategy (to name but a few examples). There is therefore clearly no doubt that the UAE will continue to be at the forefront of pioneering initiatives in the renewable and clean energy sector, driving forward the regions clean energy ambitions and helping the country continue to reduce its carbon footprint for many years to come.

Qatar

Background

In October 2008, the General Secretariat for Development Planning in the State of Qatar released a development plan titled Qatar National Vision (**QNV**) 2030. QNV 2030 was organised into four pillars: human development, social development, economic development and environmental development. Broadly, QNV 2030 identifies the need for sustainable development in order to balance the interests of the current generation with the interests of future generations, and emphasises the need for preventive measures to mitigate the effects of climate change.

In 2012, Qatar demonstrated its support for global action on climate change action by hosting the 18th Conference of Parties (**COP18**) to the United Nations Framework Convention on Climate Change. Qatar has also twice hosted the Doha Carbon & Energy Forum, a workshop-style conference hosted by the Qatar

Foundation, Qatar Petroleum and ExxonMobil and featuring international experts from the region's industries, academia and governments. The forum focuses on generating policy recommendations for industry and government on climate change, alternative energy, and energy efficiency.

Qatar has also prepared National Development Strategies (**NDS**) that function as supplementary development plans to QNV 2030. NDS 2011-2016 (**NDS-1**) was the first comprehensive development strategy, a major achievement of which was that it created a national culture of development planning across all government entities, and set out targets to halve gas flaring to 0.0115 billion cubic metres per million tonnes of energy produced from the 2008 level of 0.0230 billion cubic metres per million tonnes of energy produced.

NDS 2017-2022 (**NDS-2**) acknowledges that Qatar has made limited progress in renewable energy production and the share of renewable energy of total national energy needs is negligible despite a high potential for renewable energy in the country. NDS -2 sets a target to reach a production of 200 megawatts of renewable energy by 2020 to be increased to 500 megawatts afterwards.

Recent developments

In 2017, Qatar Water and Electricity Company (**Kahramaa**) signed an agreement with the Emirati Masdar Company and the Qatari Nebras Company to establish a joint working relationship to develop renewable and sustainable energy projects.

As per the targets identified in NDS-2, Kahramaa developed a plan to generate 200 megawatt of solar energy by 2020, which was to be further increased to 500 megawatt afterwards, owing to subsequent projects in developments with Qatar Petroleum (**QP**).

Qatar Solar Technologies (**QST**), a joint venture between Qatar Solar, a subsidiary of Qatar Foundation for Education, Science and Community Development's solar investment company, SolarWorld AG, and the Qatar Development Bank, was established to manufacture materials needed for the State's solar energy programme. QST has also worked with Kahramaa to build an 8000-tonne-per-annum polysilicon plant in Ras Laffan Industrial City in 2018. The plant is expected to produce 8,000 metric tons of polysilicon per year.

Qatar is also currently developing a 800MW PV power project, which is the country's first large-scale solar power plant. The Al Kharsaah Solar Power Project is 60% owned, developed and operated by Siraj Energy (a Qatar Petroleum and Kahramaa joint venture), and 40% jointly owned by the Consortium of the Total Solar International and the French-Japanese Consortium Marubeni.

In less than two years, Qatar is poised to host the FIFA World Cup. It is reported that FIFA and the Supreme Committee for Delivery & Legacy that implement the event's Sustainability Strategy intend for the cooling systems for the venues to rely on renewable energy.

Conclusion

In summary, the three jurisdictions are shifting towards greener growth through a number of drivers, mostly related to national objectives and strategies.

Analysts have expressed concerns on the delivery of the identified renewable energy targets, especially considering that progress has slowed down in 2020-2021, as the Covid-19 pandemic has caused delay and disruption to renewable energy supply chains. However, this is not expected to negatively affect the KSA,

UAE and Qatar's renewable energy strides in the long-term.

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