

# INVESTING IN THE FUTURE

## OPPORTUNITIES FOR RENEWABLE ENERGY INVESTMENT



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## 1. EXECUTIVE SUMMARY

This research and recommendations report establishes the context of energy generation, infrastructure and technology in the geographies where Majid Al Futtaim operates in order to identify clean energy investment opportunities to support Majid Al Futtaim’s commitments to be Net Positive in carbon by 2040.

The report provides guidance on renewable energy generation technologies as well as their practical feasibility and implementation within the Middle East and Northern Africa (MENA) region. Considerations of feasibility are wide-ranging, from issues like local legislative support to variations in climate and topography. The technologies discussed are solar, wind, geothermal and waste to energy as well as the potential coupling of power generation alongside storage systems.

The report then assesses the corporate power sourcing mechanisms present in the MENA region (as summarised in Table 1 below), the current energy market outlooks and the legislative directions being carved out through financial incentives such as levies, taxes and frameworks of the top electricity consumer countries in Majid Al Futtaim’s portfolio. This report also aims to support and advise on the level of investment that may be required to achieve Net Positive status for the electricity consumed by operational activities in existing developments.

Investment Opportunity	Financial Investment
Source power from private renewable generators via Corporate Purchasing Power Agreements (CPPAs)	None to low
Scale up on-site renewable generation	Medium
Partly or fully-fund renewable energy generation projects as an Independent Power Producer (IPP) and sell power to grid via Purchasing Power Agreements (PPAs)	High to very high
Purchase Renewable Energy Certificates	Low to medium

Table 1: Investment Opportunity Summary

The research and recommendations report concludes by outlining potential pathways for renewable energy investment available to the Company in the countries where it operates and the impact of these recommendations on the organisational carbon footprint.

## 2. BACKGROUND

Majid Al Futtaim is committed to the implementation and delivery of a comprehensive sustainability strategy, *Dare Today, Change Tomorrow*, through which the Company manages the socio-economic and environmental issues that are most material to its business. *Dare Today, Change Tomorrow* has three fundamental business priorities:

- Transforming the lives in the communities Majid Al Futtaim serves, to provide a healthy, fulfilling and sustainable way of life.
- Rethinking resources, addressing Majid Al Futtaim's use of resources to make a Net Positive impact.
- Empowering our people to unlock their full potential.

One of the material issues under Rethinking Resources is Net Positive Carbon, whereby Majid Al Futtaim strives to ensure the availability of more clean energy than it consumes across its operations, developments and tenants' activities by 2040.

With abundant oil and gas reserves, the Middle East and Northern Africa (MENA) has traditionally relied on conventional fossil fuel-based energy sources for power generation; however, in recent years there has been a shift towards cleaner energy sources. The high volatility in oil prices and the resulting turbulence in energy markets has compelled many MENA countries to look for alternate sources of energy, for both economic and environmental reasons. The significance of renewable energy has been increasing rapidly worldwide due to its potential to mitigate climate change, to foster sustainable development in poor communities, and augment energy security and supply.

Allowing wider access to renewable energy investment is crucial in tackling the global climate crisis and curbing average temperature increase to 1.5 degrees Celsius above pre-industrial levels. For that to happen, "annual investment in the renewable energy sector through to 2050 would need to be roughly triple that of 2017" [1]. With corporate entities making up two-thirds of the world's total demand for energy, it is evident that organisations play an important role in scaling up the renewable energy sector [2].

This research and recommendations report will look at the technological environment for green power in the MENA region and the various mechanisms for corporate sourcing available for investing in renewable energy. The purpose of this is to gain a better understanding of potential pathways for the Company to support the region's transition to a low carbon economy.

### 3. TECHNOLOGICAL ENVIRONMENT

This section investigates the available renewable sources and alternative generation technologies in the MENA region, with a focus on solar, wind, geothermal and waste treatment technologies. Other renewable generation technologies such as nuclear and hydro have been excluded from the discussion due to their very high capital and maintenance costs, however that does not mean they are not present or feasible in the regions studied.

#### 3.1. SOLAR POWER

The MENA region has one of the highest potentials for solar energy development in the world due to its high solar exposure rates and high availability of uninhabitable arid land. There are two widely recognised solar technologies for large-scale generation, namely solar photovoltaic (solar PV) and concentrated solar power (CSP) which capture sunlight in different ways, allowing the most suitable technology to be used based on location and meteorological conditions.

Figures 1 and 2 below show the global horizontal irradiation (GHI) and direct normal irradiation (DNI) heatmaps in the member countries of the Gulf Cooperation Council (GCC), including Bahrain, Kuwait, Oman, Saudi Arabia and the UAE as well as Egypt and Jordan. Higher GHI coefficients indicate areas that are more compatible with solar PV technologies, while CSP installations are more effective in areas with higher DNI coefficients [3].

- **Solar PV** can cater for a wider range of solar irradiations, in areas that experience sandstorms, high degrees of humidity or get cloudy.

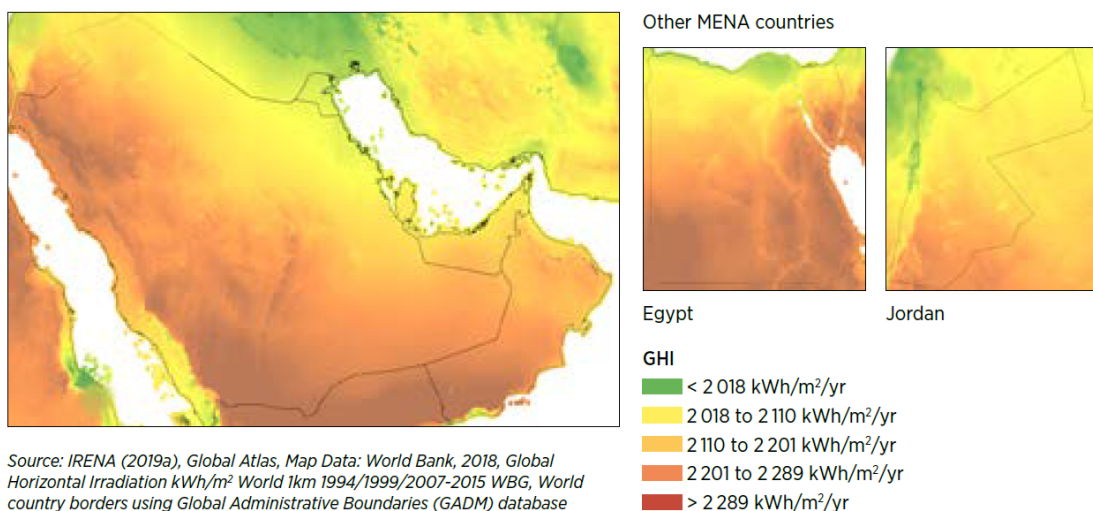


Figure 1: Global horizontal irradiation (kWh/m<sup>2</sup>/yr)- indicative of compatibility with solar PV technology

- CSP technology** is more suitable in areas with plenty of direct sunlight and away from potential debris accumulation as they generate solar power by using mirrors or lenses to concentrate a large area of sunlight onto a small area to create a focal point of very high temperatures which can then be used to generate electricity.

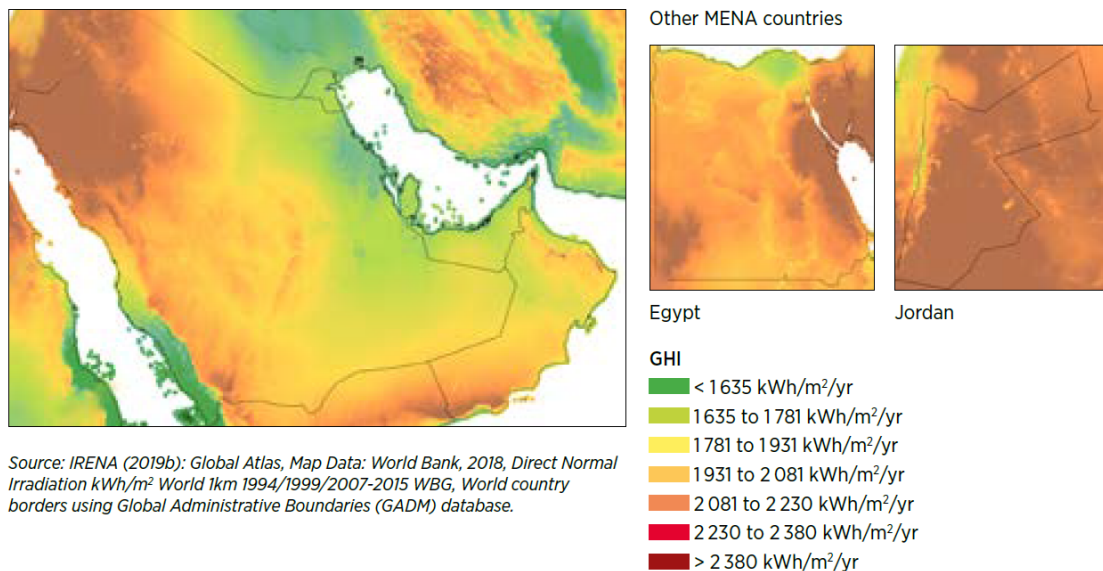


Figure 2: Direct normal irradiation (kWh/m<sup>2</sup>/yr) – indicative of compatibility with CSP technology

Based on the maps above, it can be concluded that solar PV technology would be suitable in most countries in the MENA region due to its complex ability to capture sunlight even in the event of bad weather. CSP technology however, is more restrictive, and is more suitable in regions such as eastern and south-western Egypt, most of Jordan, north-eastern Saudi Arabia, and the south-eastern coast of Oman.

Smaller, on-site PV panelling can also produce significant renewable electricity output and reduce demand on grid generation. Roof-mounted solar PV panelling is the most common form of self-generation worldwide, and is a highly reliable source of power, and a renewable alternative to heating water, particularly in countries located in the MENA region.

If operated correctly and maintained regularly, a good solar PV installation can produce electricity for over 25 years. Solar PV panels can also be installed in carparks, on canopies that offer protection to vehicles from the sun. During daylight hours, the electricity generated can be used to power electric vehicle charging points, while at night, if stored in an external battery system, can power car park lighting as well as other nearby sources of demand. A recent Worldwide Wildlife Fund (WWF) study<sup>[4]</sup> prepared for the UAE which looks at the country's current renewable context and its ability to support the transition to a low carbon economy, emphasizes the role of the policymakers in facilitating public and private investment in storage technologies in conjunction with solar generation (PV & batteries, solar CSP & integrated thermal storage, pumped storage etc).

In the MENA region, equipment costs remain relatively high compared to other parts of the world, potentially due to limited government subsidies and financial incentives. However, most countries where

Majid Al Futtaim operates in have net metering schemes available (except for Iraq, Kenya, Kuwait and Oman) where owners of on-site generation systems are incentivised to connect their installations to the grid. This enables any surplus energy to be is reverse-fed hence offsetting the equal value of the grid power amount drawn. The report looks at each country's net metering schemes in more detail in Section 4, Legal and Regulatory Framework.

A more innovative, integrated alternative to solar PV roof panelling is available for new builds and is particularly suitable in countries like Bahrain and Kuwait, that may struggle for land availability. Building Integrated Photovoltaics (BIPV) is a ground-breaking technology that challenges old architectural and construction ways of thinking and aims to integrate power generating PV cells into the building's envelope (roofing, façade, windows, devices & other architectural elements and structures) and is price competitive in comparison to traditional glass. This measure saves energy both through reducing unwanted heat gain, as well as collecting energy through the photovoltaic cells <sup>[5]</sup>.

Although the cost of installation of PV-panelling can vary significantly depending on building design, size of the system, manufacturer and installer, it can be estimated that the equipment price ranges between 30-50% of total installation costs. Ongoing annual maintenance fees will be equivalent to 0.5-1% of the initial investment <sup>[6]</sup>.

### 3.2. WIND POWER

Wind power is the use of wind energy to provide mechanical power through turbines to turn electric generators. Wind farms consist of several wind turbines that may extend onto a large plot of land, and like solar energy, are an intermittent source of energy. Wind, however, can generate throughout the day and night and can therefore complement 24-hour consumption patterns.

There are two types of wind farms; those located on land, called onshore, and those found at sea, offshore. With onshore wind farms, unlike solar farms, the space between individual turbines can be used for other purposes, such as agriculture.

Despite common perceptions that countries located in the MENA region may not benefit from substantial wind resources, wind speed data gathered from the region show the contrary. Figure 3 below illustrates the wind energy potential in the GCC countries, Egypt and Jordan, where patches of electric blue indicate areas with particularly strong wind speeds.

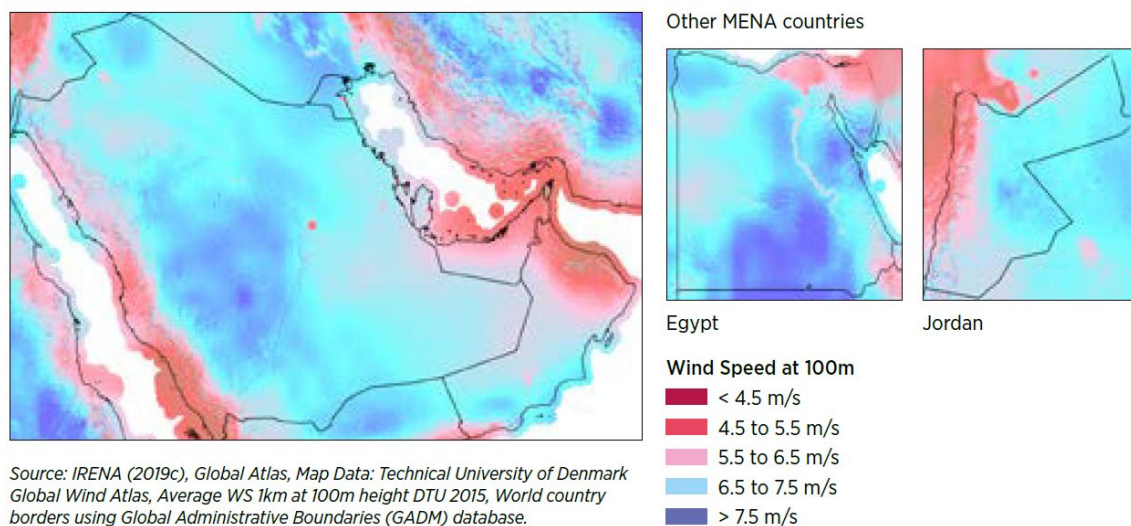


Figure 3: Annual average wind speeds

### 3.3. ENERGY FROM WASTE

Waste is an abundant and growing resource across the globe. Waste has not always been considered a resource, however, due to its harmful effect on the environment if stored in landfill sites, alternative disposal routes have been identified, e.g. utilising waste to generate energy.

Well-known waste-to-energy technologies such as anaerobic digestion (AD), pyrolysis, gasification and combustion are utilised worldwide and are cleaner alternatives to burning fossil fuels, however some technologies emit more greenhouse gases than others in their processes. For instance, waste incineration is the most polluting waste-to-energy technology, while anaerobic digestion (AD), the cleanest<sup>[7]</sup>. On this basis and in line with circular economy thinking, this research and recommendations report will not consider incineration as a viable option for potential investment, but will investigate gasification, pyrolysis and AD further.



- **Waste gasification** is a process that produces syngas and other bi-products such as transport fuels and fertilisers from the treatment of waste with oxygen and/or steam. Syngas is primarily used to generate electricity. Waste gasification is much cleaner than conventional incineration as the waste is heated at high temperatures rather than burned. The high heat breaks the material's molecular bonds apart, producing syngas. Syngas is short for synthetic gas and has similar properties to those of natural gas. Natural gas, however, is a much worse polluter than syngas when burned for power generation purposes [8].
- **Pyrolysis** processes waste without oxygen or in the presence of inert gases at high temperatures and is generally cleaner than combustion, emitting less air pollutants.
- **Anaerobic digestion (AD)** processes organic waste such as animal, garden and food waste in the absence of oxygen in a confined tank, called a digester. The organic matter is broken down to biogas, which is then burned to generate electricity. The bi-products of AD are organic fertiliser and some emissions that are generally lower than other forms of waste disposal (e.g. landfill). A case study conducted on three AD plants in the UK revealed that 5.5 million tonnes of treated organic waste would generate enough electricity to power around 164,000 households and would save between 220,000 and 350,000 tonnes of carbon dioxide than if the waste was composted instead [9].

The MENA region is well-positioned for Waste-to-Energy development, particularly the Middle Eastern areas. According to a study conducted by World Bank, the countries in the Gulf Peninsula produce higher than average levels of waste per capita, especially the UAE, Bahrain and Kuwait. Given the high rate of population growth, urbanisation and economic expansion, the figures are expected to grow further.

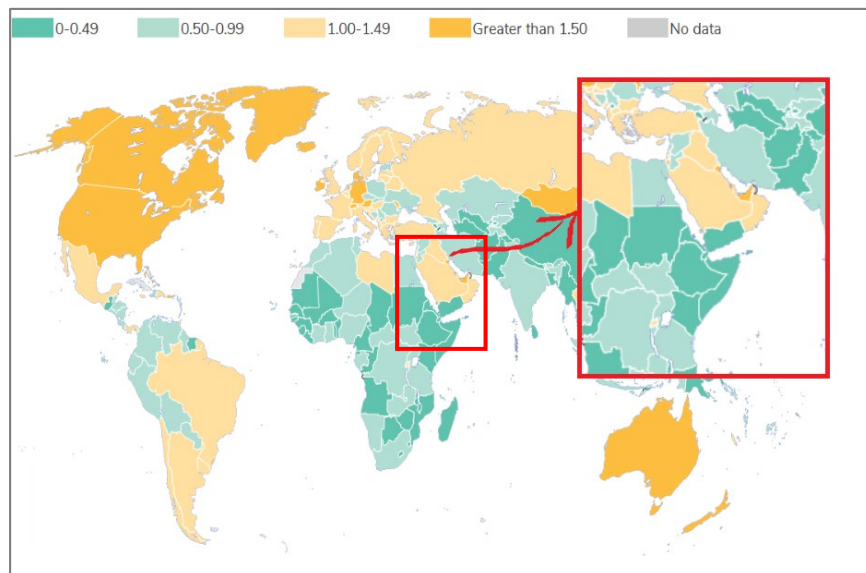


Figure 4: Annual municipal solid waste generated per capita (kg/capita/day). Source: World Bank

One advantage of waste-to-energy over wind and solar is that both biogas and syngas can be stored, allowing it to be used for power generation when there is demand. Therefore, solar and/or wind power, used in conjunction with waste-to-energy, could be a viable solution for continuity of generation/supply across a variety of meteorological/irradiance conditions.

### 3.4. GEOTHERMAL ENERGY

Geothermal energy is yet to be explored as a potential source for renewable energy generation in the MENA region. Geothermal energy is carbon-free, renewable energy stored deep in the ground in the form of heat that can be used to power heat pumps to generate electricity.

Geothermal energy is not only a clean resource, but it is also a steady and highly reliable source of energy. Historically thought to be solely found near tectonic plate boundaries, recent technological advances have significantly expanded the range and size of probable sources for geothermal energy, as well as its utilisation. Geothermal energy now has various uses such as in district and space heating, industrial process, desalination and agriculture processes.

Recent studies show that the MENA region has potential for harvesting geothermal energy. So far, the two explored areas in the region have been deemed unsuitable for power generation due to the low temperatures recorded in the wells; however, studies concluded that other direct thermal applications could be considered, such as large-scale desalination, cooling and steam production <sup>[10]</sup>. Although potential has been identified, harvesting geothermal energy doesn't exist in a commercially viable format yet but it is a good technology to consider supporting from a research and development standpoint.

## 4. MARKET ACCESS FOR RENEWABLE INVESTMENT

This section looks at the available mechanisms for corporate sourcing of renewable power in the MENA region, such as policies and government schemes, but also at the importance of private investment within transitioning energy markets. The chapter concludes with a summary table of each country of interest which, together with the previous section, can be used to identify potential opportunities for further exploration in 2020.

### 4.1. THE BENEFITS OF CORPORATE SOURCING OF RENEWABLE POWER

Figure 5 below lists the potential benefits associated with corporate sourcing of renewable power for governments, large-scale private generators and organisations. Whilst benefits outweigh the risks, the report also identifies the possible drawbacks of corporate sourcing of renewable energy. In the case of small-scale self-generation, capital and maintenance costs for organisations can be a deterrent. In the case of large-scale private generation, there are risks that arise with long-term agreements as prices and load are fixed for the duration of the contract, typically between 10 to 25 years. In the likelihood of economic or climate turmoil, parties involved may find it difficult to comply with the terms and conditions agreed at the start of the contract, which may result in contract breaches.

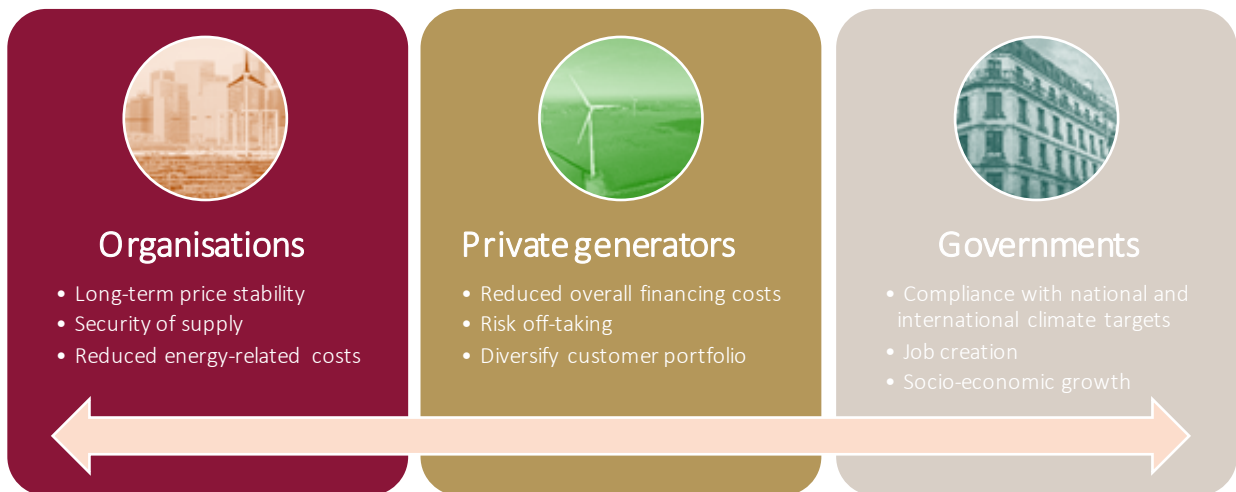


Figure 5: The benefits of corporate outsourcing of renewable power

### 4.2. CORPORATE RENEWABLE POWER SOURCING OPTIONS

This section of the report looks at the various mechanisms made available by governments and energy authorities to organisations to facilitate the access to renewable power.

#### 4.2.1. POWER SOURCED FROM RENEWABLE ENERGY DEVELOPERS

- **Corporate Power Purchasing Agreements (CPPAs)** are long-term supplier agreements between an energy producer or developer and a private organisation whereby the two parties agree to supply/buy a specific amount of renewable power from a specified asset at an agreed price. In most cases, the energy will be transported via the grid infrastructure from the generator to the load, a principle called “energy wheeling”, unless the generator is built near the load. When energy is wheeled to the buyer via the national grid infrastructure, the grid will most likely be involved in the agreement as a third party, and terms and conditions for the transportation will be covered in the CPPA. In the MENA region, there are only a few instances where direct agreements between developers and users have been signed; however, it is very likely the trend is upward.
- **Unbundled Energy Attribute Certificates (EACs)** are contractual instruments that represent guarantees of origin of the electricity generated and, in most markets, can be purchased separately from the electricity supplied. The International Renewable Energy Certificates (I-REC) Standard is a scheme in which organisations can support renewable generation through the purchase of green certificates (I-RECs) via an internationally recognized, tradable and reliable attribute tracking system. When renewable generators produce energy, they can claim one I-REC for each MWh of power generated that can then be sold to organisations that wish to source their electricity from renewable sources but can’t do so directly from a generator. It then allows the I-REC holder to claim zero carbon emissions on the electricity usage backed by renewable certificates. The price of one I-REC varies largely based on availability of renewable energy, demand for renewable energy and country the certificates are traded in. Organisations will incur additional costs associated with account setting-up and other admin fees, an example of which can be seen in Figure 6 below <sup>[11]</sup>.

Participant Fees (Trade and redemption accounts)	
One-time trade account opening fee	EUR 500.00
Annual trade account fee	EUR 2000.00
Additional redemption account fee	EUR 0.00
Redemption fee (per MWh)	EUR 0.06
<i>Invoices issued by the I-REC Services</i>	

Figure 6: Participant Fees for enrolling in the I-REC scheme,  
Source: [https://www.irecstandard.org/assets/doc\\_3983.pdf](https://www.irecstandard.org/assets/doc_3983.pdf)

- **Independent Power Producers (IPPs) or Independent Water and Power Producers (IWPPs)** are private developers who can bid in auctions for large-scale development projects proposed by the government or the local energy and water authorities. Bidding for utility-scale renewable development is becoming increasingly common in the MENA region even to foreign energy companies and developers. The winning bidder, generally the developer offering the lowest price per unit of power generated, is then awarded with the right to sell its electricity generated to the government or to licenced distribution companies through long-term PPAs (usually these have a term of 20-25 years) at an agreed fixed electricity price (also known as feed-in tariff). Appendix 1 lists several facilities built with private funding, their owners and developers and the feed-in tariff they agreed with the local energy distributing authorities.

#### 4.2.2. POWER SOURCED FROM ON-SITE GENERATION: INCENTIVES AND SCHEMES

- **Self-generation & net-metering schemes** allow small-scale generators to connect to the grid and send back any surplus energy in exchange for feed-in tariffs, or to offset future consumption drawn from the grid. Governments in the MENA region have encouraged self-generation for a while; however, very few offer financial incentives.
- **Tax exemptions** are cuts in taxation on renewable technology and equipment (reduced VAT) or reliefs from paying climate change levies on renewable energy generation.
- **Grants and subsidies** are financial aids offered by the government to renewable generators to accelerate the development of the renewable sector that are generally recovered through taxes. Grants and subsidies can take various shapes and forms but most commonly they can fully or partly fund the installation costs of PV systems for small developers, pay renewable developers a premium price for generating renewable power compared to those that burn fossil fuels, etc.

Table 2 below lists the various renewable investment incentives and schemes previously described that are available in the countries that the Company operates.

Country	Incentives and schemes						
	Power sourced from renewable energy developers			Power sourced from on-site generation			
	EACs	CPPAs	Auctions/tenders for large-scale development (FITs)	Is self-generation permitted?	Net Metering	Grants/ Subsidies	Tax exemption
UAE	I-RECs	N/A	IPPs and IWPPs	Yes	Only Dubai & Abu Dhabi (Up to 5MW)	N/A	N/A
Oman	I-RECs	N/A	IPPs and IWPPs	Yes	Sahim I (Solar PVs only and between 2 and 4 kW)	Sahim II – accelerated subsidy adjustment	N/A
Saudi Arabia	I-RECs	N/A	IPPs and IWPPs	Yes	Up to 2MW	N/A	N/A
Egypt	I-RECs	Yes	IPPs and IWPPs	Yes, solar PV only	Between 500 kW to 20 MW	N/A	Yes
Bahrain	N/A	N/A	IPPs and IWPPs	Yes, solar PV only	Yes	N/A	N/A
Jordan	I-RECs	Yes	IPPs and IWPPs	Yes	Yes		N/A
Iraq	N/A	N/A	IPPs and IWPPs	N/A	N/A	N/A	N/A
Kuwait	N/A	N/A	IPPs and IWPPs	Yes	N/A	N/A	N/A
Pakistan	N/A	N/A	IPPs and IWPPs	Yes	Yes	N/A	N/A
Georgia	N/A	N/A	IPPs and IWPPs	Partially	Yes	N/A	N/A
Lebanon	N/A	N/A	IPPs and IWPPs	Yes	Yes	N/A	N/A
Kenya	N/A	Yes	IPPs and IWPPs	Yes	N/A	N/A	Yes
Armenia	N/A	N/A	IPPs and IWPPs	Yes	Yes	N/A	N/A

Table 2: Summary of renewable energy investment incentives and schemes

## 5. PLAN FOR THE FUTURE: RENEWABLE ENERGY INVESTMENT

In 2017, Majid Al Futtaim made the bold commitment to become Net Positive by 2040, making it the first organisation in the MENA region with such an ambition. Under this commitment, the Company aims to achieve Net Positive Carbon status for all operational activities carried out in the countries in which it operates by 2030 and for all tenants and development activities by 2040. Nearly 70% of the Company’s operational carbon emissions are linked to its electricity consumption in buildings it owns and operates, illustrated in Figure 7 below.

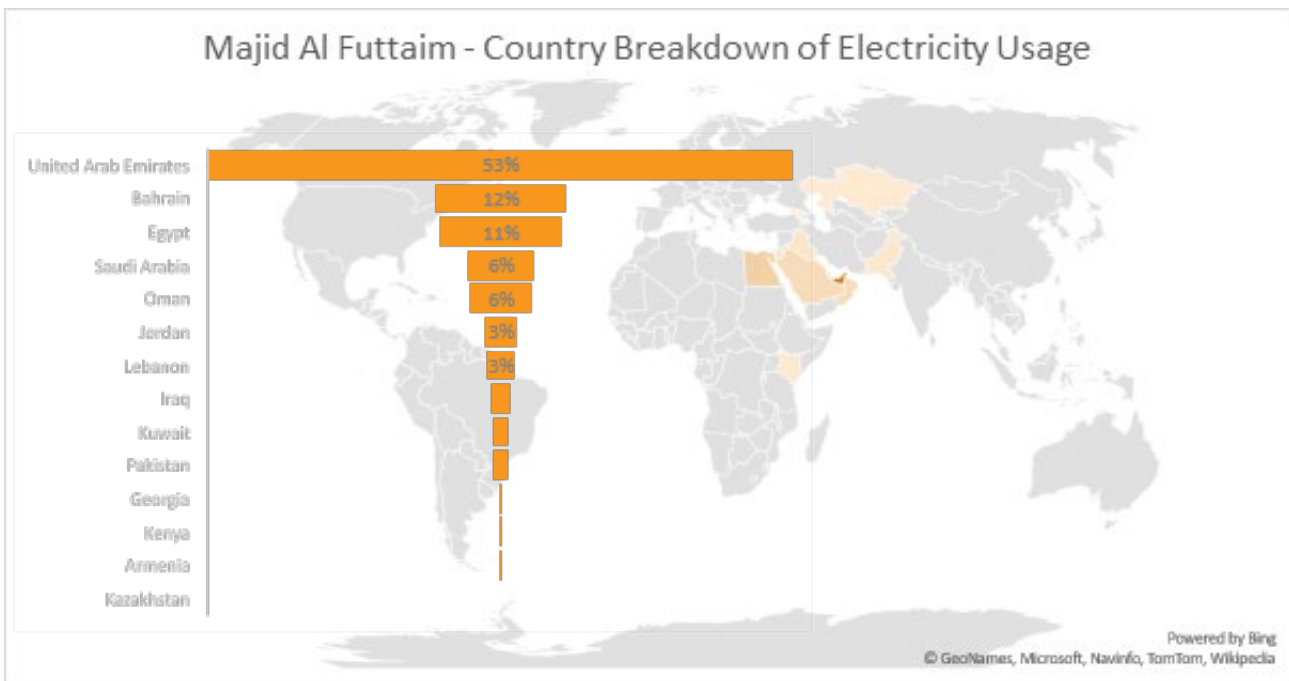


Figure 7: Country breakdown for Majid Al Futtaim’s electricity usage in year 18/19

Based on the country share from the Company’s total electricity consumption, the report will look at the largest contributors in more detail and assess the current and future context for renewable energy investment. The countries researched are the UAE, Egypt, Saudi Arabia, Bahrain and Oman. In the subsequent sections, several pathways for potential investing in renewable energy at corporate level are proposed for further exploration as well as the funding options for possible investment in renewable energy. These proposed measures will be assessed in relation to their impact on GHG emissions and potential capital and operational investment required.

## 5.1. UNITED ARAB EMIRATES

Renewable energy targets	27% by 2021, 44% by 2050
Feasible renewable energy technologies	Solar, Waste to Energy, Geothermal
Market access mechanisms	Net-metering, IPPs/IWPPs, I-RECs
On-site generation capacity for net metering	Maximum 5 MW per site
Majid Al Futtaim CO <sub>2</sub> e from electricity (2018)	403,737 tonnes CO <sub>2</sub> e (32% of total corporate operational footprint)

### 5.1.1. INDEPENDENT WATER AND POWER PRODUCERS

Despite its potential, solar energy accounted for only 2% of the installed generation capacity in 2018 in the UAE <sup>[12]</sup>. This is subject to change in the upcoming years with major utility-scale renewable plants coming online in an effort to diversify the economy and reduce the country's reliance on fossil fuels. With higher GHI levels, PV solar technology is believed to be more effective than CSP in the UAE; however, this has not prevented the UAE from exploring CSP technology as well.

A number of ambitious utility-scale solar parks are in the pipeline for development in the UAE, making it the country with the largest existing and planned solar capacity in the region. One of the most exciting projects currently under construction is Mohammed bin Rashid Al Maktoum Solar Park, the world's largest single-site solar park, with a planned production capacity of 5 GW by 2030. The park is being developed on an independent power producer (IPP) model, and among the many private investors is a consortium led by Saudi registered ACWA Power and Spanish engineering and industrial company TSK <sup>[13]</sup>. The solar project, a hybrid of CSP and solar PV technologies, is set to break many world records with building the world's tallest solar tower, at 260 meters, and benefiting from the largest thermal energy storage capacity in the world of 15 hours, enabling the generation of power even in the absence of sunlight. Perhaps the most notable of records is that the project achieved the world's lowest levelized cost of electricity (LCOE) of only 2.4 USD cents per kWh for the 250 MW PV solar panels and 7.3 USD cents for the 700 MW CSP technology.

While corporate power purchasing agreements (CPPAs) may not currently be an option in the UAE, independent power producers (IPPs) are increasingly common. Companies like Majid Al Futtaim can invest, on their own or as part of a consortium, in the development of renewable power plants and sell the energy produced to the government via a long-term PPA.

Waste treatment and incineration projects are also on the rise in the UAE with several large-scale plants in operation and in development built by private investors and in some cases co-financed by the government. A one-of-its-kind biogas production project is currently being developed in the Emirate of Dubai at one of the facilities owned by a local dairy company – Al Rawabi. The plant will process animal waste to produce 1.3 MW of power, 1.4 MW of thermal energy and 10 tonnes of high-grade fertiliser. It will also extract 150 cubic meter of water which will be utilised in farming <sup>[14]</sup>. The UAE is one of the largest producers of waste in the Gulf region, and only 20% of waste produced annually is recycled <sup>[15]</sup>. The country has, however, begun to intensify its recycling efforts and aims to divert 75% of waste from landfill by 2021. This will drive further support for the development and innovation of the waste to energy sector in the coming years.

Geothermal energy has only been considered as a potential electricity generation technology in the UAE in recent years, following the study of a group of researchers at the UAE University, who looked at two geological sites in Al Ain and Ras Al Khaimah. Based on the initial findings and data gathered, both sites show potential for harvesting geothermal power that could produce around 1,000 MW <sup>[16]</sup>. The heat that creates hot springs needs to reach temperatures of over 200°C for it to be considered viable for power generation and, so far, the research has recorded temperatures of only 120°C. However, if the hot springs prove incompatible with power generation, other uses could be considered, such as geothermal-based desalination processes <sup>[17]</sup>.

### 5.1.2. NET-METERING

Shams Dubai is one of the first government-led initiatives in the UAE, introduced in 2015, that encourages household and building owners to install on-site PV panels, and connect them to the grid via the Dubai Electricity & Water Authority (DEWA) <sup>[6]</sup>. Via the Shams Dubai initiative, consumers who generate excess electricity can export the surplus back to the grid, amount which can be credited and used to off-set future consumption of electricity. Similarly, Abu Dhabi Water and Electricity Authority, now part of the Emirates Water and Electricity Authority (EWEA), allows small-scale generators installed in the Emirate of Abu Dhabi with a capacity of up to 5 MW to connect to the grid via a net metering scheme and send back surplus energy <sup>[18]</sup>. There is limited information available on the plans of the other Emirates regarding the introduction of net metering schemes.

### 5.1.3. RENEWABLE ENERGY TARGETS

The UAE has been at the forefront of the climate change agenda in the MENA region, making it the country with the most ambitious targets.

- **Country-level:** In 2017, the UAE launched its first unified energy strategy to become law called “Energy Strategy 2050” which aims to increase the country’s renewable energy share to 50% by 2050 <sup>[19]</sup> (44% from solar power, wind and biofuels, and 6% from nuclear). The UAE has also set an interim target of 27% to be generated from renewable sources by 2021 as part of the country strategic plan, “Vision 2021”.
- **Emirate-level:** As energy is an emirate-level matter in the UAE, each emirate will have set targets on renewable energy developments and plans on how to achieve them which go hand in hand with the country’s national targets. Emirates of Abu Dhabi and Dubai look to increase renewable energy generation to 7% by 2020, to 25% by 2030 and finally to 75% by 2050. Ras al Khaimah has a target of 20% by 2040. The other four Emirates’ energy, being under the control of the UAE federal authority, will adhere to the country-level targets. Additionally, in Dubai, 75% of new buildings’ water heating requirements are to be met with renewable sources.



## 5.2. EGYPT

Renewable energy targets	20% by 2020, 45% by 2035
Feasible renewable energy technologies	Solar, Wind, Waste to Energy
Market access mechanisms	Net-metering, CCPAs, IPPs/IWPPs, I-RECs
On site generation capacity for net metering	Between 500 kW and 20 MW
Majid Al Futtaim CO <sub>2</sub> e from electricity (2018)	48,397 tonnes CO <sub>2</sub> e (4% of total corporate operational footprint)

### 5.2.1. INDEPENDENT WATER AND POWER PRODUCERS

Egypt, a “sun belt country, with 2,000 to 3,000 kWh/m<sup>2</sup>/year of direct solar radiation in NE and SW”, that benefits from 9 to 11 hours of sunshine a day, has higher solar generation potential than any of the GCC countries [20]. Benban Solar Park in Egypt’s Western Sahara is the country’s first and largest solar plant built by private developers, with a capacity of 1.8 GW upon its completion at the end of 2019 [21]. Independent water and power producers are the primary developers for large-scale renewable projects, with developers dealing directly with the government for the sale and distribution of power. So far, Egypt hasn’t utilised wind power to generate electricity despite its high potential, particularly in the southern region.

### 5.2.2. CORPORATE POWER PURCHASE AGREEMENTS

Corporate power purchase agreements are generally rare in the countries that Majid Al Futtaim operates in; however, they have been present in Egypt. A 25-year agreement to generate and supply power from a 6 MW solar energy facility to a private entity has been signed at the beginning of the year in Egypt, the first of its kind. The buying organisation is the Arabian Cement Company (ACC), the largest cement producer in Egypt. The solar plant run by SolarizEgypt will supply 4% of the total demand for power at an ACC facility [22]. Egypt has put in place a third-party access scheme which allows independent water and power producers to enter bilateral supplier agreements with eligible consumers, such as Majid Al Futtaim, and sell that power directly to them. The transportation and distribution of power will be possible through the grid and the grid operator will also be part of the agreement.

### 5.2.3. NET-METERING

The net-metering scheme in Egypt allows solar PV systems of unusually large capacity (up to 20 MW) to be connected to the grid to export any surplus power.

### 5.2.4. RENEWABLE ENERGY TARGETS

Egypt’s New National Renewable Energy Strategy, first published in 2008, sets out the country’s strategy and targets for renewable energy generation, with the private sector expected to deliver most of the additional capacity:

- 20% of total electricity by 2020
- 45% of total electricity by 2035 (25% solar, 14% wind, 2% hydro)

### 5.3. BAHRAIN

Renewable energy targets	5% by 2025, 10% by 2030
Feasible renewable energy technologies	Solar, Waste to Energy
Market access mechanisms	Net-metering, IPPs/IWPPs
On site generation capacity for net metering	Yes, however capacity limit is unknown
Majid Al Futtaim CO2e from electricity (2018)	57,490 tonnes CO2e (5% of total corporate operational footprint)

#### 5.3.1. INDEPENDENT WATER AND POWER PRODUCERS

Bahrain, with comparably good irradiation levels to those of other countries in the MENA region, is also looking to expand its solar power generation capacity. Bahrain’s largest solar plant, Askar Landfill, a 100 MW solar PV plant, built by Saudi’s ACWA, accounts for over a third of Bahrain’s planned PV capacity by 2025 <sup>[23]</sup>. Due to limited land availability, one of the most successful ways for Bahrain to develop utility scale renewable projects is by utilising rehabilitated landfill sites and turn them into solar fields. The Askar project is one example. A pilot hybrid generation power plant is also under construction at Al Dur in Southern Bahrain, with a planned capacity of 2 MW of solar energy and 2 MW of wind power <sup>[24]</sup>.

#### 5.3.2. NET METERING

The government of Bahrain has recently introduced net metering schemes to incentivise on-site generation. In addition, Bahrain requires all new buildings and real estate developments to source a minimum percentage of energy from integrated renewable generation systems <sup>[25]</sup>.

#### 5.3.3. RENEWABLE ENERGY TARGETS

Bahrain’s National Renewable Energy Action Plan comes as a response to the country’s strategy to direct investment to clean technologies, reduce carbon emissions and minimise pollution – also known as Bahrain’s “Economic Vision 2030”. The plan sets national renewable energy targets of:

- 5% by 2025
- 10% by 2035
- All new buildings and new real estate development required to source a percentage of energy from on-site renewable sources

## 5.4. SAUDI ARABIA

Renewable energy targets	3.45 GW by 2020, 27.3 GW by 2023, 58.7 GW by 2030
Feasible renewable energy technologies	Solar, Wind, Waste to Energy
Market access mechanisms	Net-metering, IPPs/IWPPs, I-RECs
On site generation capacity for net metering	Up to 2 MW (5MW is multiple premises)
Majid Al Futtaim CO2e from electricity (2018)	58,743 tonnes CO2e (5% of total corporate operational footprint)

### 5.4.1. INDEPENDENT WATER AND POWER PRODUCERS

Saudi Arabia has a lot of untapped solar power capacity and not only benefits from some of the highest irradiation levels in the world, it is also one of the largest countries in the region by land area, making it a prime location for large-scale solar PV and CSP plants. Saudi Arabia has only 300 MW installed solar power capacity at its first solar plant in Al Jouf province called Skaka, which will be part of a much larger solar project, the 2.6 GW Faisaliah Solar Power Project which is currently under development <sup>[26]</sup>. The project is funded with the help of private investors, also known as independent water and power producers.

### 5.4.2. NET METERING

Saudi Arabia's Net Metering Policy came into force in mid-2018 and allows residential and commercial properties to install solar PV systems with a maximum capacity of 2MW, if located in one premise (5MW if multiple premises under the same area of supply) and export any excess power back to the grid. For new premises, the installed capacity cannot exceed the connection load of the consumer while for existing premises, the limit for generation is the average load in the previous year from the date of application <sup>[27]</sup>.

### 5.4.3. RENEWABLE ENERGY TARGETS

The Kingdom of Saudi Arabia is planning to reduce its reliance on fossil fuels via its Vision 2030 plan. The National Renewable Energy Program (NREP) has recently revised the Kingdom's renewable energy targets to more ambitious ones with plans to increase its clean energy capacity to <sup>[28]</sup>:

- 3.45 GW (by 2020): 2-Year Target
- 27.3 GW (by 2023): 5-Year Target (was 9.5 GW)
- 58.7 GW (by 2030): 12-Year Target
  - 40 GW Solar PV
  - 16 GW Wind
  - 2.7 GW CSP

## 5.5. OMAN

Renewable energy targets	10% by 2025
Feasible renewable energy technologies	Solar, Wind, Waste to Energy
Market access mechanisms	Net metering & subsidies, IPPs/IWPPs, I-RECs
On site generation capacity for net metering	Between 2 to 4 kW
Majid Al Futtaim CO <sub>2</sub> e from electricity (2018)	44,373 tonnes CO <sub>2</sub> e (3% of total corporate operational footprint)

### 5.5.1. INDEPENDENT WATER AND POWER PRODUCERS

Oman experiences higher GHI levels on average meaning that solar PV technology is a viable technology for harvesting solar power; however, Oman also shows good prospects for CSP deployment in the south-eastern region of Dhofar, where the DNI coefficient is strong <sup>[12]</sup>. Despite its huge solar potential, Oman has not yet harvested solar energy. Oman’s first two utility scale solar plants currently under construction, Amin and Ibri, are due to go online in 2020 and 2021 respectively and will have a combined capacity of 600 MW. Both plants are developed by private companies, under an IPP model. The power generated from Amin will, however, be supplied entirely to Petroleum Development Oman (PDO) to run its oil related operations. Oman is also exploring wind power and is currently developing a wind farm in the sultanate’s region of Dhofar, known for its strong winds. The project will reach a capacity of 200 MW by 2023.

### 5.5.2. NET METERING

Oman offers a net metering scheme (Sahim I) which allows households and businesses to install small-scale grid connected PV panels at their own cost, but with the possibility of receiving an export tariff for surplus electricity. The second phase of the Sahim scheme (Sahim II) will aim to secure funding solutions for between 10% to 30% of residential properties to cover the initial cost of installation of solar PV systems. The funders will then recover the costs (capex, opex plus some return) through contracts with licensed suppliers <sup>[29]</sup>.

### 5.5.3. RENEWABLE ENERGY TARGETS

Oman has started planning for the diversification of its economy and produced a very high-level document, called “Oman Energy Master Plan 2040”, with no specific for targets for renewable development set. It has, however, set the foundations for the “Fuel Diversification Policy” which outlines the following targets for the electricity sector:

- 10% of electricity will be generated from renewable sources by 2025
- Clean coal will power up to 3,000 MW of generation capacity by 2030 <sup>[30]</sup>

## 6. INVESTMENT OPPORTUNITIES FOR FURTHER INVESTIGATION

Following on from previous sections where we looked at the renewable energy context in the MENA region, the report will now investigate potential opportunities for investment in renewable energy and the possible pathways available to Majid Al Futtaim for achieving carbon reductions through scaling up its renewable energy sourcing.

### 6.1. CORPORATE POWER PURCHASE AGREEMENTS AND THIRD-PARTY SALES

Based on the findings in previous sections, it can be concluded that corporate power purchase agreements, where available, are one of the most attractive ways of investing in renewable energy and reducing carbon emissions associated with electricity consumption. The main reasons for this are:

- Corporate power purchase agreements are inexpensive and no upfront capital investments are required
- corporate power purchase agreements create additionality, meaning that additional renewable capacity is generated

Currently, not many countries allow renewable developers to supply power directly to private organisations; however, it is expected this to change in the next decade. At present, there are three countries in which Majid Al Futtaim operates – Egypt, Jordan and Kenya – in which corporate PPAs have been struck and therefore present opportunities for the Company to pursue further corporate power purchase agreements. In Jordan, the Company already sources its entire power demand from a private developer, a 17 MW wheeling solar project <sup>[31]</sup>.

The cost per MWh sourced from the independent generator will depend on the terms of the agreement with the developer; however, as learned from Section 3, which looked at the technological outlook in the MENA region, the cost of renewable energy generation, particularly from solar energy, has fallen below those of conventional fuels, becoming the cheapest option on the market.

In most cases, the generator will not be directly connected to the consumer, so the power will have to be transported via the grid network, and the costs associated will be incurred by the end user. With generally lower electricity wholesale prices than those offered by the grid, Majid Al Futtaim will not only benefit from carbon neutral power, but in some cases also from cost savings. However, sourcing electricity in this way requires commitment to a long-term agreement – typically between 10 to 25 years. Consequently, this arrangement should only be considered where the Company has a good level of certainty over its likely future electricity demand in the country.

### 6.2. SELF-GENERATION

On-site generation, particularly from solar, is encouraged through government schemes in almost all countries Majid Al Futtaim operates in, as showed in Section 4 of the report. Most countries have net-metering schemes in place, with only a few offering more innovative incentives (e.g. Feed-in Tariffs, loans, grants or tax reliefs).

Given the general lack of attractive financial incentives for self-generation in the MENA region, the report concludes that on-site generation technologies should be used primarily for the purpose of powering the demand of the estate where installed, and where possible, maximise the financial incentives available. Based on that, the cost of installation should be offset using a Return-on-Investment principle (ROI), which is typically around 8 years, but the ROI can also be improved where Feed-in Tariffs are offered for surplus energy supplied back to the grid. Appendix 2 shows the power generation capacity of various on-site generation system sizes, as well as the potential energy generated over a period of one year.

From a design perspective, particularly if the load of the building where the solar systems are installed is relatively flat during a 24-hour period, battery storage systems should be considered. A typical 10-kW solar PV installation in the MENA region could produce up to 16 MWh annually, but if a considerable amount of load is consumed during night time, without a battery, the night demand will have to be met by grid power.

### 6.3. INVESTING IN LARGE-SCALE RENEWABLE DEVELOPMENTS

As learned from the report, most large-scale renewable generation projects are funded and developed by private investors (please refer to Appendix 1 for a list of independent water and power producers in the countries Majid Al Futtaim operates in). Majid Al Futtaim could potentially consider part-funding a facility of this type, and the electricity generated from it can then be sold to the energy authorities, normally as part of a very long-term supplier agreement. How quickly investors recuperate the initial capital investment is entirely dependent on the collection of Feed-in Tariffs which is the price per unit of power generated agreed with the energy authorities (the buyer). Additionally, if the generating project is registered with the I-REC issuer in the MENA region (Dubai Carbon Centre of Excellence), I-RECs can be claimed for the generation of green electricity under the International Renewable Energy Certificate Standard. Majid Al Futtaim could maintain its share of I-RECs to cover their own needs in any country the scheme operates.

### 6.4. PURCHASE INTERNATIONAL RENEWABLE ENERGY CERTIFICATES (I-RECS)

Where corporate power purchase agreements, on-site generation and PPAs with the government may not be feasible or may not satisfy the entire demand for renewable electricity, Majid Al Futtaim may consider a more indirect way of sourcing renewable energy – by purchasing I-RECs. I-RECs can reduce GHG emissions and improve an organisation's sustainability scoring; however, it is considered more of an offset mechanism, as it does not create additionality in the global energy mix. Therefore, purchasing I-RECs is only recommended as a temporary strategy for curbing emissions and meeting internal targets for carbon reduction until more suitable mechanisms become available.

## 7. FUNDING OPTIONS

As some renewable investment pathways researched in this report require significant capital investment, finding the right funding is important. One option is via Majid Al Futtaim's Green Bonds/Sukuks issued under the Company's Finance Framework – a corporate commitment to financing the long-term sustainable projects required to transition to a low carbon economy, by raising funds from environmentally and socially conscious investors and demonstrating its leadership on sustainability in the global marketplace [32].

According to the framework, green bonds can be utilised to fund the generation or procurement of energy from solar or wind to power the company's operations. This report identified potential opportunities in generating energy from the treatment of waste, technology that is not yet eligible under Majid Al Futtaim's Green Bond, therefore it is recommended that the framework should be updated to include anaerobic digestion (AD) as well as geothermal energy as potential renewable power sources.

Additional ways for funding can be explored such as setting internal carbon prices or taxes on non-renewable energy. Green loans and grants may be also considered in countries where they are available.

## 8. CONCLUSION

This research and recommendations report concludes by summarising the recommendations for exploring investment in renewable energy by country and by degree of capital and operational investment and assesses their impact on the Company's carbon footprint. The carbon contraction figures for each recommendation are calculated based on the potential transition to renewable energy sourcing in relation to Majid Al Futtaim's GHG footprint in 2018, and do not include potential reductions from energy efficiency initiatives that may take place in conjunction as part of the organisation's wider plan – which would increase the reductions further.

As previously mentioned, corporate PPAs are the most preferred renewable energy sourcing mechanism due to its competitive price and additionality feature; however, it should only be considered if the Company plans to remain present in the respective country in the following 10-25 years, depending on the terms and conditions of such an agreement.

On-site generation comes second, primarily due to its relatively high capital cost. However, scaling up on-site generation capacity across the portfolio is part of an ongoing ambition for the Company and internal targets have been set to ensure this is taking place. Therefore, Majid Al Futtaim will continue to drive this further and ensure financial incentives available in the countries that on-site generation is planned are being utilised.

Next, the report recommends investigating the possibility for Majid Al Futtaim to become an Independent Power Producer (IPP). Although similar to corporate power purchase agreements, as it involves a long-term commitment with a second party to supply electricity from generation, the energy generated from an IPP's project will not supply Majid Al Futtaim's demand for electricity directly. Therefore, if the Company decides to cease operations in the country where the IPP is located, it can do so without any restrictions. Additionally, the associated I-RECs gained from funding renewable generation projects, can be claimed for consumption elsewhere, as long as they are registered with a body certified by the International Renewable Energy Certificate Standard.

Based on the above suggested hierarchy of investment mechanisms, the table below offers a high-level summary of potential pathways for investing in renewable energy at the existing estate. The pathways were analysed in relation to the Company's Net Positive commitment to achieve the status in operational activities by 2030. Any recommendations should, of course, be explored with future agreed initiatives e.g. energy efficiency projects and planned business growth in mind and it is recommended that the forecasting tool is used to support this.

Lastly, Majid Al Futtaim should consider purchasing I-RECs in the short term to support the achievement of targets in countries where investment in renewable power is not yet available or may not fully meet the demand for it. However, it is crucial that this continues to be coupled with strong efforts to increase energy efficiency of assets in these areas.

Although this research and recommendations report focuses on the potential renewable generating technologies for existing estate, the learnings can be applied to new developments and ventures and utilised in building strong business cases for both retrofit and planned developments.



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## 10. APPENDICES

Country	Renewable energy project name	Technology	Capacity (MW)	Completed by	Price (US cents/kWh)	Cost of construction (USD)	Developers & Owners
UAE	Shams 1 CSP	CSP	100	2013		600,000,000	Masdar (60%) Abengoa (20%) Total S.A. (20%)
UAE	Noor 1 PV – ADWEA	Solar PV	1,177	2019	2.42 (non-weighted price of 2.94)	872,000,000	Abu Dhabi Power Corporation (60%) Sweian PV Power (20%) JinkoSolar (20%)
UAE	Sheikh Mohammed bin Rashid Solar Park (Phase I)	CSP & PV	13	2013		3,200,000,000	
UAE	Sheikh Mohammed bin Rashid Solar Park (Phase II)	Solar PV	200	2017	5.85		
UAE	Sheikh Mohammed bin Rashid Solar Park (Phase III)	Solar PV	800	2020	2.99		
UAE	Sheikh Mohammed bin Rashid Solar Park (Phase IV)	CSP & PV	950	2030	7.3 for CSP and 2.4 for solar PV		
UAE	Sheikh Mohammed bin Rashid Solar Park (V)	CSP & PV	900	2050			
UAE	Total Rooftop PVs	Solar PV	81	2019			
UAE	Abu Dhabi	Waste-to-energy	100				Abu Dhabi National Energy Company PJSC (Taqa) Centre of Waste Management (Tadweer)
UAE	Al Warsan (Dubai)	Waste-to-energy	60	2020		545,000,000	
UAE	Ras al Khaimah	Waste-to-energy	2			32,000,000	

Country	Renewable energy project name	Technology	Capacity (MW)	Completed by	Price (US cents/kWh)	Cost of construction (USD)	Developers & Owners
UAE	Sharjah	Waste-to-energy	90	2021		33,000,000	Emirates Waste to Energy Company – a joint venture between Sharjah’s Bee’ah and Abu Dhabi’s Masdar
UAE	Barakah plant (Unit 1)	Nuclear	1,000	2020		24,000,000,000	The Korea Electric Power Corporation (KEPCO)
UAE	Barakah plant (Unit 2)	Nuclear	1,000	2021			
UAE	Barakah plant (Unit 3)	Nuclear	1,000	2022			
UAE	Barakah plant (Unit 4)	Nuclear	1,000	2023			
Oman	Dhofar (Phase I)	Wind	50	2019			
Oman	Dhofar (Phase II)	Wind	150	2023			
Oman	Miraah Solar Thermal	Solar thermal					
Oman	Ibri PV Plant	Solar PV	500	2021		400,000,000	Saudi Arabia's Acwa Power (50%) Kuwait's Gulf Investment Corporation (40%) Alternative Energy Projects Company (10%)
Oman	PDO Amin PV Plant	Solar PV	100	2020			Marubeni Corporation Oman Gas Company SAOC Bahwan Renewable Energy Company
Oman	Barka Waste to Energy	Waste-to-energy	150	2023		800,000,000	Under tender
Saudi Arabia	Skaka	Solar PV	300	2019	2.34	319,000,000	ACWA Power AlGihaz Holding Company
Saudi Arabia	Dumat Al Jandal	Offshore Wind	400	2022	2.13	500,000,000	EDF Renewables (51%) Masdar (49%)
Saudi Arabia	Alfaisalia	Solar PV	600				Under tender
Saudi Arabia	Radigh	Solar PV	300				Under tender

Country	Renewable energy project name	Technology	Capacity (MW)	Completed by	Price (US cents/kWh)	Cost of construction (USD)	Developers & Owners
Saudi Arabia	Jeddah	Solar PV	300				Under tender
Saudi Arabia	Alras	Solar PV	300				Under tender
Saudi Arabia	Saad	Solar PV	300				Under tender
Saudi Arabia	Qurrayat	Solar PV	200				Under tender
Saudi Arabia	Qurrayat II	Solar PV	40				Under tender
Saudi Arabia	Wadu Aswawser	Solar PV	70				Under tender
Saudi Arabia	Madinah	Solar PV	50				Under tender
Saudi Arabia	Rafha	Solar PV	45				Under tender
Saudi Arabia	Mahad Dahab	Solar PV	20				Under tender
Kuwait	Shagaya	CSP	50				
Kuwait	Shagaya	Solar PV	10				
Kuwait	Shagaya	Wind	10				
Kuwait	Al Dibdibah/ Shagaya Phase II	Solar PV	1,500				
Bahrain	Askar Landfill	Solar PV	100		3.9		ACWA Power
Bahrain	Al Dur	Solar-wind hybrid	5			17,100,000	Bahrain's Electricity and Water Authority (EWA)
Egypt	Benban Solar Park (operating)	Solar PV	800	2018		4,000,000,000	Alcazar Energy IB Vogt Scatec Solar Shapoorji Pallonji
Egypt	Benban Solar Park (planned)	Solar PV	1,000	2020			Alcazar Energy IB Vogt Scatec Solar Shapoorji Pallonji financing provided by the EBRD (European Bank for Reconstruction and Development) & International Finance Corporation
Egypt	Siwa	Solar PV	10	2015			
Egypt	Kuraymat (solar thermal)	CSP	20	2011			Japan Bank for International Development and Global

Country	Renewable energy project name	Technology	Capacity (MW)	Completed by	Price (US cents/kWh)	Cost of construction (USD)	Developers & Owners
							Environmental Facility
Jordan	Baynouna	Solar PV	200	2020			
Jordan	Various Solar PV	Solar PV	716	2018			
Jordan	Various Solar PV (planned)	Solar PV	436	2020			
Pakistan	Quaid-e-Azam Solar Park	Solar PV	400	2016			
Pakistan	24 various scale solar projects	Solar PV	550				
Georgia	1st Large scale PV Plant	Solar PV	50				
Lebanon	12 solar projects	Solar PV	180				

*Appendix 1: Large-scale renewable energy projects in countries that Majid Al Futtaim operates in*

Installation power capacity (kW)	Annual potential electricity generation (kWh)	Potential cost of installation (AED) <sup>[33]</sup>	Annual savings from avoiding buying electricity from the grid (AED)	ROI (with no FITs) in years
3	4,800	6,000	720	8.33
8	8,000	16,000	1,200	13.33
10	16,000	20,000	2,400	8.33
15	24,000	30,000	3,600	8.33
20	32,000	40,000	4,800	8.33
50	80,000	100,000	12,000	8.33
1000	1,600,000	2,000,000	240,000	8.33
2000	3,200,000	4,000,000	480,000	8.33
3000	4,800,000	6,000,000	720,000	8.33
4000	6,400,000	8,000,000	960,000	8.33
5000	8,000,000	10,000,000	1,200,000	8.33

Appendix 2: Possible costs and ROIs for small scale solar PV system with capacities ranging between 3 to 5000 kW

*This research and recommendations report has been produced by our sustainability consultants JLL.*



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