



USSBC Economic Brief Renewables: Saudi Arabia Energy Diversification Update

Overview

The Saudi power sector is in the midst of significant developments aimed at generating and growing its capacity to supply electricity to residential consumers and commercial customers. Facing strong demand for electricity, a desire to diversify its domestic energy mix, the need to improve energy efficiencies, the decline in the cost of alternative energy sources, and the abundance of solar radiation across the country are measures that will allow the Kingdom to become a global leader in renewable energy. The Kingdom has developed robust initiatives under the Ministry of Energy that include the creation of the National Renewable Energy Program (NREP) in line with Vision 2030 and the formation of the Renewable Energy Project Development Office (REPDO), which is responsible for the delivering the goals of NREP. Furthermore, and as part of the Kingdom's development plan, the private sector's participation in the sector is instrumental to the proliferation of the renewable energy sector. To date, a number of independent power producers (IPP) have developed solar and wind projects and the growth of the private sector as a catalyst plays a prominent role in shaping the sector's future.

Since the NREP's development in 2017, the renewable energy landscape has dramatically shifted as numerous projects currently under execution or in the planning/bidding phases are expected to boost the supply of power. While the current contribution of renewable energy to the Kingdom's total capacity is in a nascent stage, the scale of growth is expected to significantly ramp up as the Kingdom aims to reach its ambitious goal of generating 50 percent of its energy through alternative resources by 2030. In order to reach this goal, the Kingdom will prioritize the growth of the sector through private sector participation, attracting foreign direct investments, job creation, and localizing domestic production and content.

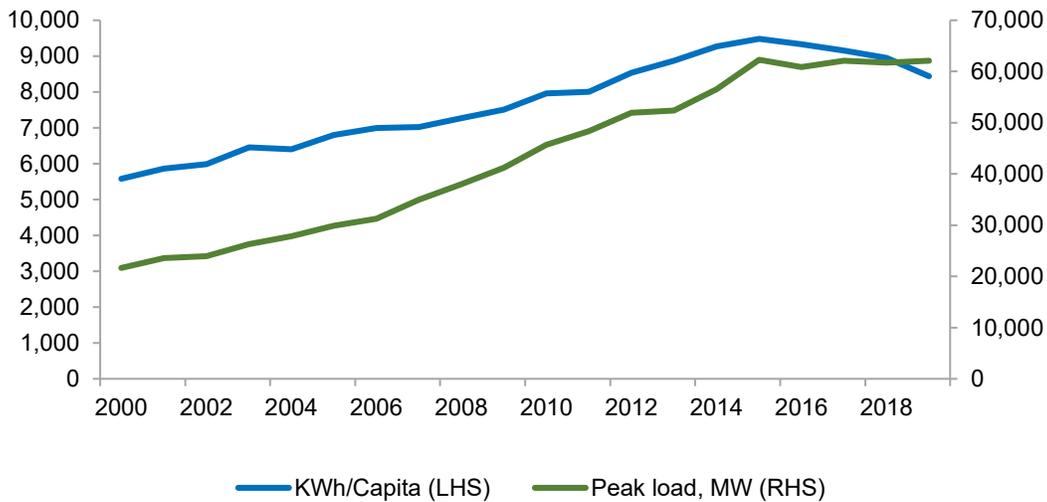
Market Determinants

A growing population coupled with a surge of mega projects over the past two decades has necessitated significant strides by the government to meet the Kingdom's demand for power. According to the General Authority for Statistics (GASat), Saudi Arabia's population grew by a compounded annual growth rate (CAGR) of 2.8 percent between 2000-2019, reaching approximately 34.2 million people. Meanwhile, the Kingdom's peak load grew from 21.7 MW in 2000 to 68.1 MW in 2019 according to the Electricity &



Cogeneration Regulatory Authority (ECRA), marking a CAGR of 5.7 percent. This points to the growth in demand for electricity per user that outpaces population growth and has placed growing pressure on the government to provide to the needs of consumers. Further illustrating the growth in demand is the per capita usage over the last two decades. The KWh/capita grew from 5,575 in 2000 to 8,434 in 2019, representing a CAGR of 2.2 percent. The KWh/capita has steadily decreased since 2015, which reached KWh/capita of 9,484. The decrease is mainly attributed to the government’s partial removal of energy subsidies in 2015 and again in 2018 for both the residential and commercial sectors.

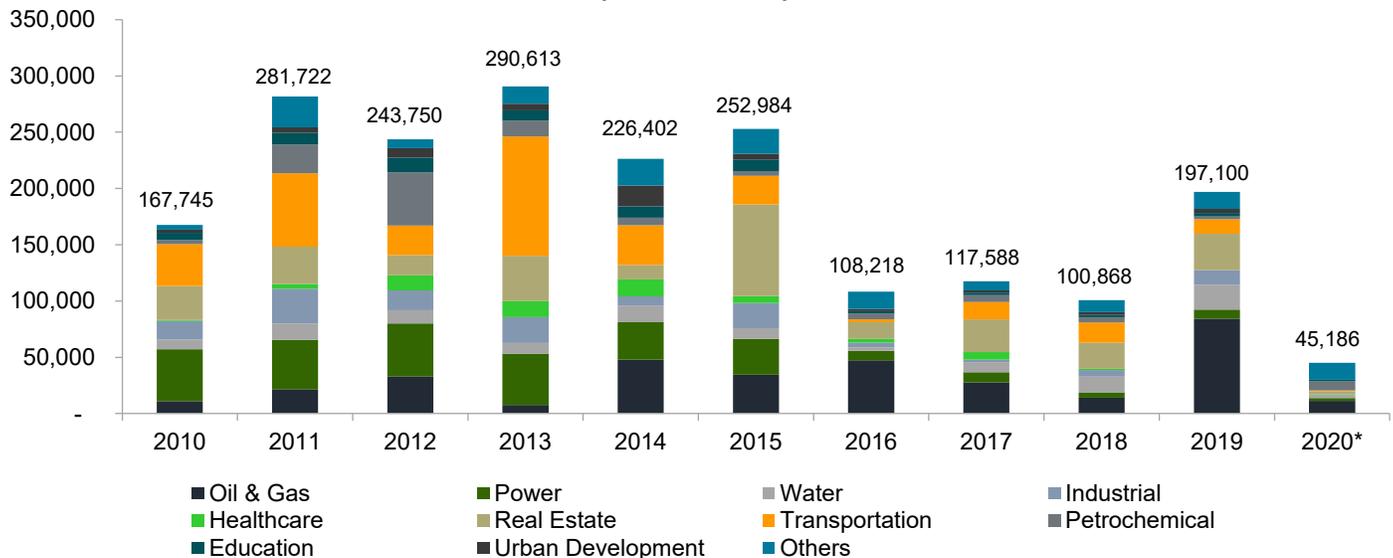
Figure 1 - Peak Load and Electric Power Per Capita



Source: Electricity and Cogeneration Regulatory Authority

The rise in construction projects, particularly mega-projects over the last 10 years has intensified the demand for electricity across every phase of development. According to the USSBC Contract Awards Index, the cumulative value of contract awards between 2010-2019 reached SAR2 trillion (\$533 billion).

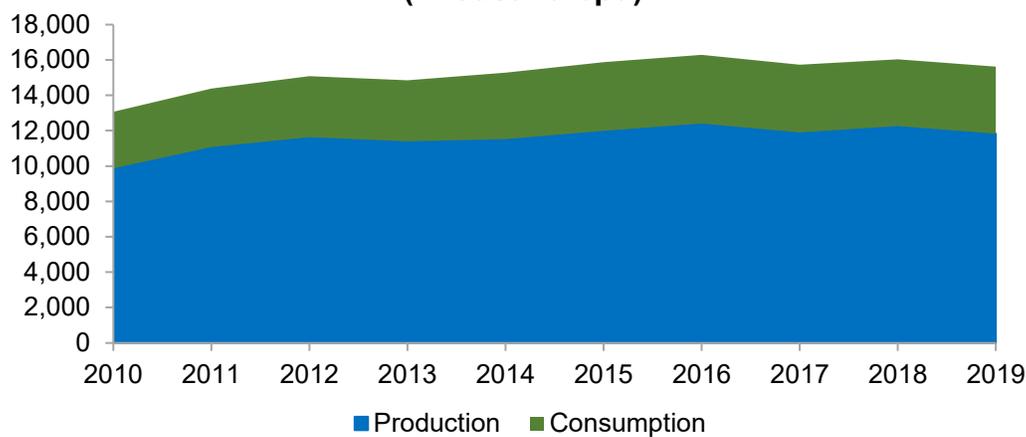
Figure 2 - Value of Awarded Contracts by Year (SAR Million)



*Through Q1 2020
 Source: MEED Projects, public outlets, government data, USSBC

The level and scale of projects during this period reflects the commercial sector’s demand for electricity to support the Kingdom’s development. The need to shift towards alternative energy sources comes on the heels of growing domestic consumption of fossil fuels. The Kingdom primarily relies on crude oil and natural gas for electricity production given the abundance of crude oil reserves and the low cost of extracting. Other fuels such as diesel and heavy fuel oil have seen lower usage over the years, which put more emphasis on crude oil and natural gas for power production. According to BP’s 2020 annual report, Saudi Arabia consumed 3.8 million barrel per day (mbpd) of the 11.8 mbpd it produced in 2019.¹ This represents up to a 32 percent bite out of Saudi Arabia’s export capacity to the rest of the world that is currently serving its domestic energy needs.

Figure 3 - Saudi Oil Production & Consumption (Thousand bpd)

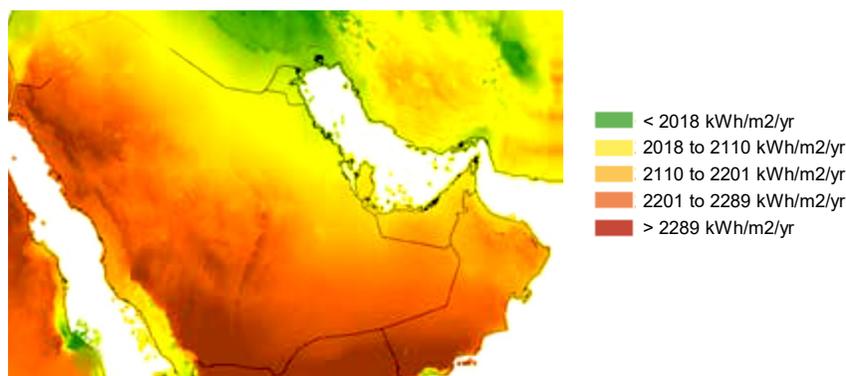


Source: BP Statistical Review of World Energy (2020)

Renewable Energy Geographical Characteristics of Saudi Arabia

Saudi Arabia’s geographical location places it in a very favorable location in terms of utilizing solar and wind as renewable energy sources. It is ranked as the 6th country globally with the highest potential for solar energy.² Photovoltaic (PV) generation is the widely utilized solar energy source in the GCC. The global horizontal irradiance (GHI) map in Figure 4 reveals that the northwestern and central regions of Saudi Arabia are especially good areas for PV resources.

Figure 4 - Global Horizontal Irradiation (kWh/m²/yr)



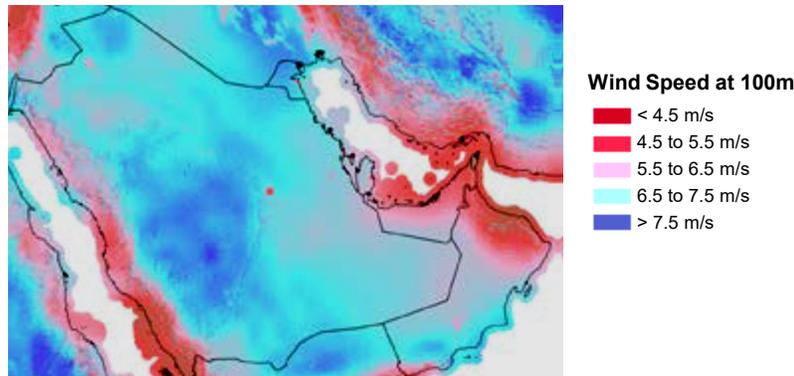
Source: International Renewable Energy Agency

¹ BP 2020 Statistical Review of World Energy Report

² Shell Global Energy Resources Database

Concentrated solar power (CSP) is another abundant source of renewable energy in Saudi Arabia. According to the International Renewable Energy Agency (IRENA), the northwestern region of Saudi Arabia has some of the strongest direct normal irradiation (DNI), which is a relevant resource for CSP.³ Saudi Arabia is home to one of the best DNI locations in the Middle East, and is comparable to Jordan, Spain, and Morocco. As depicted in Figure 4, Saudi Arabia contains large areas with GHI scores above 2,200 kilowatt-hours per square meter per year (kWh/m²/yr).

Figure 5 - Annual Average Wind Speeds (m/s)



Source: International Renewable Energy Agency

Wind is another potentially strong source of energy in Saudi Arabia. The Kingdom is located within the Hadley cell, and is the 13th ranked country in wind energy.⁴ According to IRENA, an average annual wind speed at a hub height of 100 meters reveals that large areas in the center and north regions of Saudi Arabia have good wind sources (above 7.5 m/s).⁵

Current Renewables Energy Landscape

The Saudi renewable energy sector's promising future is built on a robust regulatory framework that coincides with initiatives that will allow it to flourish over the long-term. The creation of the NREP and the implementation of initiatives under the REPDO has provided needed clarity for domestic and international players. The NREP has created the foundation for opportunities in the sector through these three main objectives:



Source: NREP

³IRENA GCC Renewable Energy Market Analysis (2019)

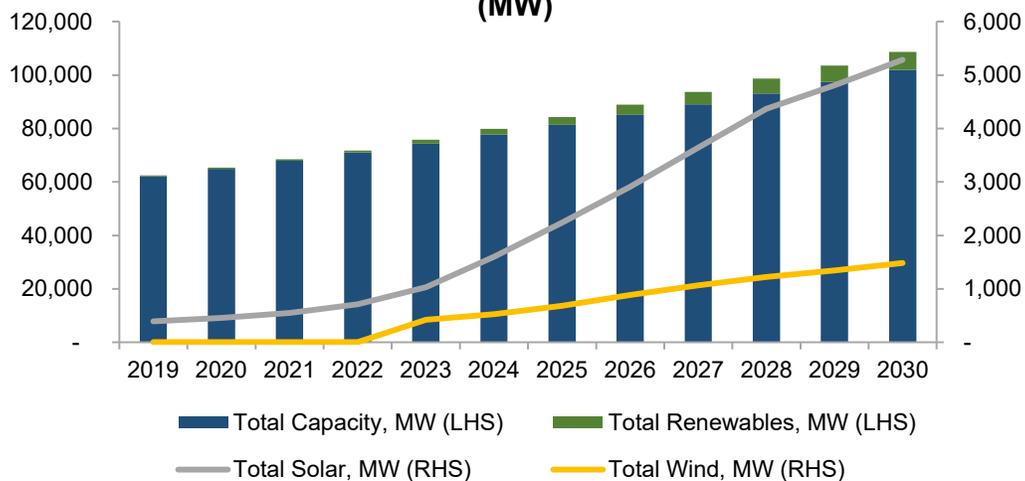
⁴Shell Global Energy Resources Database

⁵IRENA GCC Renewable Energy Market Analysis (2019)

The ambitious plans by the government to grow its renewable energy mix will be spearheaded by multiple entities. As previously mentioned, the NREP through REPDO will deliver on the Kingdom’s broad Vision 2030 objectives. Additional entities that will be instrumental to the success of the sector include the King Abdullah City for Atomic and Renewable Energy (KA-Care), ECRA, and the Saudi Electricity Company (SEC). These entities will work together to advance the Kingdom’s renewable energy research, measurement, data acquisition, regulation, predevelopment, and tendering. Furthermore, this past April witnessed the launch of the Supreme Committee for Energy Mix Affairs, for Electricity Production and Enabling Renewable Energy. The committee, headed by H.R.H. Prince Mohammed bin Salman, is responsible for coordinating renewable project execution between government sectors, streamlining the pre-construction phases of such projects to expedite the development of the Kingdom’s ambitious 9.4GW renewables target for 2024.

While many initiatives have already begun and projects already under execution, the Kingdom faces challenges in meeting its short to medium-term goals. According to IRENA’s Renewable Capacity Statistics 2020 report, Saudi Arabia renewable energy capacity has grown from 2 MW in 2010 to 397MW in 2019.⁶ In order to achieve its medium to long-term renewable energy objectives, the Kingdom must prioritize the sector within its budgetary planning and allow for continued foreign investment attraction. According to our estimates, Saudi Arabia’s total renewable energy capacity will grow to 5.3 GW by 2030, accounting for 7 percent of the Kingdom’s total electricity output of 102 GW. Solar power is forecasted to account for 77 percent of all renewables by 2030.

Figure 6 - Total and Renewable Electricity Capacity (MW)



Source: International Renewable Energy Agency, USSBC estimates

Current and upcoming projects

Saudi Arabia’s decision to utilize auctions to attract bids have yielded the lowest prices for solar PV, CSP, and wind. The decrease in prices can be attributed to a number of key factors: (1) the availability of vast land with good solar resources; (2) auction designs successful at achieving low prices; (3) access to finance and (4) technological improvements.⁷ Hence, auctions create competition between bidders, which reduces technology costs associated with bids.

⁶ IRENA Renewable Capacity Statistics (2020)

⁷ IRENA GCC Renewable Energy Market Analysis (2019)



REPDO's Round One

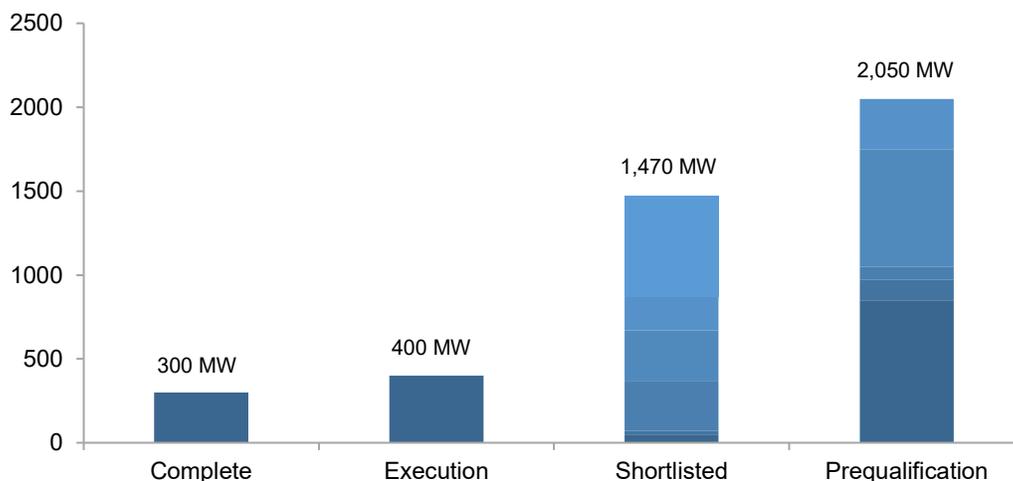
As part of Round One of the National Renewable Energy Program, REPDO awarded its first 300 MW IPP solar PV project in Sakaka in 2018 to renewable energy developer ACWA Power through a 25-year Power Purchase Agreement of 2.36 cents/kWh with the Saudi Power Procurement Company (SPPC). It is the first utility-size renewable energy plant in the Kingdom. The project also set the world record for the lowest levelized cost of energy (LCOE) at the time. The award came after a stringent prequalification process as REPDO received 128 statements of qualifications and short-listed 27 companies. Eight of the short-list companies submitted a bid.

Located in the city of Al Jawf, the project generated a private sector capital investment of SAR1.1 billion (\$302 million) leading to the creation of more than 400 clean energy jobs. Subsequently, California-based NEXTracker partnered with ACWA Power to supply the project with its advanced single-axis tracker technology and its advanced data connectivity technology. As part of the project, REPDO requires a minimum local content of 30 percent.

In January of 2019, REPDO awarded the Kingdom's first utility-scale wind power project, Dumat Al Jandal onshore wind farm project, to a consortium led by EDF Energies Nouvelles and Abu Dhabi Future Energy Company (Masdar). The SAR1.9 billion (\$500 million) project was awarded based on the levelized cost of energy of \$1.99 cents/kWh, registering a new record-low price for a project of this type in Europe, Middle East and Africa. When completed, the wind farm will have an installed capacity of 400 megawatts, enough to power up to 70,000 Saudi households and is expected to create almost 1,000 jobs during construction and operation. The project, which will be financed by domestic and international banks, will commence commercial operations in the first quarter of 2022.

In March of 2019, the Ministry of Energy announced the Kingdom's plans to build a 2,600 MW solar project in the holy city of Makkah. A contract for 600 MW will be tendered with the project set to be developed in two phases. The initial phase will be developed after a bidding process through the ministry and the remainder will be developed by the Public Investment Fund (PIF) and its partners.

Figure 7 - National Renewable Energy Program (NREP) Projects (MW)



Source: Ministry of Energy, NREP



Round Two

REPDO announced its selection of shortlisted bidders for projects tendered under its second round of auctions in 2019. The final investor selection was expected to be announced in April 2020, however the announcement was likely delayed due to the impact of COVID-19 as the Kingdom continues to prioritize programs that will stabilize the economy and focus on the health of its citizens. REPDO created two categories, "A" and "B" that are expected to produce 1.47 GW solar power. Successful bidders for Categories A and B bidders are expected to enter into a 25-year power purchase agreement (PPA) with the Saudi Power Procurement Company (SPPC) as off-taker.

Category A:

REPDO announced two projects for category A that will produce solar power. The first project pertains to the construction of a 50 MW solar power plant in Madinah. According to MEED Projects, the project's estimated value will be approximately SAR263 million (\$70 million). The current shortlisted bidders are Al-Balagha/ Alfancar/ Desert Technologies with an LCOE (in halalah's) of SAR7.257; and First Solar/ Mowah with an LCOE of SAR11.35.

The second project under category A pertains to the construction of a 20 MW solar power plant in the city of Rafha in the Northern Borders for an estimated value of SAR225 million (\$60 million). According to MEED Projects, the current shortlisted bidders include Al-Blagha/ Alfancar/ Desert Technologies with an LCOE of SAR13.07; and First Solar/ Mowah with an LCOE of SAR19.04.

Category B:

Category B is expected to develop 1.4 GW of solar power over four projects that will be awarded in this phase. Round two category B projects are expected to carry a minimum requirement of 17 percent local content as calculated by the mechanisms defined by the Local Content & Government Procurement Authority (LCGPA).

The first project involves the construction of a 600 MW solar power plant in Makkah and is estimated to be valued at SAR3 billion (\$800 million), according to MEED Projects. No LCOE data has been made available but the three shortlisted bidders include MASDAR/ EDF Renewables/ Nesma; ACWA Power/ GIC/ Al-Babtain; Marubeni/ Al Jomaih; and Total Solar/ Altaqaa/ Al Gihaz.

The second project involves the construction of a 300 MW solar power plant in Jeddah and is estimated to be valued at SAR1.5 billion (\$400 million), according to MEED projects. The current shortlisted bidders are also MASDAR/ EDF Renewables/ Nesma with an LCOE of SAR6.09; ACWA Power/ GIC/ Al-Babtain with an LCOE of SAR6.215; Marubeni/ Al Jomaih with an LCOE of 6.381; and Total Solar/ Altaqaa/ Al Gihaz with an LCOE of SAR6.684.

Another project involving the construction of a 300 MW solar power plant will be developed in Rabigh. MEED Projects estimates the value of the project to also be SAR1.5 billion (\$400 million). The current shortlisted bidders are also MASDAR/ EDF Renewables/ Nesma with an LCOE of SAR5.956; ACWA Power/ GIC/ Al-Babtain with an LCOE of SAR6.597; Marubeni/ Al Jomaih with an LCOE of SAR6.381;



and Total Solar/ Altaqaa/ Al Gihaz with an LCOE of SAR6.684.

The final project under category B calls for the construction of a 200 MW solar power plant that will be constructed in Qurrayat. The estimated value of the project is SAR938 million (\$250 million), according to MEED Projects. The current shortlisted bidders are also MASDAR/ EDF Renewables/ Nesma with an LCOE of SAR6.273; ACWA Power/ GIC/ Al-Babtain with an LCOE of SAR6.688; Marubeni/ Al Jomaih with an LCOE of SAR6.453; and Total Solar/ Altaqaa/ Al Gihaz with an LCOE of SAR6.785.

Round Three

The REPDO issued requests for proposals (RFP) for four projects tendering in the round three auction phase. Round three will have four projects split evenly into category A and category B. The total expected solar power capacity will be 1.2 GW. According to MEED, REPDO has prequalified 49 firms to bid for the third round of the Kingdom's NREP program and expects to receive proposals for the category A and category B projects between September and October 2020, respectively.

Category A:

The two projects in category A are expected to produce 200 MW of solar power. According to MEED Projects, the aggregate value of the two projects is expected to be SAR1.1 billion (\$300 million). The first project under category A calls for the construction of the 120 MW Wadi Al Dawasir solar power plant in Riyadh. The estimated value of the project is SAR675 million (\$180 million), according to MEED Projects. The second project under category A involves the construction of the 80 MW Laila solar power plant. The estimated SAR450 million (\$120 million) power plant will be located in Riyadh.

Category B:

The two projects in category B are expected to produce 1 GW of PV solar power. According to MEED Projects, the aggregate value of the two projects is expected to be SAR4.9 billion (\$1.3 billion). The first project under category B involves the construction of a 700 MW PV solar power plant known as Al-Rass. The plant will be located in Riyadh and is estimated to be valued at SAR3.4 billion (\$900 million), according to MEED Projects. The second project under category A is for the construction of the 300 MW Saad PV solar power plant in Riyadh. MEED Projects estimates the value of the project to be SAR1.5 billion (\$400 million).

Additional Non-Auction NREP Projects

Two additional projects, Yanbu Wind IPP (850MW) and Mahad al-Dahab solar PV IPP (20 MW), were initially included in the third round of the NREP program but were excluded when REPDO issued an RFQ for the third round earlier this year. However an issue for the request for prequalification for the Yanbu Wind IPP is expected for the second half of 2020, according to MEED.

In addition to NREP projects, there has been a growing trend of incorporating renewable energy as part of a number of projects across the Kingdom. For instance, Ma'aden's SAR2.3 billion (\$606 million) Mansourah & Massarah gold mine project, which was awarded in April 2019 calls for the construction of a 44 MW solar power plant. Saline Water Conversion Corporation's (SWCC) project to build a 125,000 m3/d



reverse osmosis water plant in Tabuk also incorporates solar energy. As part of the project, SWCC constructed a 4MW solar power plant to supply power to the desalination plant. Another example includes FAS Energy's development of a PV roof power station with an installed capacity of 60 MW and a parking shed power station with an installed capacity of 5 MW in Riyadh.

A significant mega-project was recently announced between NEOM, Acwa Power, and Air Products as part of a SAR19 billion (\$5 billion) development for a world-scale green hydrogen-based ammonia production facility powered by renewable energy and will be based in NEOM. The project will be equally owned by the three partners, and is expected to introduce a new model for sustainable living while providing export markets with green ammonia. The project will include the construction of a 4 GW renewable energy powered by solar, wind, and storage. According to MEED Projects, the electricity produced by the power plant will be used in an electrolyzer to split oxygen from hydrogen in the water for the ammonia plant.

Local and International Partnerships

In May of 2019, Saudi Basic Industries Corporation's (SABIC) subsidiary Nusaned Investment and Germany-based Schmid Group finalized a joint venture (JV) that aims to manufacture and develop Vanadium Redox Flow Batteries (VRFB) in Saudi Arabia. This marks an important development in the value chain integrated production. The JV, Advance Energy Storage System Investment Company, plans to set up a gigawatt-scale manufacturing facility in Dammam Third Industrial City. The firm aims to start the construction of the manufacturing facility in the first half of 2020 with production expected to begin in 2021. The facility will have an annual production capacity of 3 GW. The planned manufacturing facility will produce energy storage systems for use alongside utility-scale renewables projects, telecom towers, mining sites, remote cities and off-grid locations.

Another recent JV was signed between Al-Rushaid Group and France-based Optimum Tracker. The Saudi-registered joint-venture company will provide design and engineering services in the field of solar energy, with a focus on manufacturing mounting system structures for photovoltaic (PV) solar panels. It will have an initial investment of SAR200 million (\$53 million) and will be based in the Eastern Province. A gradual capacity increase of no less than 150MW is targeted.

The Public Investment Fund has also played an active role in the development of the renewable energy sector. Its controls a 25 percent stake in Acwa Power, while the Public Pension Agency owns 5.7 percent. Acwa Power has been a very active player in the renewable energy arena as evidenced by it being shortlisted for a number of projects in REPDO's auctions. PIF's investment has also allowed Acwa Power to become a regional player in the development and operation of its growing portfolio of projects in the region.

SABIC has been active with its investments in international renewable energy programs for a number of years. Most recently, it began plans to build the world's first chemical plant to be powered by solar power in Spain. The plant will produce polycarbonate and will include 263,000 solar panels that will power the 100 MW project. According to news sources, SABIC will enter a 25-year deal as part of its goal to have 4 GW of solar and wind energy installed for its sites by 2025, with the aim of increasing its capacity to 12 GW by 2030. This project follows a number of deals that took place last year in India and Thailand that



involved the installation of solar panels.

Within the private sector, the Abdul Latif Jameel Group’s energy subsidiary invested in the acquisition of Spain’s Fotowatio Renewable Ventures in 2014. According to the Abdul Latif Jameel company, the acquisition is part of their strategy to become a global independent power producer. The acquisition included 3.8 GW of renewable energy plants globally. This includes 94 MW in Australia, 65 MW in Uruguay, 175 MW in Brazil, and 60 MW in Egypt.

Local Supplier Chain

The number of local suppliers by supply chain in the Kingdom has grown to keep up with the growth of the renewable energy sector. The NREP created a portal for suppliers to amplify their products and services to international developers as part of its localization drive. The goal of the portal is to allow domestic suppliers to become involved in the growth of the sector as they build their internal capabilities to meet future demand. The portal, wesupplyrenewables.com.sa, identifies 77 domestic suppliers that are involved within solar and wind projects. A total of 66 suppliers are involved in solar projects while 40 cater to wind projects.

Table 1 - Renewable Suppliers by Category

Solar		98
Solar PV		60
Solar CSP		38
Wind		48
Services		27
Engineering, Procurement, and Construction		11
Manufacturing		4
Supplier		4
Developer		2
Waste to Energy		73
Incineration Power Generation		21
Gasification Power Generation		20
Gasification with Melting Furnace		17
Organic Waste Methane Fermentation		15
Other		17
Other category		17

Source: NREP

*Suppliers may be active across multiple categories



Financing

Paramount to the successful future of the renewable energy sector is the availability of financing and concessions from the government and private banks. Given the priority to develop the renewable energy sector, the government has introduced favorable financing mechanisms to support local and international organizations. The SAR105 billion (\$28 billion) Saudi Industrial Development Fund opened applications for the renewables program, called Mutjadeda, in September 2019. Depending on a company's ownership level, the program will provide loans up to SAR1.2 billion (\$320 million), focusing on renewable-energy parts manufacturers and independent production projects. Players in other industries deploying renewables can apply for loans with repayment periods of up to 12 years and grace periods of 36 months.

Additionally, the government offers the following incentives for foreign investors in the Kingdom's renewable energy market:

- ◆ **Duty Exemption:** Exempts manufacturers with an industrial license from the duty on raw material and finished products not produced domestically
- ◆ **Low Land Rate:** Provides manufacturers with plot spaces with the required basic infrastructure for a low price of \$0.8 cent/square meter
- ◆ **Favorable Loan Terms:** Offers 12-year loan financing at up to 75 percent of CAPEX with upfront fees of 6-8 percent and semi-annual fees of 1.5-2.5 percent of outstanding amounts
- ◆ **Repatriation of Capital:** No restrictions on the repatriation of capital
- ◆ **Nationalization Incentives:** Up to 15 percent (males) and 20 percent (females) of monthly salaries of Saudi national employees to be covered by the Human Resources Development Fund

Commercial banks are increasing their lending appetites for well-designed renewable energy projects by offering long loan tenors and low interest rates. Renewable energy projects in the region attract loan tenors over 20 years, high debt-to-equity ratios of 70-80 percent, and low interest rates that are 120-200 basis points above the London Interbank Offered Rate (LIBOR). The average debt-to-equity range for international solar PV projects are usually between 60-70 percent.⁸ International banks have been active as well. For example, the 300 MW Sakaka PV solar power plant attracted SAR1.1 billion (\$302 million) in financing from France's Natixis as part of the off take agreement with the SPCC for a 25 year PPA. As the market transitions from its nascent stage to a mature one, the availability of financing at attractive rates will be more widely available for smaller projects.

Although used in the region but not yet in the Kingdom, green bonds will be another option for developers to secure financing. Green bonds are used in large-scale project financing as well as project refinancing. Green bonds are an increasingly attractive vehicle for large investors, such as institutional investors, to invest in renewable energy projects via capital markets securities.⁹ They provide issuers with large-scale

⁸ IRENA GCC Renewable Energy Market Analysis (2019)

⁹ Ibid.



long-term non-bank capital, possibly at lower cost of capital. To date there has been only one green bond issued for a renewable project in the region. The UAE's First Abu Dhabi Bank issued the first green bond valued at SAR2.2 billion (\$587 million) in 2017. As the Kingdom's renewable energy sector develops, the availability of sophisticated financing mechanisms will become more widespread.

COVID-19 Impact on Renewable Energy Sector

The global economy continues to face challenges from the negative effects of the coronavirus pandemic. Governments have pushed through with significant fiscal and monetary stimulus measures to reduce the health and economic effects on their citizens. One of the negative effects has been the delay of fiscal spending on capital projects. The Kingdom was swift to address the pandemic by redirecting large portions of its state expenditures to lift the private sector by committing over SAR270 billion (\$72 billion) in support.

One of the downsides of the pandemic has been the suspension and cancellation of projects. The negative effects of the pandemic on the renewable energy sector has caused delays in the selection of winning bids for round two of NREP's auctions. The final selection for round two was expected to occur in April 2020 but was delayed. REPDO has yet to announce when the finalists will be selected. The Yanbu 850 MW wind IPP project was expected to draw request for pre-qualification (RFQ) in April 2020 as well. However, there have been no announcements regarding the entities that have been selected to the next round. The pandemic is likely to cause project completion dates for round two to be pushed back by another year, assuming the ongoing containment of the virus.

The coronavirus pandemic has also disrupted global supply chains as entities grapple with their lack of control of available input supplies. The renewable energy sector is heavily reliant on the success of global supply chains, especially goods sourced from China. The impact on global supply chains were immediately felt as China was the first nation to experience disruptions in its economy. The cascading effects led to shortages of goods for majority of economies whom heavily rely on China's manufacturing sector. China accounts for 70 percent of the global market share in solar manufacturing since 2019.¹⁰ Global solar energy developers are heavily reliant on imports of solar panels and photovoltaic cells from China, and the delivery of this equipment continues to be impacted by the pandemic given labor shortages and logistical delays. While China is expected to continue being the leader in supplying renewable energy products, the pandemic has boosted initiatives to localize production domestically.

Renewable Energy Sector Outlook

The abundance of solar and wind exposure places the Kingdom in position to become the regional leader in renewable energy. While the Kingdom's current renewable energy environment is in its beginning stages of development, the upcoming plans to develop its capabilities will boost the government's diversification plans by reducing domestic consumption of crude oil and gas and provide growing employment opportunities for its citizens.

¹⁰ Fitch Solutions Saudi Arabia Renewables Report (2020)



Table 2 - Local Content Target Plan

Short Term (Current)	Medium Term (2024-2025)	Long Term (2028 onwards)
<p>Local Content Build-up</p> <p>Established LCOE price baseline Kick-start supply chain development 17-19% Localization</p>	<p>Global competitiveness</p> <p>Balanced LCOE and local content Setup of solar and wind clusters 33-35% Localization</p>	<p>RE Industrialization Hub</p> <p>Balanced LCOE and local content Export focus RE supply chain 40-45% Localization</p>

Source: Ministry of Energy, REPDO

Localization

An important development that will drive the success of the sector is localization. REPDO’s medium to long-term plan involves increasing the Kingdom’s percentage of localization of solar and wind. Its current plans call for the development of the sector’s supply chain development and a localization target of 17-19 percent in solar and wind. The next phase envisages setting up solar and wind clusters as part of its renewable energy industrialization strategy with localization rising to 33-35 percent by 2024-2025. Its long-term strategy emphasizes the development of a globally competitive renewable energy sector that will become an export leader by 2028 and beyond while having localization levels of 40-45 percent.

Employment Creation

The renewable energy sector is expected to provide numerous employment opportunities as part of the Kingdom’s broader Vision 2030 goals. The level of growing investments into the sector as evidenced in REPDO’s round one and upcoming round two and three will be largely reliant on experienced Saudi nationals to help implement these developments. According to IRENA’s Transforming Energy Scenario, each million dollars invested in renewables or energy flexibility would create at least 25 jobs, while each million invested in efficiency would create 10 jobs.¹¹ According to MEED Projects, REPDO’s expected value of current and announced projects is SAR113 billion (\$30 billion). On a simplistic level, taking IRENA’s estimates as well as the expected value of REPDO’s projects will create between 300-750 thousand jobs over the next decade.

Declining Costs

Another development that highlights the need to prioritize renewables is its declining costs. The cost competitiveness of global renewable energy stems from enhanced technologies, the availability of low cost financing, competitive procurement, growing widespread deployment, and general acceptance of the viability of renewables as an alternate source of power. The global weighted average LCOE for solar PV projects around the world decreased by 73 percent between 2010 and 2017, with projects regularly being commissioned around 6 to 10 US cents/kWh.¹² However, REPDO’s round one LCOE’s were well below these values and illustrates the competitiveness of Saudi Arabia’s renewable energy projects.

¹¹ IRENA “The Post-COVID Recovery” Report (2020)

¹² IRENA GCC Renewable Energy Market Analysis (2019)



The widespread development of the renewable energy sector over the last few years has allowed it to become more cost efficient than fossil fuels. For instance, the Sakaka solar project's LCOE of 2.36 cents/kWh is lower than the lowest gas-based generation costs, estimated at 3 cents/kWh assuming a gas price of \$2 per million British thermal units (MMbtu). Furthermore, Solar PV and CSP based electricity generation have become more competitive than oil at \$40 a barrel. Solar projects in the region have produced LCOE's that make it cheaper than oil based electricity generation even at \$20 a barrel.¹³

Conclusion

The Kingdom's renewable energy sector is poised for significant growth in the coming years. Saudi Arabia is endowed with favorable solar and wind power potential that will allow it go from a regional leader to an export market over the next 10 years. The upcoming projects indicate how vital renewable energy is to the diversification of the Kingdom's economy.

The Kingdom's ambitious plan to generate 50 percent of its energy through alternative resources by 2030 amplifies the degree of investments needed to achieve its goals. With support from the government, the private sector will play a pivotal role in the future development of this sector. International developers will be counted on to play significant roles as partners in building the technological know-how and to grow manufacturing localization.

The attractiveness of renewable projects has gained the attention of commercial banks in recent years. Bank risk appetites have developed to incorporate more renewable projects within their portfolios, especially larger projects. As renewable projects become more widespread, the availability of more sophisticated financing mechanisms, such as green bonds, will be available. The government has also stepped up the availability of subsidies and financial support to attract foreign developers.

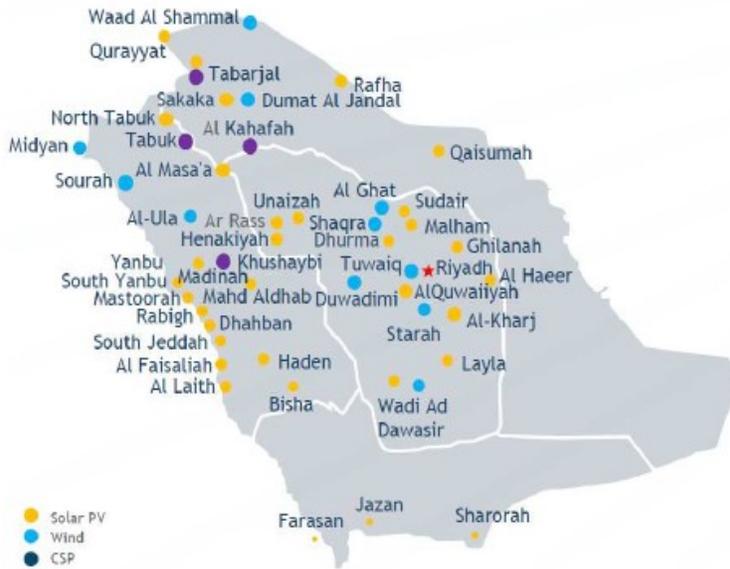
The renewable sector is expected to create numerous employment opportunities over the medium to long-term. Aligning with Vision 2030, renewables will become a prominent sector in the development of Saudi talent. The level of ongoing investments in the sector is expected to create up to 750,000 jobs over the next 10 years, assuming renewables remain as a priority sector. Localizing the manufacturing base will provide for most of the employment opportunities as the Kingdom aims to localize the sector to 40-45 percent by 2028 and beyond.

Lastly, the growing domestic consumption of oil and gas is another major reason renewables are growing in importance to the Kingdom. The opportunity cost of consuming rather than exporting reduces the Kingdom's future potential revenue streams. Furthermore, the declining cost of employing renewable energy sources gives the Kingdom a comparative advantage globally given the abundance of solar and wind sources in addition to its already low cost of oil and gas extraction. However, the current cost of employing renewables in electrification has already proven to be more sustainable and affordable than fossil fuels. This will allow the Kingdom to thrive as it exports oil and gas while partly relying on renewables domestically to generate power.

¹³ IRENA GCC Renewable Energy Market Analysis (2019)

Appendix:

Pipeline Renewable Projects



Source: NREP

Industrial opportunities for manufacturers

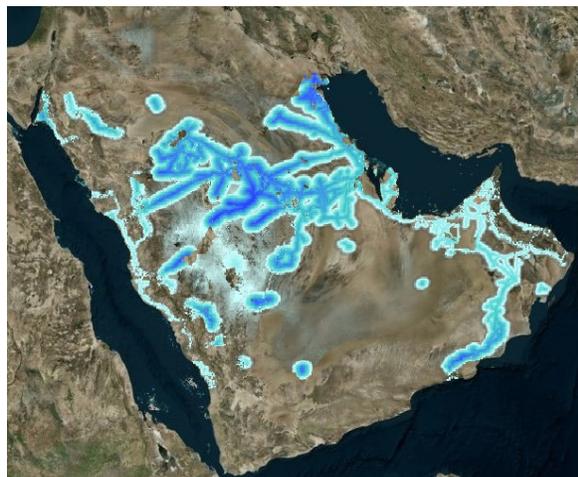
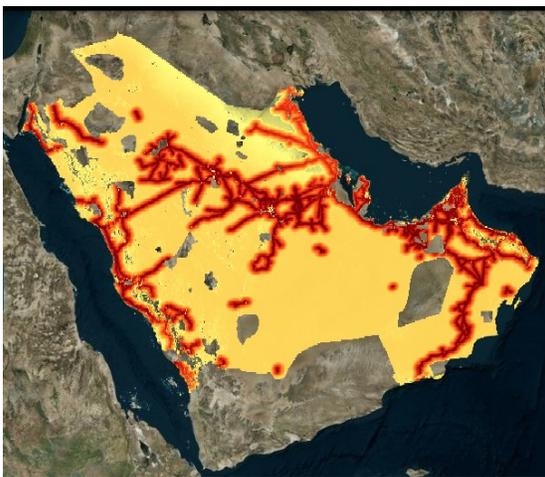


- o 12,000 Blades
- o 4,000 Steel Tower
- o 150 million solar modules
- o 4,000 Nacelles



- o Steel: 4.1 million tones
- o Glass: 2.8 million tones
- o Concrete: 1,8 million tones
- o Aluminium: 1 million ton

Suitability Analysis for On-Grid Solar PV and On-Grid Wind



Source: IRENA

Note: Darker shade indicates >80% suitability



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