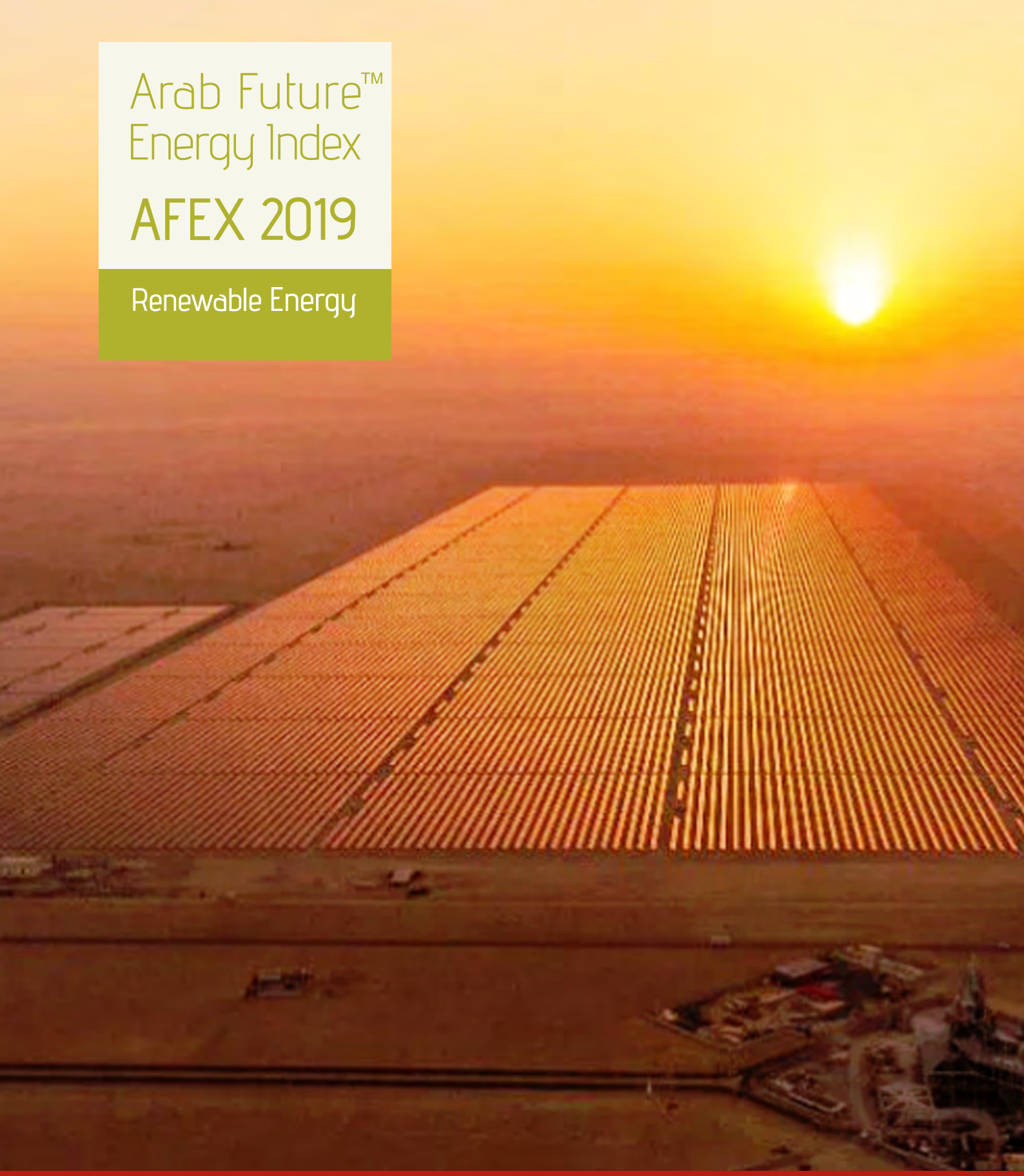
Arab Future™ Energy Index

AFEX 2019

Renewable Energy



RCREEE

Regional Center for Renewable Energy and Energy Efficiency

المركز الإقليمي للطاقة المتجددة وكفاءة الطاقة

UNDP

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About AFEX

The Arab Future Energy Index (AFEX) is the first Arab index dedicated to monitoring and analyzing sustainable energy competitiveness in the Arab region. AFEX offers both quantitative and qualitative analysis on key renewable energy and energy efficiency markets across 20 Arab countries. Countries are ranked by over 20 different indicators to shed light on key energy market characteristics including policies, institutional and technical capacities, strategies, and investments. AFEX data has been collected and sourced locally and internationally to guarantee accuracy and transparency.

AFEX has two publications, updated and published alternatively each two years: AFEX Renewable Energy and AFEX Energy Efficiency. In its 2019 edition, AFEX Renewable Energy ranks 20 Arab states and provides tailored recommendations for countries to help improve their sustainable energy markets.

Countries of assessment include: Algeria, Bahrain, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, UAE, and Yemen.

AFEX is produced by the Regional Center for Renewable Energy and Energy Efficiency (RCREEE), an independent, not-for-profit regional organization which aims to enable and increase the adoption of renewable energy and energy efficiency practices in the Arab region. AFEX Renewable Energy 2019 is produced in collaboration with the United Nations Development Program (UNDP).

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Arab Future Energy Index™(AFEX) Renewable Energy 2019

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Arab Future Energy Index 2019 RCREEE Foreword

Energy is an enabler for sustainable development and is linked directly or indirectly opportunities and challenges that require decisive actions. Renewable energy is a major pillar in a sustainable energy future and for ensuring access to affordable, reliable, sustainable and modern energy for all as stipulated by the seventh Sustainable Development Goal. Evidently, Arab countries are taking great leaps to develop competitive renewable energy markets as revealed by this important AFEX Renewable Energy (RE) 2019.

The Arab region has one of the highest potentials for renewable energy among the world countries. This edition of AFEX illustrates the ambitious renewable energy targets of Pan-Arab countries to exploit these promising potentials.

These targets are proof of the commitment, persistence, and support of The Arab countries' leaders towards renewable energy technologies integration into the energy mix.

The region is attracting global attention. International firms are competing fiercely in several tenders and auctions to provide their services. This led to multiple records of the lowest LCOE prices around the globe. These prices were seen both in on-shore wind and in photovoltaic solar energy projects. Sustainable Energy Projects in Pan-Arab region have shown region's candidacy to lead the world in renewable energy applications.

This edition of AFEX RE 2019 – gives an overview of the latest developments in Pan-Arab countries. Developments that include renewable energy projects, applied policies, updated national targets for their energy mix, technologies used, countries programs, and recent regulatory changes. In addition to the above, AFEX 2019 provides solid analysis for main areas that promotes the adoption of renewable energy. These areas are market structure, policy framework, institutional capacity and finance and investment. This publication is a great tool for investors, energy experts and enthusiast, regulator and policymakers to know about different markets approaches to embrace renewable energy.

Cooperation between Pan-Arab countries has reached a promising level. The 'Pan-Arab Strategy for the Development of Renewable Energy 2010-2030' has been expanded in 2018 to become the "Arab Sustainable Energy Strategy - ASES" including energy efficiency and energy access domains. This valuable tool – AFEX 2019 – facilitates the advancement of the collaboration between Arab countries by showing the distinguished trends and success stories that every country can implement.

This report is launched as a result of collaboration between RCREEE and the United Nation Development Program (UNDP). I would like to express my gratitude to the entire contributors of this publication. This amazing work would not have been produced without the efforts of the authors, collaborators and the relentless support of the UNDP.

RCREEE is always concerned with how to promote sustainable energy application in the Arab region. RCREEE has been successfully contributing to address all relevant challenges and risks, whether financial, technical, socioeconomic, or on policy level. This publication is a piece of the continuous efforts that RCREEE is exerting restlessly to help Arab countries towards reaching their sustainable energy goals.

Dr. Ahmed Badr

Executive Director, RCREEE

Arab Future Energy Index 2019
UNDP Foreword

Climate change presents the single biggest threat to sustainable development and could well lead to a reversal of development gains by mid-century. But climate action also stands as a major opportunity for countries to transition to a low carbon, sustainable energy economy. This is particularly important for the Arab region. While holding the world's highest levels of solar radiation, the region to date has made only modest progress in expanding the share of renewable energy in its energy mix. This is starting to change.

The Sustainable Development Goals (SDGs) and the Paris Agreement are catalyzing greater prioritization and accelerated investments for solar solutions across the Arab region. The Nationally Determined Contributions (NDCs) countries have enacted under the Paris Agreement serve as platforms for action, as countries seek a larger role for renewable energy to diversify the economy, generate new high-tech knowledge-based jobs, and reduce the energy intensity of growth. In most countries, renewable energy can help achieve local development goals and build resilience of poverty reduction efforts. In the crisis contexts of the region, energy is a key factor for meeting basic needs of conflict-affected communities and for supporting resilient recovery. Meanwhile in oil-exporting economies, renewable energy can be a strategic resource to diversify the economy and reduce the energy intensity of growth.

To support countries in these efforts, the United Nations Development Programme (UNDP) is expanding our role as a provider of technical assistance across the Arab region. UNDP serves as the UNs largest implementer of grant assistance for climate action, with over $4 billion of ongoing projects around the world today. In the Arab region, UNDP promotes innovation and scaled up finance to implement the SDGs and NDCs in an integrated manner, so as to help partners shift the trajectory of development towards a more sustainable and resilient future.

As part of this effort, UNDP is pleased to partner with the Regional Centre for Renewable Energy and Energy Efficiency (RCREEE) in producing this 2019 edition of the Arab Future Energy Index (AFEX). As a means of chronicling progress made by countries across the region on SDG 7 on energy and the Paris Agreement, AFEX uses over 30 indicators to rank country progress on regulatory and institutional structures, financial innovations, policy frameworks and public and private investments. As seen in this year's report, important examples are arising across the region on how innovative solutions can help de-risk the environment for scaled up investments in sustainable energy, with the Arab region now hosting some of the world's largest solar facilities.

Seizing new levels of ambition in the region towards local climate action – and supporting the acceleration of these positive trends – not only helps to protect the planet, it builds the social and economic resilience of communities, and empowers countries to set course for a new low carbon, sustainable energy pathway.

Khaled Abdelshafi
Director, UNDP Regional Hub for Arab States

About UNDP

The United Nations Development Programme (UNDP) is the United Nations' global development network, working in over 170 countries and territories to achieve the eradication of poverty, and the reduction of inequalities and exclusion. UNDP helps countries to develop policies, leadership skills, partnering abilities, institutional capabilities and build resilience in order to sustain development results. Through UNDP's extensive work at global, regional and national levels, UNDP has learned that tackling climate change and expanding access to sustainable energy and water must be central to efforts to make results of development sustainable and resilient. UNDP is the UNs largest implementer of assistance on climate change, with over $4 billion of grants to countries around the world. In support of the new Paris Climate Change Agreement and Sustainable Development Goals, UNDP helps countries transition to a low-carbon, climate-resilient development future. Support to countries is led by UNDPs extensive system of Country Offices and five UNDP Regional Hubs.

In the Arab region, UNDP has been present supporting development for over 50 years, including the past 25 years of experience supporting countries on climate change, energy and environment agendas. UNDP support in the region has helped establish new policies and regulations to scale-up energy efficiency in key sectors like buildings and transport; new public-private partnerships for scaling up renewable energy technologies like solar and wind; new institutions and centers of excellence for low-carbon, sustainable energy solutions; and has helped expand access to solar energy for the poor including those displaced by conflict. UNDPs has played an important role at the regional level, including strategic partnerships with the League of Arab States, the Regional Center for Renewable Energy and Energy Efficiency, the Arab Water Council, the OPEC Fund for International Development, International Renewable Energy Agency and the Islamic Development Bank.

UNDP Regional Hub for Arab States

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About RCREEE

The Regional Center for Renewable Energy and Energy Efficiency (RCREEE) is an intergovernmental organization with diplomatic status that aims to enable and increase the adoption of renewable energy and energy efficiency practices in the Arab region. RCREEE teams with regional governments and global organizations to initiate and lead clean energy policy dialogues, strategies, technologies and capacity development in order to increase Arab states' share of tomorrow's energy.

Through its solid alliance with the League of Arab States, RCREEE is committed to tackle each country's specific needs and objectives through collaborating with Arab policy makers, businesses, international organizations and academic communities in key work areas: capacity development and learning, policies and regulations, research and statistics, and technical assistance. The center is also involved in various local and regional projects and initiatives that are tailored to specific objectives.

Having today 17 Arab countries among its members, RCREEE strives to lead renewable energy and energy efficiency initiatives and expertise in all Arab states based on five core strategic impact areas: facts and figures, policies, people, institutions, and finance.

We, the Regional Center for Renewable Energy and Energy Efficiency, are the strategic partner for the Arab countries driving energy transition for the prosperity of all our people.

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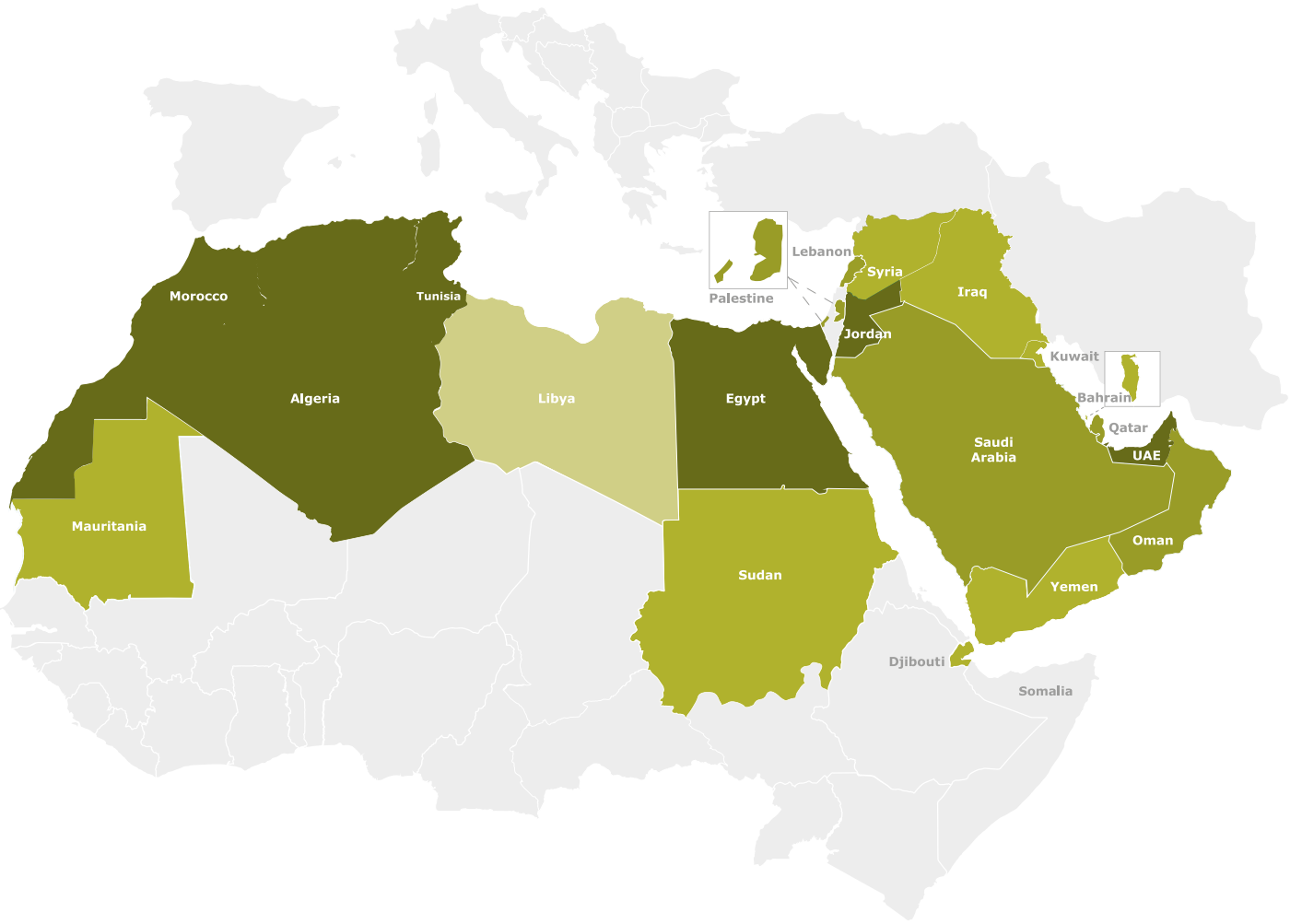


Green colors indicate overall ranks

- 80-100
- 60-80
- 40-60
- 20-40
- 0-20
- Other Arab states
- Rest of the world

Key Findings

Regional

The AFEX 2019 - Renewable Energy edition reveals how energy systems in the Arab region are moving towards becoming more sustainable and resilient. Simply, the renewable energy (RE) business is in ascendance. The region-wide developments prove the robust commitment of Arab countries to adopt financially, socially, and environmentally sustainable energy systems through the accelerated deployment of RE solutions. AFEX RE 2019 unveils the measures taken by Arab countries reflecting their ambitious pledges to climate action under the Paris Agreement and to the UN Sustainable Development Goals (SDGs). AFEX RE 2019 highlights those measures not only related to energy (SDG7): Ensure access to affordable, reliable, sustainable and modern energy for all, but also with further connections to other SDGs including; SDG 1 poverty reduction, SDG6 water and sanitation; SDG 11 sustainable cities; SDG13 climate change and SDG17; partnerships for the goals. The present edition of the AFEX captures the impressive progress and provides a comprehensive assessment of the investment climate for RE development. AFEX as a monitoring tool is continuing to gain a deeper value reflecting the relevance of RE targets and executed projects to sustainable development and to actions under the Paris Agreement on climate change. Many Arab countries have made perceptible progress towards creating better conditions for scaling up RE investments. The market structures have substantially improved, providing viable private investments opportunities and embracing measures to ease access to the power generation market for both on-grid and off-grid projects. The subsidy reform movement across Arab countries continues to provide a better reasoning for the necessity of increased contribution of renewables to the energy mix. All Arab countries are currently allowing for some sort of private participation in power generation activities. At least nine countries have allocated dedicated areas for the development of RE projects, and all countries have dedicated institutions or Ministry-level departments to promote the development of RE. Grid codes for RE projects are already adopted in 10 Arab countries.

The political commitment to foster the RE has translated into coherent policy frameworks, where RE targets with detailed action plans and supporting policies such as competitive bidding, auctioning, direct proposals and net-metering are continuously being adopted with feed-in tariffs playing lesser role than before. By the end of 2018, the total installed capacity in Arab countries of new renewables (excluding hydro) surpassed 7 GW, more than double the capacity recorded two years ago.

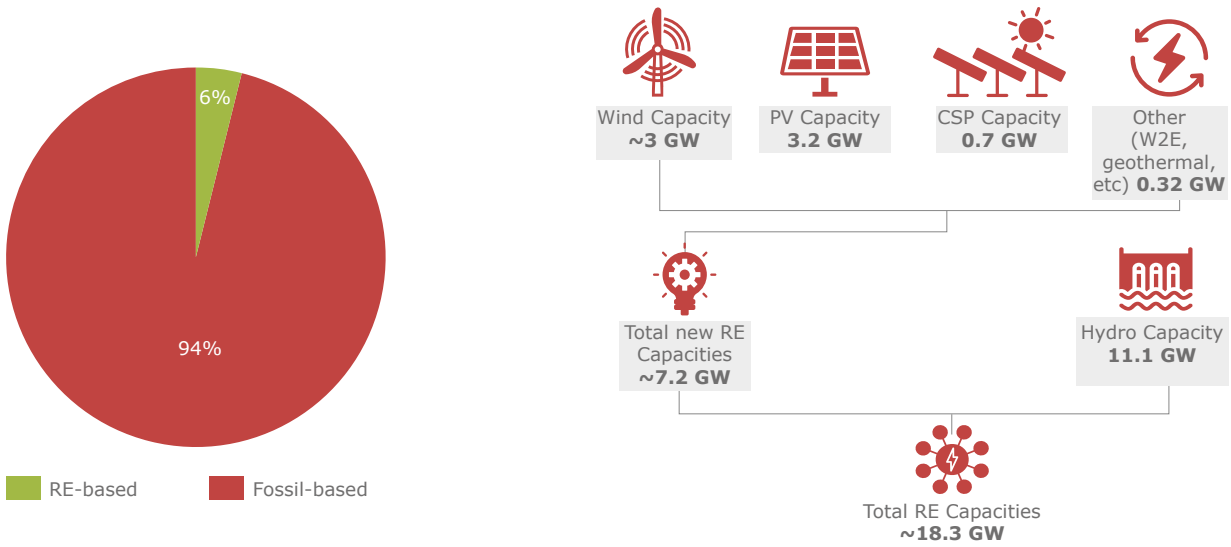


Figure 1: Share of RE in Installed Capacity

For the first time, PV capacities have exceeded wind capacities (3.2 GW versus around 3 GW), reflecting that many Arab countries are seizing the immense value of cost reduction and modularity of PV systems compared to other renewable technologies. PV installations are widespread all over the region, be it utility scale or small/medium decentralized systems. Wind generation is currently dominated by utility scale installations in Egypt, Morocco, Tunisia and Mauritania, while solar CSP have gained new frontiers in KSA, adding to developed projects in Algeria, Morocco, Egypt and the UAE.

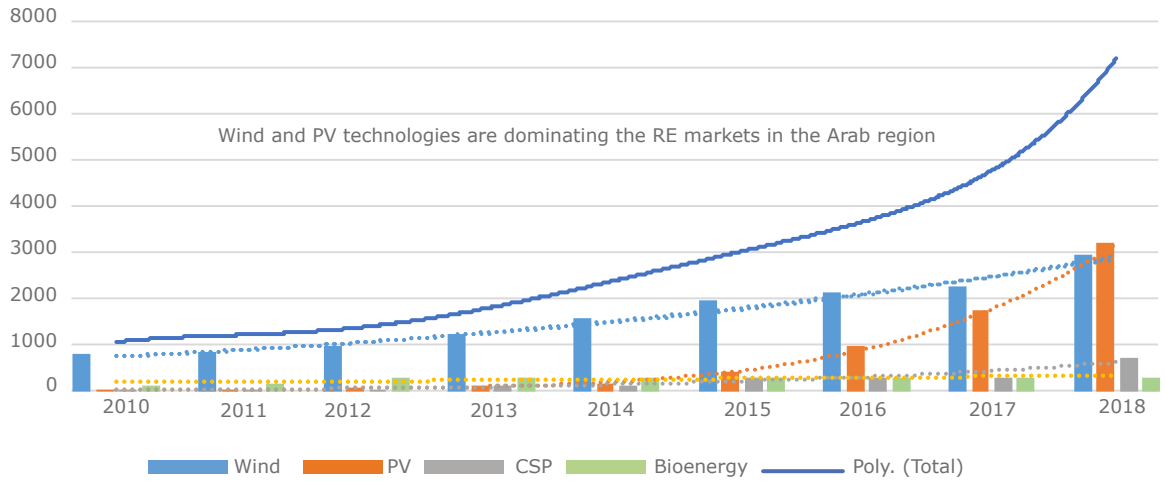


Figure 2: Development of RE Capacities by Technology in the Arab Region (2010-2018), [MW]

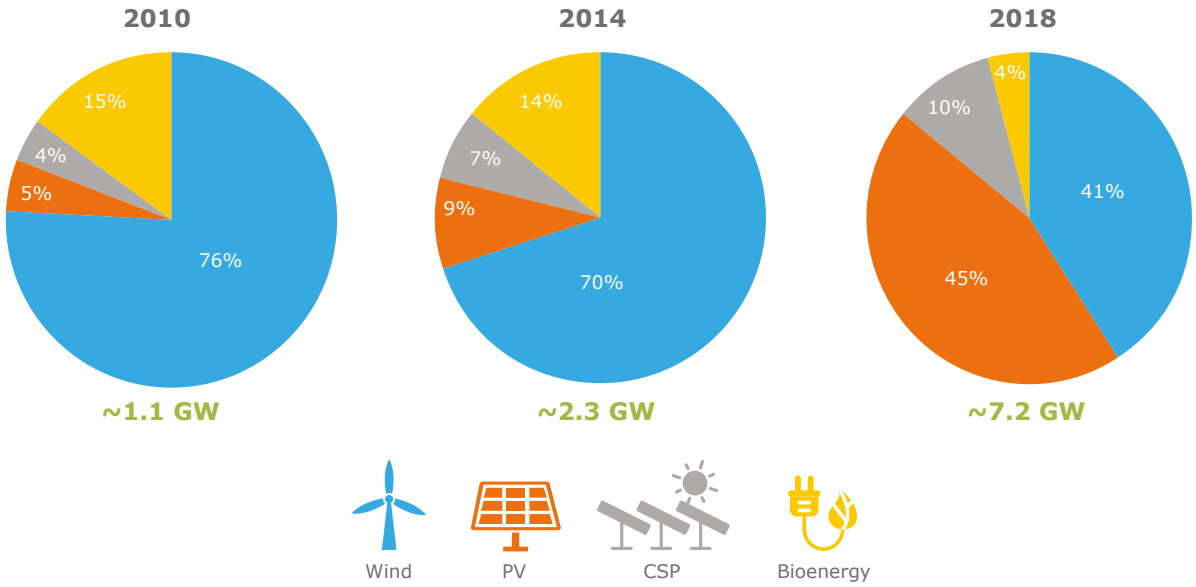


Figure 3: Market Transformation from Wind to PV Technologies

In terms of the renewable energy share in the overall installed capacity, the region is still on the verge of 6%. The key reason behind that is the additional conventional capacities brought online during the same period. It can be noted that Arab African countries enjoy a higher overall share reaching 12%, indicating the relatively faster development pace, where as Arab African countries renewable capacities represent 65% of the total renewable energy capacities in the Arab region. Sudan is leading with around 49% share attributed to its large hydro capacity. If hydro is excluded, Morocco and Jordan stand first with around 14% shares, followed by Mauritania with 12%. Other Arab countries lag behind with Tunisia at 5%, followed by Egypt and Algeria at almost 2%.

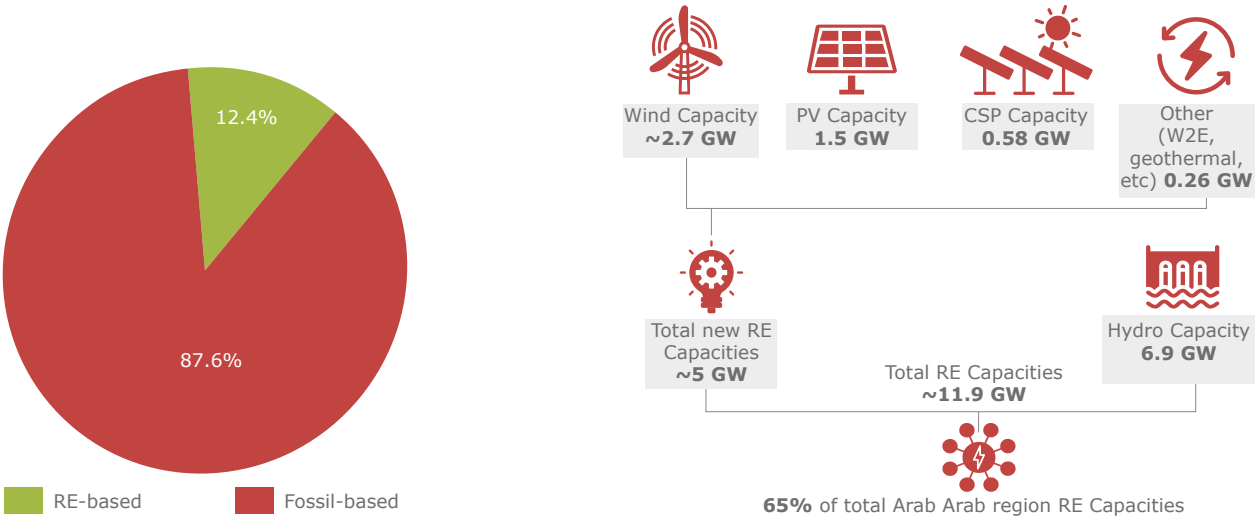


Figure 4: Share of RE in Installed Capacity in Arab African Countries

The growth in renewable energy in the Arab region is mainly due to the growth in wind and PV capacities, while the hydropower has shown a relatively weak growth as most of the hydro potential is already utilized in the region.

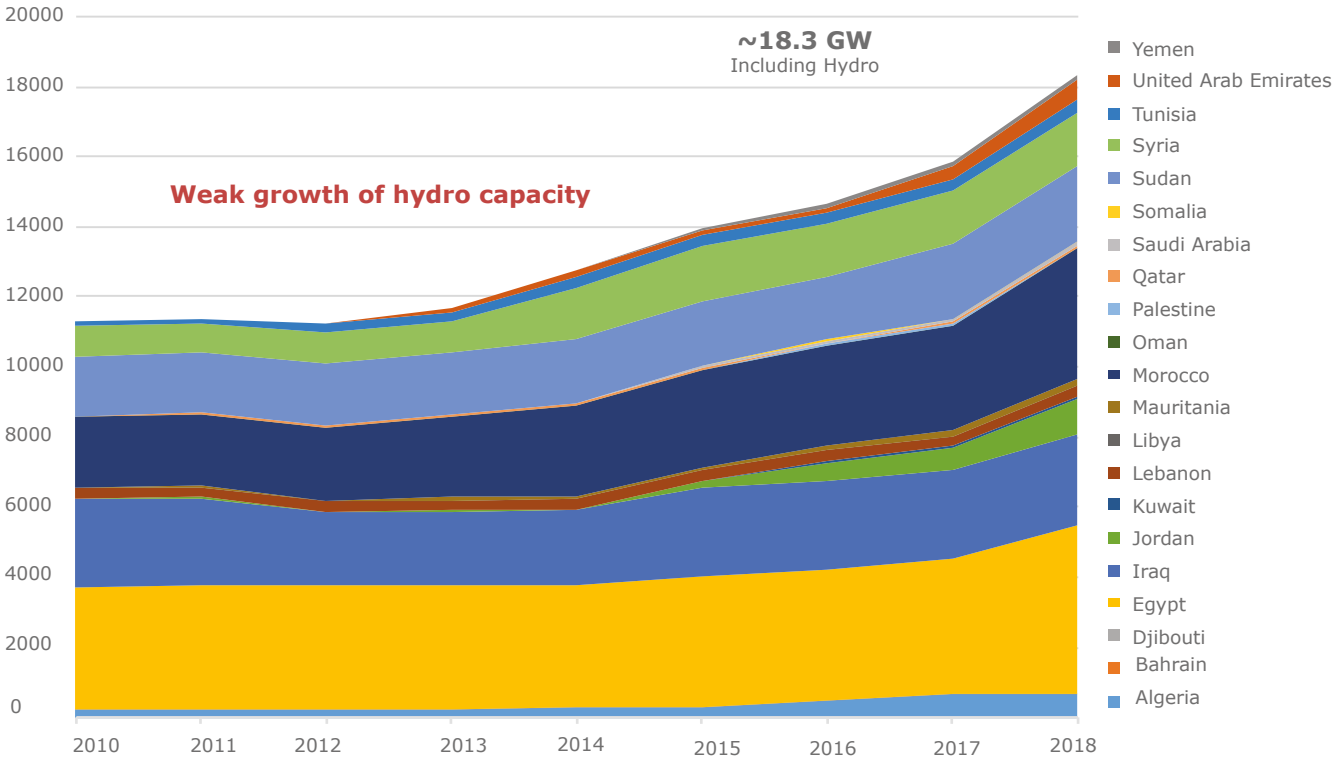


Figure 5: Total Renewable Energy Capacities in the Arab Region (2010-2018), [MW]

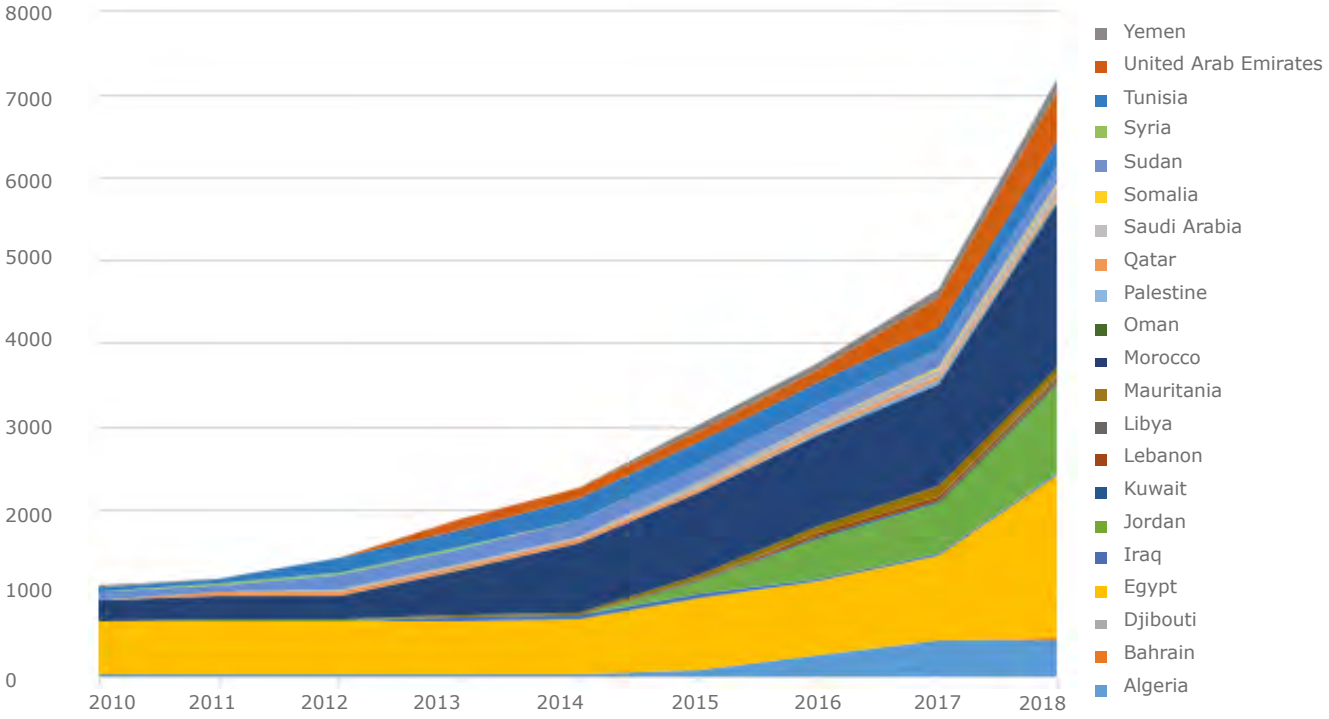


Figure 6: Total Renewable Energy Capacities in the Arab Region Excluding Hydro (2010-2018), [MW]

The total accumulative investments in renewable energy projects over the past decade (excluding hydro) are estimated at around USD 15 billion compared to only USD 1.2 billion in 2008. This is a reflection of the fact that in 2008 only 4 Arab countries had operational renewable energy capacities, while in 2018, all the countries have renewable energy installations. The supporting schemes have also evolved and almost all common supporting schemes known worldwide are practiced by the market actors in the Arab region, such as competitive bidding, auctions, feed-in tariffs, direct proposals, net metering and variations of corporate sourcing of renewables business models. The current openness for private investments was not the case 10 years ago, where the dominant approach was relying mainly on state owned projects and the only way for private sector engagement was through engineering, procurement and construction contracts. In 2018, Egypt and Morocco were over billion-dollar markets

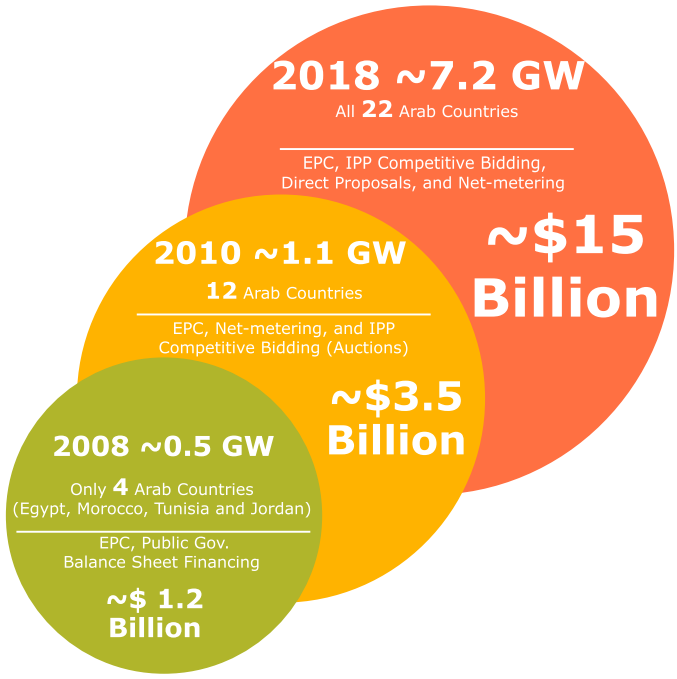


Figure 7: Arab Region Operational RE Projects Capacities and Investments (Excluding Hydro)

Seven Arab countries (Egypt, Morocco, Iraq, Sudan, Syria, Jordan and Algeria) possess 90% of the current RE capacities in the region. Egypt and Morocco together have 46% of the total installed capacities. Although Sudan and Iraq have not yet started an effective market transition towards solar and wind technologies, their advanced ranks are due to the existing hydropower facilities in both countries.

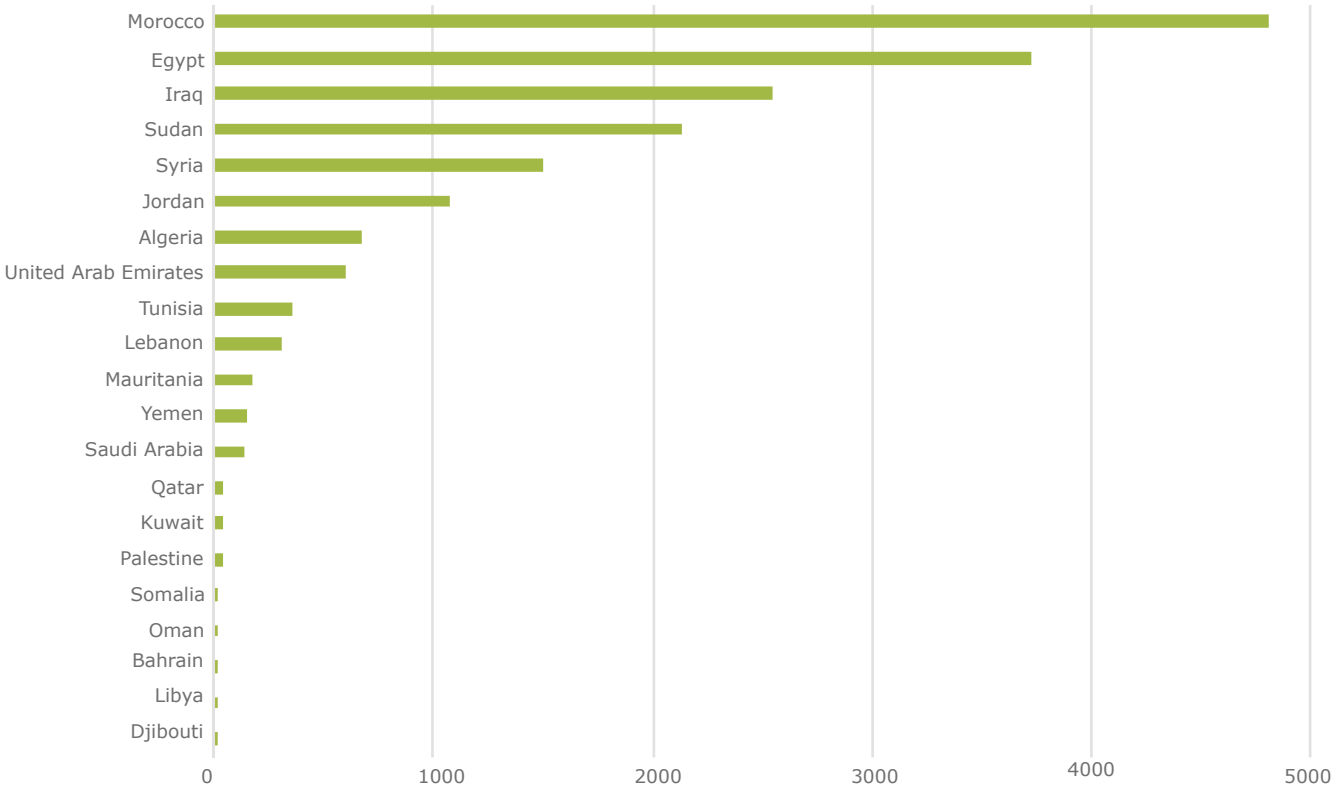


Figure 8: Total Renewable Energy Capacities, 2018 [MW]

Egypt and Morocco assume again the highest capacities excluding hydro with each hold around 27% of the total regional capacities.

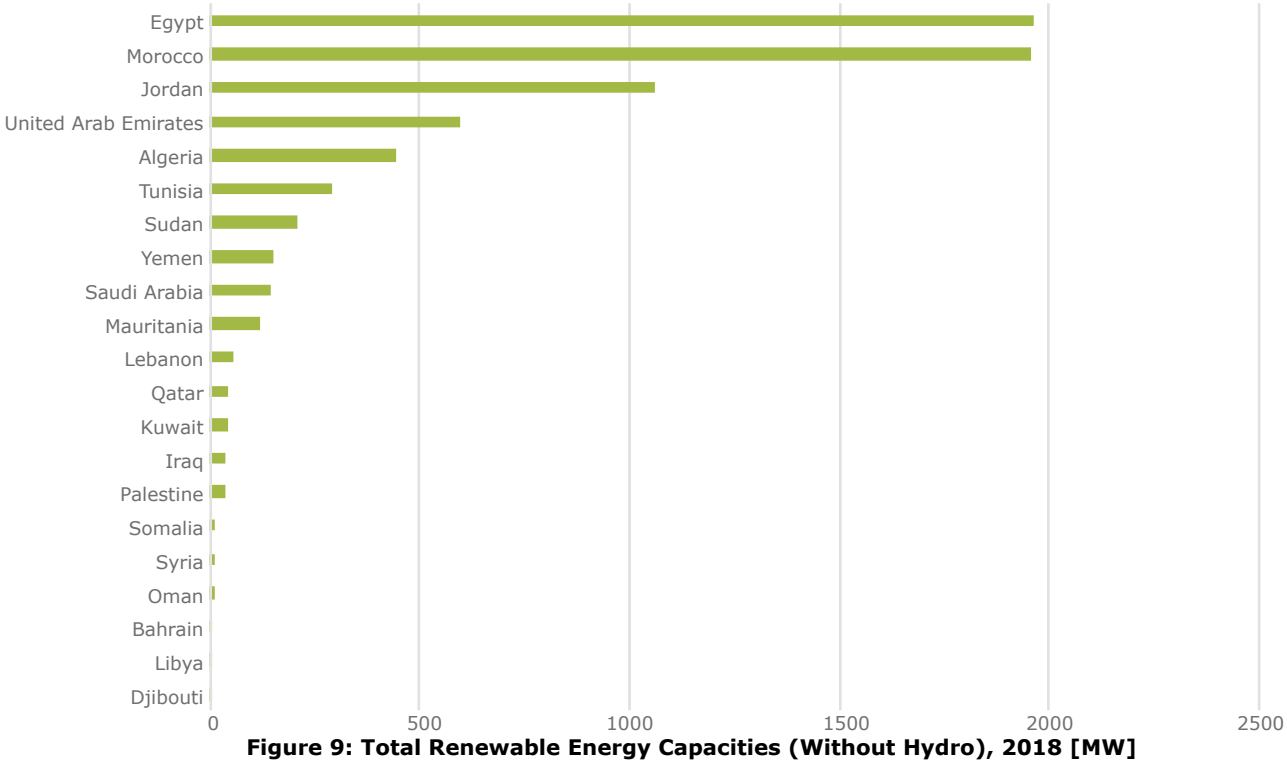


Figure 9: Total Renewable Energy Capacities (Without Hydro), 2018 [MW]

Jordan and UAE rank first and second in case the per capita share of the installed capacity is considered (excluding hydro). Morocco, Mauritania and Tunisia are also among the top 5 performers.

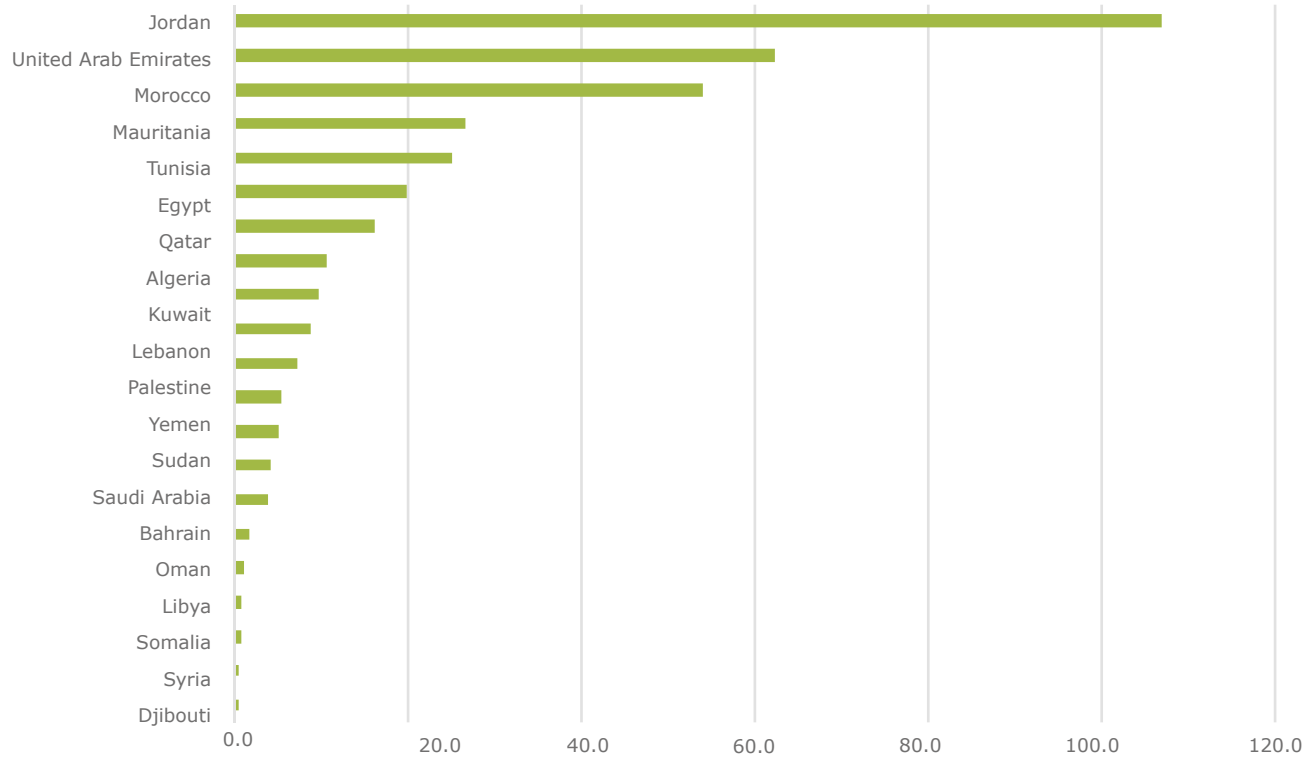


Figure 10: Per Capita Share of Renewable Energy Capacities (Without Hydro), 2018 [W/capita]

Egypt, Jordan, UAE, Morocco, and KSA are the top five Arab countries in terms of year-to-year installed capacity increase. Yemen in a fragile and crisis context has shown that PV is of true value to its citizens as a survival solution during the difficult war situation.

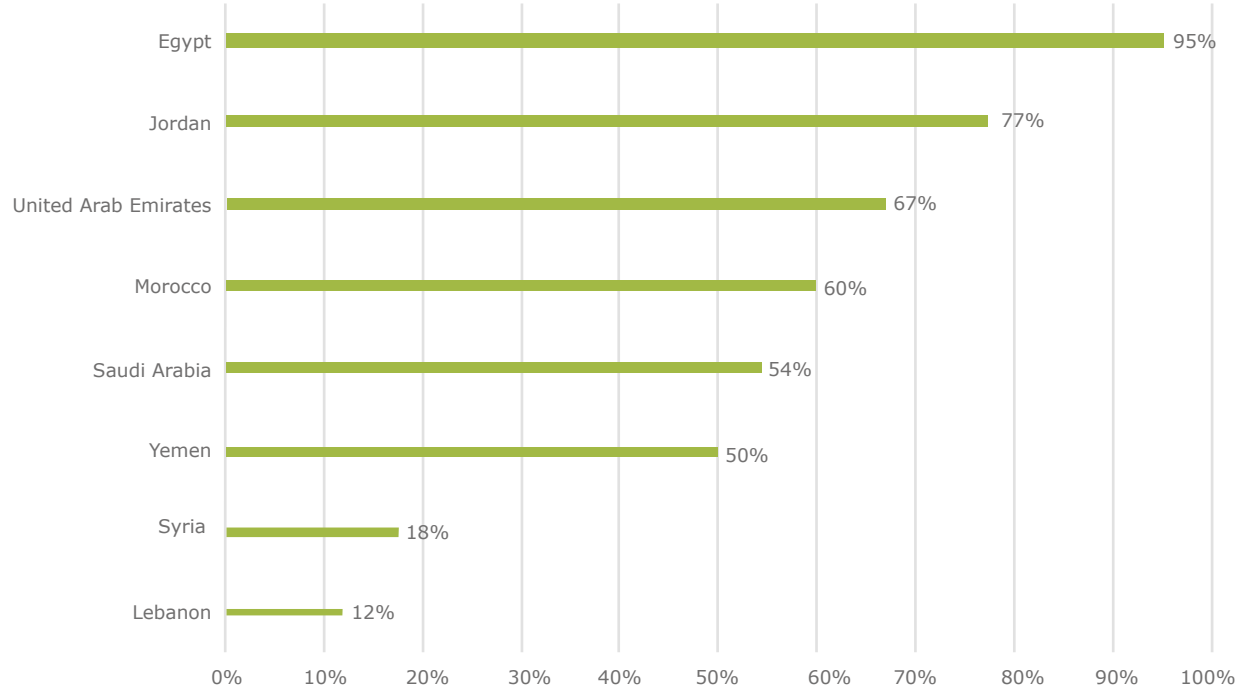


Figure 11: Top Year-to-Year Capacity Increase (2017-2018) [%]

Seven Arab countries (Jordan, Egypt, UAE, Algeria, Morocco,Yemen, and KSA) hold 90% of the current PV capacities in the region.

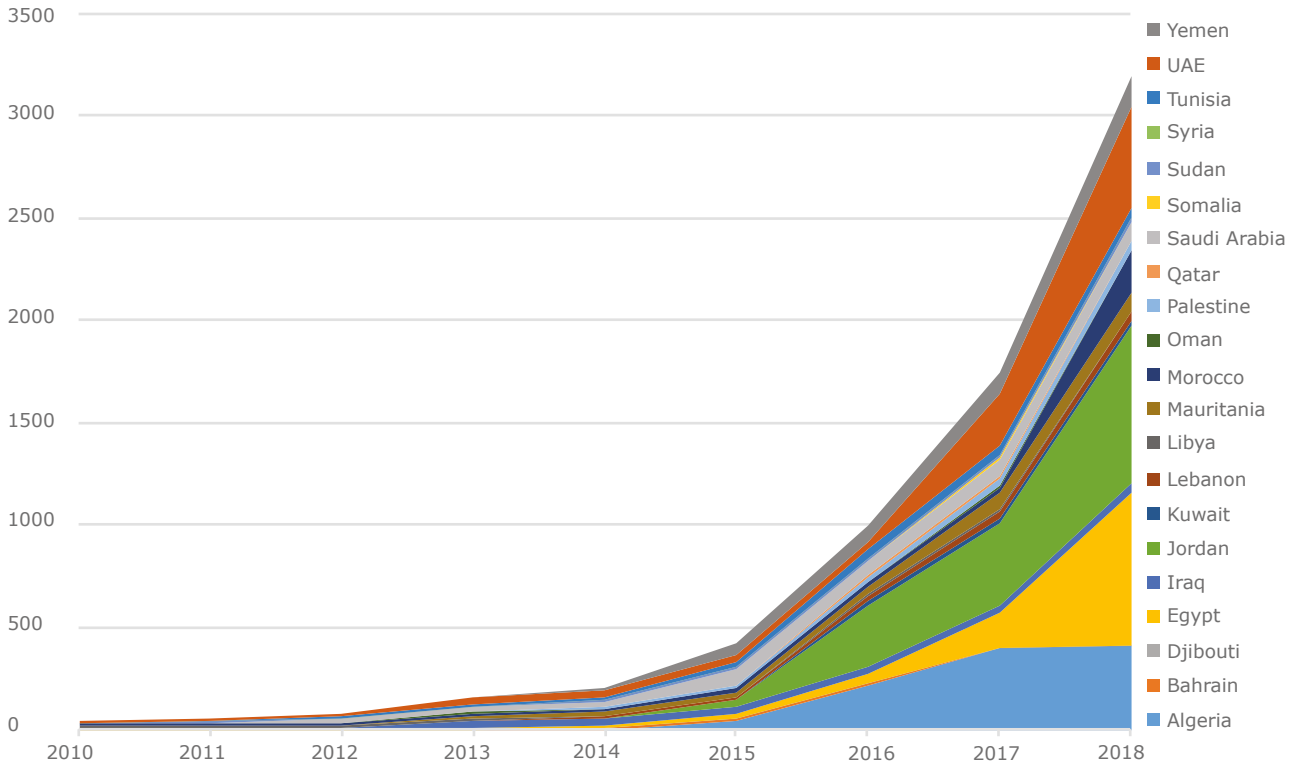


Figure 12: Total Solar PV Capacities in the Arab Region (2010-2018), [MW]

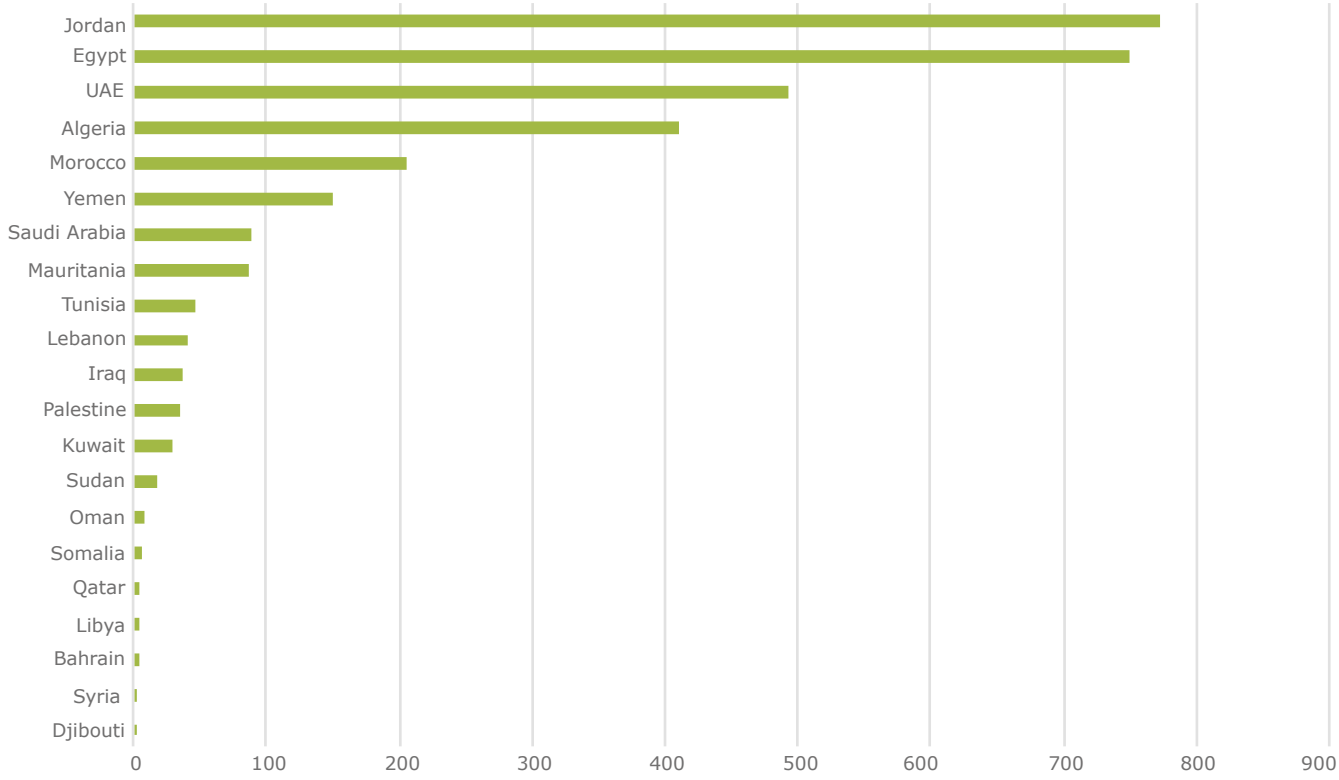


Figure 13: Solar PV Capacities in Arab Markets, 2018 [MW]

Only five Arab countries have utility scale CSP projects (Morocco, UAE, KSA, Algeria and Egypt). Morocco alone has around 74% of the total CSP regional capacity by Dec. 2018.

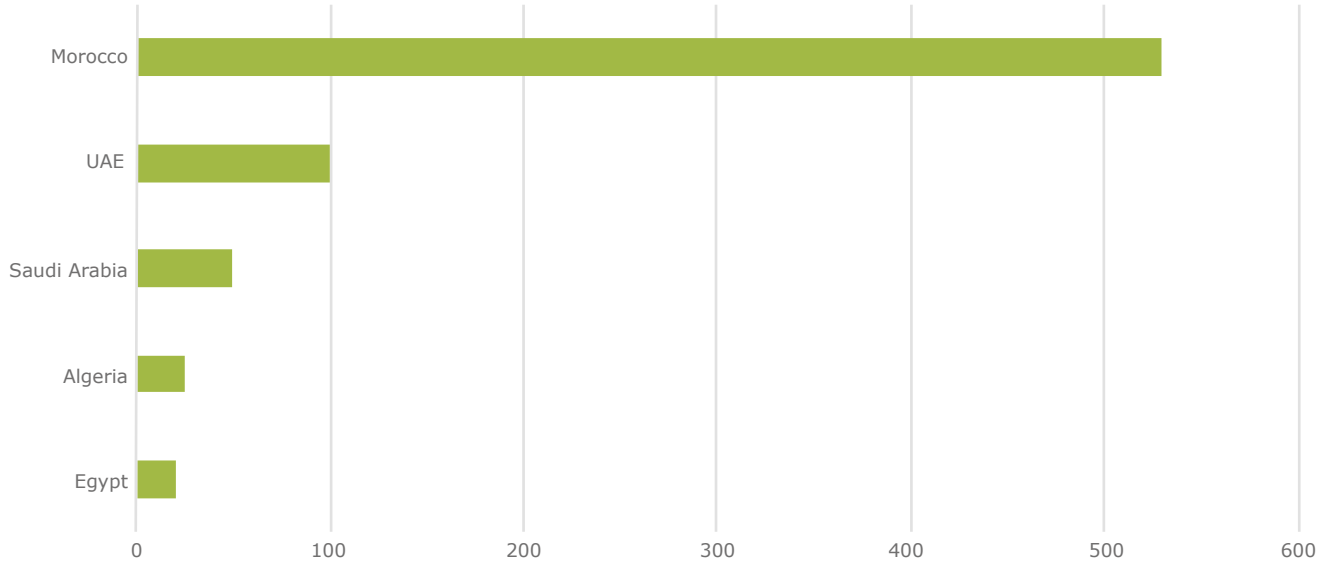


Figure 14: Solar CSP Capacities in Arab Markets, 2018 [MW]

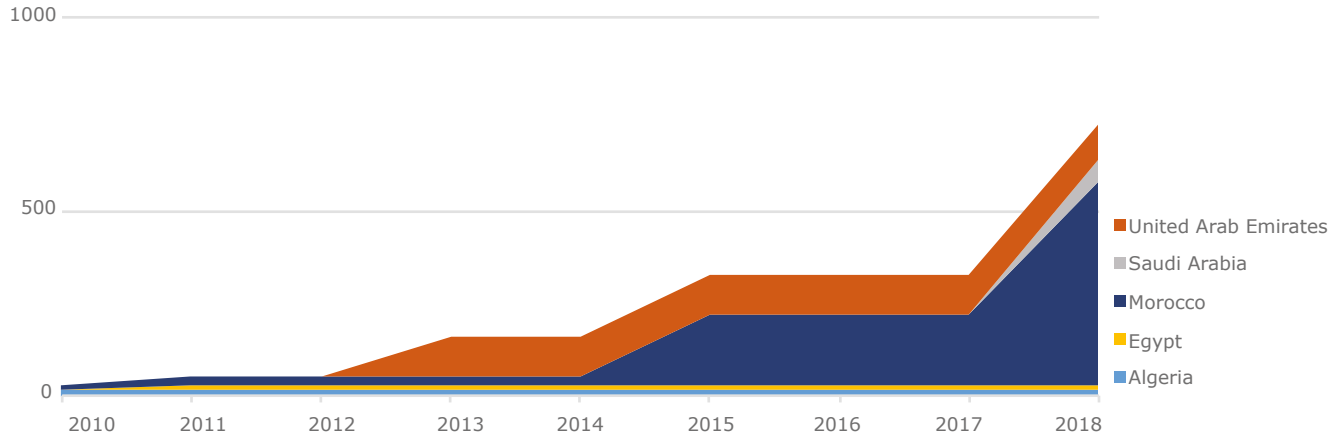
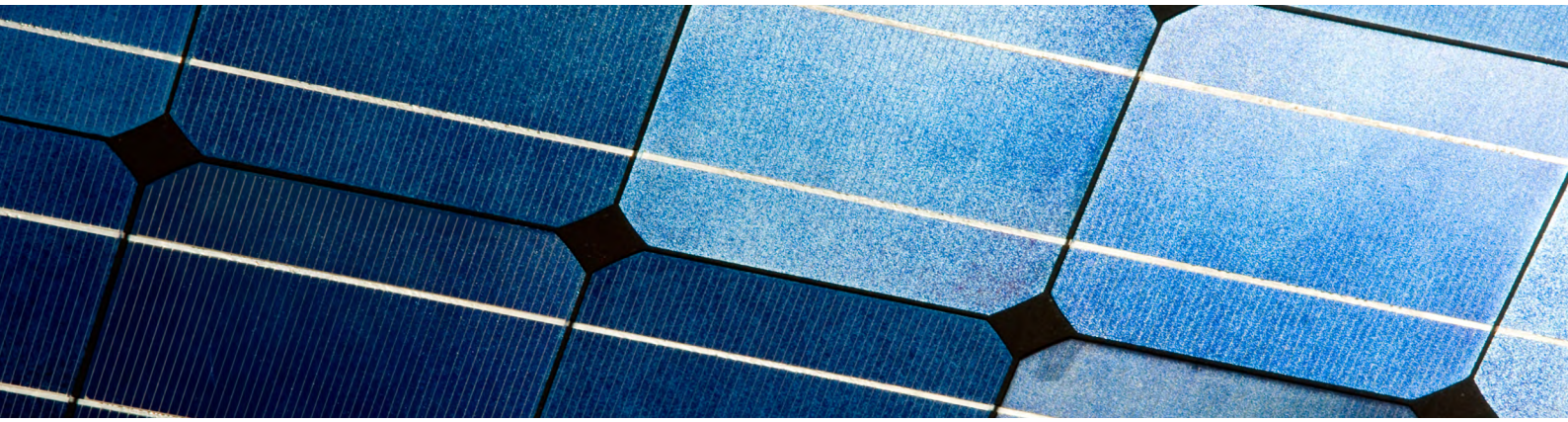


Figure 15: Total Solar CSP Capacities in the Arab Region (2010-2018), [MW]

Five Arab countries (Morocco, Egypt, Jordan, Tunisia and Mauritania) possess 99% of the current wind capacities in the region. Morocco and Egypt are the first Arab countries to exceed 1 GW of wind projects (1.2 GW and 1.1 GW respectively). Together they have around 80% of total installed wind capacities. Saudi Arabia, in 2018, has awarded its first wind project at Dumat Al Jandal.



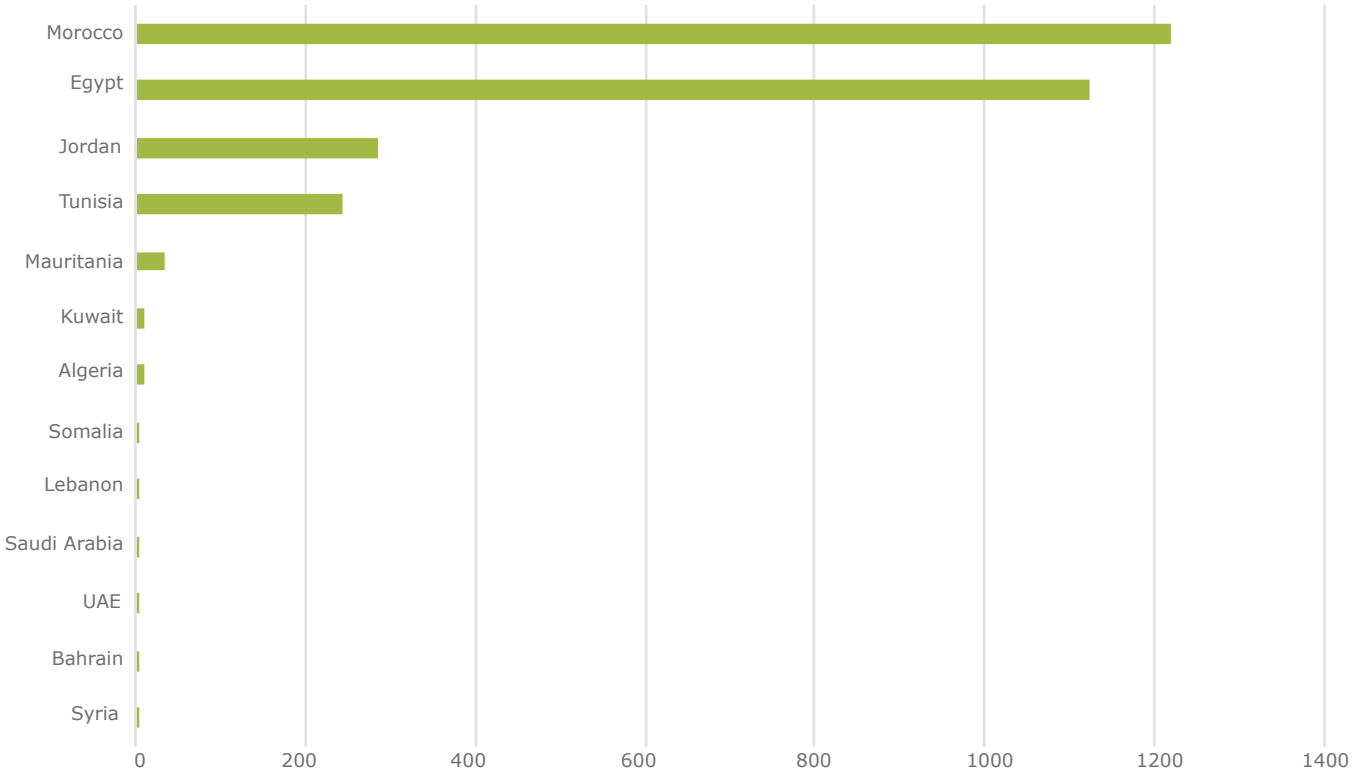


Figure 16: Arab Markets Leaders Wind Power, 2018 [MW]

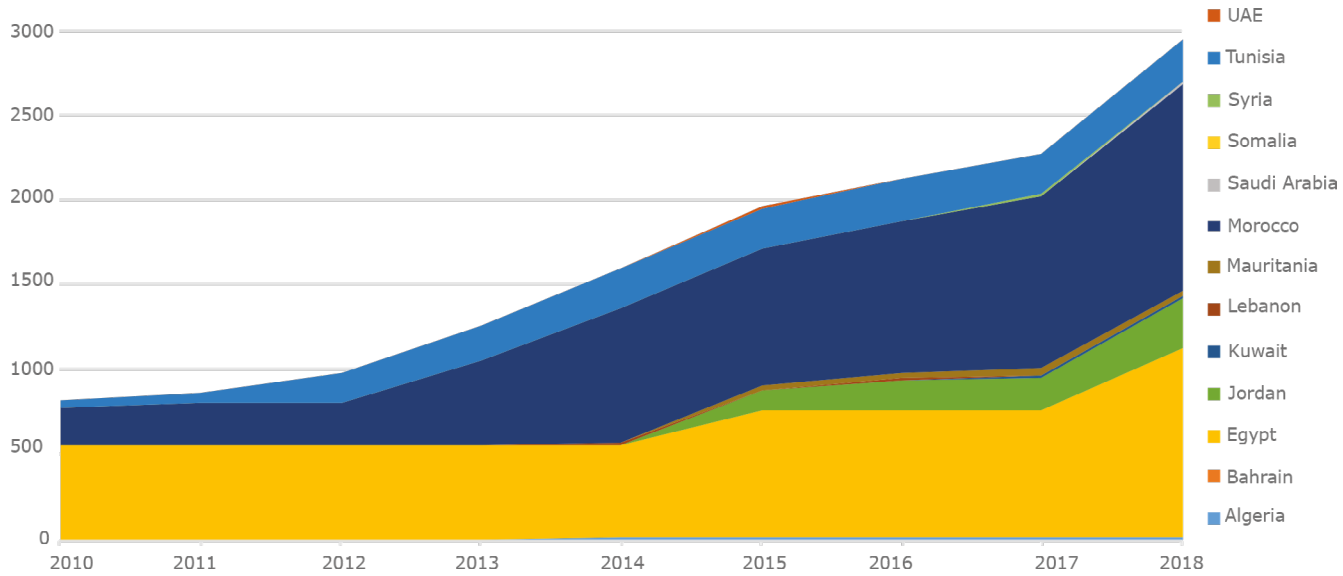


Figure 17: Total Wind Power Capacities in the Arab Region (2010-2018), [MW]

Based on the announced targets for 2035, the region will have more than 190 GW of operational capacities. Renewable energy business opportunities throughout the Arab region are estimated at over 30% of the global solar and wind growth. The 2019 edition of the AFEX documents several target updates in various countries. Egypt has expanded its target to reach 42% (54 GW) of its power mix by 2035. Saudi Arabia has also announced an ambitious target for renewables to reach 30% (58.79 GW) of its generation capacity, which makes Saudi Arabia country with the largest target in the Arab region when it comes to installed capacity. These two countries Egypt and Saudi Arabia together would create a pipeline of projects exceeding 100 GW. Most of the expressed Arab countries' targets are ambitious, considering the high regional reliance on fossil fuels. The most ambitious target in terms of the share of the power mix is Djibouti, where the target would reach 100% renewables by 2035. The second highest target by Morocco with 52% followed by UAE then Egypt. An interesting observation is that the Arab African countries total projected capacities exceed 100 GW by 2035, promising that these countries will contribute with at least 25% of the African Renewable Energy Initiative target for 2030. Interestingly, these targets confirm an overall preference for solar rather than wind and bioenergy in the region.

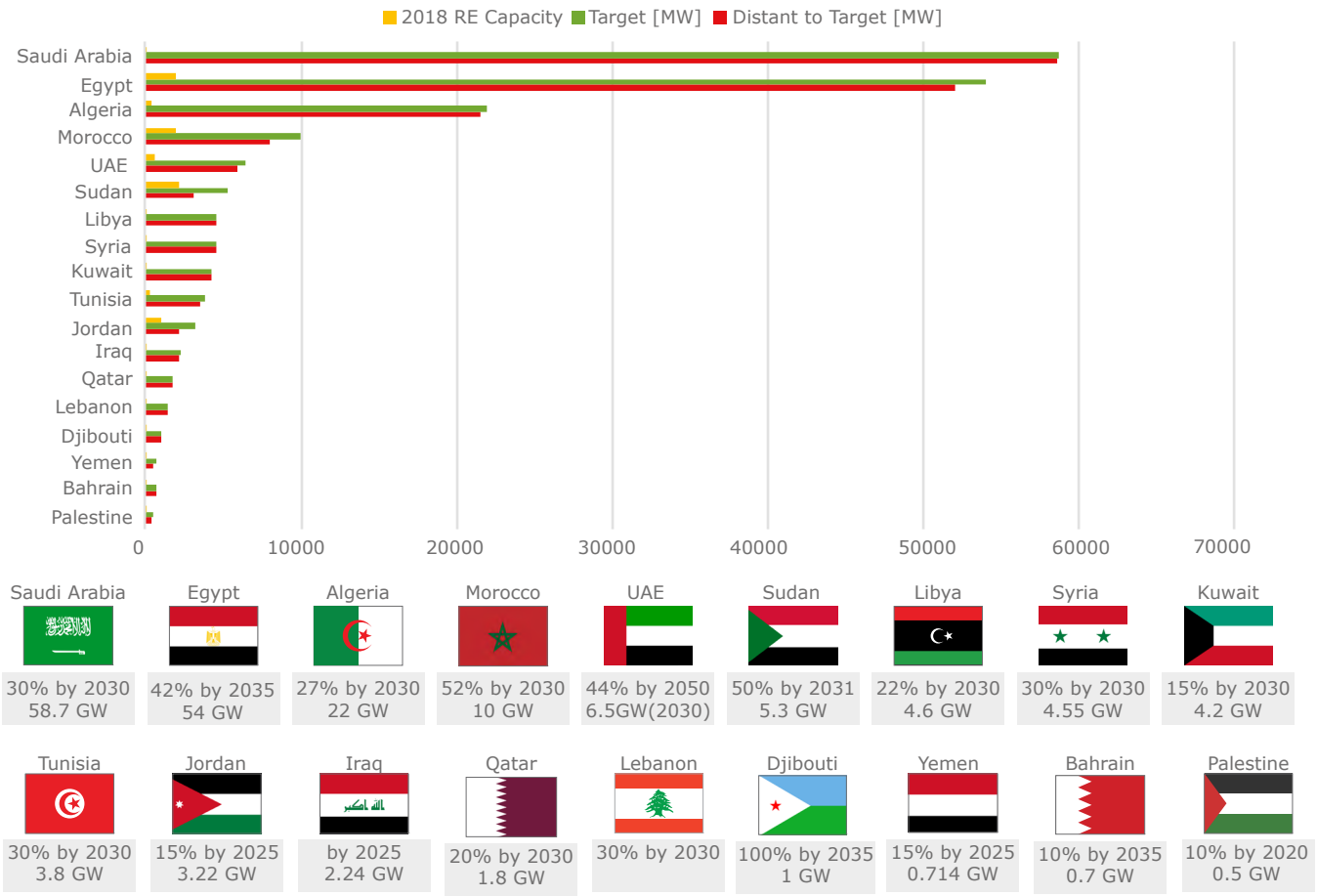


Figure 18: Renewable Energy Targets in the Arab Region [MW]

By the end of 2018, Algeria, Egypt, Jordan, Lebanon, Morocco, Palestine, Tunisia, and UAE were the only countries in which private actors practically owned and operated utility scale renewable energy power plants. Other Arab countries are still in the planning or tendering phases, or solely relied on state-owned utilities and institutions to own and operate projects. Due to its financial efficiency in particularly, competitive biddings for private utility scale renewable energy projects are becoming the preferred option for the Arab region. Over a dozen of competitive bids and auctions for private investments were held over the past couple of years in the Arab countries, such as Algeria, Bahrain, Egypt, Tunisia, Jordan, Kuwait, Lebanon, Oman, Palestine, Qatar, Saudi Arabia and the UAE. Interestingly, the technologies of interest included storage, not only thermal storage for CSP plants, as the case is for Morocco and UAE, but also battery storage with PV systems in Lebanon and Jordan. Furthermore, pumped storage projects are under consideration in Egypt, Jordan and UAE in an attempt to face the challenges of possible curtailment of variable renewable power and adding to grid stability. Small hydro projects started to appear in the scene on 2018, where Egypt added a 32 MW project on the river Nile.

Developers are continuing to run a cost race under competitive bids for utility scale projects all over the region, reflecting the competitiveness of wind and PV power. Very low bid prices were observed across the Arab region. Prices reported in many cases near or under USD 30 per MWh. Saudi Arabia's latest wind project was awarded based on the levelized cost of energy of USD 21.3 per MWh, registering a new record-low price for a project of this type across Europe, the Middle East and Africa. Correspondingly, Saudi Arabian PV project revealed a price of USD 23.4 per MWh, and another PV power purchase agreement (PPA) was signed in UAE at USD 24 per MWh. It should be noted that, tariffs as low as of USD 20 per MWh range have been negotiated in the Arab region, under optimized conditions for sites with high solar irradiation, stable policy ecosystem as well as deep engagement of local utilities as partners (shareholders) in the project, offering measures to mitigate investment risks backed by some concessional finance.

Most of the Arab countries (14 countries) enjoy an electrification rate (share of population with access to electricity) above 98%. Only 7 Arab countries have lower electrification rates, including Syria (92%), Comoros (69%), Sudan (45%), Djibouti (42%), Mauritania (30%), Somalia (17%) and Yemen (47%). Except for Syria, where the political situation has strongly affected the power infrastructure, other countries with relatively low access rate are expected to have increased

reliance on different renewable energy technologies that are economically viable. For example, geothermal is among the preferred options for Djibouti, while Sudan hydro resources are of significant importance.

Distributed generation is gaining an increased momentum in the Arab region, not only in traditional markets characterized by low overall access to electricity, but also in those markets typically known as utility scale focused. In Algeria, Bahrain, Egypt, Jordan, Lebanon, Morocco, Oman, Saudi Arabia, Tunisia, and the UAE several small and medium sized PV plants came on line under the feed-in tariff and net-metering schemes as well as rooftop solar PV programs adopted in these countries.

Interestingly, Egypt increased the ceiling of individual projects applying for net metering scheme to 20 MW allowing for increased demand from industrial and commercial facilities. Nevertheless, distributed solar PV generation remains largely untapped in the Arab region.

The traditionally key solar thermal markets in the Arab region: Jordan, Palestine and Tunisia, are still leading the region. The UAE, KSA and Morocco have started adopting and implementing regulations. Some emirates require solar thermal installations for new/existing construction, such as Dubai's solar thermal obligation. The UAE mandates that solar energy provide at least three-quarters of the annual hot water needs in any new building owned by a single individual, including hotels, worker dwellings, private villas, shopping malls and public buildings. It is important here to refer to the Solar Heating Arab Mark and Certification Initiative (SHAMCI), the Arab solar thermal certification schemes that signed a co-operation agreement with Egypt in 2017 and Jordan in 2018 to promote the SHAMCI quality mark in the country. The Jordan Standards and Metrology Organization and the Egyptian General Organization for Standardization and Quality (EOS), are the first and second SHAMCI recognized certification bodies in the Arab region.

AFEX RE 2019 proves that renewable energy in the Arab region can gain further impetus by socio-economic drivers. The promise of further positive socio-economic benefits due to wider deployment of renewable energy is driving the support of influential political actors and promoters. Securing local high-quality jobs and local business development opportunities are increasingly associated with renewable energy plans along with security of supply and energy independence arguments. Renewable energy sector jobs are becoming noticeable in some countries such as Egypt, Jordan, Morocco, Tunisia, Lebanon; this is despite the fact that the number of jobs in these countries is comparatively small. More attention is paid to local assets of human resources and the industrial bases that could be used and improved to serve the renewable industry. Higher local content ratios are progressively achieved and in some cases, stipulated as a qualifying condition in tenders, in wind and solar projects announced in countries such as Morocco, Egypt, Jordan's and KSA. AFEX 2019 portrays some off-grid decentralized renewable energy projects in the Arab region contributing not only to the development of rural and new communities, but also supporting the survival and recovery in fragile areas suffering political instabilities. There is a clear need to research in sufficient detail the impact of existing and proposed renewable energy plans on differently valued socio-economic components, such as equitable business and employment opportunities, adequate services and infrastructure, health and well-being, sustainable land access and traditional/alternative use, protecting heritage and cultural resources, adequate sustainable income and lifestyle. AFEX highly recommends initiating such research on both the national and regional levels.

Regionally coordinated actions are getting increased stimulus in the region. The 'Pan-Arab Strategy for the Development of Renewable Energy 2010-2030 has been expanded in 2018 to become the "Arab Sustainable Energy Strategy - ASES" including energy efficiency and energy access domains. The ASES action plan suggests 17 programs for adoption including 6 programs on the regional level and 11 programs that can be adopted on the national levels. The programs rest not only on the Arab countries efforts, but also on regional and international cooperation. The ASES opens the horizon for transforming the Arab electricity markets towards more reliance on renewables and ensuring the needed public and private investments as well as mitigating most of the risks and challenges related to grid planning, expansion and operation together with integrated smart services and quality assurance schemes.

The implementation tool for renewables is the Arab Renewable Energy Framework (AREF), which offers a regional guideline for Arab states to develop their National Renewable Energy Action Plans (NREAPs) based on a customized template, which in turn is the baseline for annual progress reports. Since the adoption of AREF and NREAP's template by the League of Arab States' member states in mid-2015, six countries (Bahrain, Egypt, Lebanon, Palestine, Sudan and Tunisia) have taken the lead to prepare their national plans, mostly with support of RCREEE, based on the NREAP template, while several other Arab countries expressed interest in developing their respective action plans.

AFEX 2019 illustrates that the Arab countries have addressed several interrelated challenges and uncertainties about grid infrastructure's readiness to absorb renewable energy and grid access to private developers. An improved capacity is observed to provide institutional support, to streamline the administrative procedures and to set financial and fiscal incentives. Several Arab countries worked extensively on facilitating land access, enhancing stakeholders' coordination to obtain required permits, setting standardized contractual documents, and correctly designing incentive mechanisms to mobilize finance. Still, a key challenge to the region is to increase the public appetite and subsequently the market volume for decentralized renewable energy solutions in different sectors, such as solar pumping for irrigation and hybridization of renewables with diesel for electricity and heat generation in industry and commercial sectors.

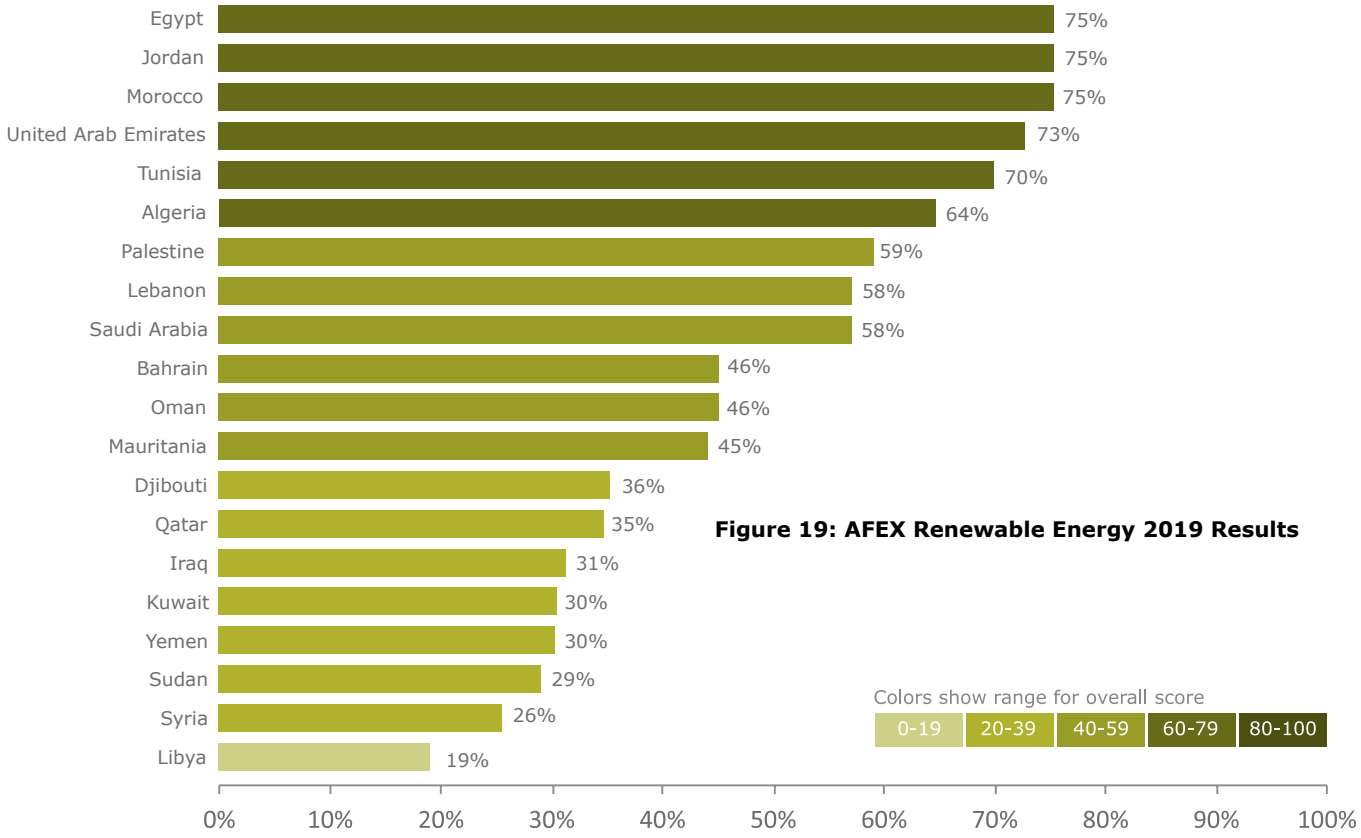


Figure 19: AFEX Renewable Energy 2019 Results

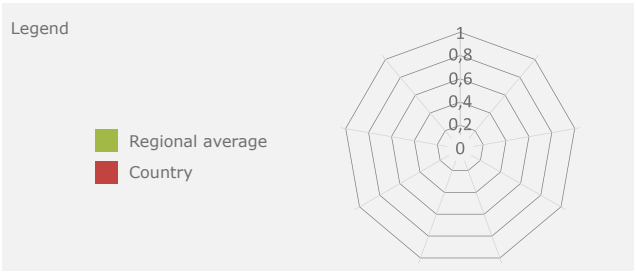
	Final Score	Market Structure	Policy Framework	Institutional Capacity	Finance and Investment
Egypt	75%	84%	53%	73%	89%
Jordan	75%	78%	51%	78%	94%
Morocco	75%	79%	51%	78%	90%
UAE	73%	83%	44%	69%	94%
Tunisia	70%	78%	44%	73%	84%
Algeria	64%	78%	33%	66%	78%
Palestine	59%	47%	50%	58%	80%
Lebanon	58%	56%	44%	59%	75%
Saudi Arabia	58%	50%	29%	71%	82%
Bahrain	46%	55%	36%	66%	29%
Oman	46%	51%	22%	51%	60%
Mauritania	45%	33%	32%	51%	61%
Djibouti	36%	28%	47%	35%	33%
Qatar	35%	38%	14%	57%	33%
Iraq	31%	33%	22%	45%	23%
Kuwait	30%	40%	21%	51%	10%
Yemen	30%	15%	22%	29%	55%
Sudan	29%	25%	24%	38%	29%
Syria	26%	18%	19%	39%	26%
Libya	19%	10%	18%	38%	12%

Table 1: Categories Scoers for Countries

By Country

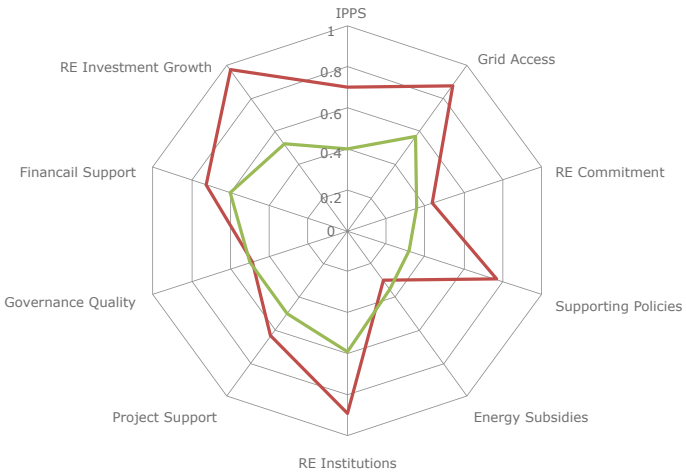
AFEX Renewable Energy 2019 provides an assessment of countries' progress in renewable energy according to four evaluation categories: Market Structure, Policy Framework, Institutional Capacity, and Finance and Investment. Under these categories, countries are assessed according to nine different factors and 30 quantitative and qualitative indicators.

The following diagrams illustrate total scores attributed to each country assessed. The countries are presented in order according to their final ranking.



EGYPT

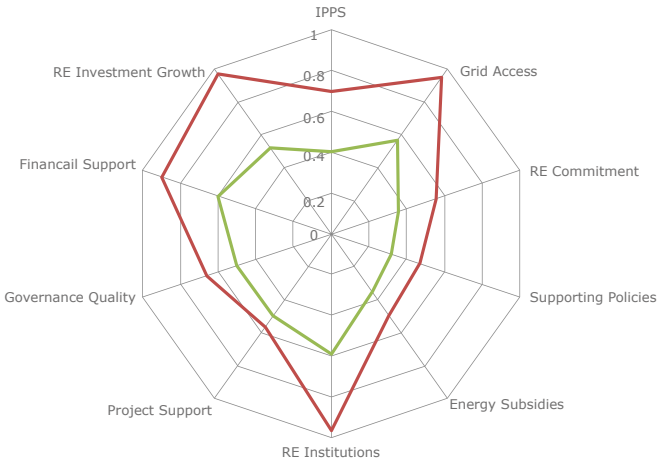
SCORE 75



For the first time, Egypt together with Jordan and Morocco led this edition of AFEX renewable energy due to the remarkable achievements and successes in several areas. Egypt made substantial improvements to its renewable energy policy framework and attracted the attention of private investors. The $2 billion 1,460 MW Benban solar power park has been built over the course of more than two years, representing Africa's largest solar park. Other solar and wind IPP projects have been tendered and PPAs have been signed for most of them. Egypt IPP's competitive bids (auctioning) proved successful in reaching competitve price records in wind energy. Furthermore, Egypt allowed direct proposal submission for RE projects, for qualified developers offering similar or lower electricity price than those prices achieved in the competitive bidding. Egypt has exerted more efforts in advancing distributed generation of renewable energy through the introduction of net-metering mechanism improving the business case for residential, commercial and industrial investment in renewable energy, particularly PV systems. Egypt is currently facing the challenge of maintaining a steady pipeline of utility scale IPP projects to keep the momentum required to achieve its ambitious RE targets.

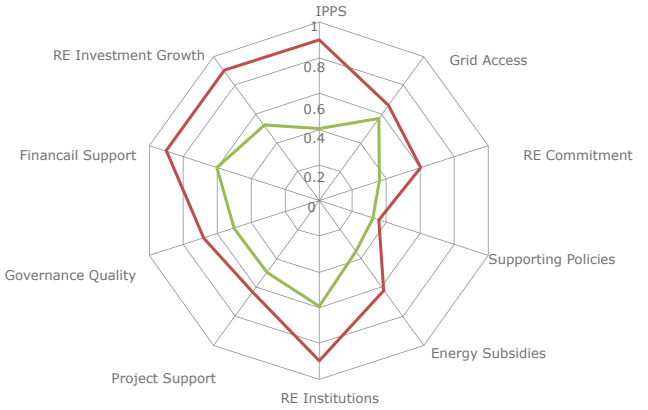
JORDAN

SCORE 75



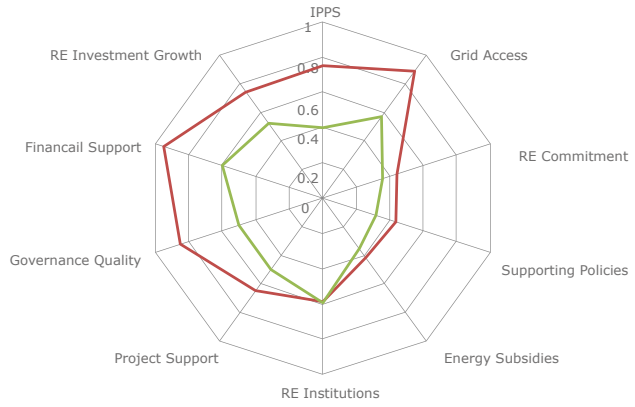
Jordan led the AFEX ranking with Egypt and Morocco. Jordan has made substantial progress in the past year in attracting private investment for renewable energy development. Jordan is the first Arab country to achieve its RE announced target ahead of its due date in 2020. It continues to be the only country in the region to have operated a full ownership separation of its power sector, with notable performance of its dedicated RE fund (JREEEF). Moreover, the country is also also advanced significantly in the implementation of its net metering scheme. The electricity pricing reform, together with the supporting policies, have attracted investments in renewable energy. Project developers have shown great interest in the direct proposal scheme adopted with remarkable success in Jordan. Jordan's RE sector is currently challenged by the capacity of the electricity grid, which has triggered transmission grid expansions and enforcement. Jordan is further facing the challenge of the surplus RE and conventional generation and therefore needs to envisage solutions to increase the demand to accommodate for the available generation capacities. Jordan may consider also opening its power generation market to allow private-to-private sale of electricity from renewable sources.

MOROCCO SCORE 75



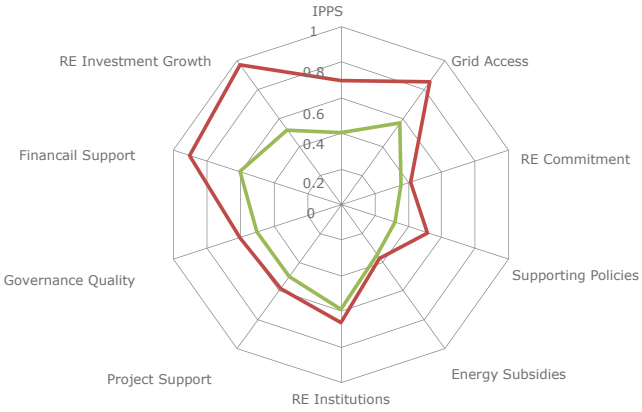
Morocco continues to lead this eddition of AFEX renewable energy together with Jordan and Egypt. Morocco has made significant progress towards meeting its ambitious targets by installing additonal PV, CSP and wind power capacity and issuing tenders for more projects. Morocco has improved its regulatory and institutional capacities, by establishing an independent regulator as well as adding the development of wind energy projects to the mandate of the Moroccan Agency of Sustainable Energy (MASEN). However, the market's development for small-scale distributed renewable energy generation in Morocco remains slow. Morocco should move faster with opening up its power market for small-scale generation of renewable energy projects and let small and medium enterprises enter into the business development sector. This reform will help Morocco to improve the socio-economic impacts of renewable energy.

TUNISIA SCORE 70



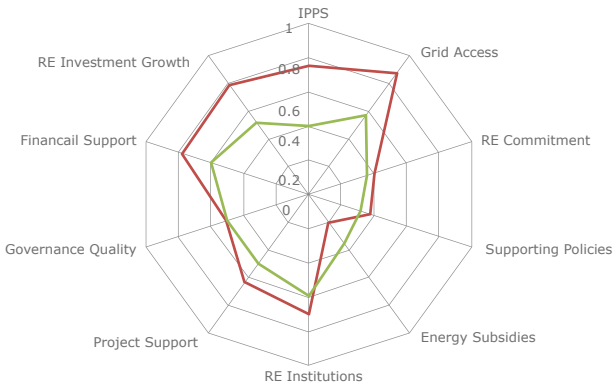
Tunisia has made serious improvements in its private investments engagment poilicies. Tunisia has successfully introduced both auctions and competitive bidding schemes. The design of the schemes allows for both medium sized and utility scale projects, which helped in attracting both local and international investors to the Tunisian markets. Furthermore, Tunisia is among the few Arab countries where the IPP scheme is not conditioned by the provision of sovereign guarantees, highlighting the developers, trust of the financial capacity of the off-taker STEG. For deceneteralized solutions the smartly designed Tunisian net metering scheme has led to the deployment of small-scale PV projects in the residential and industrial sectors. Tunisia has the potential to attract more investments in renewable energy based on its generally favorable business conditions. Tunisia should focus on creating a sustainable pipeline of private renewable energy projects. Since the energy prices in Tunisia are relatively high, the next consideration could be further opening the power generation market to private-to-private sale of electricity from renewable sources.

UNITED ARAB EMIRATES SCORE 73



UAE ranks the highest among GCC countries. UAE has continued its leadership in achieving new records for the lowest cost of PV production in the world. The strong support and engagement of the UAE's utilities such as the Dubai Electricity and Water Authority (DEWA) and the Abu Dhabi Electricity and Water Authority (ADEWA) have proved instrumental in advancing the large scale IPP projects. Shams Dubai initiative's success has encouraged similar new net-metering initiatives in other emirates, creating unprecedented momentum in promoting small-scale distributed generation systems. In general, UAE has favorable conditions for business operation, including liberal fiscal and trade policies. UAE may need to focus on creating more options for the private sector through more adoption of its renewable energy policies to all UAE emirates.

ALGERIA SCORE 64

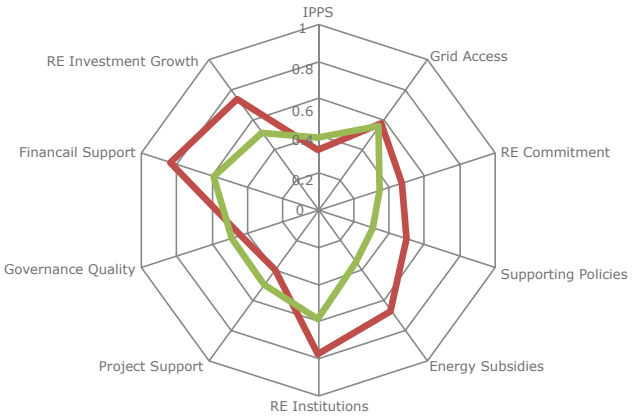


Algeria presents an attractive market for the development of renewables due to its market size and strong resource potential. The key accomplishment of Algeria was the completion of the projects approved under the feed-in-tariff scheme. Algeria issued the grid code for connecting RE systems to the grid. Algeria's RE projects have now a guaranteed access to the grid, and within FiT scheme are subjected to a specific regime offering preferrential prices based on a 20-year power PPA with one of the four distribution grid operators, which all are subsidiaries of the state-owned by Sonelgaz Group. Algeria has stopped the FiT scheme and is currently adopting the bidding and auction schemes for attracting private investments, where several projects are either in the tendering phase or in the pipeline. Furthermore, Algeria oil and gas companies have been encouraged to invest in renewable energy projects.

The Algerian investment framework can be improved to allow participation of more foreign investors and to allow for small scale decenteralized RE systems in residential, commercial and industrial sectors.

PALESTINE

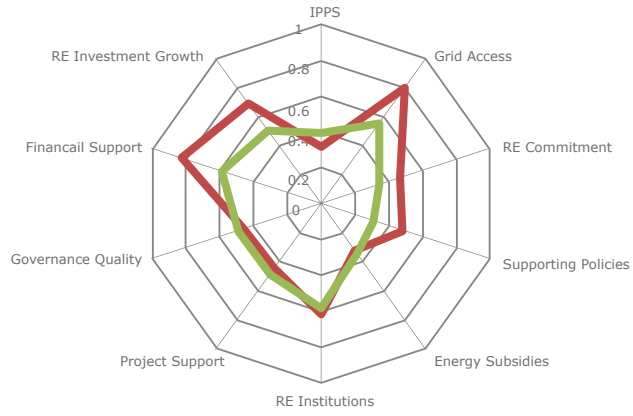
SCORE **59**



Palestine has sufficiently attractive renewable energy policies in place such as the FiT for residential sector under the Palestenian Solar Energy Initiative, net metering scheme, the direct proposal submission process and recently the competitive bidding scheme. Tax incentives have been offered (and extended) to support wider adoption under different policy schemes. Existing policies allowed RE to face the energy shortage challenges and fostered growth in distributed generation. The revolving fund helped also the governmental entities to lead by example through installing RE and EE systems. Several licences have been issued to the private sector to install solar PV projects. Furthermore, hospitals, health care facilities, and schools have been subject to several support programs including donor grants. Palestine may need to focus more on enhancing the functionality of these schemes to help reach its targets.

LEBANON

SCORE **58**

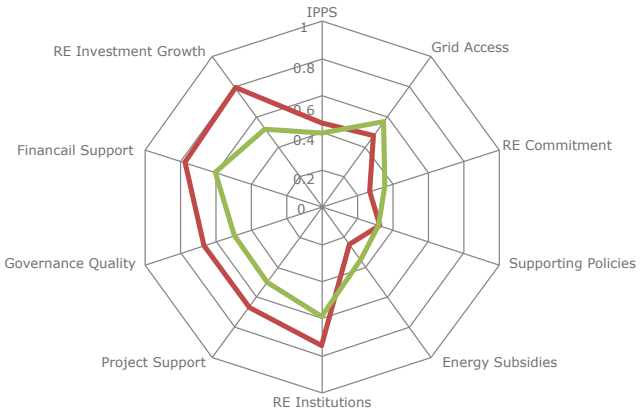


Lebanon's biggest accomplishment over the past couple of years was the successful bidding processes for large scale wind projects which resulted in the signature of three PPAs with IPPs. The wind bidding has been followed by calls for several solar IPP projects following also a similar bidding process. The wind energy IPPs are the first authorized utility scale private generation in Lebanon's power sector. Lebanon has also continued leveraging of private funds for financing small-scale projects through several innovative financing mechanisms in collaboration among international and local banking institutions.

The country is still in need of an independent regulatory body to upscale and operationalize effectively private sector participation in both utility scale and small-scale power generation.

SAUDI ARABIA

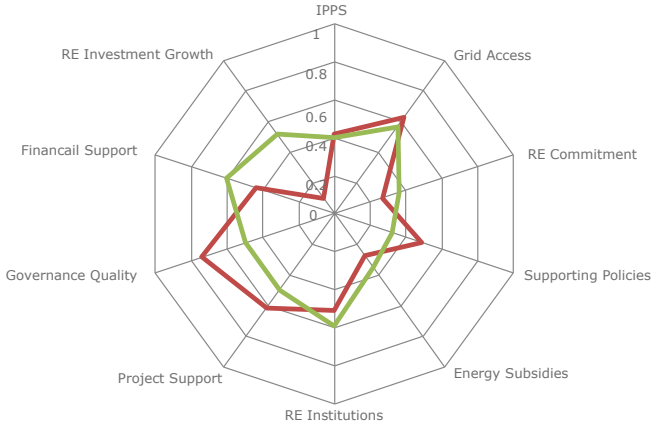
SCORE **58**



Saudi Arabia presents one of the most attractive markets for renewables due to its market size, resource potential, land availability and high energy demand. Saudi Arabia has shown commitment for RE by adopting ambitious targets, initiating the National RE Program (NREP), and attracting private developers. The country is pursuing a power sector reform towards more market-oriented structure. The RE program is managed by the Renewable Energy Project Development Office (REPDO) of the Ministry of Energy, Industry and Mineral Resources. REPDO has successfully tendered large-scale wind and solar projects, yielding some of the most competitive energy prices worldwide. In addition to PV projects, Saudi Arabia has operated its first utility scale CSP project and has awarded its first wind project in 2018. The NREP also targets maximizing the local content and value creation.The electricity regulatory agency has developed regulations allowing for small PV systems net-metering arrangements.Third-party sales are also possible where several projects have been announced lately, a dedicated Saudi Industrial Development Fund's "Mtujadeda" programme is expected to be launched in 2019. The ambitious updated target of Saudi Arabia is the largest in terms of installed capacity in the region and would require intensive efforts to reach it.

BAHRAIN

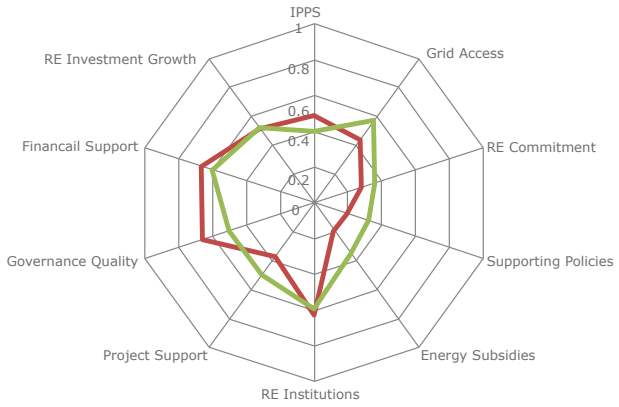
SCORE **46**



Bahrain is among the early GCC countries that opened their power sector for IPPs. Furthermore, Bahrain is also among the Arab countries undergoing successful subsidy reform program. Bahrain has achieved a substantial progress over the past two years in the RE domain, through endorsing its National RE Action Plan and setting targets for 2025 and 2035. Furthermore, a dedicated unit for sustainable energy was created. The Electricity and Water Authority of Bahrain adopted competitive bidding and net-metering schemes to attract private investments. The competitive bidding culminated in the signature of the PPA for its first IPP 100MW PV project. The net-metering regulations is among the best designed net-metering schemes in the region and has started to attract small scale investments. Bahrain has favorable macro investment conditions and the potential to attract investments in renewables due to its compact size, available financial resources and favorable business conditions. With the right focus, Bahrain could show leadership in innovative applications and business models for private investments in renewable energy.

OMAN

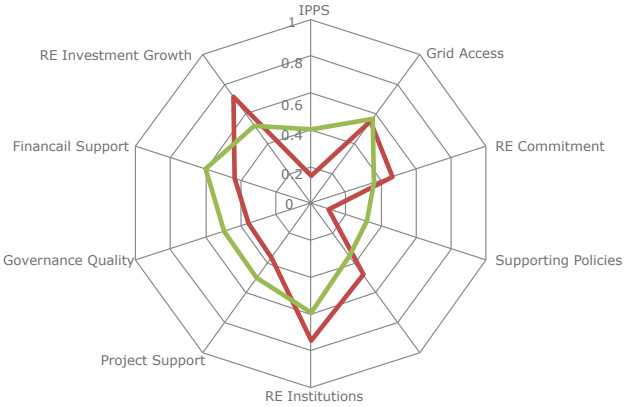
SCORE **46**



Oman has a good track in engaging IPPs in the power sector and is expected to become the first GCC country to introduce spot trading in the electricity market within the coming few years. Oman has set an ambitious target and started effective actions. A landmark utility scale IPP wind power project of 50MW, the first in the GCC region was partially brought online. Oman Power and Water Procurement Company (OPWP) has awarded a tender for the 500MW IPP solar project, and other similar tenders are in the pipeline. Petroleum Development Oman (PDO) will build a solar plant of 1GW for enhanced oil recovery (EOR) to extract heavy and viscous oil at the Amal oilfield. Such project is an examplary project for the rest of the GCC. Oman initiated also a scheme called Sahim, targeting residential PV systems (3 kW – 5 kW) by tendering the rooftops to private developers who will contract with the relevant distribution companies. Sahim is not a net metering scheme but allows consumers to sell power back to the grid at the prevailing bulk electricity tariff. Oman may consider financial and regulatory incentives to acclerate renewable energy deployment in the country.

MAURITANIA

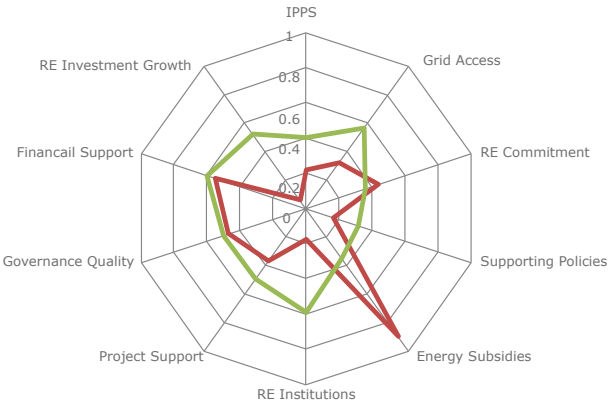
SCORE **45**



In terms of RE share in the overall installed capacity, if hydro is excluded, Mauritania is among the leading Arab countries. Mauritania is a large country with a small population where load centers are spread throughout the country, which implies a strong need for decentralized services. Numerous programs and electrification projects in Mauritania focus on poor rural areas not connected to the grid. Mauritania has a functioning regulator and developed a unique system to finance a portion of the cost of extending services to rural areas from telecommunications sector revenues. A new energy strategy has been under development lately. Nevertheless, there is a need to set the regulatory framework and necessary administrative processes to create more options for private investments.

DJIBOUTI

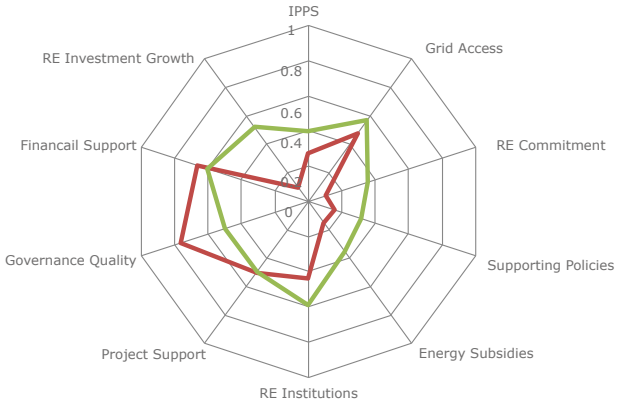
SCORE **36**



The most ambitious target in terms of the share in the power mix is Djibouti, where the target would reach 100% renewables by 2035. RE is seen as a viable solution to address the weak energy access in the country (around 42%). Governmental policies focus on both large scale projects and remote communities electrification through a mix of RE and non-renewables, where several small projects are operational. For the IPPs, the preferred policy scheme is direct proposals, where Djibouti's Ministry of Energy signed the contract and PPA for the implementation of the 60 MW wind project as the first contract with an IPP. The utility EDD is currently constructing the power line allowing to evacuate this energy from the project site. Further, the Ministry of Energy signed a Memorandum of Understanding for a project to develop a 30MW Photovoltaic Solar Power Plant. Djibouti needs to consider further different policy options and incentives for private decentralized and utility scale projects to help reaching its targets.

QATAR

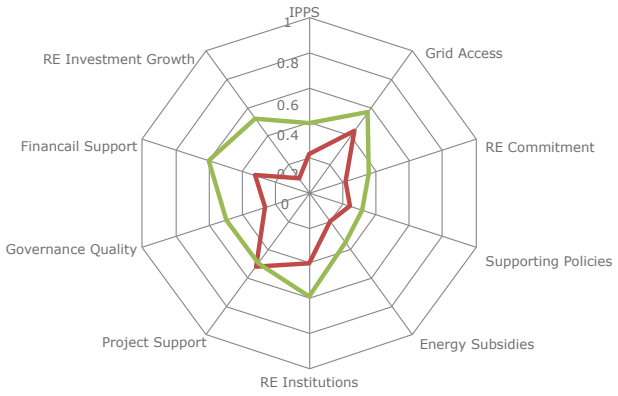
SCORE 35



Qatar has the potential to attract investments in renewable energy due to its relatively favorable business climate and financal resources availability. Nevertheless only last year, Qatar's utility Kahramaa resorted to competitive bidding scheme for its first 700-800 MW project scheduled on 2 stages by 2021 and 2022 under a build-own-operate-transfer (BOOT) basis. The business model inspired from other GCC projects is that state Siraj Solar Energy is assigned as the local partner will hold the 60% stake in the project company while the winning developers will retain a 40% stake. The project is seen as an important step towards achieving Qatar's RE target. Qatar is among the few countries investing in waste to energy solutions. Qatar needs to foster other policy schemes, especially those focusing on decentralized solutions and corporate sourcing of renewables to expand the market beyond the large scale projects and to maintain the commitment to rely more on RE in its energy mix.

IRAQ

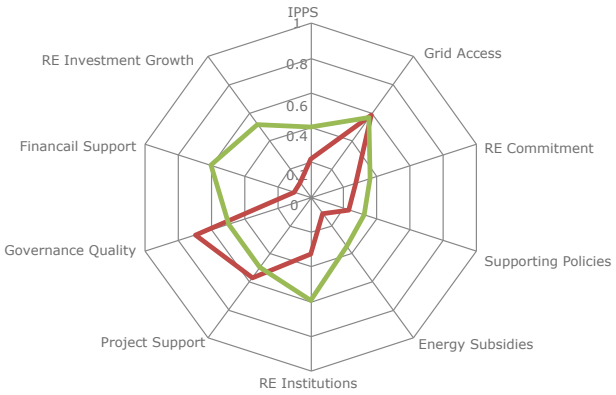
SCORE 31



Iraq power sector has a high degree of state ownership. Iraq suffers from power cuts and deficiency in covering the energy demands of its governorates. Iraq also suffers from high Transmission and Distribution (T&D) losses. Solar energy is seen as part of the most feasible solutions to adress these challenges. Iraq established a dedicated RE division in the Ministry of Energy and set short term targets for utility scale projects. Utility scale PV projects were announced, but inefficiency in the process resulted in retendering. An improved competitve bidding process is under development expected to attract reliable developers. Expression of interest for 700MW IPP PV projects was lately announced. No policy scheme is in place for small scale decenteralized solutions. Given the grid situation, more emphasize on small scale hybrid on-off grid PV systems is under consideration for the short term, to be evolved into a net-metering scheme when stable grid operation is achieved. No financial or fiscal incentives are adopted but a financial mechanism to support small PV systems through local banks is under consideration.

KUWAIT

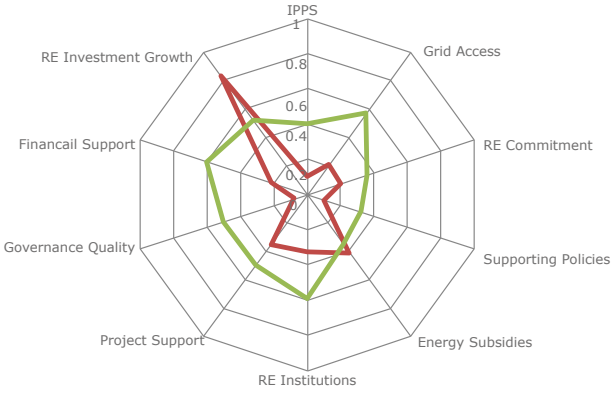
SCORE 30



No announced framework for renewable IPPs exists in Kuwait. Kuwait National Petroleum Company (KNPC) is taking the lead to install the first utility scale 1.5 GW solar project. The Kuwait Foundation for the Advancement of Sciences (KFAS) started funding projects for commercial use including homeowners to install rooftop solar by offering to finance projects, provided that the homeowners pay an initial insurance fee. Although there is a small decentralized PV capacity but no net metering scheme or FiT policy in place. There is a need for clear regulations supporting the growth of both private RE utility scale and distributed generation with sufficient financial and fiscal incentives to ensure the successful implementation of these regulations.

YEMEN

SCORE 30

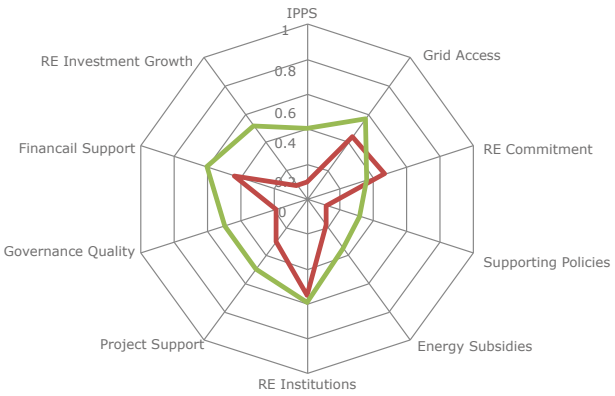


Yemen is a country in a crisis context. Yemen has shown that PV is of true value to its citizens as survival solution during the difficult war situation. Yemen faces the challenge of delivering electricity to a larger portion of its population. The current difficult political situation, which directly affected electricity access around the country, has stimulated a huge market for small-scale solar energy projects for both residential and agriculture sectors.

Other sectors such as health, water and municipalities have been subject to several donors support programs for installing solar systems to cover their needs. Due to the war, Yemen has not been able to make progress in attracting large-scale investments in renewable energy. Yemen lately has been exploring possible business models that will help the recovery of its power sector based on mini and micro grids as transitional solutions, including IPP solar power stations of small to medium sizes.

SUDAN

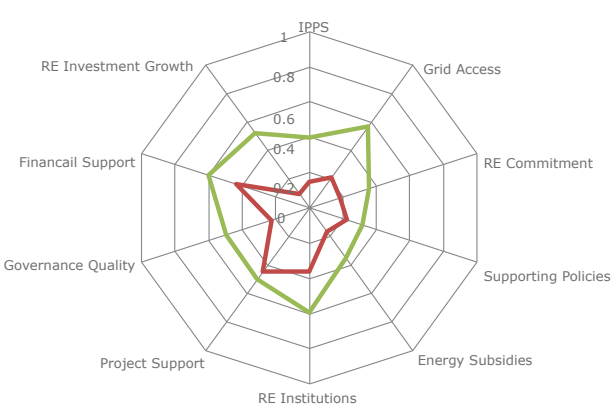
SCORE **29**



Sudan has the highest share of RE installed capacities with around 49% of the total generation mix attributed to its large hydro capacity. Sudan has not yet started effective market transition towards solar and wind technologies, but both technologies are cornerstones in the future of RE in Sudan as indicated in its announced national plans and strategies. Sudan's largest portion of its population still has to gain access to electricity. Sudan has already initiated a rural PV electrification program, this initiative is a step in the right direction. Sudan is currently developing its legal and regulatory frameworks to help creating a better business case for RE with increased reliance on private investments in both utility scale projects and decentralized applications. The political situation in Sudan has caused some delays in the adoption of different policy options and incentives. Nevertheless, there are several positive signs that Sudan will become one of the very active RE markets in the near future.

SYRIA

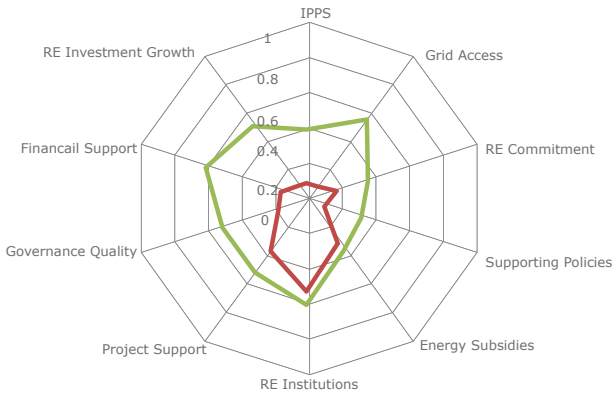
SCORE **26**



As the political situation in Syria is gradually improving, Syria has been working extensively lately on resuming its RE programs. Syria adopted progressive measures in 2011 to attract interests and activities in the renewable energy sector. It has opened its market for private developers, adopted feed-in-tariffs and a net metering policy, authorized private-to-private sale of renewable electricity and announced tenders for public competitive bidding to develop the first large-scale wind projects. These were all positive foundational activities. However, due to the deteriorating political situation, all activities were paused. Currently, a new strategy including updated measures is under consideration, with increased reliance on private investments. Furthermore extensive capacity building activities are taking place with support of regional and international bodies.

LIBYA

SCORE **19**



Despite the difficult political situation of Libya, the country is targeting opening its renewable energy market to IPPs, where recently the Renewable Energy Authority of Libya (REAOL) has established a new affiliated company that will use public-private-partnerships to allow for more reliance on private investments. An updated RE strategy was lately developed, outlining its main objectives as well as the institutional framework required under the currently difficult circumstances for future stability. Libya Institutional stability will be the first necessary step in supporting Libya's long-term renewable energy goals.

AFEX RE 2019 Regional Progress Highlights

Key

RE Target | Installed RE Capacity

6%
of the total installed capacity
> 18 GW operational projects

> 4000 MW
Projects under construction

> 190 GW
announced targets by 2035

Algeria
%32 by 2030 (22,000MW)
673MW

Sudan
%11 by 2031 (1,602MW)
2,136MW

Oman
%10 by 2020
15MW

Lebanon
%30 by 2030

Egypt
%42 by 2035 (54,000MW)
4,813MW

UAE
%44 by 2050 (6,500MW)
%596MW

Yemen
%15 by 2025 (715MW)
150MW
(%6.18 of the total installed capacity)

Iraq
2,240MW by 2025
2551MW

Bahrain
%10.3 by 2035 (710MW)
6MW

Syria
%30 by 2050 (4,5GW)
1503MW

Palestine
%25 by 2030 (500MW)
37.2MW

Libya
%22 by 2030 (4600MW)
5MW

Jordan
%15 by 2025 (3220MW)
1073MW

Saudi Arabia
%30 by 2030 (58,700GW)
142MW

Mauritania
%20 by 2020
168MW

Kuwait
%15 by 2030 (4,266MW)
41MW

Djibouti
%100 by 2035 (1,000 MW)
0.1MW

Tunisia
%30 by 2030 (3,815MW)
358MW

Qatar
%20 by 2030 (1.8GW)
~43MW

Morocco
%52 by 2030 (~10GW)
3757GW

All values for installed operational capacities including hydro date December 2018.

Arab Future™ Energy Index
AFEX 2019
Renewable Energy

1 Introduction

1.1 About AFEX Renewable Energy

AFEX Renewable Energy is a policy assessment and benchmarking tool that aims to provide a comprehensive assessment of the investment climate for renewable energy development and ranks the Arab region's ongoing progress. The assessment is based on the compilation and analysis of detailed, country-specific data according to the set of pre-defined indicators listed in Table 1.

AFEX Renewable Energy aims to:

- Provide a comprehensive assessment of the current investment climate for renewable energy (RE) development
- Formulate targeted recommendations on improving regulatory and institutional frameworks for RE investment
- Benchmark countries' performance in creating better conditions for RE investment
- Highlight developments and progress made by each country toward RE since the previous edition of AFEX in 2016
- Effectively communicate RE success stories and highlight areas for improvement
- Identify areas for possible intervention at the regional level in order to maximize the effects of Promoting RE

1.2 Scope of Assessment

AFEX Renewable Energy is designed to embrace the perspective of private investors and as such, focuses on barriers and challenges they may face in the various phases of RE deployment in Arab countries. The conceptual framework of AFEX Renewable Energy is presented in Table 1. It consists of four evaluation categories relating to the index's objectives and scope of assessment:

1. Market Structure: assesses the ease of accessing the power generation market for private investors, including grid access.

2. Policy Framework: assesses the level of political commitment to pursue the development of RE, which includes setting RE targets with detailed action plans, formulating supporting policies to encourage investment in RE, and phasing out fossil fuel subsidies.

3. Institutional Capacity: measures institutional capacity of Arab states to design and formulate RE policies and, most importantly, provide institutional support for private developers in RE deployment.

4. Finance and Investment: assesses financial incentives available to private RE developers and measures private investment growth in RE.

For each of those four categories, 10 factors are evaluated and broken into sets of quantitative and qualitative indicators.

AFEX Renewable Energy measures the existence of policies, their implementation and most importantly, their effectiveness. The focus of AFEX Renewable Energy is upon power generation from renewable sources, thus biofuels and the use of RE for cooling and heating purposes currently remain outside the scope of the assessment. AFEX Renewable Energy also does not assess countries' theoretical natural potential for power generation from renewable sources, although this factor is surely an important element for investors' decision-making. Another aspect that is left out of this report is the level of maturity of the supply chain. The current state of the grid infrastructure in each country and the potential of grid interconnections between various countries, while having an impact on the development of the RE market, won't be included in this report until comprehensive data become available.

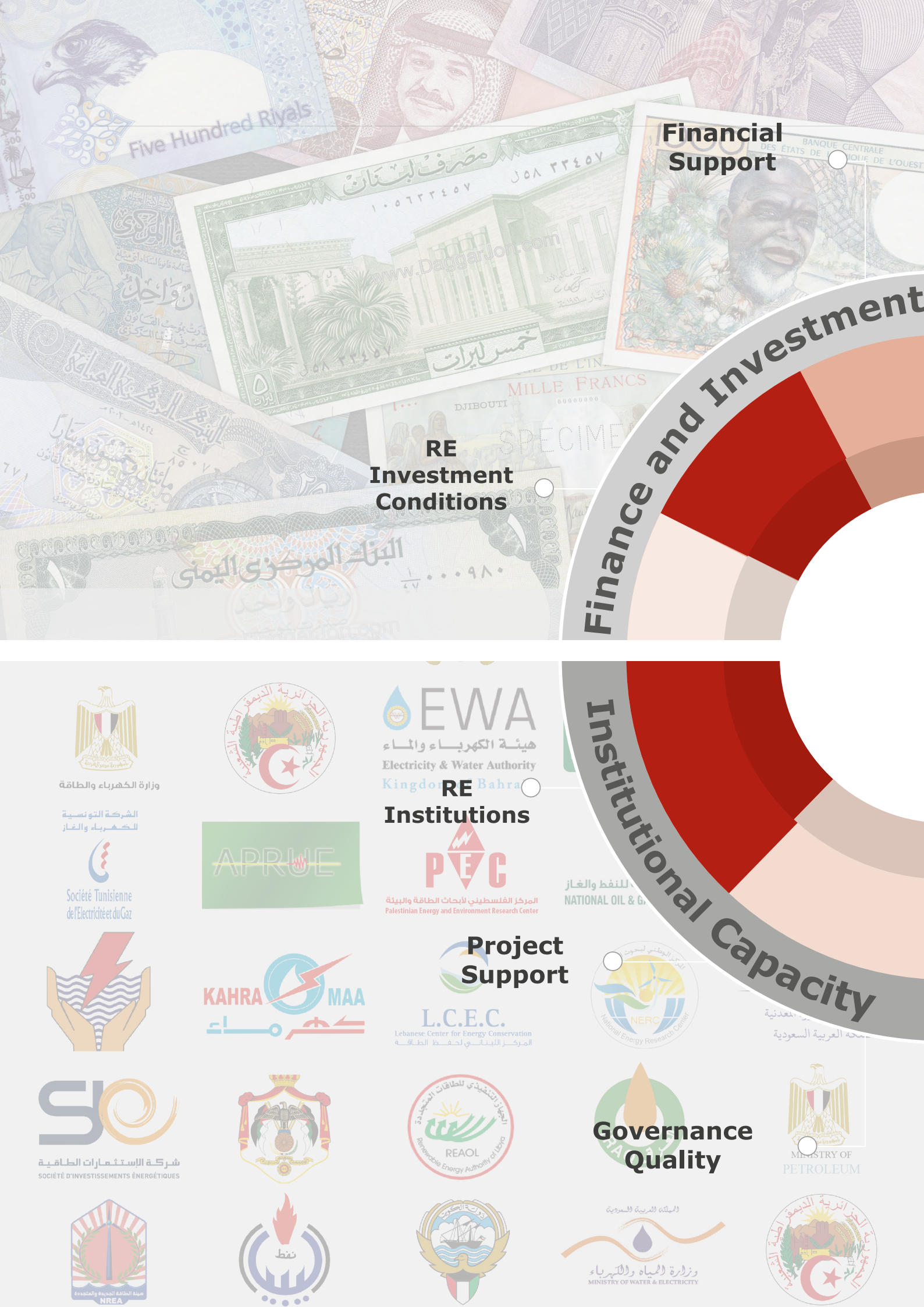
1.3 What is New in AFEX Renewable Energy 2019?

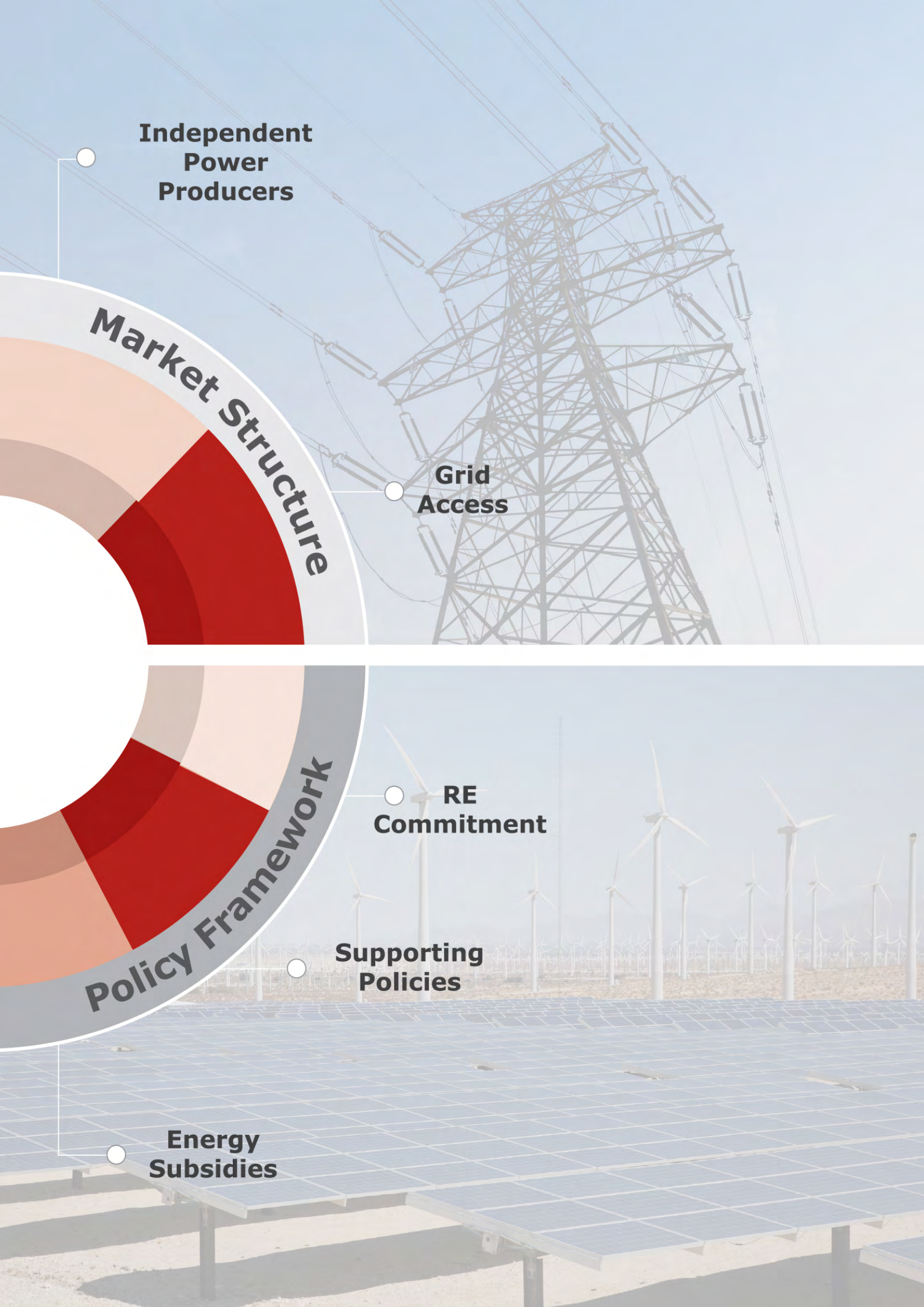
In the AFEX RE 2019 edition, the conduciveness of the investment climate in Arab countries has been under focus. It takes an in-depth look into emerging policy trends in the region, such as competitive bids and auction processes, as well as net-metering, corporate sourcing of renewables and new business models used across the region. Furthermore, a special chapter on " Renewable Energy in Crisis Contexts" is included as part of this AFEX edition.

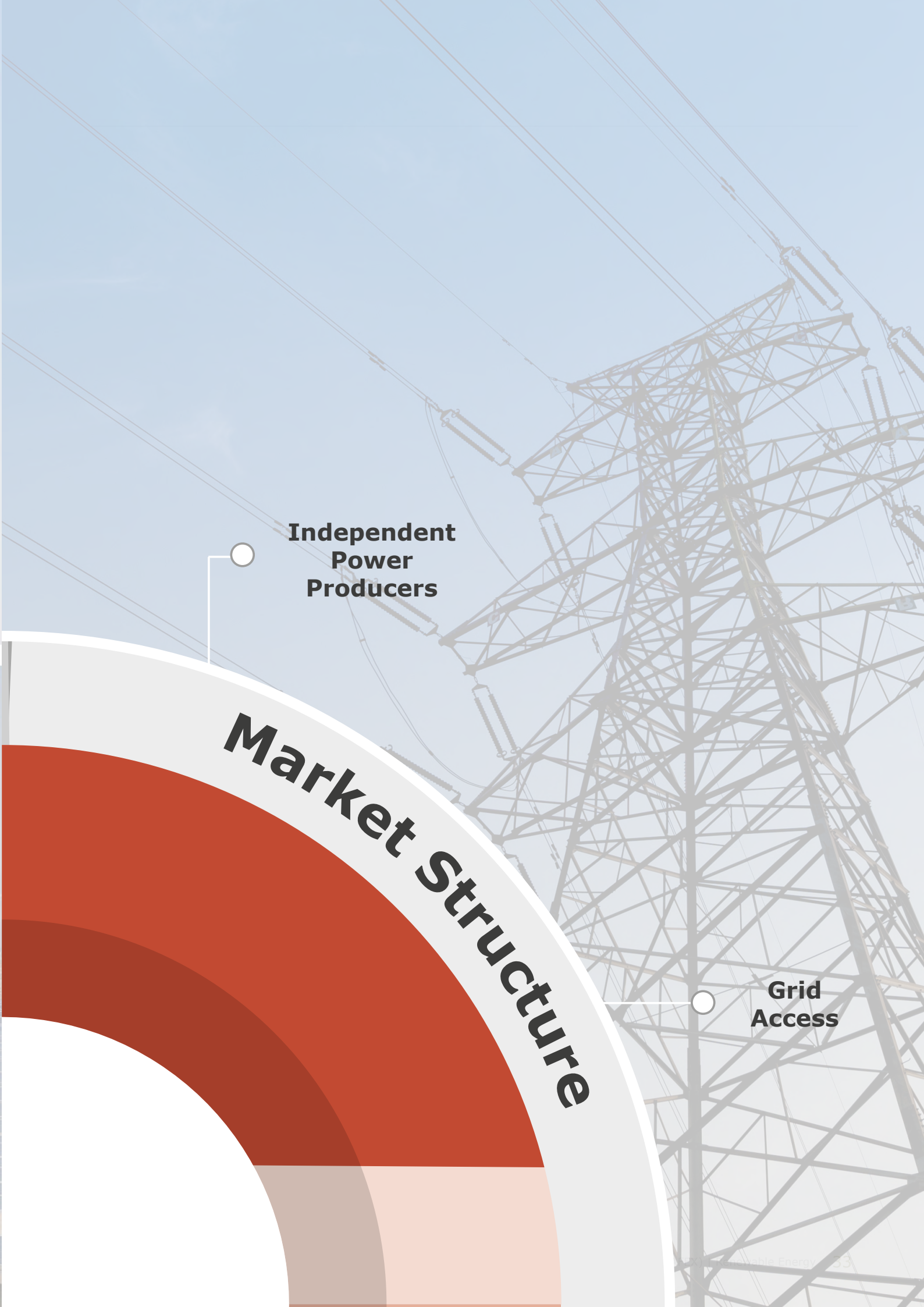
Table 2: AFEX Renewable Energy Conceptual Framework

Category	Factors	Indicator	Score/Measuring Unit
Market Structure	Independent Power Producers	Utility Suppliers	Utility supply authorized by law. Utility suppliers of exist in practice.
		Third-party Suppliers	RE third-party supply is authorized by law.
		Direct Export	Direct export of RE authorized by law. Direct exporters of RE exist in practice.
	Grid Access	Guaranteed Access to Grid	Priority dispatch guaranteed by law. priority dispatch guaranteed in practice.
		Grid Code for RE	Technical guidelines to connect distributed smaller PV systems to low-voltage grid adopted. Technical guidelines to connect utility -scale PV systems to medium- and high-voltage grids adopted. Technical guidelines to connect wind parks to medium and- high-voltage grids adopted.
Policy Framework	RE Commitment	RE Targets	RE targets are officially adopted as part of RE strategy or action plan by higher political authorities. RE targets are defined, but not officially adopted yet by higher political authorities or scattered in various
		RE Share Operational	Percentage of total installed capacity (MW).
		RE Projects under Construction	Percentage of total installed capacity (MW).
		RE Projects under Tendering	Percentage of total installed capacity (MW).
	Supporting Policies	PPA Bidding or Public Competitive Bidding	Resources identified for private development. Tenders announced PPA signed (MW).
		Direct Proposal Submission	Policy adopted by law. Proposals selected for private development PPA signed (MW).
		Feed-in Tariffs	Officially adopted. RE projects implemented through Feed-in-Tariffs (MW installed).
		Net Metering	Officially adopted. RE projects implemented through net metering scheme (MW).
	Energy Subsidies	Residential Electricity Subsidies	Percentage of Palestinian residential retail prices (benchmark).
		Commercial Electricity Subsidies	Percentage of Palestinian commercial retail prices (benchmark).
		Industrial Electricity Subsidies	Percentage of Palestinian industrial retail prices (benchmark).
Institutional Capacity	RE Institutions	Independent Regulator	Established by law or similar sovereign act. Under establishment Non-existent.
		RE Agency	Established by law. Under establishment.
		Capacity of RE institutions	Expert assessment from 1 to 10.
	Project Support	Resource Quality Assessment	Detailed wind atlas published and available to public. Detailed solar atlas published and available to public.
		Land Access	Land allocated for private development of large-scale wind projects. Land allocated for private development of large-scale solar projects.
	Governance Quality	World Bank Ease of Doing Business Index	Rank under World Bank Ease of Doing Business Index.
		Global Competitiveness Index	GCI scores.
		Bertelsmann Stiftung's BTI Status Index	BTI Status Index scores.
Finance and Investment	Financial Support	Fiscal Incentives	Number of fiscal and/or financial incentives for RE projects.
		RE Fund	RE fund established by law. Sources of financing are clearly defined. Disbursement procedure is clearly defined. RE fund has collected and disbursed funds.
	Investment Growth	Share of Private Investment	Percentage of total installed capacity.
		Growth Rate of Private Investment	Percentage increase in installed capacity of RE.

AFEX Renewable Energy is constructed in accordance with the OECD methodology for constructing composite indicators (OECD, 2008). A detailed description of the methodology is presented in Annex A.


Financial Support
RE Investment Conditions
Finance and Investment
RE Institutions
Project Support
Institutional Capacity
Governance Quality


Independent Power Producers
Market Structure
Grid Access
RE Commitment
Policy Framework
Supporting Policies
Energy Subsidies


Independent
Power
Producers
Market Structure
Grid
Access

2 Market Structure

Assessing the openness of electricity markets to private generation of RE across the Arab region is the ultimate objective of the market structure category. Although the power sectors in many Arab countries were traditionally characterized by a high degree of vertical integration and state control, a gradual but slow transition towards competitive power market status is observed in some countries through unbundling vertically integrated power utilities. Two key issues are addressed in this chapter: (1) independent power producers (IPPs); and (2) grid access. Those are further measured by a set of qualitative indicators as shown in Table 3.

Table 3: Power Market Structure Evaluation Factors and Indicators

Category	Factors	Indicator	Score/Measuring Unit
Market Structure	Independent Power Producers	Utility Suppliers	Utility supply authorized by law Utility suppliers exist in practice Utility suppliers of RE exist in practice
		Third-party Suppliers	RE supply to third-party authorized by law RE suppliers to third-party exist in practice
		Direct Export	Direct export of RE authorized by law Direct exporters of RE exist in practice
	Grid Access	Guaranteed Access to Grid	Priority access guaranteed by law Priority access guaranteed in practice Priority dispatch guaranteed by law Priority dispatch guaranteed in practice
		Grid Code for RE	Technical guidelines to connect small scale PV systems to low voltage grid adopted Technical guidelines to connect medium to large scale PV systems to medium and high voltage grid adopted Technical guidelines to connect medium to large scale wind systems to medium and high voltage grid

2.1 Power Sector Structure

State ownership and vertical integration are common power sector structures across the Arab region, where all stages of the electricity value chain (generation, transmission, and distribution) are mostly owned and operated by the same actor. Unbundling describes a separation of the different segments in the power sector value chain and is considered as a pre-condition to eliminate conflicts of interest among the operating actors and to enhance competition in the power market. Based on the degree of vertical separation, one can distinguish between ownership, legal, functional, and accounting separation. Of course, the highest degree of unbundling is through ownership separation between transmission, distribution and generation stages, while in other types of unbundling, separations occurs at lower levels.

Although none of the Arab countries has reached the situation of a wholesale- and retail-liberalized market, during the last decade most countries in the Arab region have introduced power sector reforms in order to open up their electricity markets and facilitate private sector integration. As an important part of these reforms, nine Arab countries have already undertaken some first steps towards a formal unbundling of generation with transmission and distribution activities. For sure, independent regulators are crucial in this process, especially for enforcing the legal provisions that are the basis for an open and unbundled market. Chapter 4 on institutional capacity provides more information on the regulators.

The earlier AFEX RE editions highlighted the success story of Jordan as the first Arab country to implement a full ownership separation of its power sector, while also shedding the light on some other countries efforts. In this AFEX RE edition, several updates are introduced. One example is Oman, where 100% of the generation capacities of the main interconnected system (MIS) are privately owned[1]. All over the Sultanate, more than 70% of power generation in the country comes from IPPs. Like other GCC countries, Oman state utility (Oman Power and Water Procurement Company OPWP) holds majority equity stakes in all IPPs and usually offers 15-year PPAs. Oman's transmission and distribution activities are also foreseen for privatization. Oman is expected to become the first GCC country to introduce spot trading in the electricity market within the coming few years. Another important development is related to the Saudi Electricity Company, the Gulf's largest utility, which plans to establish a power generation subsidiary, a sign of the long-awaited restructuring. The unbundling of Saudi Electricity Company is a cornerstone of Saudi Arabia's energy reforms and restructuring of the power sector[2]. Similarly, Kuwait Authority for Partnership Projects (KAPP) invited local, national, and international companies for an expression of interest (EOI) for two water and power projects: Al-Khairan Phase 1 and Az-Zour North 2 and 3[3].

[1] KAPSARC, "Oman Electricity Sector: Features, Challenges and Opportunities for Market Integration", King Abdullah Petroleum Studies and Research Center, 2019.
[2] http://www.arabnews.com/node/1411171/business-economy
[3] https://www.arabianindustry.com/utilities/features/2018/oct/8/more-gcc-utilities-embrace-the-ipp-model-5987618/

For the first time in the Arab region, Egypt's electricity law (87/2015) promotes a new competitive market for High voltage (HV) customers to be established, adding to the regulated market for lower voltage customers. In the law, eligible customers have a choice of electricity supply provider and can freely negotiate prices directly with generators operating in the competitive electricity market that to be established, or with suppliers. Balancing service to the competitive electricity market shall be provided by the transmission system operator (TSO) and financially settled by the "Market Operator (MO)", established in the TSO. According to the Egyptian electricity law article 63, the structure of the power sector should be examined within 8 years (i.e. by 2023), including the Egyptian Electricity Holding Company, the Transmission Company and production companies. The objective is to "establish a fully competitive electricity market, where electricity generation, transmission and distribution activities are fully unbundled". The proposed market will adopt bilateral contracts with a balancing and settlement mechanism. Efficiency increase and service enhancements are sought by virtue of introducing competition, freedom of electricity supplier choice, and third-party access. Gradual enhancement of procedures and functions are expected to create a fair and attractive investment environment for new comers in electricity generation and trading Sudan's electricity sector restructure and separation of generation, transmission and distribution activities was implemented in 2016 via a new cabinet decree (decree 468/2016). This decree established the Sudan Electricity Holding Company. This company owns the affiliated companies for electricity distribution, electricity transmission, electricity thermal generation, electricity hydro generation and renewable energy. It is important to mention that the Sudanese company for hydro generation and renewable energy includes a general department for renewable energy. Under this general department there are departments for planning, management of biomass, solar and wind departments.

In fact, several Arab countries have demonstrated its ambition to unbundle and privatize their power sectors through taking steps towards a legal or functional separation. The most common way to accomplish a legal separation is to create a state-owned holding company with a number of subsidiaries which manage and operate separately the different activities within the power sector value chain. This type of unbundling can be found in Algeria, Egypt, UAE (Abu Dhabi), and, to some extent, Bahrain and Saudi Arabia.

Table 4: Status of Power Sector Unbundling, Incorporation and Privatization in the Arab countries

	Reference to the policy	Status of unbundling
Algeria	Law 02-01 on Electricity and Gas Distribution	Functional or legal separation
Egypt	LAW 87/2015, Article 13	Functional or legal separation
Iraq	Electricity law of 2017	Functional or legal separation
Jordan	General Electricity Law no. 64.	Ownership separation
Oman	Royal Decrees 78 of 2004, 59 of 2009, 47 of 2013 and 43 of 2018	Ownership separation
Palestine*	General Electricity Law no. 13.	Ownership separation*
Saudi Arabia	Electricity Law of 2005	Functional or legal separation
Sudan	Electricity Law of 2001 and Cabinet Decree 169 of 2010	Functional or legal separation
United Arab Emirates (Abu Dhabi)	Law 2-98 of 2008	Functional or legal separation

* Palestine's current status of separation is naturally high since almost no generation or transmission takes place in the country. Distribution companies are private or owned by a municipality.

2.2 Independent Power Producers

Independent Power Producers (IPPs) are those typically building, owning, and operating power generation facilities to sell electricity either to the utility or directly to a third-party through a PPA. IPPs can also have forms of direct export or partial self-consumption. Exclusive self-consumption is not typically defined through IPPs, although some of the literature includes this form among the IPP schemes. IPPs selling directly to the utility are the common practice in the Arab region, while third-party sales can be considered as an emerging supply option particularly appealing for larger industrial and commercial actors with high electricity needs and who are reluctant to become auto-producers of electricity.

The Arab region, to a large extent, relies on the single-buyer model. A state-owned entity is the wholesale purchaser frompower generating companies and is responsible for selling the electricity to distribution companies that deal with the final consumers.

All Arab countries have adopted legislation or institutional settings allowing IPPs to operate in power generation activities. Private participation in RE power generation is becoming a trend in the Arab region. By the end of 2018, Algeria, Egypt, Jordan, Lebanon, Morocco, Palestine, Saudi Arabia, Tunisia and the UAE were the leading countries in which private actors owned and operated utility scale renewable energy power plants. In Algeria and Egypt several small and medium sized PV plants came on line under the feed-in tariff schemes adopted in the two countries. In Egypt, Lebanon, Morocco, Saudi Arabia, and the UAE, competitive bids and auctions have proved to be very successful in attracting private local, and international investments. Jordan has continued resorting to the direct proposal submission scheme which represents a success story for attracting private investors through well-defined windows for projects.

2.2.1 Utility Supply

Most of the large-scale RE projects in the Arab region have been made possible through competitive bidding processes and long-term PPAs with a single-buyer. 12 Arab countries allow for public competitive bidding either under IPP or EPC tendering procedures based on government calls for tenders. Jordan, Palestine and Egypt opted for direct proposal submissions. In addition to that, Algeria, Egypt, Palestine, and Syria have introduced FIT schemes.

The Arab region currently hosts one of the world's largest solar parks, including 32 individual IPP projects in Benban, Egypt, as part of the 2 GW FIT program launched by the Egyptian Government in 2015. The park will reach 1.465 GW cumulative capacity by end of 2019. Benban Solar Park won the title of Global Multilateral Deal of the Year at the PFI Awards 2017. The IPP developers will sell all output generated to the Egyptian Electricity Transmission Company (EETC) under a 25-year Power Purchase Agreement. The 32 project developers secured a substantial part of the finance needed through international financing institutions. For example, the IFC approved a $660 million financing for the construction of 11 solar power plants with a cumulative capacity of 500 MW. The African Development Bank (AFDB) also approved a loan of US$55 million for 3 independent solar projects.

Another Arab region solar PV flagship project is the 1,177MW IPP Sweihan power project in Abu Dhabi, UAE. This IPP was initially proposed to be a 350MW project, but after allocating additional land, the capacity has been increased to 1,177MW. The project has been called "Noor Abu Dhabi" solar power plant, and its cost is estimated at $871.2 million (Dh3.2-billion). The project started its commercial operation in 2019. Based on the results of a competitive bid in 2016, Sweihan Solar Holding Company was established in March 2017 by Abu Dhabi Water and Electricity Authority (ADWEA) with 60% stake, together with Japan's Marubeni and China's JinkoSolar equally sharing the remaining 40% stake, for developing the PV project on a build, own and operate (BOO) basis. The project company will sell the electricity at a tariff of $2.94 cents per kWh to ADWEA under a 25-year PPA. The project is financed through a combination of debt and equity, where a syndicate of international and local banks provides $648m debt with a door-to-door tenure of 26 years and a cash sweep starting in the sixth year.

Noor Abu Dhabi solar plant, UAE

Among the most important Arab region developments is the 700 MW Solar CSP Power Plant at Mohammad Bin Rashid Al Maktoum Solar Park Phase 4, UAE. The project features the world's tallest solar tower measuring 260 meters and the world's largest thermal energy storage capacity. The plant has achieved the world's lowest CSP levelized cost of electricity (LCOE) of 7.3 US cents/kWh. Emirate Ras Al Khaimah, also revealed a 20% equivalent to 1.2GW solar target by 2040 as a part of its new sustainable building program that looks to install 600MW of rooftop solar and 600MW of utility-scale projects. The program guidelines for new buildings require a 30% cut in energy and water usage with the so called 'solar ready' requirement.

In Saudi Arabia, the IPP model is expected to prevail in Saudi Arabia's ambitious renewable energy targets. Round one for 700MW of IPP solar and wind energy projects took place in 2017, when the Renewable Energy Project Development Office (REPDO) was formed. In round two, REPDO invited 60 pre-qualified companies to submit bids for six solar energy projects with a combined capacity of 1.5 gigawatts. Applicants are classified as managing members, technical members or local managing members. The six projects include two small "Category A" projects with the capacity to produce 100 megawatts or less, requiring all three member types and a minimum of 17% local content, as well as four large "Category B" projects with a capacity of above 100MW which do not need a local member. All projects tendered are IPPs backed by 20 to 25-year PPAs.

Lebanon had launched the request for proposals (RFP) for the construction of 12 solar PV farms across the country in May 2017 for the development of projects in the capacity range of 10 to 15 MW, i.e. a total of 180 MW solar power tender. These projects are expected to be located in the regions of Mount Lebanon, Bekaa and Hermel, South and Nabatieh, and North and Akkar. 28 bidders were qualified to step into stage 2, which is based on technical and capability scoring. The solar farms will be backed by a power purchase agreement (PPA) based on permits by the Council of Ministers. In April 2018, Lebanon issued an expression of interest for up to 300 MW of solar plus battery storage capacity including 3 PV farms with battery storage. The power capacity of each PV farm is between 70 and 100 MW a minimum of 70 MWh of battery energy storage capacity, regardless of the PV sizing. The projects will deliver electricity to local utility D.

Bahrain awarded the contract for the construction of the country's first IPP large-scale PV power plant of 100MW, to Saudi energy company ACWA Power that submitted the lowest bid of BD14.668/MWh ($39.1) for electricity to be generated by the project. The project will be located at the Askar landfill site, in Bahrain's southern governorate.

A landmark utility-scale IPP wind power project of 50MW, the first in the Arabian Gulf region located at Harweel in Dhofar Governorate, Oman, was partially brought online for the first time in 2019. The commercial operation of the wind farm is expected in the coming months, announcing the operational phase of Oman's ambitious grid-connected renewable energy program. The Oman Power and Water Procurement Company (OPWP) the sole offtaker of output from power generation and water desalination projects will purchase electricity output from the Dhofar Power Project under a long-term PPA with operator, the Rural Areas Electricity Company (Tanweer). In the UAE, the Dubai Electricity and Water Authority (DEWA) is also increasing its reliance on IPPs for renewables, e.g. Dubai's large solar park is offered under the IPP model.

Saudi Arabia's first wind power project, costing $500 million, reached a financial close in July 2019. The 400-MW Dumat Al Jandal wind farm had been awarded to a consortium led by France's EDF and Masdar. The consortium lately announced a world record-low onshore wind levelized cost of electricity of 1.99 US cents/kWh. The project was initially awarded at 2.1 cents/kWh, but late-July 2019, after completing the financial close, the project had made a 6.5% improvement on levellized cost of electricity, bringing it down to 1.99 cents/kWh. The projects commercial operations are due to start in 2022.

Another milestone 250 MW wind farm is currently under construction in Gulf of Suez, Egypt. This IPP project is under the build, own and operate (BOO) scheme where the energy will be sold under a 20-year PPA to the Egyptian Electricity Transmission Company (EETC). The total investment cost of the project amounts to approximately USD 400 million with financing provided by the Japanese Bank for International Cooperation (JBIC) in coordination with commercial lenders SMBC and Sociéte Générale. Egypt has also officially awarded electricity generation licenses to four wind farms with a combined capacity of 1,420 MW.

In Lebanon, the first ever utility scale authorized IPPs are three wind farm projects currently being planned in the Akkar district in the Northeast of Lebanon, near the Syrian border. Together, these projects will establish around 54 turbines with a total capacity of 219 megawatts (MW). The activities for these projects will include land clearing, the installation of foundational structures and the installation of wind turbines. The projects will also include the upgrade of existing and establishment of new access roads to the turbine sites, the installation of a substation, two operation buildings and underground transmission lines for grid connection.

Qatar's utility Kahramaa pre-qualified 16 bidders for a 700 MW solar tender, and five consortia submitted bids so far. The 700 MW project will be on two-stage and could potentially be expanded to 800 MW. The first 350 MW stage is scheduled for completion in 2021, and the second 350-450 MW stage is expected by 2022. The project will be built under a build-own-operate-transfer (BOOT) basis, with a 25-year power purchase agreement with Kahramaa. Siraj Solar Energy, the local partner, will hold the 60% stake in the project company while the winning developers will retain a 40% stake. Kahramaa, the single owner and operator of the country's electricity transmission-distribution networks, has assigned a 10km^2 area West of Doha for the project, and it will sign PPAs with independent power producers.

The most recent Arab country to open its renewable energy market to IPPs is Libya, where recently the Renewable Energy Authority of Libya (REAOL) has established a new affiliated company that will use public-private-partnerships to allow for more reliance on private investments.

In early 2019, Iraq's Ministry of Electricity has invited companies to pre-qualify for the announced procurement of seven PV power projects with a combined capacity of 755 MW. The largest two projects of 300 MW and 225 MW, will be at Karbala and Babylon. Another two 50 MW projects will be based in Wasit. The governorate of Muthanna will host two 50 MW and 30 MW projects and the last 50 MW project is expected in Al-Qādisiyyah governorate.

Djibouti's Ministry of Energy off Natural Resources signed in Mid 2019 with the Africa Finance Corporation (AFC) the contract for the implementation of a 60 MW wind project in Goubet. Along with this contract, Electricity of Djibouti (EDD) signed an energy purchase contract with AFC as its first contract with an independent power producer. EDD is currently constructing the power line allowing to transport this energy from the project location at Goubet to capital of Djibouti.

Algeria's commitment to open the market for IPP has continued, with technical offers for 7 project sites with a cumulative capacity of 150MW PV under an auction scheme have been received and evaluated in 2019. These 7 sites are expected to host 15 projects (10MW each). Furthermore, total of 1 GW distributed over 5 allocated sites is expected to be offered for IPP developers by Sonatrach.

2.3 Third-Party Supply of RE

Nine Arab countries allow, in one way or another, IPPs to produce electricity for third-party sales: Algeria, Egypt, Iraq, Lebanon, Jordan, Morocco, Saudi Arabia, Syria and the UAE. In Morocco, Law 13-09 allows RE IPPs to sell electricity directly to large consumers and bypass the single-buyer ONE. Morocco was the first Arab country exercise this option 2013, with NAREVA Holding company's three wind projects of 200MW total capacity that were the first to supply power directly to large industrial customers. Egypt is currently applying the third-party option in practice for PV projects through a special business model under a net-metering scheme that was scaled-up in 2018 to allow projects up to 20 MW. Jordan's regulatory commission EMRC allowed wheeling of green electricity through the directive issued in 2015 pursuant to Article 7/B/3 and Article 9/B from the General Electricity Law No. 64 of the year 2002. The Algerian Sonatrach oil complexes have piloted their first 10MW project and is preparing for around 1.3GW of PV projects for their other facilities. Third-party sales are also possible in Saudi Arabia, a recent example of that is the Saudi Arabia's National Agricultural Development Co (Nadec) that signed with the developer Engie for a period of 25 years for energy output of a 30MW solar power plant in Nadec City, Haradh, at a fixed tariff of USD 0.03 (SAR0.09) per kWh. The projects commercial operation is expected in 2020.

2.4 Direct Export of RE

Although electricity exports and particularly RE electricity exports to Europe has sparked intense controversy over the past decade to the extent that Algeria, Jordan, Morocco and Tunisia have made RE electricity exports an option in their legislation, such an option has not yet been realized. In Algeria, Law 02-01 allows for export of electricity. In Jordan, the General Electricity Law specifies that subject to the Council of Ministers approval, import and export will be handled on a case-by-case basis. In Morocco, Law 13-09 permits the export of RE-produced electricity by using the national grid and interconnections with specific authorization by the state-owned utility ONE. Tunisia Law 12 for 2015 has specified some conditions for exporting RE sourced electricity. Most experts believe that for the near and medium terms, RE expansion will mostly be for satisfying growing domestic needs. However, given the fact that many of the Arab countries currently enjoy a surplus in electricity supply, with increasing shares of RE, while some of their neighboring countries suffer from power supply shortages, there has been some discussions on the possibility of exporting green electricity to other Arab countries. No concrete action has been announced in this regard to date.

Table 5: Status of IPPs Producing RE in the Arab Countries (2019)

	RE Utility Supply		RE Third Party Supply		RE Direct Export	
	Legal basis to operate as IPP and sell power to utility	Implemented	Legal basis to operate as IPP and engage in third-party supply	Implemented	Legal basis to operate as IPP and engage in direct export	Implemented
Algeria	Executive decree No. 17-98 of 26 February 2017, Law No 02-01 (2002) on Electricity and Distribution of Gas, Article 26; Decree No 13-218 (2013) on Feed-in tariffs for Renewables	Yes	Law No 02-01 (2002) on Electricity and Distribution of gas[4] Decree 06-429 of 2006, article 4	-	Law No 02-01 (2002) on Electricity and Distribution of Gas[5]	-
Bahrain	Legislative Decree No. 1 of 1996 with respect to Electricity and Water	Yes	-	-	-	-
Djibouti	Law No 88 (2015) on Regulation of the Activities of the Independent Electricity Producers	Yes	-	-	-	-

[4] The Law 02-01 (2002) does not differentiate between export of power produced from conventional sources and renewables.
[5] The Law 02-01 (2002) does not differentiate between export of power produced from conventional sources and renewables.

	RE Utility Supply		RE Third Party Supply		RE Direct Export	
	Legal basis to operate as IPP and sell power to utility	Implemented	Legal basis to operate as IPP and engage in third-party supply	Implemented	Legal basis to operate as IPP and engage in direct export	Implemented
Egypt	Law No 100 (1996); Law No 89 (1998) on Competitive Bidding; Renewable Energy Law No 203 (2014)	Yes	Decree No. 326 (1997) establishing "The Electric Utility and Consumer Protection Regulatory Agency"	-	-	-
Iraq	Economic Affairs Commission Decree No S.L. 614, August (2008)	Yes	-	-	-	-
Jordan	Law No 13 (2012) on Renewable Energy and Energy Efficiency Law, Article 5 (competitive bidding), Article 6 (Direct Proposal Submission)	Yes	-	-	General Electricity Law 64[6]	-
Kuwait	IPP Law No 39-10 (2010)[7]	Yes	-	-	-	-
Lebanon	Law 463 and its amendments	-	-	-	-	-
Libya	REAOL Decree on Establishing RE Private Investment Promotion Co. (2018)					
Morocco	Law No 13-09 (2009) on Renewable Energies	Yes	Article 26 of the Law 58-15 (2015) revision Law No 13-09 (2009) on Renewable Energies.	Yes	Law 13-09 (2009) on Renewable Energies	-
Palestine	Decision of the Cabinet for motivations package for the purpose of encouraging investment in the use of RE technologies (2017). Renewable Energy Efficiency Law No 14 (2015) General Electricity Law No 13 (2009)	Yes	Renewable Energy Efficiency Law No 14 (2015)	Yes	-	-
Qatar	Law No 10 (2000) on the Establishment of KAHRAMAA[8]	-	-	-	-	-
Saudi Arabia	"Saudi Vision 2030" plan. "King Salman Renewable Energy Initiative" in 2017 Royal Order A/35 of H.M. King Abdullah bin Abdulaziz Al Saud on 17th April 2010 on establishment of KACARE [9]	-	-	-	-	-
Sudan	Electricity Act (2001) Chapter II Article 3.2	-	-	-	-	-
Syria	Law No 32 (2010), Article 30	-	Article 30 of the Law 32 (2010)	-	-	-
Tunisia[10]	Law No 1996-27 (1996); Decree 1996-1125 (1996)	Yes	Law No 74/2013, (adopted in April 2015)	Yes	Law No 74/2013, (adopted in April 2015)	-
UAE	Article (3) of the Decree No. (1) (1992), amended by Article (1) of Decree No. (9) (2011)[1 1]	Yes	No	-	-	-
Yemen	Electricity Law No 1 (2009)	-	-	-	-	-

[6] The General Electricity Law No 64 regulates issues of export and import, but does not specify the situation for renewables.
[7] The IPP Law No 39-10 (2010) does not specify situation for renewables.
[8] The law authorizes KAHRAMAA to formulate and enter into power and water purchase agreements and provide necessary technical and corporate support for establishment of generation and desalination ventures.
[9] The Royal Order authorizes KACARE to develop, lead and implement clean energy projects in the Kingdom.
[10] Law 74-2013: in April 2015, the law on electricity production from RE was adopted by the Tunisian Parliament. The law aims to promote private sector integration and to open RE market and promote the export of electricity generated from renewable. and at the end of 2015 this law was amended but still not announced yet.
[11] Authorizes Dubai Water and Electricity Authority to purchase electricity from any entity at the prices and under conditions it deems appropriate.

2.5 Grid Access

2.5.1 Priority Access and Dispatch

Clear and consistent conditions for grid access represent a precondition for private investments in grid-connected RE markets. Priority access and dispatch are also effective encouragement measures that improve the competitiveness of the RE projects and increase the attractiveness of the overall market. Priority dispatch is a controversial issue due to the technical and financial burdens that exist in cases of transmission congestion or low demand periods, when conventional generators are requested to reduce their generation levels to allow for RE generators to feed in and sell all their electricity. Unfortunately, such discussions reflect a concern for grid operators that started to appear in some countries with relatively high share of RE in its power mix such as Jordan and on local levels in Upper Egypt.

To encourage investment in RE power generation activities, it is important that all producers are treated in a non-discriminatory way. A common approach is to specify grid access technical details in national-level regulations and grid codes referenced in the PPA, helping to avoid case-by-case negotiations. Additionally, regulated grid-transporting tariffs combined with anunbundled power sector can contribute towards guaranteeing non-discriminatory access.

An increasing number of countries in the region have specified grid-access details in their regulations. So far, Algeria, Egypt and Jordan are providing the most preferential grid-access conditions for RE projects guaranteeing the access and exercising the priority of dispatch. The consent of the relevant utility is a must when it comes to distributed systems installed under net-metering or grid-connected auto-producers of RE.

In Morocco, Law 13-09 was amended to specify the grid access conditions for the low, medium, high, and extra high voltage grids, which can be accessed within the limits of the technical capacity of the networks. In Tunisia, a ministerial decree was issued in 2017 focusing on grid integration requirements for solar and wind projects with high and medium voltage networks. Grid operators in both Egypt and Palestine are de facto committed to purchasing all generated RE electricity, provided that grid integration requirements are met. The Egyptian Electricity Transmission Company (EETC) has taken this further and specifies priority dispatch for RE in its network access contracts with power producers. Saudi Arabia have also specified requirements and conditions for connecting PV systems on low, medium and high voltage networks, and for wind projects to medium and high voltage networks. UAE has detailed grid codes.

Table 6: Examples of RE Grid Access Conditions in the Arab Region

	RE Guaranteed Access to the Grid	RE Priority Access/ Dispatch
Algeria	Executive decree No. 17-98 of 26 February 2017, Executive decree No. 06-428 of 26 November 2006, Executive decree No. 06-429 of 26 November 2006, and the order of 21/02/2008.	Priority dispatch once a RE system is connected.
Bahrain	Ministerial Resolution No. 2 of 2017 on regulating the connection of RE electricity generation units with the distribution system of Electricity and water Authority, amended by Ministerial Resolution No. 1 of 2019.	-
Egypt	Egyptian Electricity Transmission Company (EETC) and distribution companies (DCs) are required to expand their networks to accommodate all renewable energy supply and purchase all electricity that has been produced from renewable energy power plants at the price set by the Cabinet of ministers.	The Egyptian Electricity Transmission Company (EETC) has taken this further and specifies priority dispatch for RE in its network access contracts with power producers.
Jordan	Non-discriminatory guaranteed access foreseen by the Law No 13 (2012) on Renewable Energy and Energy Efficiency, Article 8C.	PPA contracts with NEPCO stipulates the take or pay concept with IPPs under Direct Proposal Submission Scheme
Palestine	Cabinet Decision for motivations package for the purpose of encouraging RE investment (2017). Renewable Energy Efficiency Law No 14 (2015). General Electricity Law No 13 (2009)	Palestinian electricity distribution companies are committed to purchase all produced electricity under different IPP Schemes

2.5.2 Grid Code or Connection Guidelines

Grid codes, or network codes are technical specifications regulating the general conditions pertaining to how, different power generation installations connect to the grid, as well as the management and functioning of the electricity grid and system services. The grid codes in some cases include cost sharing specifications and priority conditions as mentioned in the previous section. The specifications in the grid code apply to all generation facilities feeding the grid, whether large utility scale power plants of several hundred megawatts or a decentralized solar rooftop system of few kilowatts. Since the technical capacity of the grid can be particularly problematic for RE developers, grid codes must clarify which technical rules govern access to the grid for all types of RE projects. Furthermore, the grid code defines specific conditions for plants to receive pre-qualification and participate under different supporting schemes such as net metering or bids/auctions. As shown in the following table, for the Arab region, technology-specific RE grid codes and network connection guidelines have been introduced progressively, especially in countries introducing regular support schemes for RE. In some cases, international standards are applied such as in the case of Palestine where the Australian Standard AS 4777-1: Grid connection of energy systems via inverters has been implemented.

Table 7: Examples of RE Grid Connection Code/ Requirements in Arab Countries

	Technical Guidelines Adopted to Connect		
	Small Scale PV Systems to Low Voltage Grid	Medium- to Large-Scale PV Systems to Medium and High Voltage Grid	Medium- to Large-Scale Wind Systems to Medium and High Voltage Grid
Algeria	Yes	Yes	Under preparation
Bahrain	Yes	Yes	-
Egypt	Yes	Yes	Yes
Iraq	Under preparation	Under preparation	Under preparation
Jordan	Yes	Yes	Yes
Kuwait	-	-	-
Lebanon	Yes	Under preparation	Under preparation
Libya	-	-	-
Morocco	Under preparation	Under preparation	Under preparation
Palestine	Yes	-	-
Qatar	-	Yes	-
Saudi Arabia	Yes	Yes	Yes
Sudan	Under preparation	Under preparation	Under preparation
Syria	-	-	-
Tunisia	Yes	Yes	Yes
UAE	Yes	Yes	-
Yemen	-	-	-

2.6 Market Structure Final Scores and Ranking

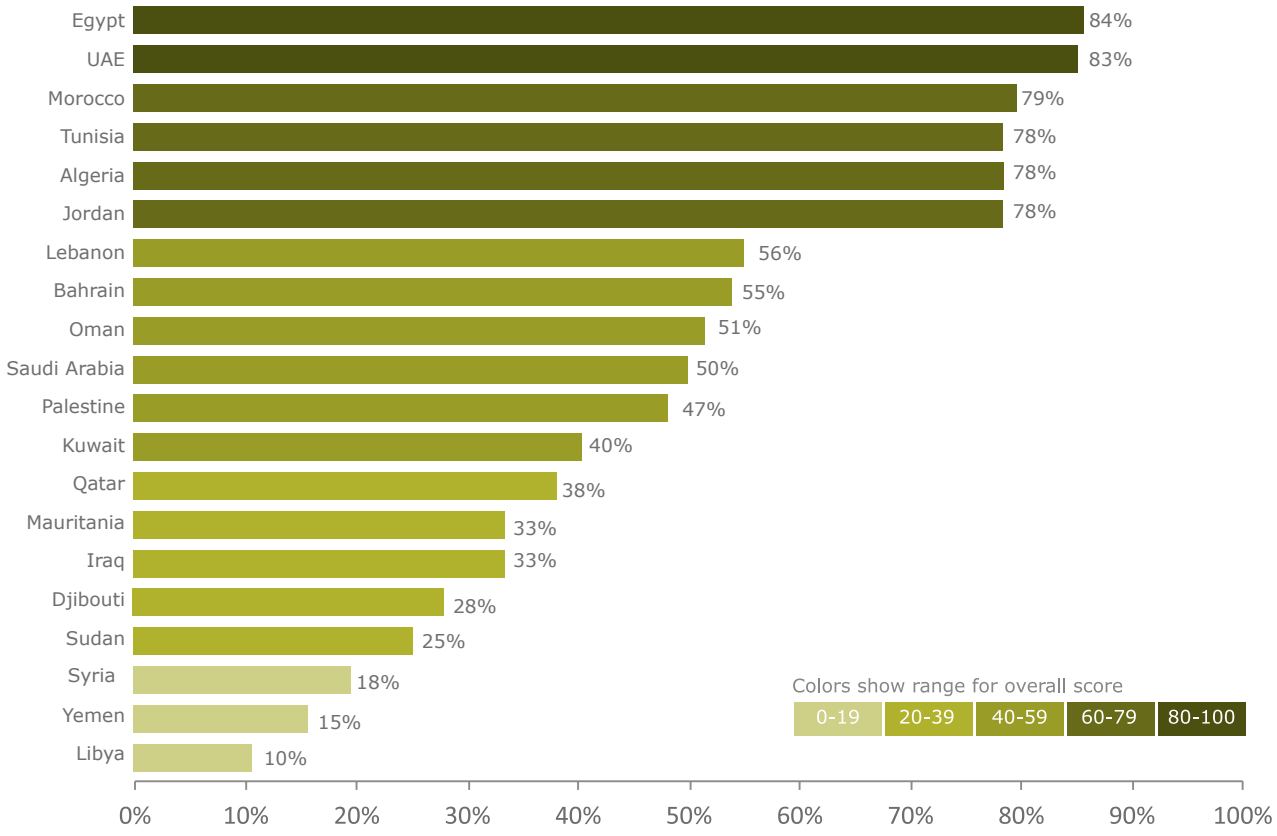
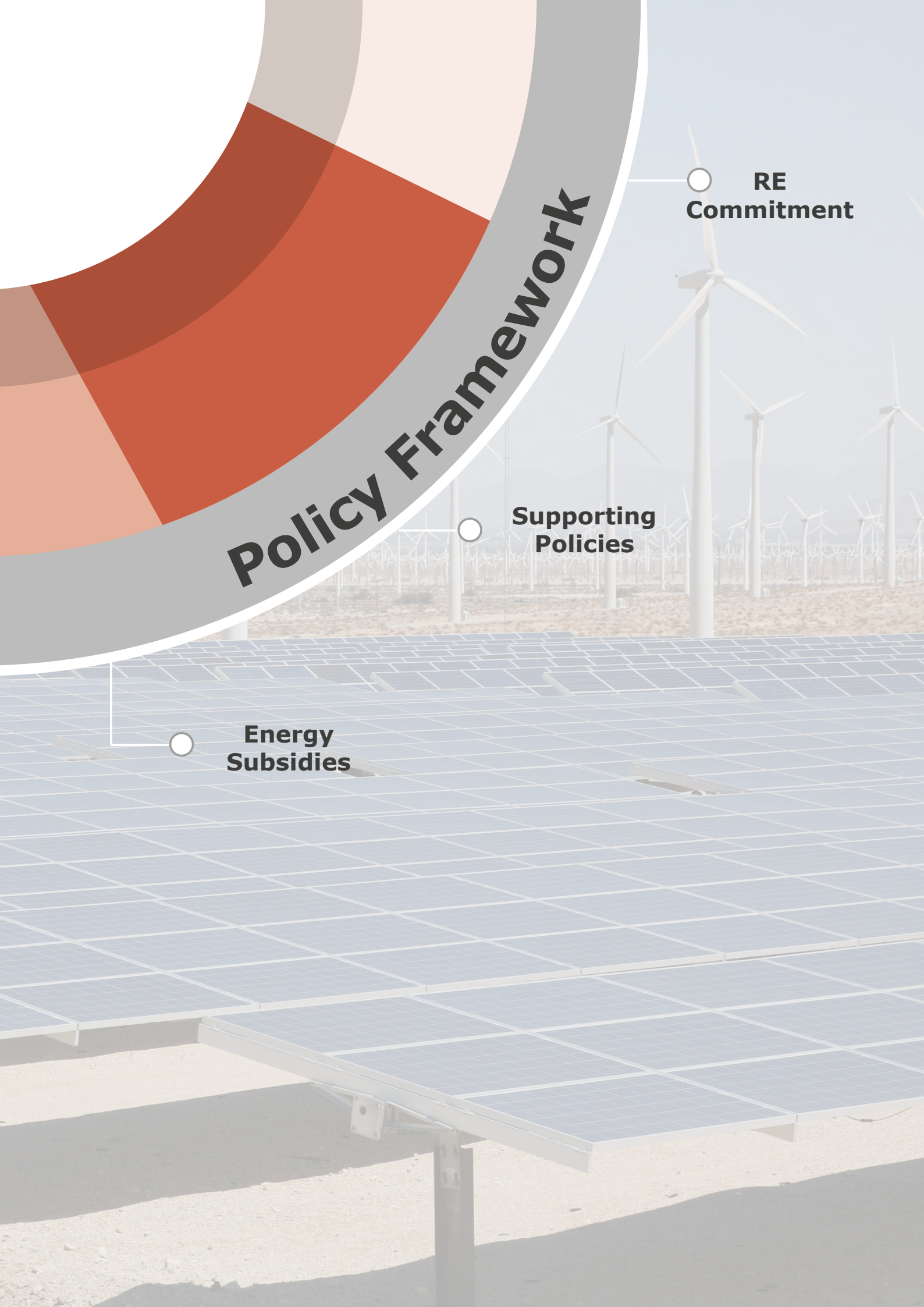


Figure 20: Market Structure Final Scores and Ranking


Policy Framework
RE Commitment
Supporting Policies
Energy Subsidies

3 Policy Framework

The policy framework category looks at the overall political commitment to enable RE development in order to assess the investment environment for RE. Those commitments derive from official and credible targets; the establishment of a predictable and transparent regulatory framework; the streamlining of administrative procedures; the integration of fragmented RE strategies into the overall energy strategy; and the mobilization of funds for the deployment of demonstration projects. In order to efficiently attract both national and foreign RE investments, it is crucial to establish RE policies in official and legally binding documents.

To better understand investment conditions in the region, the policy framework category focuses on three factors: (1) RE commitment; (2) supporting policies; and (3) energy subsidies. These factors are measured by a number of qualitative and quantitative indicators as shown in Table 8.

Table 8: Policy Framework Evaluation Factors and Indicators

Category	Factors	Indicator	Score/Measuring Unit
Policy Framework	RE Commitment	RE Targets	RE targets are officially adopted as part of RE strategy or action plan by higher political authorities; RE targets are defined, but not officially adopted yet by higher political authorities or scattered in various documents; No targets are adopted
		RE Share	Percentage of total installed capacity (MW)
		RE Projects under Construction	Percentage of total installed capacity (MW)
		RE Projects under Tendering	Percentage of total installed capacity (MW)
	Supporting Policies	PPA Bidding or Public Competitive Bidding	Resources identified for private development; tenders announced; PPA signed (MW)
		Direct Proposal Submission	Policy adopted by law; proposals selected for private development; PPA signed (MW)
		Feed-in Tariffs	Officially adopted; RE projects implemented through feed-in Tariffs (MW installed)
		Net Metering	Officially adopted; RE projects implemented through net metering scheme (MW)
	Energy Subsidies	Electricity Subsidies Residential	Percentage of Palestinian residential retail prices (benchmark)
		Electricity Subsidies Commercial	Percentage of Palestinian commercial retail prices (benchmark)
		Electricity Subsidies Industrial	Percentage of Palestinian industrial retail prices (benchmark)

3.1 RE Commitment

3.1.1 RE Targets

Demonstrating political will and commitment to pursue RE are critical to foster favorable RE investment. Clearly formulated and officially adopted targets represent an important first step to any RE development plan and can provide a basis for generating investors' trust. Most Arab countries have announced targets for RE deployment. Based on the announced targets until 2035, the region will have more than 190 GW of operational capacities. Renewable energy business opportunities throughout the Arab region are estimated at over 30% of the global solar and wind growth.

Most of the expressed Arab countries' targets are ambitious, considering the high regional reliance on fossil fuels. The most ambitious target in term of the share in the power mix is Djibouti, where the target is to reach 100% renewables by 2035. The second highest target is morocco with 52% followed by UAE then Egypt. An interesting observation is that Arab African countries total projected capacities exceed 100 GW by 2035, promising that these countries will contribute at least 25% of the African Renewable Energy Initiative target for 2030. The targets confirm an overall preference for solar rather than wind and bioenergy in the region.

There are several target updates in various Arab countries. Egypt has expanded its target to reach 42% (54 GW) of its power mix by 2035. Egypt leads the Arab countries in terms of installed capacity for the 2020s timeframe with its plan to develop 10 GW of wind and solar projects by 2022. Saudi Arabia has also announced an ambitious target for renewables to reach 30% (59 GW) of its generation capacity which make Saudi Arabia country with the largest target in the Arab region when it comes to installed capacity. As part of the Saudi Arabia "Vision 2030", the country revised its renewable energy target from 9.5GW to 27.3GW in 2024. By 2030, Saudi Arabia aims to reach 58.7GW capacity, comprising 40GW from solar photovoltaic, 16GW from wind and 2.7GW from concentrated solar power. The two countries Egypt and Saudi Arabia together would create a pipeline of projects exceeding 100 GW.

According to the UAE Energy Plan 2050, the country's first energy strategy, the entire UAE has set a goal of 44 percent renewable energy in 2050, mainly from solar.

The Oman Power and Water Procurement Company (OPWP) plans to procure at least 2,200 MW of renewables-based electricity capacity by 2025 within the Main Interconnected System (MIS) serving the northern half of the Sultanate. Kuwait has put effort into developing uses of renewable energy and ensure it covers 15% of the total used energy by 2030. A key project that will contribute to achieving Kuwait's target for the energy production from renewable sources is the second phase of the Dabdaba solar energy project with 1,500 MW capacity, the project is expected to involve the private sector in commercial activities related to the operation and maintenance of the station, creating more job opportunities. Kuwait National Petroleum Co. KSC is leading the project as it aims to replace the need for 5.2 million barrels of oil a year and reduce carbon emissions by 1.3 million tons annually.

To support the implementation of the Pan-Arab RE strategy, the Energy Department of the LAS in collaboration with RCREEE and GIZ introduced the Arab Renewable Energy Framework (AREF). AREF is a guideline for Arab states to develop their national renewable energy action plans (NREAPs) until 2030, based on a customized template and reports on the progress accomplished. Five Arab countries (Bahrain, Lebanon, Tunisia, Palestine and Sudan), have taken the lead and drafted/ consolidated a national plan based on those documents. The Lebanese NREAP was officially endorsed in 2017. Bahrain's also launched it National Renewable Energy Action Plan in September 2017, envisaging 700 MW of generation capacity by 2030 using solar, wind and energy-from-waste projects. Bahrain aims to bring online 255 MW of PV capacity by 2025 using net metering, 100MW IPP PV tender and a renewable energy mandate for new buildings. In mid-January, the Sustainable Energy Unit of Bahrain – with the help of the United Nations Development Program – launched a 3 MW tender for solar arrays at eight locations containing 66 government buildings. The Palestinian NREAP proposes a 2020 target of 100 MW mostly PV and 2030 target reaching 500 MW. The renewable generation would equal about 7.1% of the final electricity consumption forecasted in 2030. 80% of the 2030 targets shall be achieved with solar PV, 10% with wind and 10% with biogas/biomass.

Providing a comparative analysis between the countries' official targets is rendered complex by the fact that each country expresses its target differently: either as a share of generation mix, as share of installed capacity or as a share of its total primary energy consumption. In addition, countries which express targets as a percentage of installed capacity in MW do not automatically provide the corresponding percentage output in MWh, which is in every case considerably less impressive. Despite these shortcomings, it is safe to say that most of the expressed targets are relatively ambitious, especially in relation to the high regional reliance on fossil fuels. Interestingly, the targets confirm an overall preference for solar rather than wind in the region. The following table summarizes the targets announced in Arab countries.

Table 9: Lists RE targets in the region

	RE Strategy/Action Plan/Program that has these targets	RE Targets							Target Date
		Wind MW	PV MW	CSP MW	Biomass MW	Geothermal MW	Total MW	Total %	
Algeria	National Program for Renewable Energy and Energy Efficiency 2030	1,010	3,000	-	360	5	4,525	15	2020
		5,010	13,575	2,000	1,000	15	21,600	27	2030
Bahrain	National energy action plan (NREAP) Adopted in 2017	50	200		5	-	255	5	2025
		300	400		10	-	710	10.3	2035
Djibouti	National Program for Development of Renewable Energy and Energy Efficiency	300	200		0	500	1,000	100	2035
Egypt	National RE Strategy 2020 adopted in 2008, updated in 2012; Egyptian Solar Plan;	7,200	At least 2,300				9,500	20	2022
	SE Action Plan for the Power Sector (2018)	21,000	17,300	11000	4700		54,000	37-42	2035
Iraq	PV Solar Plan 2017-2020b y the Ministry of Electricity		2,240				2,240		2020 2025
Jordan	Master Strategy for Energy Sector 2015-2025	670	2500		50		3,220	15	2025
Kuwait	Kuwait Energy Security Vision						4,266	15	2030
Lebanon	Prime Minister decision							30%	2030
Libya	Strategic Plan for Renewable Energies 2018 - 2030	850	3,350	400			4,600	22	2030
Mauritania	Update Target of the Ministry of Oil, Energy and Minerals						60	60	2020

	RE Strategy/Action Plan/Program that has these targets	RE Targets							Target Date
		Wind MW	PV MW	CSP MW	Biomass MW	Geothermal MW	Total MW	Total %	
Morocco	Moroccan Solar Plan 2030. Morocco INDC submission to CoP 21.	2,000	2,000				6,000[(d)]	42	2020
		4,200	4,560				10,090	52	2030
Oman	Sultan Qaboos bin Said's "Vision 2020"	-	-	-	-	-	-	10	2020
Palestine	National Energy Strategy (2012-2020); Palestinian Solar Initiative.	44	45	20	21		130	10	2020
Qatar	NREAP 2018	50	400		50		500	25	2030
	Qatar Vision 2030	-	-	-	-	-	1,800	20	2030
Saudi Arabia	REPDO RE Plan 2019	7,000	20,000	300			27,300		2023
	Saudi Arabia's Renewable Energy Strategy	16,000	40,000	2,700			58,700	30	2030
Sudan	Sudan Energy Policy Paper - Updated 2018 Sudan's Renewable Energy Action Plan Study.	680	750	50	68	54	1602	11	2031
Syria	The 11th Five-Year Plan for 2011-2015	1,000	2,000	1,300	250		4,550	30	2030
Tunisia	National Renewable Energy Action Plan 2018.	1,755	1,510	450	100		3,815	30	2030
UAE	UAE 2050 energy strategy							44	2050
Yemen	National RE and EE Strategy adopted in 2009	400	8.25	100	6	200	714.25	15	2025

Source: RCREEE Focal Points

a) Primary energy
b) Electricity generation
c) Including 400 MW hydro
d) Including 1330 MW hydro
e) Including additional 63 MW hydro
F) Waste to energy

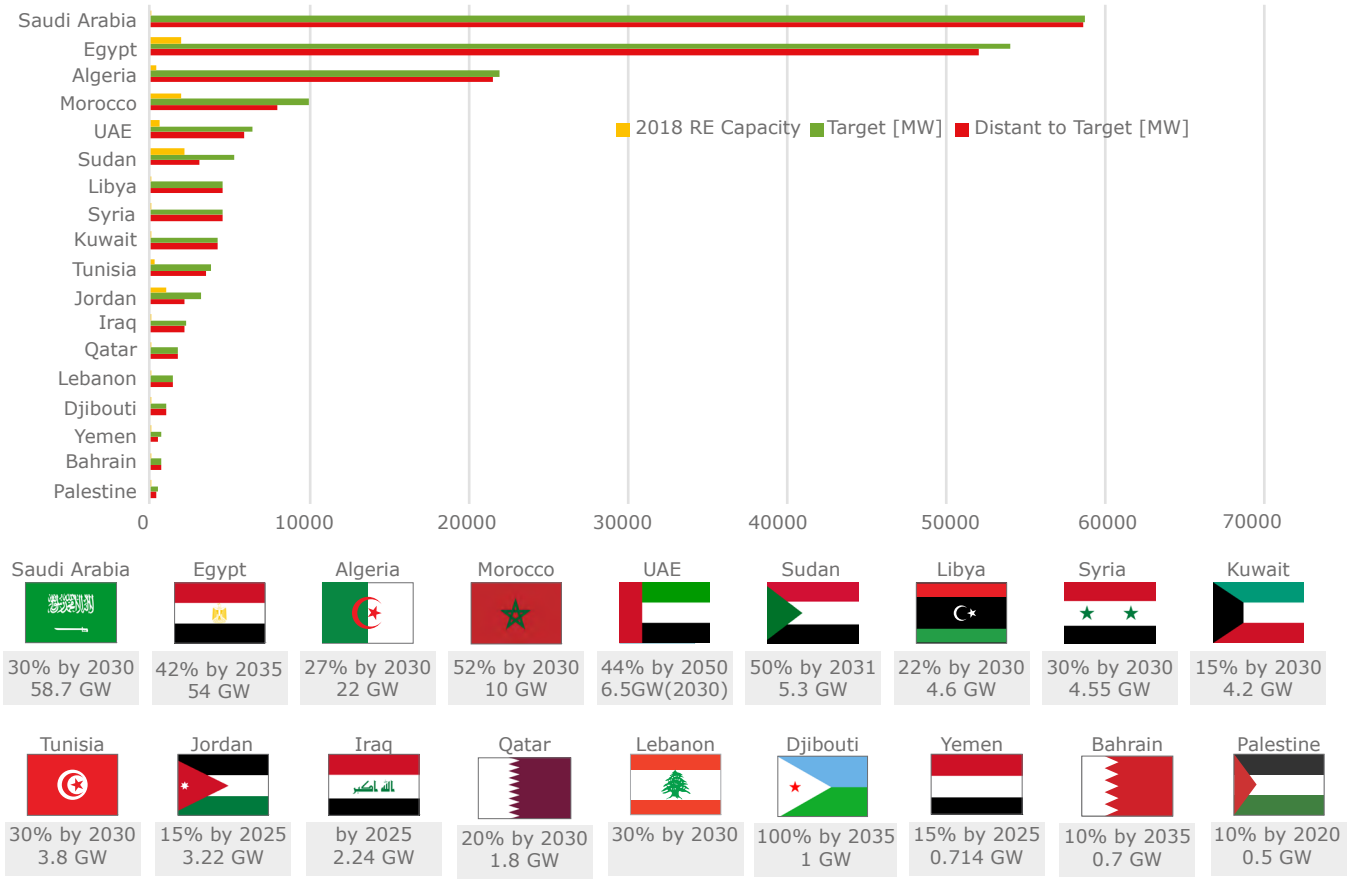


Figure 21: Renewable Energy Targets in the Arab Region [MW]

3.1.2 RE Share

The most common way to evaluate the overall effectiveness of a country's efforts to promote RE is by looking at the share of RE in the installed power capacity mix. The changing volume of installed capacity or generation, usually expressed as share of the total power mix, is often a very reliable indicator to present how committed a country is to its national target.

By the end of 2018, the total installed capacity in the Arab countries of new renewables (excluding hydro) surpassed 7 GW, more than double the capacity recorded two years ago. For the first time, PV capacities exceeded wind capacities (3.2 GW versus around 3 GW), reflecting that many Arab countries are seizing the immense value of cost reduction and modularity of PV systems compared to other renewable technologies. PV installations are widespread all over the region, be it utility scale or small/medium decentralized systems. Wind generation is currently dominated by utility scale installations in Egypt, Morocco, Tunisia and Mauritania, while solar CSP have gained new frontiers in KSA, adding to developed projects in Algeria, Morocco, Egypt and the UAE.

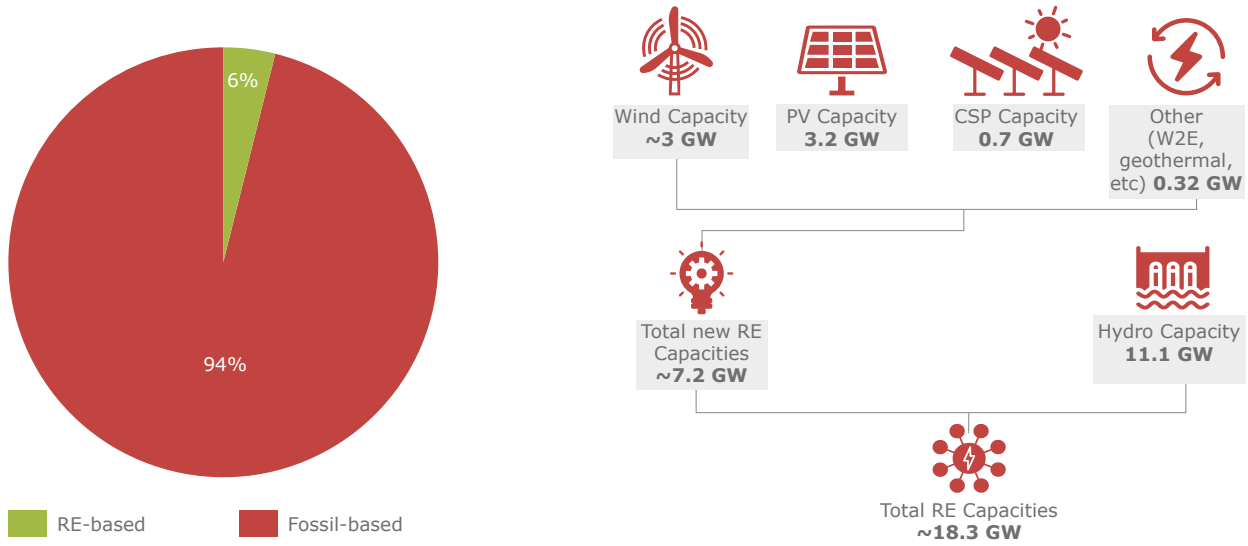


Figure 22: Share of RE in Installed Capacity

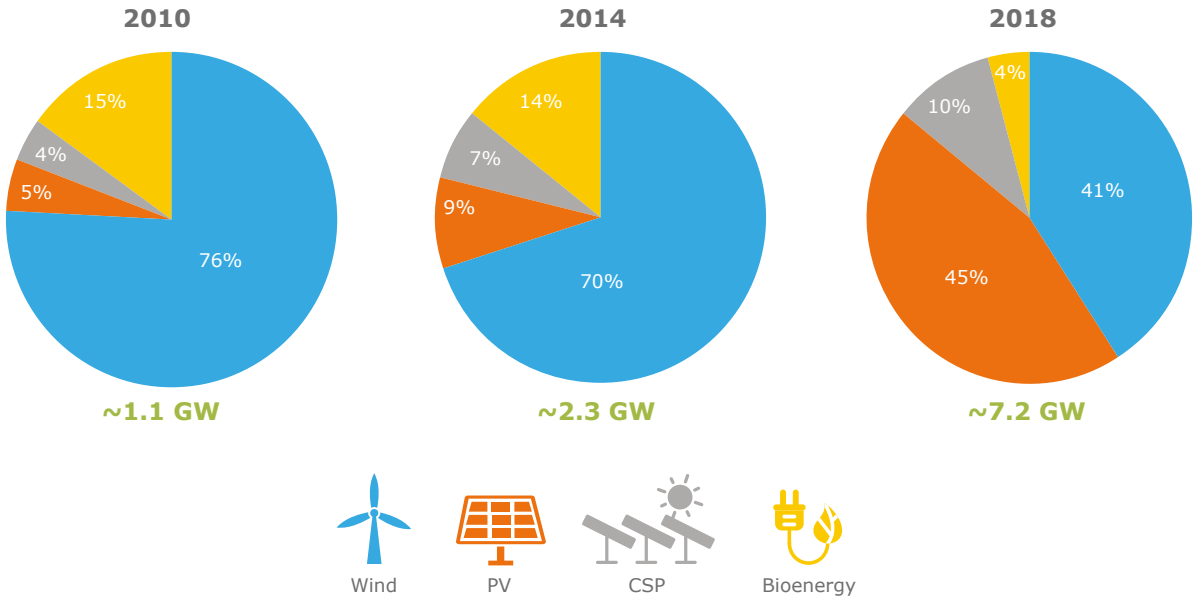


Figure 23: Market Transformation from Wind to PV Technologies Since 2010

In terms of renewable energy share in the overall installed capacity, the region is still on the verge of 6%. The key reason behind this is the additional conventional capacities brought online during the same period. The renewable mix installed capacity (excluding hydro) for the Arab countries can be found in the following table. The fossil-fuel-based installed capacities are only available until the end of 2017, and accordingly the RE share calculations are of end-2017. Nevertheless, the table introduces end-of-year-2018 installed capacity information to showcase the significant growth achieved on year-to-year bases, which in total increased from 15.8 GW in 2017 to 18.3 GW in 2018-translating to a 16% increase.

Sudan is leading in terms of RE share with around 54% percent share attributed to its large hydro capacity. If hydro is excluded then the Sudan RE share would be only 5%, attributed mainly to bioenergy and decentralized PV solutions. Morocco and Mauritania have both exceeded a 30% share of RE. If hydro is not considered, the only two countries that surpass 20% shares are Mauritania and Palestine with 23% and 20% respectively. While Morocco and Jordan follow with around 14% shares. Other Arab countries will then lag behind with, surprisingly Yemen coming in the fifth rank with 6% share due to the increased reliance of rooftop small-scale PV systems to face the challenges of war. Five Arab countries have a share of 1% to 6% of new renewables (Tunisia, Sudan, Algeria, Egypt and Lebanon). All other Arab countries still have a negligible share of non-hydro RE, below 0.5%. Please refer to the introductory regional summary for further details on the position of countries with respect to different technologies. New RE technologies have found their way onto the list such as biomass in Egypt and Jordan, waste-to energy in Qatar and geothermal in Palestine.

Table 10: Renewable energy installed capacity in the Arab countries

State	Wind [MW]	PV [MW]	CSP [MW]	Geothermal [MW]	Biogas/ Biomass/ W2E [MW]	TOTAL RE w/t hydro [MW]	Hydro [MW]	TOTAL RE - End 2018 [MW]	TOTAL RE - End 2017 [MW]	TOTAL RE w/t Hydro - End 2017 [MW]	Fossil Fuel Based - End 2017 [MW]	Total Capacity- End 2017 [MW]	Share of RE in Installed Capacity - End 2017 (%)	Share of RE in Installed Capacity w/o Hydro - End 2017 (%)
Algeria	10	410	25	0	0	445	228	673	663.2	435.2	18892	19555	3.39%	2.23%
Bahrain	1	5	0	0	0	6	0	6	5.7	5.7	3921	3927	0.15%	0.15%
Djibouti	0	0.1	0	0	0	0.1	0	0.1	0.3	0.3	145	145	0.21%	0.21%
Egypt	1125	750	20	0	67	1962	2851	4813	3856.8	1006	41582	45439	8.49%	2.21%
Iraq	0	37	0	0	0	37	2514	2551	2550.8	36.5	24300	26851	9.50%	0.14%
Jordan	285	772	0	0	4	1061	12	1073	609.9	597.9	3810	4419	13.80%	13.53%
Kuwait	10	31	0	0	0	41	0	41	40.5	40.5	18850	18891	0.21%	0.21%
Lebanon	3	42	0	0	9	54	253	307	301	48	2793	3094	9.73%	1.55%
Libya	0	5	0	0	0	5	0	5	5.1	5.1	10224	10229	0.05%	0.05%
Mauritania	34	86	0	0	0	120	48	168	167.2	119.2	341	508	32.90%	23.46%
Morocco	1250	206	530	0	1	1987	1770	3757	2994.3	1224.8	5851	8845	33.85%	13.85%
Oman	0	8	7	0	0	15	0	15	8.2	8.2	7236	7244	0.11%	0.11%
Palestine	1	36	0	0.2	0	37.2	0	37.2	35.4	35.4	140	175	20.18%	20.18%
Qatar	0	5	0	0	38	43	0	43	43.1	43.1	10171	10214	0.42%	0.42%
Saudi Arabia	3	89	50	0	0	142	0	142	92	92	57309	57401	0.16%	0.16%
Sudan	0	18	0	0	190	208	1928	2136	2130.8	202.6	1814	3945	54.02%	5.14%
Syria	1	1	0	0	7	9	1494	1503	1501.4	7.4	8560	10061	14.92%	0.07%
Tunisia	245	47	0	0	0	292	66	358	357.7	292.1	5004	5362	6.67%	5.45%
UAE	1	494	100	0	1	596	0	596	356.6	356.6	28701	29058	1.23%	1.23%
Yemen	0	150	0	0	0	150	0	150	100	100	1519	1619	6.18%	6.18%
Region	2969	3192.1	732	0.2	317	7210	11164	18374	15820	4656.6	251163	269537	5.87%	1.73%

RE Projects under Construction

A clear overview of the RE projects under construction will provide strong indicators about country's performance in reaching its RE targets. Tracking RE efforts is crucial for countries to follow up their progress, adjust their strategies, develop the related RE policies, and to expand their networks to eventually reach much more successful energy transitions.

The following table shows examples of the RE projects in Arab countries under construction in late 2018 . Impressively the current RE projects under construction should add in total around 4,000 MW of RE to Morocco, Jordan, Egypt and Tunisia - taking the lead of the list for the timeframe 2018-2019, due to implementing large scale projects, while some countries are absent - such as Yemen, Sudan, Syria and Iraq - due to their critical situations. Other Arab countries like Algeria, the UAE and Saudi Arabia show promising numbers for the upcoming year in 2020.

Table 11: Examples of RE Projects under Construction, End 2018 (non-exhaustive list)

	RE Technology	MW	Project
Algeria	Wind	20	Khenchela
	PV	343	Distributed projects in different sites
	Geothermal	5	Guelma
Bahrain	Wind and PV	5	Experimental plant for solar and wind electricity production
Djibouti	Wind	20	Ghoubet
	PV	50	Grand Bara Phase I
	Geothermal	50	Asal –Fiale Project
Egypt	PV	710	Completinig Benban 1500MW solar complex
	Wind	220	Gabal Al-Zayt
		120	Gulf of Al-Zayt
		200	Gulf of Suez
		40	Increasing the capacity of Gabal Al-Zayt project
		26	Kom Ombo
		20	Hurghada
Jordan	Wind	171	89MW in Shobak, 82MW wind Direct Proposals Round I
	PV	523	343MW Solar PV Panels Projects in Al Mafraq, AlQweirah and South Amman. 180 small scale projects
Kuwait	Wind and PV	70	Shagaya RE Complex
Lebanon	Wind	200	R1 of wind projects
	PV	2.95	Projects In cooperation with the United Nations development program
Libya	Wind	60	Darnah
	PV	110	Distributed projects in different sites
	CSP	25	Sebha
Mauritania	PV	30	Nouakchott
Morocco	Wind	150	Taza
		180	Midelt
		36	El Oualidia
	PV	72	Noor Ouarzazate IV
		85	Noor Laayoune
		20	Noor Boujdour
	CSP	200	Noor ourazazate II
		150	Noor Ouarzazate III

	RE Technology	MW	Project
Oman	Wind	50	Amal Oil Field Phase I out of 1021 MW plan
	PV	50	Dhofar Wind farm
Palestine	PV	20	Projects through direct proposal submission
		0.87	Solar projects for schools and the Precedential Building
	others	0.34	Electricity Generation Project from biogas in Hebron
Saudi Arabia	PV	300	Sakaka solar project
Tunisia	Wind	190	Bizerte
	PV	64	Distributed projects in different sites
	CSP	200	Tonor 1
UAE	PV	200	Mohammed Bin Rashid Solar Energy Complex - Phase II

Source: RCREEE focal points (2018), Arab Sustainable Energy Portal TaqaWay (2018)

3.2 Supporting Policies

The ambitious Arab states renewable energy targets can be achieved when supported by policies that mitigate the different sets of risks associated with financing and deployment of RE projects for the investors, lenders and other stakeholders. Some Arab country's utility scale renewable energy sectors can be considered at a reasonable level of maturity. This is mainly attributed to adopting best-fit policies of a dynamic-design nature to reflect changing market conditions. On the contrary, the decentralized small and medium scale RE solutions markets are, to a high extent, untapped, and this is mostly because of the absence or improper design of policies and implementation mechanisms to address these markets. The key supporting policies implemented in different Arab countries are competitive bidding, auctions, direct proposals, and net-metering with less reliance on feed-in tariff.

3.2.1 Competitive Bidding and Auctions

With IPP public competitive bidding and auctions, government anticipates to procur electricity at the lowest possible price and to minimize the risks, as prescribed by a request for proposal (RFP). The project developer undergoes a tendering process and when selected PPA is signed. IPP public competitive bidding and auctions are currently the preferred policy option for enabling private development of large-scale RE projects in the Arab region due to its financial efficiency and design flexibility.

Building on the strong success of leading Arab countries such as Morocco, the UAE and Egypt well elaborated in previous AFEX editions, over a dozen competitive bids and auctions for private investments were held over the past couple of years throughout Arab countries. The countries adopting some form of a bidding or auctioning scheme include Algeria, Bahrain, Egypt, Tunisia, Jordan, Kuwait, Lebanon, Oman, Palestine, Qatar, Saudi Arabia and the UAE. Most of the bids and auctions focused on solar PV and onshore wind as matured technologies. Nevertheless, the technologies of interest included storage, not only thermal storage for CSP plants, as the case is for Morocco and UAE, but also battery storage for PV systems in Lebanon and Jordan. Furthermore, pumped storage projects are under consideration in Egypt, Jordan and UAE in an attempt to face the challenges presented by the variability of renewable power and to add to grid stability. Small hydro projects started to appear on the scene in 2018, when Egypt added a 32 MW project on the river Nile.

Developers are continuing to run a cost race under competitive bids to add projects all over the region, reflecting the competitiveness of wind and PV power. Very low bid prices were observed across the Arab region. Prices reported in many cases near or below USD 30 per MWh. Saudi Arabia's latest wind project was awarded based on the levelized cost of energy of USD 21.3 per MWh, registering a new record-low price for a project of this type in Europe, Middle East and Africa. Correspondingly, a Saudi Arabian PV project revealed a price of USD 23.4 per MWh, and another PV power purchase agreement (PPA) was signed in the UAE at USD 24 per MWh. It should be noted that, tariffs as low as of USD 20 per MWh range have been negotiated in the Arab region, under optimized conditions for sites with high solar irradiation, a stable policy ecosystem as well as the deep engagement of local utilities as partners (shareholders) in the project offering measures to mitigate investment risks backed by some concessional finance.

Although perceived mostly as a scheme for large-scale projects, auctions and bids have been implemented for the first time in Algeria and Tunisia focusing on medium sized projects. In Algeria, an auction targeted installation of 15 PV plants of 10 MW each, distributed over 7 sites. In Tunisia, an auction targeted wind projects below a max capacity of 30MW each with a total of 130MW, and PV projects of capacities below 10MW each with accumulative capacity of 140MW. Two rounds have been announced at the end of 2018 for PV auctions and the price ranges are around USD 40 to 50 per MWh.

In UAE, after the successful operation of the 1.17 GW Noor Abu Dhabi solar plant in Sweihan, the Emirates Water and Electricity Company (EWEC) opened the tender for 2 GW Al Dhafra project and received 48 expressions of interest in developing and constructing the project from domestic and international developers. The successful bidder will secure a 40% stake in the project with the balance held by the Abu Dhabi Power Corporation and other, unspecified public entities. The solar field is expected to be operational during 2022.

Among the most recent calls are request for quotes (RfQ) for the Noor Midelt II solar project issued by the Moroccan agency for sustainable energy (Masen). The solar complex of 230 MW is expected to include CSP and PV technology as well as energy storage. The plant will benefit from a 25-year power purchase agreement. This follows several other Moroccan projects through competitive bidding schemes such as the 170 MW Noor PV I project, the 580 MW Ouarzazate Solar Power Station, a CSP-PV solar complex in the Drâa-Tafilalet region of central Morocco, the 120 MW Noor Tafilalet plant, tendered in 2017; the 200 MW Noor Argana project expected to be tendered in 2019; and seven PV plants under the Noor Atlas projects of 200 MW capacity in the south and east of the country.

In Egypt, the 250 MW wind farm - Ras Gharib - competitive bid contracts have been signed as build-own-operate, own and operate (BOO) project. The USD 400 million project location is an optimal site with more than 50% gross capacity factor and the energy will be sold under a 20 - year PPA to the Egyptian Electricity Transmission Company (EETC).

In Lebanon, after a thorough tendering process, three wind farms with a total capacity of 200 MW were signed in 2018 based on law 288 allowing the Lebanese Government to issue licenses to private sector entities to produce electricity based on the recommendation of the Ministry of Energy and Water and the Ministry of Finance. The licenses by the Government are followed by Power Purchase Agreements (PPA's) between the Government and the private sector. It is important to note that the wind energy projects are the first IPP projects in the history of the Lebanese power sector.

Bahrain's first IPP 100MW PV project has been awarded to a consortium led by the Saud ACWA Power. Bahrain's Electricity and Water Authority (EWA) awarded the contract after the

Bahrain's first IPP 100MW PV project has been awarded to a consortium led by the Saudi Arabia - based company - ACWA Power. Bahrain's Electricity and Water Authority (EWA) awarded the contract after the Tender and Auction Board selected the ACWA-led group over other contenders. The bid resulted in an electricity price of BD14.668 per MWh and is going to be implemented as a build-own-operate (BOO) project.

Oman Power and Water Procurement company (OPWP) has awarded a tender for the 500MW IPP Ibri II Solar, the largest and first utility-scale solar project in Oman, to a consortium also led by Saudi Arabia-based ACWA Power. OPWP conducted a competitive bidding process for the project and received bid proposals from three bidders. The estimated project cost is over USD 400 million and will be commercially operational by 2021.

Direct Proposal Submission

Four Arab countries including Jordan, Egypt, Palestine and Djibouti have resorted to direct proposal submissions, allowing developers to submit unsolicited applications to the government. This process allows for a power purchase agreement (PPA) to be signed on the initiative of the developer. Since it naturally requires less preparatory work from government, this process is usually faster and more direct. Direct proposals usually put greater responsibility upon the developer to find a suitable site for deployment. This is particularly difficult in Palestine where most rural land, suitable for larger scale RE systems, remains under Israeli control.

The Jordanian direct proposals submission scheme (DPS) is among the most successful schemes in the Arab region. It was allowed by the 2012 Renewable Energy Law. Jordan decided to follow direct proposal submission within competitive tenders or DPS rounds to satisfy the targeted capacity with proposals delivering the most value for money at high technical standards. Most of Jordan's renewable energy projects have been procured based on the DPS scheme. The DPS rounds are essentially a two-stage tender process with a distinct pre-qualification (PQ) stage, under which developer's experience and ability is implement the project confirmed, then a tender stage under which short-listed developers are invited to prepare proposals, given minimum technical requirements. Following pre-qualification, developers sign a Memorandum of Understanding (MOU) with the Ministry of Energy and Mineral Resources (MEMR), which regulates the project procurement and gives developers certain rights such as land access as well as extended Government support. After signing an MOU, the tender documents are released called - Instruction and Requirements for Proposal Preparation and Submission (IRPP). The tender package includes all necessary project agreements such as PPA, Grid Connection Agreement, Government Guarantee Agreement and the Lenders Direct Agreement. The tender is structured as a two-envelope process where technical compliance is established at first, followed by opening of the financial proposal and ranking of tariffs. The submitted tariffs by the developers have to be lower than the ceiling reference price, which is calculated, based on the mechanism issued by the EMRC in this regard. The strong growth in renewable energy development has largely been driven by strong Government commitment. This commitment was gained through a Government Guarantee, which ensures the payments for the electricity off-taker. At the end of 2018, more than 33 renewable energy PPAs are already either signed by NEPCO and some distribution companies or are in the final process of signing.

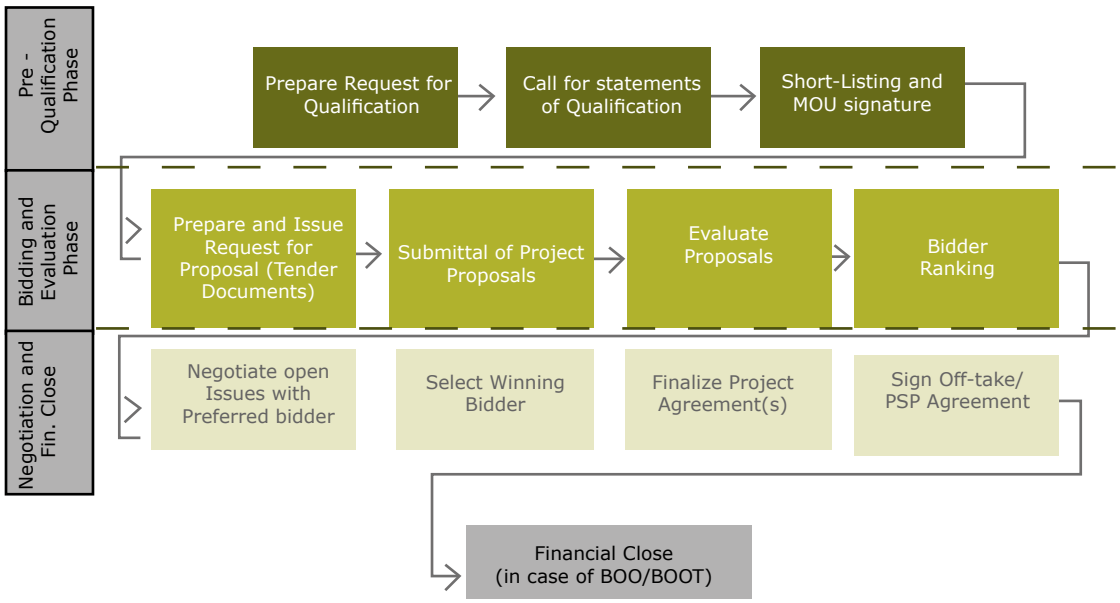


Figure 24: The procedure of direct proposals applied in Jordan

More than 1840 MW of renewable energy projects from direct proposals are at different stages in terms of implementation (constructed, under construction or under development) in which 669 MW is wind, 1134 MW is PV, and 40 MW is waste to energy. Additionally, a 30 MW energy storage project is under preparation.

In Egypt, a deal was announced in 2015 with Siemens for deploying large wind projects for up to 2000 MW in the Gulf of Suez and West Nile. The deal includes setting up a blade factory in Egypt to serve both domestic and regional markets. Nevertheless, no information was available on the project status.

In Palestine, the direct proposal scheme is known as the license scheme and was introduced in 2016. RE power producer can sign a PPA with the Palestine Energy Transmission Company Limited (PETL) and receives a tariff which is 10% below the actual IEC price, i.e. it fluctuates over time. In October 2017 there were about 2.2 MW under this scheme installed and 13 project applications with a total of 40 MW. For three of the projects a PPA was signed, eight were under construction with temporary licenses and two under study.

In Djibouti, the Ministry of Energy of Natural Resources and the Africa Finance Corporation (AFC) signed a contract for the implementation of a 60 MW wind project in Goubet complemented by also signing a PPA with the utility Electricity of Djibouti. Further, the Ministry of Energy signed a Memorandum of Understanding for a project to develop a 30MW Photovoltaic Solar Power Plant.

3.2.2 Feed-in Tariffs

Feed-in-tariff (FIT) are a market-based instrument used when the supply price has not reached grid parity and the incremental costs need to be covered. The FIT scheme enables RE prices to be competitive on the market and allows accelerated development in the early stages of RE market development.

Algeria, Egypt and Palestine have all opted to apply a fixed tariff rate for their FITs. Depending on the type of scheme and technology, some of these fixed rates are revised during the programs, but always according to pre-defined price levels and not according to market fluctuations (except with the FOREX rate fluctuations). This factor creates certainty for investors who know from the beginning how much support they can expect. FIT schemes in the region vary greatly in duration, scope, tariff structure and tariff levels; specifically in the way those levels have been determined.

The Egyptian FIT scheme was introduced in October 2014 and applied to both solar PV and wind projects. Tariff rates per kWh are technology-specific. For solar PV, tariffs are linked to the amount of installed capacity, while for wind projects, tariffs are determined by location and operating hours. The FIT has proved to be an investment puller scheme in Egypt, as over 130 applicants have been qualified for the first round of the FIT in Egypt for utility scale projects and over 150 for PV rooftop installations. Nevertheless, until October 2016, only three utility scale PV projects had reached yet financial closure this is due to a host of reasons, including the readiness of associated documents such as the power purchase agreement as well as the clarity of the administrative process and the large number of entities involved. Also, securing foreign currency lending and arbitration have been reported as a subject of long discussions. A second round of FIT was announced in Egypt in late 2016 for two years, addressing most of the challenges of the first round. The second round resulted in signing PPAs with 29 project companies to establish a co-located solar PV IPP project, Benban solar park, named after a Nile River village close to the power plant. The solar park is among the largest solar plants in the world and is set to operate at full capacity during 2019. The FIT guarantees signing a 25-year contract with the state-owned Egyptian Electricity Transmission Company (EETC), at a rate of USD 78 per MWh. The FIT projects have been financed at a total of around USD 2 billion, producing almost 1.5 GW of solar power. The FIT projects on the Benban site will be connected to the Egyptian high-voltage network through four new substations. These substations will in turn connect to an existing 220 kV line, which passes nearby the Benban site at a distance of approximately 12 km. The International Finance Corporation (IFC) approved USD 660 million in funding to 13 feed-in tariff (FIT) projects in Benban. These projects are worth a total of USD 730 million and have a total capacity of 500 MW. Also, the European Bank for Reconstruction and Development (EBRD) finances several solar projects as it pledged USD500 million in funding framework for the FIT project. The FIT scheme window was switched to an auction scheme for utility scale projects. For small and medium scale projects, the net-metering scheme was amended to allow for PV projects up to 20 MW. Egypt announced that the second FIT round for solar PV and wind projects is the last round, justified by the fact that sufficient liquidity have been attracted to the market.

Algeria's FIT scheme was adopted in 2013, allowing a substantial growth in its PV installed capacity. It applied fixed tariff rates where the previous scheme used premium price tariffs. The design of the scheme is similar, yet slightly more complicated than the Egyptian FITs. In Algeria, renewable power projects were subjected to a specific regime based on a 20-year power purchase agreement ("PPA") with one of the four distribution grid operators, which all are subsidiaries of the State-owned Sonelgaz Group. These projects receive preferential regulatory FIT applicable to the electricity produced. Projects with an installed capacity superior to 1 MW are eligible on an "open-door" basis. In order to benefit from FIT, producers need to apply to the Algerian energy regulator, the "Commission de Régulation de l'Electricité et du Gaz" ("CREG"), for authorization. To qualify, producers must satisfy a number of criteria, including holding an operation authorization and a certificate that guarantees the origin for key materials, both delivered by the CREG. Finally, additional authorizations such as building permits and environmental impact assessments are required. The subsidized feed-in tariffs are financed through a National Fund for Renewable Energies and Cogeneration (Fonds National pour les Energies Renouvelables et la Cogénération), established by a 1% tax levy on the state's oil revenues, and through other resources or contributions, including a premium paid by end-users.

The Algerian general investment framework is rather restrictive. To qualify for Algerian FIT, 51% of local ownership is required and financing must be structured through local banks. In addition, foreign investment projects must be submitted to the National Investment Council (CNI) for its approval. Sonelgaz represented by the dedicated subsidiary company is partnering with investors and accordingly 23 PV plants in the Highlands and the South are already constructed with a total capacity of around 350MW at the end of 2018.

Palestine has adopted FITs in 2012, through the Palestinian Solar Initiative (PSI) with eligible systems 5 kW. In 2014, the FIT scheme was stopped altogether due to financial constraints. In 2016, the FIT scheme was re-introduced with a focus on households and small commercial businesses. By 2017, some 400 out of 1000 envisaged systems with a total of 870 kW were installed and connected to the grid. In 2017 it was decided to open the FIT scheme for all residential projects until 20 MW are reached.

3.2.3 Net Metering

Net metering is a billing approach designed to encourage consumers to install RE systems, for self-consumption primarily, while the excess electricity is fed to the grid. The excess electricity is typically used to offset the consumption in the following periods. The net metering mechanism is becoming of interest to the Arab utilities as it is perceived as having lower financial burdens when compared to purchasing the full generation at a preferential price FIT. Furthermore, it has flexibility allowing for energy banking for later use or compensating the consumer with a predetermined tariff. Both concepts are applied in the Arab region. For the consumer, the bill-saving value is more attactive if the electricity tariff structure is divided in tariff-blocks, since it allows consumers to reduce their peak consumption and avoid the costly tariff blocks.

In the region, seven countries, (Bahrain, Egypt, Jordan, Lebanon, Tunisia, UAE and to some extent Morocco) have adopted net metering policies.

The net metering in Jordan targets mainly small-scale PV systems in areas, such as households and small commercial buildings. Net metering regime is organized mainly by the "Directive Governing the Sale of Electrical Energy Generated from Renewable Energy Systems" related to Article 10/B of the RE & EE Law N°13 of 2012. The Directive has referred to different cases for net-metering, such as the conditions for existing and new single-phase users, the conditions for existing and new three-phase low voltage users, and the conditions of three-phase medium voltage users. The Directive specifies the mechanism for calculating the value of electrical energy consumption, where the Distributor shall make a monthly billing and annual settlement between the electrical energy in kWh exported by the User and the electrical energy imported by the User from the distributor's network. The annual settlement can be either on financial basis (capped to 10% of the energy imported from the grid) or on an energy basis where the surplus is rotated to the next year. The total installed capacity of net-metering systems in December 2018 is 248 MW.

Bahrain approved the net metering policy by Cabinet Resolution no. 2 of 2017 and appeared in the National Gazette on 28 December 2017. The net metering regulations set by the Electricity and Water Authority of Bahrain (EWA) are considered among the most matured in the region and all its relevant documentation is available on EWA website including: EWA approved list of solar equipment; connection guidelines; inspection and testing guidelines, design recommendations, standards for PV systems connected to the distribution networks; PV connection processes; as well as several other forms for application and eligibility criteria and checklists and a list of approved contractors and consultants. (By end of 2018, and within a few months of the initiation of the scheme) ,26 contractors were qualified by EWA to install solar PV systems.

In Saudi Arabia, a net metering scheme for residential PV installations was approved in 2017 by the Electricity and Cogeneration Regulatory Authority within "Small-Scale Solar PV Systems Regulations". The regulations apply to systems up to 2 MW, while the regulations for higher capacities are under preparation. The PV systems under the Saudi net metering scheme are connected to the distribution network with two conditions; the first is that the accumulated capacity of all PV systems in the distribution region do not exceed 3% of the peak load in the previous year; the second condition is that the PV systems capacity to feed a specific transformer are less than 15% of that transformer.

Tunisia offers other net metering conditions depending on the grid level the consumer is connected to. For consumers connected to a low-voltage grid, the policy has been designed in such a way that no monetary transfer is ever needed; any net excess electricity at the end of the billing period is rolled over to the next period. To prevent electricity excess levels from becoming too high, the policy forbids prosumers from installing a higher capacity of solar PV than the capacity they subscribed to the previous year (Decree n° 2009-2773). For actors connected to the medium or high-voltage grid, it is allowed to produce and sell surplus electricity as long as it is limited to 30% of the annual production. Since the retail tariff for electricity within this sector is time-based, the net metering scheme employs a time of use design. This scheme has been successfully combined with the national Prosol-Elec initiative providing a grant and a bank loan, allowing net metering subscribers to pay off their loan directly via their electricity bill. The scheme targeting small-scale actors has been popular and reached by mid-2018 the total installed capacity of around 45MW connected to low voltage grid, while the part of net metering targeting consumers on the medium and high-voltage level reached 15MW.

Egypt adopted a net metering policy in the beginning of 2013 and stopped its program, when FIT was introduced. As the FIT was frozen in 2018, Egypt resumed its net metering program. The limit of projects eligible for net metering has been increased from 500 kW to 20 MW. The currently applied scheme allows monthly energy deferral until end of the year and the net energy will be purchased at reduced-price set by the regulatory agency.

Net metering has initiated not only demand on small and medium scale PV projects but also innovative business models for captive markets and private to private PPAs. At the end of 2018 about 250 PV companies were registered for installing small scale PV systems, and according to data received by NREA from about 95 companies the installed capacities of grid-connected projects exceeded 65 MW.

In 2014, the UAE's Executive Council allowed for rooftop PV systems to operate under a net metering system. The net metering scheme was officially launched by Dubai Electricity and Water Authority (DEWA) in March 2015 through Shams Dubai initiative. The net metering approach relies the surplus to power exported DEWA's network to be deducted from future energy bills. Shams Dubai initiative allowed residential, commercial and industrial buildings constructed to beneFIT from the net metering scheme. As of March 2019, DEWA has installed and connected 1,276 solar panels on the roofs of residential, commercial and industrial buildings in Dubai, with a total capacity of about 81 MW. DEWA has partnered with 19 governmental organizations sponsoring a total of 37 projects under the Shams Dubai initiative, including schools, mosques, and villas under the umbrella of the Mohammed bin Rashid Al Maktoum Housing Establishment. DEWA has made available the conditions and requirements for Shams Dubai, as well as lists of enrolled consultants and contractors, and eligible equipment. The installation process starts with the customer contacting one of the solar consultants or contractors accredited by DEWA to study the possibility of installing the solar power system and suggest the best solution. The contractor then obtains the necessary approvals from DEWA. These include a NOC for installing solar power and connecting it to the power network, and approval that its design meets all requirements. After obtaining the necessary approvals, site works are undertaken. DEWA has registered, 85 contractors and 11 consultants at the end of 2018. Similarly, in late 2017, Abu Dhabi Distribution Company (ADDC) launched a net-metering program to allow residents and businesses to add solar PV rooftop systems to generate solar electricity for their own electricity use, with any excess fed back into the grid in exchange for credit on the subsequent power bill.

In Palestine, a net metering scheme has been in place since 2015, where systems of up to 1 MW are eligible. Net metering is done on a kWh basis. Imported and exported electricity are netted at the end of the month. If a surplus gets generated by the end of the month, 75% of the surplus kilowatt hours get remunerated at the IEC price. The remuneration of the surplus improves bankability of the projects. The focus of this scheme in Palestine is on commercial entities. In early 2018 there was around 4 MW registered under this scheme.

in 2008, by virtue of the Law 16-08, Morocco allowed any natural or legal person to produce electricity for their own needs. This law made self-production subject to authorization and conditions and provided a ceiling for self-generation by industrial sites from 10 MW to 50 MW. Later, Law 13-09 of 2010 made it possible to also sell RE electricity through the medium or high-voltage grid to a third party. In 2015 Law 58-15 introduced the net metering scheme for solar and wind power plants, allowing private investors to sell the excess electricity production from renewables to the national network of High Voltage (HV), Very High Voltage (VHV) and Low Voltage (LV), with a cap of 20% of the annual production. However, the market liberalization of renewables on medium and low-voltage is still awaiting the completion of detailed executive regulations and implementation frameworks to enable the access to medium and low voltage networks. Decree 2-15-772 set out conditions and rules for progressive opening of the medium voltage network to RE generation. However, it was adopted only in 2015 and has not been fully implemented yet. An implementing decree on low voltage is in the approval process. Legislation requires distribution companies to specify the amount of RE generation that can be integrated into the low and medium voltage networks in each distribution zone or so-called "RE envelopes". This would correspond to between 5% and 10% of the total generation in each zone.

Table 13: Net Metering Policy

	Net Metering Policy	Projects Implemented through Net Metering Scheme
Bahrain	Cabinet Resolution no. 2 of 2017 and appeared in the National Gazette on 28 December 2017	Yes
Egypt	Decision of Egyptian Electric Utility and Consumer Protection Agency (EgyptErA) (2013) Net-metering Circulars 2 and 3 (2017) on net-metering.	Yes
Iraq	No net metering policy in place yet, but Ministry of Electricity is considering a net metering scheme to support the development of distributed renewable energy systems.	-
Jordan	Law No 13 (2012) on Renewable Energy and Energy Efficiency Directive governing the sale of electrical energy generated from RE systems issues by the Council of Commissioners of Electricity Regulatory Commission pursuant to Article 10 (b) of the Renewable Energy and Energy Efficiency Law No 13 (2012).	Yes
Lebanon	Decision of Board of Directors of Electricité du Liban (EDL).	Yes
Morocco	Law 16-08 (2008), Law 13-09 of (2010) and Law 58-15 (2015)	-
Palestine	Decree approved by the cabinet in March 2012 decision No 13/127/16 on the use of Renewable Energy.	Yes
Syria	Electricity Law No 32 (2010).	-
Tunisia	Decree of the Ministry of Industry, Energy and Small and Medium-Sized Enterprises No 2009-2773 (2009),	Yes
UAE	"Shams Dubai" net metering scheme. Abu Dhabi net metering program.	Yes

3.3 Energy Subsidies

As government budgets in the Arab regions are under pressure for a host of reasons, reforming energy subsidies is a main focus in the Arab region to alleviate fiscal pressures and allow the redirection of spending to other national priorities. The fragile situation in many Arab countries such as Syria, Libya and Yemen due to political unrest represents a real challenge to attract investments in the energy sector. Nevertheless, it also represents an opportunity for increased reliance on distributed renewable energy solutions to overcome the damaged and weakened power infrastructure and serve the people's needs. Continuous energy price reforms and the implementation of VAT have been observed across the region, including GCC countries, which were typically characterized by heavy energy subsidies (the latest are Bahrain and Oman in 2019).

There are multitude of definitions for energy subsidies. The wideset support is given to the legal definition that is adapted by WTO (164 members) within the Agreement on Subsidies and Countervailing Methods (ASCM) in 1994. ASCM deems a subsidy to exist if there is any income or price support and/or if there is any financial contribution by a government or any public body within its territory. Governments opt to implement fuel and electricity subsidies for social reasons. However, in multiple cases subsidies exist due to successful lobbying by beneficiary industries. Energy subsidies typically result in fiscal burden for the government. Eliminating subsidies would save untold billions of dollars, which would decrease the fiscal deficit and more money would be available to be spent on other priorities like health or education.

While energy subsidies aimed at protecting consumers, not surprisingly, energy subsidies do more harm than good. There are macroeconomic, environmental, equity and social implications when they are implemented. Energy subsidies hinder growth in many areas. Subsidies can result in lower profits and discourage investment in the energy sector. The difference must be paid – mostly - through the budget that can crowed out growth-enhancing public spending like health and education. Lower energy prices creates incentives for smuggling. If the domestic prices are significantly lower than in adjacent territories, illegal trade activities to smuggle products to higher-priced destinations with thrive. Energy subsidies may benefit upper-income groups. Households benefit from lower prices both through energy used for lighting, heating, and public transport but also through services that use energy as an input at subsidized prices. Negative externalities raised from energy usage are increased, as lower energy prices not only cause overconsumption of the energy products but also reduce the incentive for investments in renewable energy and energy efficiency projects. The aggravation of global warming, the incremental increase of local pollution, greater, traffic congestion, higher rates of accidents and road damage are all examples of externalities that are caused by the overconsumption of energy products. The latter consequence can be mitigated by what so-called post-tax subsidies, while the other implications can be eliminated by pre-tax subsidies. A pre-tax subsidy exists if the price paid by the consumers is below the supply and distribution cost. Post-tax subsidies arise from inefficient tax level. In other words, energy products should be taxed to alleviate the negative externalities caused by the consumption of the energy products such as global warming and local pollution. In addition, consumption taxes would help to finance the public expenditure by the increased revenue.

Although there are many methods for subsidy measurements, price gap approach is one of the most widely used methodologies to quantify energy subsidies. The basic equation for calculating price gaps is straightforward (Price gap = Reference Price – End User Internal Price). The formula examines the difference between the price the consumers are paying and the price that they should pay for the same energy source. Calculations for fuel subsidies like gasoline and diesel are different from electricity subsidy calculations. This variation exists mainly for two reasons. While the fuels are international traded goods, (so the supply cost for calculating subsidies is referenced to the international price), the electricity is a network-based utility with a limited amount that can be traded. Given this limited tradability, the appropriate benchmark price is the cost-recovery price with reasonable rate of return for the supplier. The second reason is that fuels have linear pricing whereas electricity has – in most cases – non-linear pricing. Block tariffs, time of use tariffs, and seasonal tariffs are all examples of non-linear pricing. For electricity, the subsidies could be a result of low (regulated) electricity prices, or due to high costs that are incurred from inefficiency, or both of them and the latter is usually the case in most countries that subsidize electricity prices. The losses that result in a high subsidy bill are either normative or excess losses. Normative losses are those due to technical reasons, like losses in transmission and distribution lines. These losses can be reduced but not eliminated. Excess losses (inefficiency cost) are losses due to improper maintenance, inadequate metering, bad billing practices and electricity theft.

From the above, the conclusion is that it is challenging to calculate the exact amount of electricity subsidies for each individual Arab country. The main reason is the lack of available information that is required make these calculations. The approach is to show the difference in electricity tariffs among Arab countries and use these tariffs as a proxy for electricity subsidies. As a reference price, Palestine's retail electricity tariffs were selected. Electricity in Palestine is almost unsubsidized and, therefore, represents the approximate true retail cost for a specific energy mix used for power generation. In all other Arab countries, the national governments currently set the prices. In other words, the goal of this method is not to calculate the exact amount of subsidies, but to provide a general idea of the magnitude of subsidies in the electricity sector.

The figures below illustrate the electricity prices in the residential, commercial, and industrial sectors. These figures are based on estimated average monthly electricity

figures are based on the estimated average monthly electricity consumption by different segments of consumers in 20 Arab countries. For residential customers, the average consumption is 500 kWh per month, for commercial customers 1,500 kWh per month, and for industrial customers 30,000 kWh per month. Most of the countries represented in this report subsidize electricity tariffs and fossil fuel prices.

Over the past few years, several countries have recognized that subsidizing fossil fuel prices is problematic and have started to adopt subsidy reform programs and to adjust energy prices. Despite these efforts, the overall subsidy rate remains high for both fossil-fuel-exporting and fossil-fuel-importing nations in the region.

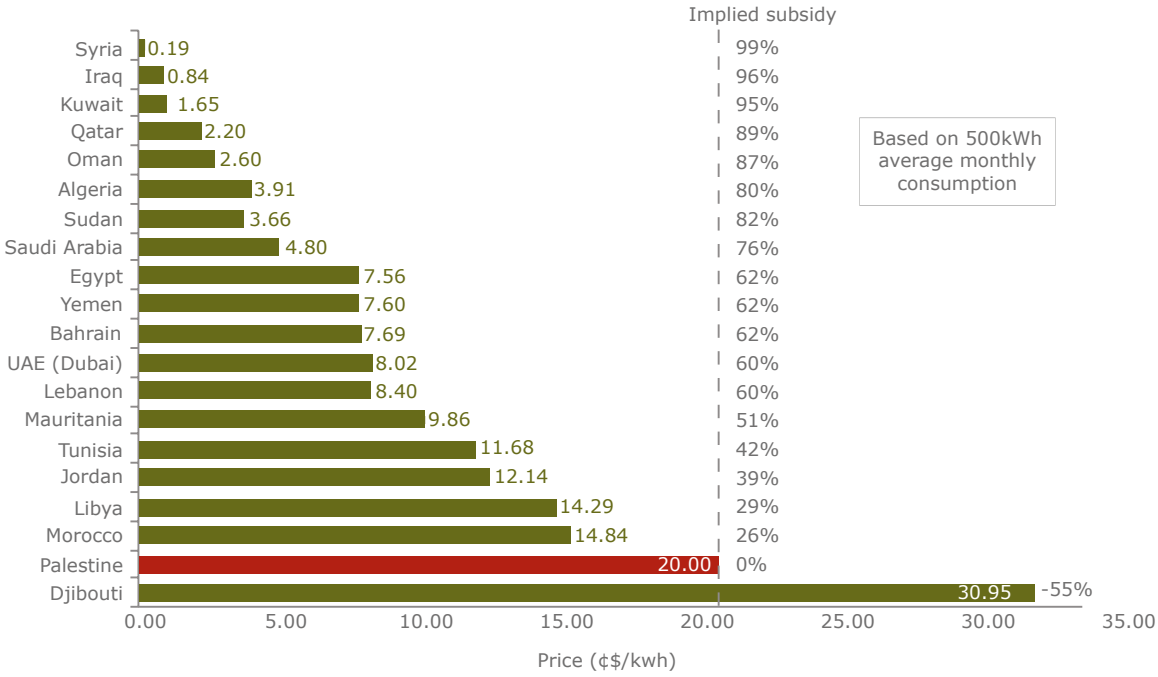


Figure 25: Residential sector electricity tariff (2018) in Arab countries

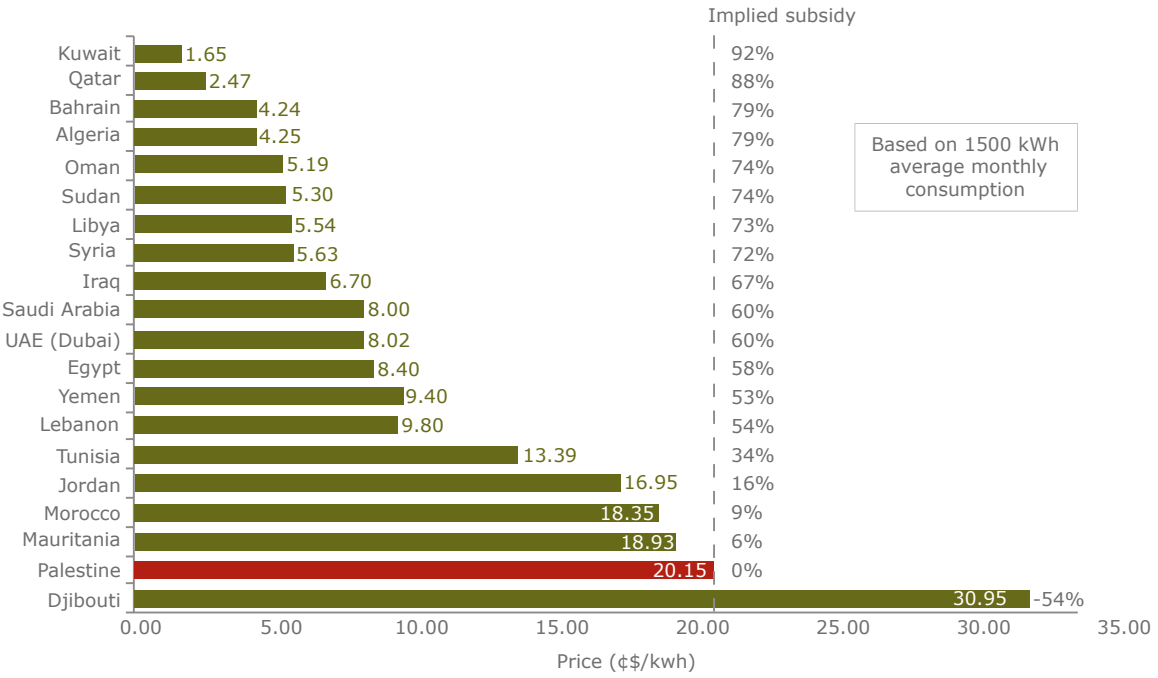


Figure 26: Commercial sector electricity tariff (2018) in Arab countries

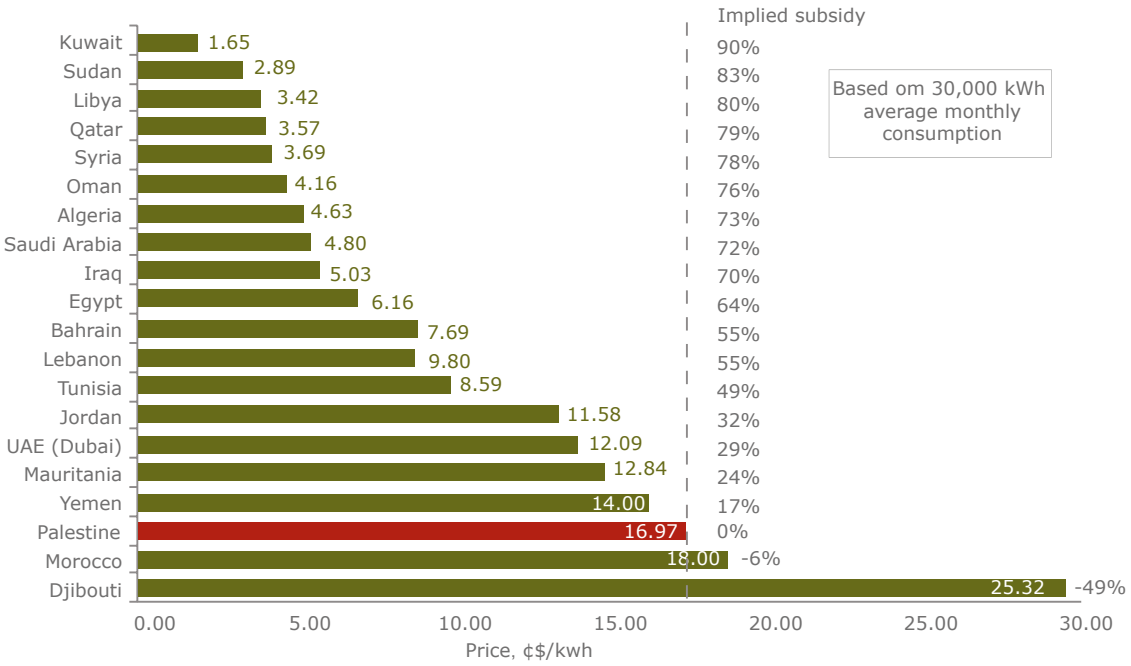


Figure 27: Industrial sector electricity tariff

It is important to note, though, that these figures are indicative as they only show the difference in price between countries at a certain level of consumption. These tariffs also do not consider the fixed charge or the demand tariff. Both of them can have a considerable impact on the final price paid by the customer. In addition, the electricity tariff rates are often pegged to the voltage and level of consumption and can thus vary greatly.

Fluctuating oil prices causes a fluctuating fiscal burden. When oil prices increase, the fiscal burden for oil-importing countries increase. When oil prices decrease, the revenues for oil-exporting countries follow suit and the fiscal stress rises. The Arab region has both types, fossil-fuel-importing countries, and fossil-fuel-exporting countries. The next figure shows the effect of oil prices on oil importers and exporters.

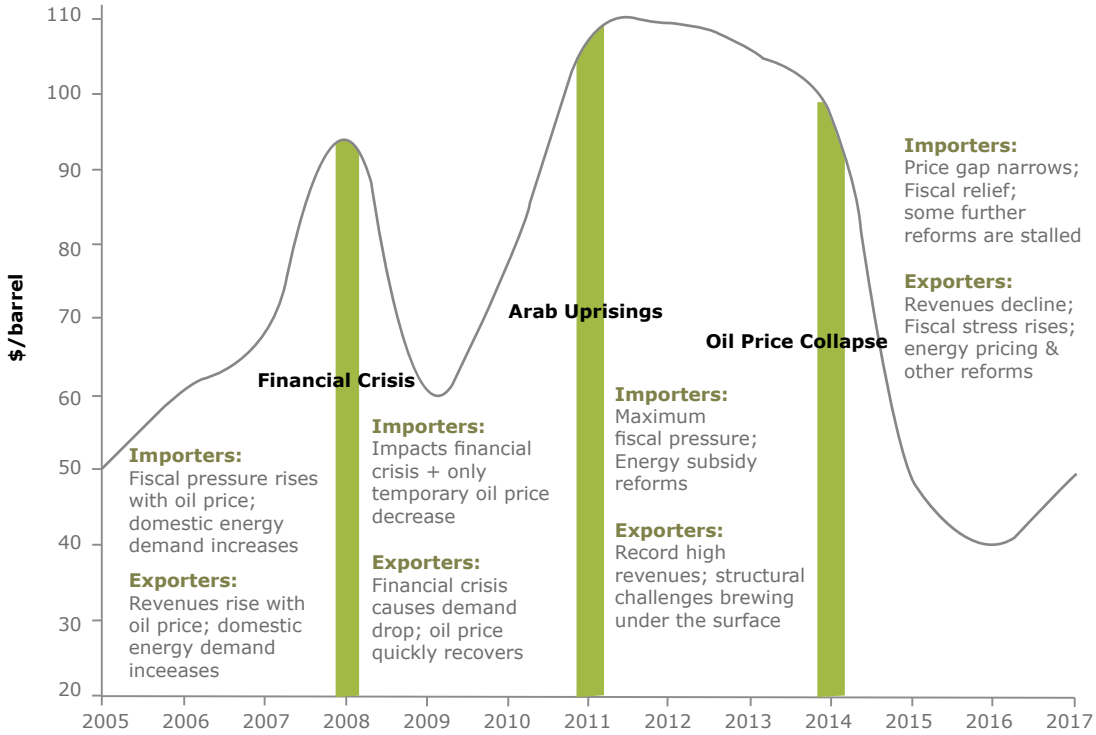


Figure 28: Oil prices trends, Source: International Institute for sustainable development, 2018

This roller coaster effect puts pressures on the Arab nation's leaders to take decisive actions and apply subsidy reforms. It is not surprising that many Arab countries adopted subsidy reform programs. Bahrain, Egypt, Jordan, Saudi Arabia, Tunisia, Oman, and the UAE have all shown diligence in implementing subsidy reform efforts in the electricity sector.

Currency exchange rates also have effects on the subsidy reform. For example, **Egypt** started its subsidy reform in 2014 with 5 year plan to totally remove the subsidy. In late 2016, the Egyptian pound was devaluated close to half. In October 2016, residential sector consumers (500kWh/month) used to pay USD 0.06 per kWh. The following month they paid USD0.03 per kWh. In response to that the Ministry of Electricity announced that the plan to remove subsidies would be extended to the fiscal year 2021-2022. In the beginning of fiscal year 2019-2020, the minister of electricity announced the new tariffs. Effective July 2019, the electricity tariff has increased around 15%.

For electricity generation in **Tunisia**, only 3 percent the total generation comes from renewables, which makes the country vulnerable to oil price fluctuations. In 2017 energy subsidies were estimated to be around 2.3 percent of GDP which represented one-third of the fiscal deficit. Electricity subsidy share is around 34 percent. A road map to eliminate electricity and gas subsidies by 2020 was defined. The new tariffs have not yet caught up with the currency devaluation and rising oil prices.

Jordan cooperated with the IMF to introduce fuel price reforms. The main challenge is electricity tariff adjustment. Price reform was planned but remain unimplemented. The cabinet announced on July 2019 that there will be no increases in electricity tariffs, instead, the cabinet will focus on cost reduction that is based on purchase prices from the companies that generate electricity.

Low oil prices have affected **Saudi Arabia** fiscal budget. In 2015, nearly all fossil fuel prices were increased. Electricity prices followed a suit in 2018. Households with an electricity consumption equal to or below 6,000 kWh/month experienced an increase in the tariff, from USD0.01 per kWh in 2016 to approximately USD0.05 per kWh starting 2018, while electricity tariffs for higher consumption households were unified at a level of USD0.08 per kWh. In fact, the new rate for the residential category represents a more than 200% increase for the customers in the lowest use group.

Bahrain faces higher fiscal pressures than other gulf countries. Bahrain does not have oil reserves like its neighbors. Austerity measures had to be introduced in recent years such as a value-added tax and higher prices for water and power consumption. Electricity prices were raised for the residential sector from USD0.0159 per kWh in 2016 to a unified tariff -flat rate- of USD0.0769 per kWh for expatriates and Bahrainis with more than one account.

In August 2016, **Kuwaiti** authorities announced reforms for energy prices. In September 2016, the government started to raise electricity tariffs. Law no.20 in 2016 outlines these rising prices. Residential villas and apartments were exempted for the reform. However, any other sector experienced the reform with unified price of USD 0.083 per kWh for the commercial sector and USD0.033 per kWh for the industrial sector.

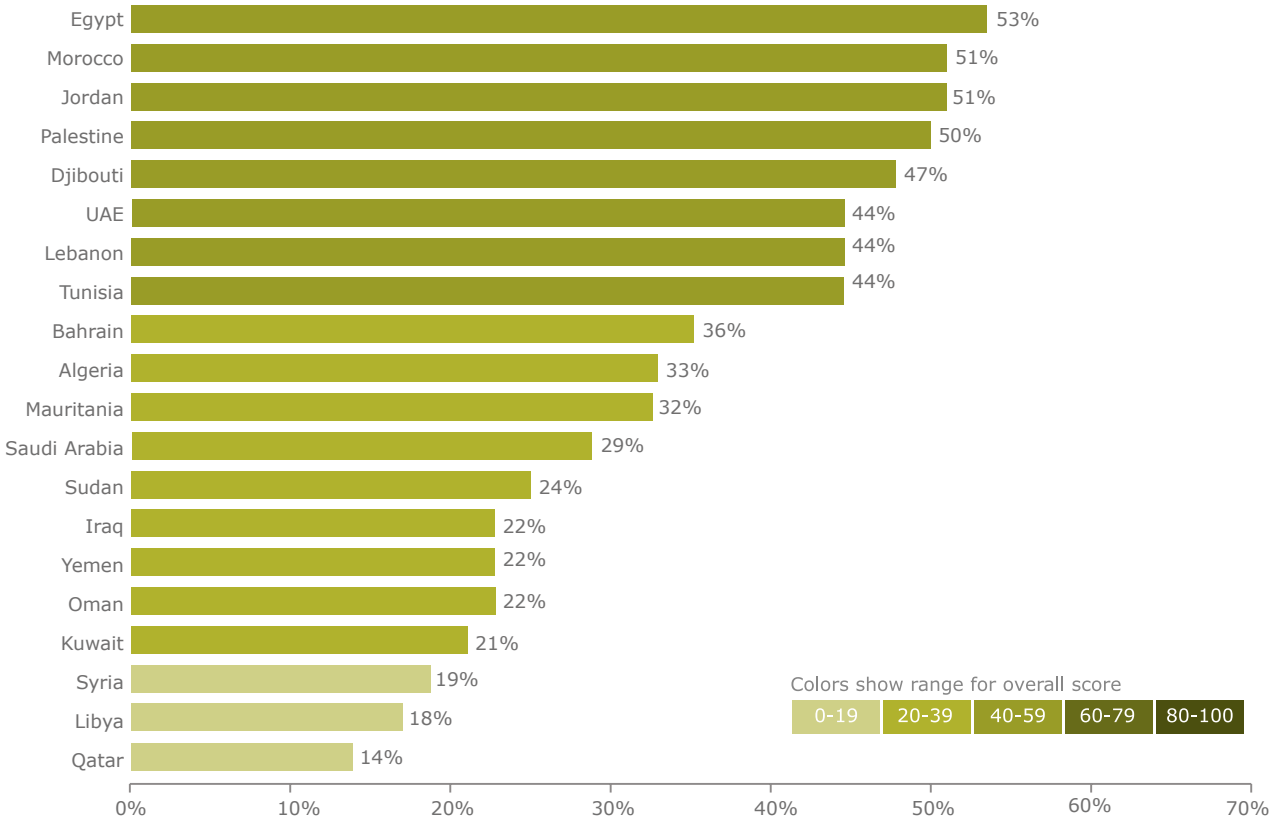
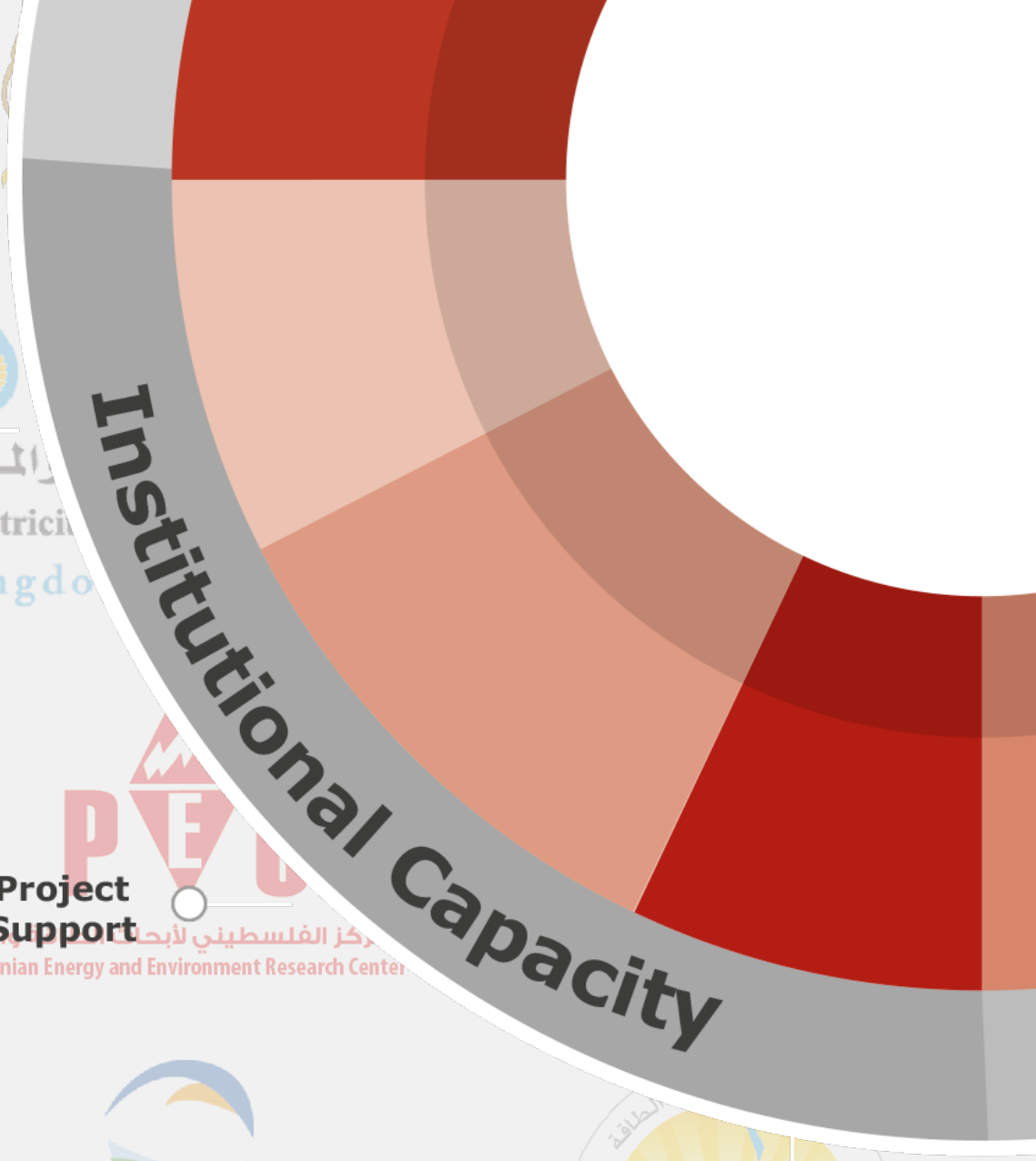


Figure 29: Policy Framework Final Scores and Ranking


Institutional Capacity
RE Institutions
Project Support
Governance Quality

4 Institutional Capacity

The Institutional Capacity category assesses each state's ability to design RE policies and to institutionally support the deployment of RE projects. Indeed, a strong institutional capacity is critical to ensure RE targets are met. The Institutional Capacity category looks into the following three segments: (1) RE institutions; (2) project support; and (3) governance quality, explained in the next table along with their 8 associated indicators.

Table 14: Institutional Capacity Evaluation Factors and Indicators

Category	Factors	Indicator	Score/Measuring Unit
Institutional Capacity	RE Institutions	Independent Regulator	Established by law; under establishment; non existent
		RE Agency	Established by law; under establishment; non existent
		Capacity of RE institutions	Expert assessment from 1 to 10
	Project Support	Resource Quality Assessment	Detailed wind atlas published and available to public; detailed solar atlas published and available to public
		Land Access	Land allocated for private development of large-scale wind projects; land allocated for private development of large-scale solar projects
	Governance Quality	World Bank Ease of Doing Business Index	Rank under World Bank Ease of Doing Business Index
		Global Competitiveness Index	GCI scores
		Bertelsmann Stiftung's BTI Status Index	BTI Status Index Scores

4.1. RE Institutions

4.1. Independent Regulator

Setting independent, transparent and cohesive regulatory frameworks for the power sector is necessary to ensure a functioning, open and trustworthy power market for investors. The presence of an independent regulator would help securing fair competition in the market and ensure consumers protection. The regulatory bodies typically are entrusted to set tariffs, issue licenses, evaluate the power sector's performance and enforces legal provisions for market operations. In the region, most of the Arab countries have established regulatory agencies, and in particular those countries committed to unbundling their power market. Nevertheless, it is common for many of these regulators to be subjected to political interference and to have their regulatory decisions relatively influenced by the government as they somehow act as advisory bodies to the government. In most countries, transferring the responsibility from government-controlled authorities to independent regulators has proven to be challenging. Hopefully, Arab regulatory agencies will transit to become fully independent. In countries with no regulatory agency, national utility operators or transmission systems operators usually perform associated functions.

Table 15: Electricity Regulatory Agencies

	Electricity Regulatory Agency	Power Off-taker for Large-scale RE Projects
Algeria	Commission de Régulation de l'Electricité et du Gaz (CREG)	Société Algérienne de Gestion du Réseau de Transport de l'Electricité (GRTE)
Bahrain	Nonexistent	Electricity and Water Authority (EWA)
Djibouti	Service des Réglementations de la Direction de l'Energie	Eléctricité de Djibouti
Egypt	Egyptian Electric Utility and Consumer Protection Regulatory Agency (EgyptERA)	Egyptian Electricity Transmission Company (EETC)
Iraq	Nonexistent	Directorate of Transmission Directorate of Transmission Project
Jordan	Energy and Minerals Regulatory Commission (EMRC)	National Electric Power Company (NEPCO)
Kuwait	Non existent	Ministry of Electricity and Water
Lebanon	Non existent	Electricité du Liban (EDL)
Libya	Department in the renewable Energy Authority of Libya (REAOL)	Renewable energy Authority of Libya (REAOL)
Mauritania	Autorité de Régulation Multisectorielle	Société Mauritanienne d'Electricité (SOMELEC)
Morocco	National Electricity Regulatory Authority (ANRE)	Office National d'Electricité (ONE)
Oman	Authority for Electricity Regulation	Oman Power and Water Procurement Company (OPWP)
Palestine	Palestinian Electricity Regulatory Council (PERC)	Palestinian Electricity Transmission Company Ltd. (PETL)
Qatar	Nonexistent	Qatar General Water and Electricity Corporation "KAHRAMAA"
Saudi Arabia	The Electricity and Co-Generation Regulatory Authority (ECRA)	Saudi Electricity Company (SEC)
Sudan	Electricity Regulatory Authority (ERA)	Sudan Electric Transmission Company (SETCO)
Syria	Non existent	Public Establishment for Electricity Generation and Transmission (PEEGT)
Tunisia	Nonexistent	Société Tunisienne d'Electricité et du Gaz (STEG)
UAE	Abu Dhabi Regulation and Supervision Bureau (RSB)	Dubai Electricity and Water Authority (DEWA); Abu Dhabi Water and Electricity Authority (ADWEA)
Yemen	Non existent	Public Electricity Corporation (PEC)

4.1.2 RE Agency

Many Arab countries have established dedicated RE agencies, and in some cases sustainable energy agencies. Their mandate is typically to address institutional and administrative barriers including complicated, lengthy, and non-transparent procedures within the investment processes and the involvement of too many public authorities, as well as lack of clarity of institutional framework. Another key responsibility is to accelerate the development of RE through the design RE policies, streamline administrative procedures, assist in the deployment of private RE projects, and lead the deployment of demonstration and other public RE projects. An essential function of RE agencies is to ensure efficient use of existing human, capital, and technical resources in achieving RE targets as well as to raise awareness, conduct resource quality assessments and feasibility studies, and to promote research and development. RE agencies can act as counterparts in negotiating and coordinating donor agreements in countries receiving donor support for RE development.

Table 16: RE Institutional Stakeholders

	RE Policy Maker (Dedicated RE Department or Dedicated Agency)	Other Key RE Institutional Stakeholders
Algeria	Renewable Energy and Energy Conservation Directorate at the Ministry of Energy and Mines	Sharikat Kahraba Takate Moutajadida «SKTM», filiale du Groupe Sonelgaz Center for development of RE (CDER) Silicon Technology Development Unit (UDTS) Unit Development of Solar Equipment (UDES) Center for Research and Development of the Electricity and Gas (CREDEG)
Bahrain	Sustainable Energy Unit (SEU);	Electricity and water Authority (EWA);
Djibouti	Direction of Energy at the Ministry of Energy in charge of Natural Resources	Agence Djiboutienne de Maîtrise de l'Energie (ADME)
Egypt	New and Renewable Energy Authority (NREA)	Egyptian Electricity Transmission Company (EETC)
Iraq	Green Tourism Unit within the Ministry of Tourism	Research Center for Energy and Environment under Ministry of Science and Technology Research Center under Ministry of Higher Education and Scientific Research (universities and institutes) Energy and Environment Research Center under Ministry of Industry
Jordan	Renewable Energy Department at the Ministry of Energy and Mineral Resources	National Energy Research Center (NERC)
Kuwait	No dedicated RE department or agency in place yet	Kuwait Institute for Scientific Research (KISR)
Lebanon	Lebanese Center for Energy Conservation (LCEC)	UNDP – CEDRO and UNIDO – DREG Projects; The Lebanese Solar Energy Society (LSES) Industrial Research Institute (IRI) National Council for Scientific Research (CNRS)
Libya	Renewable Energy Authority of Libya (REAOL)	General electricity company of Libya(GECOL) under the ministry of electricity and renewable energy Center for Solar Energy Research and Studies (CSERS)
Mauritania	Department of Electricity and Energy Management (DEME) at the Ministry of Petroleum, Energy and Mines (MPEM)	Agency for the Development of Rural Electrification (ADER); Multisectoral regulation Authority (ARM); Agency for the Promotion of Universal Access to Basic Services (APAUS);
Morocco	Direction of Electricity and Renewable Energies at the Ministry of Energy, Mines, Water and Environment; Moroccan Agency for Sustainable Energy (MASEN);	Société d'Investissements Energetiques (SIE); Institut de Recherche en Energie Solaire et Energies Nouvelles (IRESEN); Centre National pour la Recherche Scientifique et Technique (CNRST)
Palestine	Palestinian Energy Authority (PEA) Palestinian Energy and Environment Research Centre (PEC)	Energy Research Centre (ERC) at An-Najah National University
Qatar	Qatar General Water and Electricity Corporation "KAHRAMAA"	Qatar Science and Technology Park (QSTP) Energy and Environment Research Institute (QEERI) Qatar Solar Technologies (QST)
Saudi Arabia	The Renewable Energy Project Development Office (REPDO) within the Ministry of Energy	King Abdallah City for Atomic and Renewable Energy (KACARE) Saudi Electricity Company (SEC), Saudi Aramco
Sudan	Directorate for Renewable and Alternative Energy within Ministry of Water and Electricity	National Center for Energy Research (NCR)
Syria	National Energy Research Center (NERC)	Scientific Studies and Research Center Higher Institute for Applied Sciences and Technology Research Centers in universities; mainly Damascus University Industrial Research and Testing Center
Tunisia	Agence Nationale pour la Maîtrise de l'Energie (ANME)	Centre de Recherche et des Technologies de l'Energie (CRTEN)
UAE	Ministry of Climate Change and Environment	MASDAR
Yemen	Renewable Energy Department within the Ministry of Electricity and Energy	Renewable Energy and electronic design Centre, University of Science and Technology Technical Centre for Training and registration – Dhahban, Public Electricity Corporation (PEC)

4.2 Project Support

4.2.1 Detailed Resource Mapping

The quality of renewable resources differs depending on the location, time, season and climatic zone. Accordingly, it is of vital importance for establishing a sound business case to identify and assess technically, feasibly, commercially, and economically competitive electricity generation potential of renewable resources. Developers perceived risks and consequently project costs can be reduced when detailed, accurate and reliable data on wind speed and solar irradiation are obtained. As a matter of fact, resource mapping and zoning exercises that identify priority areas for different technology options represent the first step towards projects site selection, technology preference and design optimization.

The following table introduces the status of various national detailed resource mapping initiatives. It shows that several countries in the region have issued detailed solar and wind atlases. However, the data are not often easily accessible to project developers, and results are not always available in electronic format for easier processing by developers to produce reliable energy yield prediction.

Table 17: Detailed Resource Mapping

	Wind Atlas Published	Solar Atlas Published
Algeria	Yes	Yes
Bahrain	-	Yes
Egypt	Yes	Yes
Iraq	Ministry of Science and Technology installed 9 towers to measure the wind potential	Yes
Jordan	Yes	Yes
Kuwait	Yes	Yes
Lebanon	Yes	No
Libya	Yes	Yes
Mauritania	No	No
Morocco	Yes	Yes
Oman	Yes	No
Palestine	Yes	Yes
Qatar	Mapping of resources is ongoing	Mapping of resources is ongoing
Saudi Arabia	Yes	Yes
Sudan	Yes	Yes
Syria	Yes	Yes
Tunisia	Yes	Yes
UAE	Yes	Yes
Yemen	Yes	No

4.2.2 Land Access

Facilitating access to land with high quality resources is among the most appealing elements that attract investments in RE. Several Arab countries have allocated specific areas for projects under different private IPPs policy schemes. The land access is facilitated without entailing excessive administrative burdens for developers. Typically other values are considered when performing the spatial planning beside the quality of the natural resource, such as social, economic, mining rights, military importance and environmental consequences of land use changes. Other aspects are also evaluated such as the socio-cultural impacts, water availability, food security, trade concerns, existing infrastructure, local content, and employment possibilities together with other sector-specific issues such as proximity to the grid and the distance to point of common coupling with plant.

The governance for land ownership in some Arab countries is rather complex. In some desert areas tribal communities consent is a prerequisite. There is an increased attention towards valued socio-economic components in project planning, development, construction and operation phases. Local acceptance is essential for long term viability of utility scale projects. From the perspective of developers, studying the valued of socio economic components should enhance the value proposition of the renewable energy offer during the bidding and implementation phases by providing deeper understanding of local needs and impacts, guidance to opportunities and processes to generate shared values at local and national levels, congruent with public expectations. Furthermore, provide guidance on the communications that project developers must put in place.

Most countries in the region have a registry for titles of legal ownership; nevertheless, participation is not always mandatory. The political conflicts also have affected many planned projects in the concerned Arab countries. The obvious examples of this are Palestine, Yemen, Libya, Syria and Iraq.

A clear process and timeframes to conclude land lease or usufruct agreements with the land owners, whether public or private, have proved to be essential if successful project development is envisaged. In many cases, the large areas needed for RE project development have multiple owners of land and developers have to negotiate with all landowners. Reaching final agreement and signing a land lease contract between multiple landowners delayed the process extensively in the first round of the Jordanian Direct Proposal Submission scheme. Transparent regulations and standard templates for land allocation agreements have proved to be successful to shorten the time needed and secure smooth land allocation process. In all cases, developers have to start very early the process of land acquisition from either private or state-owned entities.

It is necessary for Arab countries to identify and set priorities for lands available for renewable energy development in different regions within the country. This particular measure, when properly communicated, can accelerate the deployment of renewable technologies. All Arab countries pursuing utility scale renewable energy projects have earmarked or facilitated land acquisition for renewable energy development. The following are some examples.

In **Morocco**, the government has identified a number of priority development zones for RE projects. Any project larger than 2 MW must be located in one of those development zones. MASEN is the agency responsible for the allocation of land for renewable energy projects. This agency has far-reaching authority, including the possibility to expropriate private land for developing solar projects. There are no restrictions for foreign investors except for the use of agricultural land, which is only possible to lease for 99 years.

In **Egypt**, the New and Renewable Energy Authority (NREA) is responsible for the allocation of government-owned plots of land to developers wishing to establish solar or wind FIT or BOO projects. Wind projects can make use of the land for 20 years, and solar projects for 25. In both cases, land is leased to developers on a usufruct basis established at 2% of the energy sold. The land is allocated on a first-come first-served basis based on the investors' preferences and the plots' availability. The developers are granted access to the land for a period not exceeding fifteen months to undertake the necessary technical measurements and studies, upon the signing a memorandum of understanding for land access with NREA.

In **Jordan**, the government has identified a special zone to spur industrial development and innovation called the Ma'an Development Area. Within this zone, Jordan has delineated specific areas for development of solar projects. In addition, project developers can freely select sites for projects under the direct proposal scheme.

In **Dubai**, the authorities have identified a vast area of 48 km^2 for the private development of large-scale solar projects, the Sheikh Mohammed bin Rashid Al Maktoum Solar Park. Other Emirates such as Abu Dhabi has taken similar land allocation actions.

Kuwait allocated 100km^2 for the Shagaya Renewable Energy Park, to host wind, solar thermal and photovoltaic facilities. According to the Kuwait Institute for Scientific Research (KISR) in charge of the Energy Park master plan, the development of the park will occur in three phases: the first phase will be developed by the government and the second and third phases by private investors on a BOT (build-operate-transfer) basis for a duration of 25 years. Outside of the Shagaya site, the Ministry of Electricity and Water (MEW) in partnership with the Kuwait Authority for Partnership Projects (KAPP) have allocated lands for developing the 280MW Al Abdaliyah hybrid power plant project.

4.3 Governance Quality

International firms and investors are very cautious when it comes to investment. They are in continuous quest to balance between risk and returns. Investment in renewable energy projects is not a special case; having natural resources does not qualify the countries to attract foreign investments. Countries must have promising investment climate to attract best developers. Three indicators were selected: Ease of Doing Business, Global Competitiveness Index, and Bertelsmann Stiftung's BTI Status Index. These indicators evaluate the countries attractiveness and readiness for doing business. Regulatory performance is evaluated by World Bank Ease of Doing Business.

4.3.1 Ease of Doing Business

Regulatory performance is evaluated by World Bank ease of doing business indicator. It measures the gap of each economy from the top regulatory performer on each of the indicators across all economies in the Doing Business sample since 2005. An economy's ease of doing business score is ranked on a scale from 0 to 100, where 0 indicates the lowest and 100 indicates the best performance. For example, an ease of doing business score of 60 in Doing Business 2017 means an economy was 40 percentage points away from the top performer. For the same country, a score of 70 in Doing Business 2018 would indicate the economy is improving. Next table illustrates the difference in countries' ranks between 2016 and 2018.

Table 18: Countries Performance under International Ease of Doing Business Indicator

Economy	Global Rank (2018)	Global Rank (2016)
United Arab Emirates	21	31
Bahrain	66	65
Morocco	69	75
Oman	71	70
Qatar	83	68
Tunisia	88	74
Saudi Arabia	92	82
Kuwait	96	101
Jordan	103	113
Palestine	114	129
Egypt	128	131
Lebanon	133	123
Mauritania	150	150
Djibouti	154	171
Algeria	166	163
Iraq	168	161
Sudan	170	170
Syria	174	175
Libya	185	188
Yemen	186	170

Countries that had a reltively better rank compared to 2016 are Djibouti, UAE, Morocco, Kuwait, Jordan, Palestine, and Egypt. Djibouti and Palestine had impressive progress and climbed 17 and 15 places. UAE and Jordan progressed 10 places in the score. Oman, Tunisia, Qatar, Saudi Arabia, Lebanon, Algeria, Iraq and Yemen stepped back from 2016 ranking. Last two countries position was worsened due to their critical situations. Largest deterioration in ranking belongs to Yemen followed by Qatar. They lost 16 and 15 places respectively. The rest of countries jumped few places in the ranking .

4.3.2 Bertelsmann Stiftung Transformation (BTI)

The BTI statues index evaluates the overall state of development regarding political, economic, and socioeconomic aspects. The overall result represents the mean value of the scores for the dimensions "Political transformation" and "Economic Transformation". Higher scores indicate stronger performance.

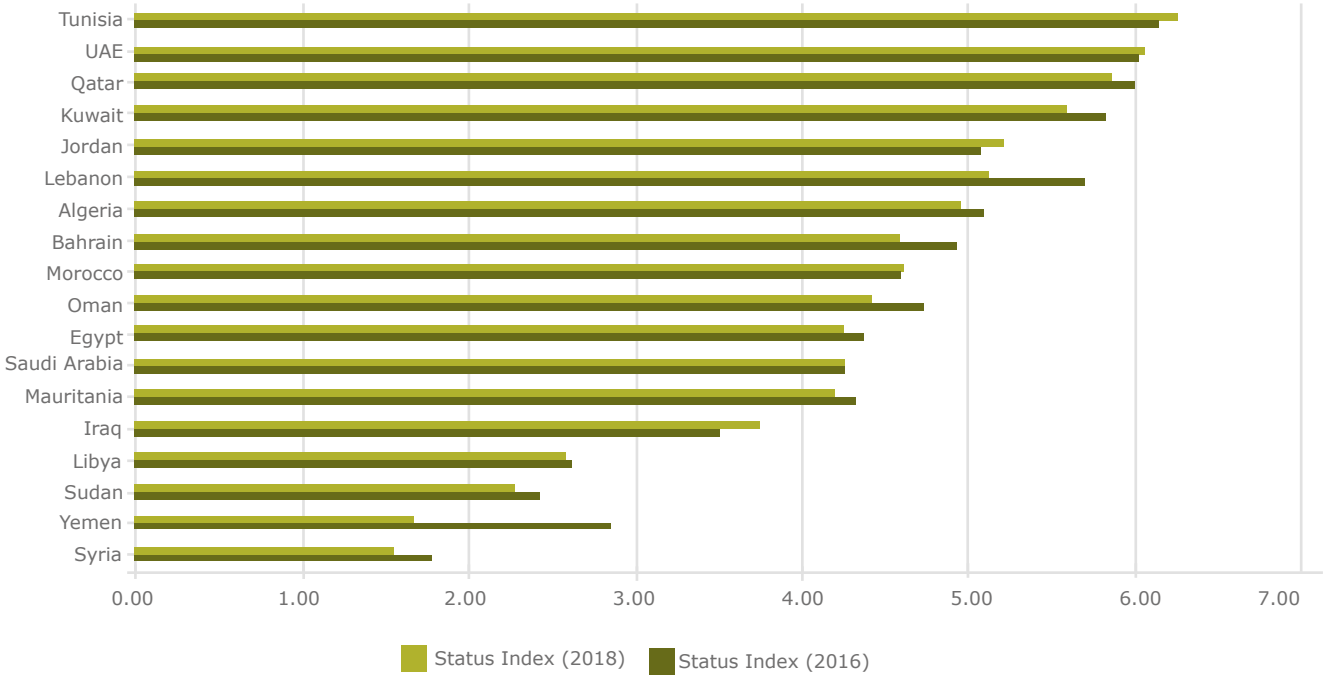


Figure 30: Difference between 2016 and 2018 BTI score

Regions:	Status Index (2016)	Status Index (2018)
Tunisia	6.15	6.27
United Arab Emirates	6.05	6.07
Qatar	6.01	5.88
Kuwait	5.85	5.61
Jordan	5.09	5.22
Lebanon	5.74	5.15
Algeria	5.11	4.98
Bahrain	4.96	4.62
Morocco	4.60	4.61
Oman	4.75	4.43
Egypt	4.40	4.28
Saudi Arabia	4.26	4.27
Mauritania	4.35	4.22
Iraq	3.53	3.75
Libya	2.64	2.60
Sudan	2.44	2.28
Yemen	2.91	1.72
Syria	1.80	1.57

Table 19: BTI score

Slight change in Arab countries' score has been noticed when comparing to 2016 score. Nevertheless, it is not the case for Yemen. Yemen score has dropped 1.19 point, due to the ongoing crisis. Three countries Iraq; Jordan, and Tunisia had improved their score. While Morocco, Saudi Arabia, and UAE have relatively the same score. The rest of the list had lost some points.

4.3.3 Global Competitiveness Index

The 2018 Global Competitiveness Index (GCI) report integrates well-established aspects with new and emerging levers that drive productivity and growth. The GCI framework is organized into 12 main drivers of productivity, or 'pillars'. These 12 pillars are defined in four main areas enabling environment, markets, human capital, and innovation ecosystem. The GCI Report is drafted to help policy-makers, business leaders and other stakeholders around the world to make sound decision based on well-analyzed data.

UAE and Saudi Arabia had a noticeable progress in the ranking leaping 10 and 9 places respectively. Jordan is the next runner with eight places breakthrough. Algeria and Bahrain, both jumped 6 places and are followed by Qatar that improved 5 places. Unfortunately, Lebanon did lose 25 places in GCI index. Followed by Oman with stepping back 15 places. Tunisia followed a suit and bled eight places. The rest of the countries have relatively same ranking

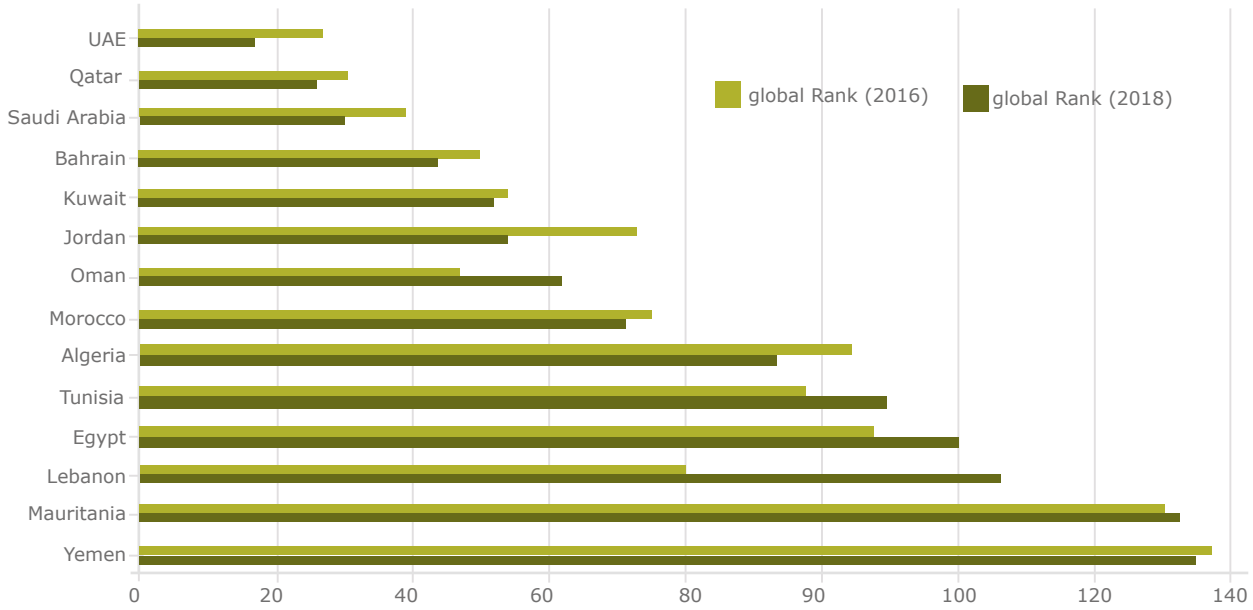


Figure 31: CGI ranking for 2016 and 2018

Country	global Rank (2016)	global Rank (2018)
United Arab Emirates	27	17
Qatar	30	25
Saudi Arabia	39	30
Bahrain	50	44
Kuwait	54	52
Jordan	73	56
Oman	47	62
Morocco	75	71
Algeria	92	86
Tunisia	87	95
Egypt	94	100
Lebanon	80	105
Mauritania	131	133
Yemen	139	137

Table 20: CGI ranking

4.4 Institutional Capacity final Score and Ranking

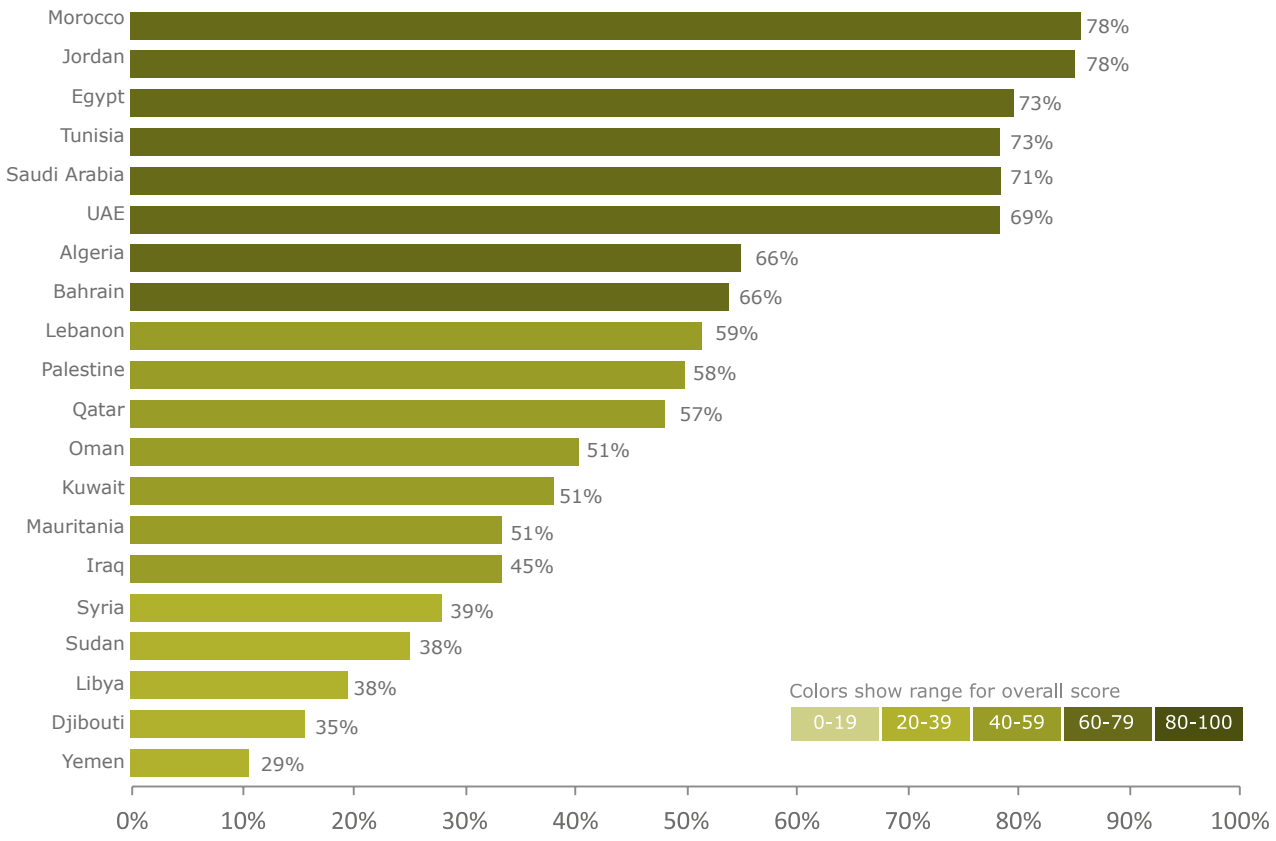
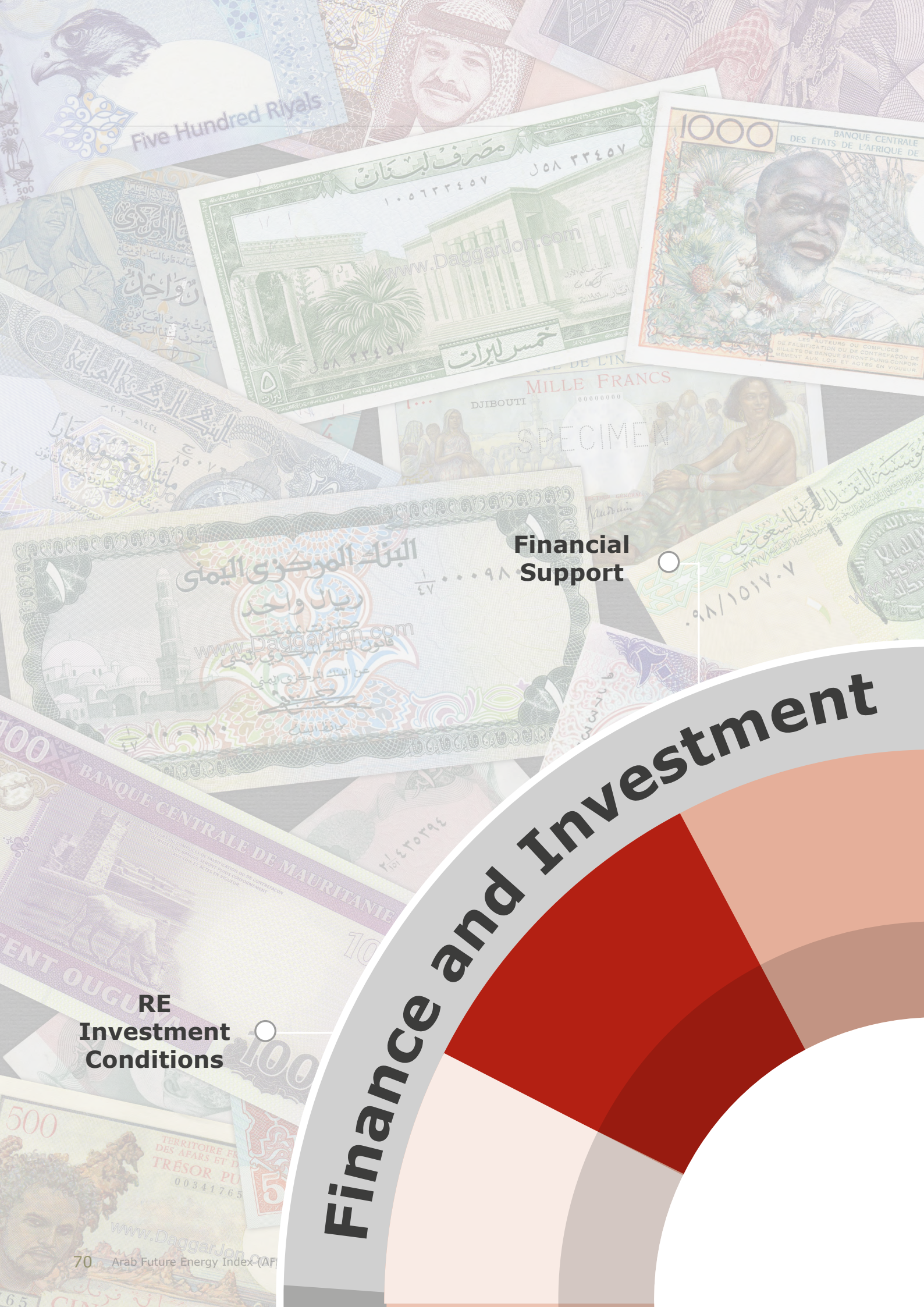


Figure 32: Institutional Capacity Final Scores and Ranking


Financial Support
Finance and Investment
RE Investment Conditions

5 Finance and Investment

The total accumulative investments in renewable energy projects over the past decade (excluding hydro) are estimated at around USD 15 billion compared to only USD 1.2 billion in 2008. This is a reflection of the fact that in 2008 only 4 Arab countries had operational renewable energy capacities, while in 2018, all the countries have renewable energy installations. The supporting schemes have also evolved and almost all common supporting schemes known worldwide are practiced by the market actors in the Arab region, such as competitive bidding, auctions, feed-in tariffs, direct proposals, net metering and variations of corporate sourcing of renewables business models. The current openness for private investments was not the case 10 years ago, where the dominant approach was relying mainly on state owned projects and the only way of private sector engagement was through the engineering, procurement and construction contracts. In 2018, Egypt and Morocco were over billion-dollar markets each.

It is estimated that power sector will represent more than one third of the total energy investments in the Arab region in the coming five years. The reasons behind are the increasing demand and the renewables growth. One third of the power sector investments in the region will be in renewable energy projects[11]. The expected accelerated renewable capacity additions are based on projects already committed or in the pipeline. AFEX 2019 observes a

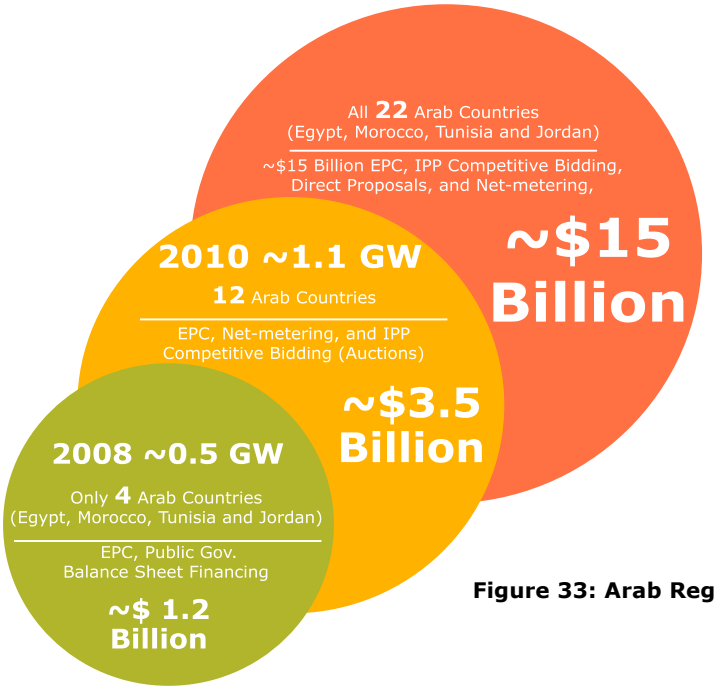


Figure 33: Arab Region Operational RE Projects, Excluding Hydro

The Finance and Investment category assesses two major factors: (1) the level of financial support provided by the state to RE projects; and (2) RE investment growth. Factors and indicators are summarized in Table 21

Table 21: Finance and Investment Evaluation Factors and Indicators

Category	Factors	Indicator	Score/Measuring Unit
Finance and Investment	Financial Support	Fiscal and financial Incentives	Number of fiscal and financial incentives for RE projects
		Mechanism to cover incremental costs of RE	Mechanism established by law; sources of financing are clear; disbursement procedure is clear; Operational
	RE Investment Growth	Share of Private RE Investment	Percentage of total RE installed capacity

[11] APICORP, 2019, "MENA Annual Energy Investment Outlook 2019", Arab Petroleum Investment Corporation.

5.1 Financial Support

5.1.1 Fiscal Incentives

Fiscal incentives, in the form of tax-related measures, are among the key issues affecting investors decision and have an impact on the overall attractiveness of the renewable energy sector in general, and the specific project in particular, in any country. Policy makers consider fiscal incentives as complementary tool to support a larger renewable energy policy and financing portfolio. The fiscal incentives can include among others: tax reduction or exemptions, tax holidays, tax credits, import duty exemptions, and accelerated depreciation. Tax reductions, exemptions and accelerated depreciation affect the total payable tax amount. Tax credits are mostly used to offset income tax payments by the end of the year. Table 20 provides an overview of various tax rates throughout the region.

Table 22: Tax Rates in the Arab Region

	Corporate Tax Rate (%)	Withholding Tax on Interest (%)	Withholding Tax on Dividends (%)
Algeria	23[13]	10	15
Bahrain	No corporate tax for most companies in Bahrain[13]	0	0
Egypt	22.5[15]	20	5-10
Iraq	15[16]	15	0
Jordan	20[17]	5	0
Kuwait	15	0	0-15
Lebanon	15	5-10	10
Libya	20	5	0
Morocco	10-31	10	15
Oman	12[18]	0	0
Palestine	15-20	0	10
Qatar	10[19]	7	0
Saudi Arabia	20[20]	5	5
Sudan	10-20	-	-
Syria	10-28	7.5	0
Tunisia	15-20	20	0
UAE	0[21]	0	0
Yemen	20[22]	10	10

Sources: ("Tax Guides and Country Highlights | Deloitte International Tax Source," n.d.)

[12] Special tax rules for hydrocarbon sector
[13] 46% for oil company
[14] 40.55% oil and gas companies
[15] 35% for hydrocarbon sector
[16] 24% for electricity generation
[17] 55% sale of petroleum
[18] 35% oil and gas operations
[19] 85% hydrocarbon
[20] 50-55% oil and gas companies, 20% foreign banks
[21] Varies greatly between sectors

The widely common tax-related incentive in the Arab region is exemptions from customs duty, which can be found, for example, in Jordan, Egypt, Libya, Palestine, Sudan, Tunisia, and Morocco. In addition, several other tax exemptions are granted in Jordan, Palestine, Tunisia, and Morocco. Customs duties and sales tax have the largest impact on the initial investment and construction stages. On the other hand, the withholding tax is applied when sponsors or lenders receive dividends or returns from their investment. It should be noted that during the commercial operation phase, the profit of the RE investment is mainly subject to corporate tax, which varies noticeably between Arab countries - from 0% in UAE to 30% in Tunisia. Countries have to work more on facilitating the use of these tax measures and ensure their applicability throughout the project lifetime.

Many countries have developed specific regulations and processes to qualify investors and projects for an exemption. Investors in Egypt, for example, have to obtain a certificate from NREA verifying that imported equipment is to be used for RE projects. In Palestine, investors need prior authorization from the occupation authorities, something that has shown to be complicated to obtain. Tunisia has allowed duty exemptions for renewable energy components that do not have locally manufactured substitutes. Jordan qualifies all renewable energy and energy efficiency systems for full exemption from sales tax.

In **Morocco**, large-scale investment projects over MAD 200 million can enjoy duty exemptions, and value-added tax exemption on all imported equipment, materials, and tools. Standard related tax rates in Jordan and Morocco indicate that considerable savings can be achieved if projects qualify for these exemptions. **Sudan** stipulates that all strategic projects, including electricity generation, are subject to an exemption from the corporate profit tax for a period of ten years. On contrary, Jordan, with a standard corporate tax rate of 20%, applies a higher tax rate for electricity production.

5.1.2 RE Funds

Many Arab countries have established sustainable energy funds, with the key objectives of facilitating finance incentives offered or backed by the government. The sustainable energy funds typically address both renewable energy and energy efficiency programs. The funds also can leverage financial resources from various national and international sources. The funds are typically intended to support establishing and putting into operation financial instruments and mechanisms that provides the market with concessional loans, grants, equity investments, subsidies, and others.

Table 23: Examples of Sustainable Energy Funds in the Arab Region

Algeria	National Fund for Renewable Energy and Cogeneration (FNER) established by executive decree No. 11-423 in December 2011 Sources of financing - 1% of oil royalties - Other sources and donations EU fund of €40 million to support Algeria diversify its economy and improve business climate, €10 million of which is earmarked for RE and EE projects.
Egypt	Green Environment Financing Facility (GEFF) with a €140 million investment Sources of financing: - European Bank for Reconstruction and Development (EBRD) - Agence Française de Développement (AFD) - European Investment Bank (EIB)
	Egypt PV Project Fund Sources of financing: - GEF Grant of USD2 million through UNDP for promoting on-grid decentralized PV projects
Jordan	Jordanian Renewable Energy and Energy Efficiency Fund (JREEEF) Sources of financing: - Annual budget allocations - Foreign donations
Lebanon	National Energy Efficiency and Renewable Energy Action (NEEREA) established by Central Bank of Lebanon in 2010 Sources of financing: - EUR 12 million from EU grant for RE projects - Central Bank of Lebanon (low interest soft loans)
Morocco	Energy Development Fund (EDF) with a total capital of USD 1 billion Sources of financing: - USD 200 million from Hassan II fund - USD 300 million from UAE - USD 500 million from Saudi Arabia
	Renewable energy fund (FER) established by SEI Sources of financing: - SIE contribution as equity investments in new and established companies focusing on wind projects
Palestine	Revolving Fund Source of finance: - Start-up capital from donor institutions
Syria	Fund for residential solar water heaters Source of finance: - Fund provided by the Ministry of Electricity
Tunisia	Fund for Energy Transition (FTE). Sources of financing: - Revenues from taxes on the first registration of cars and import or manufacturing of air conditioners according to the Law No 2005-2234 (2005) - Financial savings achieved as a result of EE activities - Donations

At least nine out of 20 countries have established, RE funds. One of the most successful RE funds can be found in Tunisia and has been formerly known as the National Fund for Energy Management (FNME) and was changed to the Fund for Energy Transition (FTE). The fund has been particularly successful in easing the access to commercial financing for small private investors. Jordan Renewable Energy and Energy Efficiency Fund (JREEEF) was established as the executive arm of the Jordan Ministry of electricity to fulfill the needs of the kingdom to invest in renewable energy and energy efficiency projects. Over the past four years, JREEEF implemented around JD50 million worth of renewable energy projects. JREEEF is working in various sector like residential, educational, health, public, industrial, and service sector. JREEEF facilitates the shift to renewable energy resources as a sustainable source of electricity and to reduce the subsidy bill presented by the government.

5.1.3 Other Financial Support

Improving access to finance is identified a priority for all Arab countries. Financing utility scale projects have benefited from traditional credit options, provided by IFIs as well as national resources. Decentralized RE solutions are facing the challenge of limited access to finance, particularly for SMEs, as the financial systems in the Arab Countries have been under different levels of maturity and reforms to foster financial stability and development and to enable entrepreneurial activity and spur sustainable energy growth. An increased engagement of local banks has been noticed over the last few years, where several financial instruments are currently available in leading Arab markets. There is a wave of interest in green banking activities, supported in many cases by international financing institutions and donors. Egypt, Jordan, Morocco, Tunisia, UAE and Yemen are examples of the Arab countries that have established entities that offer equity products to new and established companies and projects focusing on renewable energy solutions. In Yemen alone, RCREEE analysis with the support of World Bank Group have indicated more than 10 banks and micro finance institutions engaged in PV business. Interestingly, one of the governmental bodies in Yemen is the General Authority for Post and Postal Savings, which has 356 branches dealing with more than 60 suppliers selling their products including PV systems by installments. The role of the Authority is to collect the monthly installments and receive a 3% commission for this service.

In many countries, the financial support by International Financial Institutions (IFIs) in form of a credit line to local financial partners including banks and Micro Finance Institutions (MFIs) was crucial to secure renewable investments' loans. The local bank/MFI is aware that by the end of the lending period it will have to return the used fund to IFIs. In this model, risk-sharing principle fundamentally applies: the risk is shared between the borrower, the local bank/MFI, and the IFI.

Several banks operating in the region, adopt the model relies on loaning the capital needed to buy the renewable energy system (typically solar PV system) or loaning the system itself directly instead. The first case is the commonly exercised practice by local commercial banks in Arab countries, while the second case is adopted mostly by Islamic banking where the bank buys the system and rents it to the client in installments. The full property is then transferred to the client when the paid rents balance out the initial cost borne by the bank plus an ex-ante agreed amount. The model can be applied to a full upfront acquisition by the bank (known as Al-Murabaha finance) or to a share of the asset, the client thus paying the remaining part upfront (Musharakah finance).

An important development on the regional level is that the Union of Arab Banks, including Arab bankers and representatives of central banks pledged at the forum of green banking convened in July 2018 in Egypt to work together to develop a regulatory framework to encourage the Arab financial sector to actively contribute to financing sustainable development projects.

Corporate sourcing of RE in captive markets are getting increasing interest. New business models are emerging in the Arab region as a result of the net-metering and wheeling regulations. Several customers sign agreements with private independent power producers to purchase a specific amount of energy or specific output from certain renewable energy asset for predetermined amount of time. For newly built asset, the duration of project is typically not less than ten years and can be extended to 25 years. Several customers are opting for building their own renewable energy plants or get into joint venture agreements with Energy Service Companies providing and ensuring the installation, operation and maintenance of the renewable energy system (PV mostly).

Vodafone Egypt calls tender for 50-MW solar project - report

March 12 (Renewables Now) - Vodafone Egypt, a unit of British telecoms giant Vodafone Group Plc (LON:VOD), has opened a EGP-500-million (USD 28.7m/EUR 25.5m) tender for a solar park that will be able to provide 50 MW of capacity for its networks, news service Mubasher reports.

Vodafone

The move is part of the company's pledge to start using 100% renewable electricity for its global operations by 2025. As it announced last summer, the British telecoms group will seek to sign power purchase agreements (PPAs) and build on-site renewable energy installations across its technology centres and base station sites.

Specific details about the Egyptian tender were not announced.

As part of its sustainability goals, Vodafone also intends to cut greenhouse gas emissions from its network business 40% by 2025 by focusing on energy efficiency solutions.

(EGP 10 = USD 0.575/EUR 0.510)

Companies operating in many Arab countries markets are facing the increased energy prices due to subsidy reform programs and responding to corporate social responsibility requirements through deployment of on-site or off-site renewable energy systems, to generate power for their own use. In most direct investments in self-generation, the company becomes responsible for the entire project life cycle, from commissioning to de-commissioning, assuming the associated risks and financial responsibilities and reliance on local green banking instruments to improve the project conditions. In some markets, alternative models involve a third party developer installing an on-site system for self-generation under a lease (or similar) agreement, thus limiting the end user's risk. Even though such arrangements involve a third party and often some sort of PPA, they are usually categorized as self-generation.

Another important trend is that ten Arab countries directed national petroleum companies to launch investment programs in renewable energy, such as Algeria, Bahrain, Egypt, Kuwait, Morocco, Qatar, Saudi Arabia, Syria, Tunisia and UAE. The engagement of different oil companies in renewable energy projects offers excellent opportunities for sustainable transition towards becoming renewable energy companies from the wider perspective and maintain the leading position of the Arab region in the future energy markets.

Another business model is on-bill programs that refers to a unique method of financing renewable energy investment in which the utility bill is used as the vehicle for repayment. Typically, a utility or third-party lender funds customers' projects, who then repay investments through additional charges on their regular utility bills. This concept has been successfully adopted in **Tunisia** Prosol Program for promoting solar installations.

It is also practiced in **Dubai** via the scheme established its Super ESCO, Al Etihad Energy Services Company- Etihad ESCO, which is an initiative by the Dubai Electricity and Water Authority (DEWA) under the leadership of the Dubai Supreme Council of Energy (DSCE) to create a viable market for building energy efficiency including solar PV rooftop solutions.

Probably, among the promising business models emerging in the region is the model of providing financial support to sizeable entities. Clients aiming to take the loan and relend it to benefit a wider range of users, whether they are PV suppliers (ready to act as ESCOs), energy cooperatives, community service organizations, etc. The borrower ensures the necessary mechanisms to receive the monthly installments from the end users (the use of mobile money would be a convenient means to reduce transaction costs). This model is particularly fitting the support provided for users in remote areas, often with lack of financial and technical knowledge, where also a group of small users "team up" through a representative entity that can collect larger guarantees and therefore access finance, which is not possible if borrowed "alone". The clients take the risk of having an effective installment collection system that in some cases includes mobile money service. The model has been promoted recently in **Yemen**.

Among the noteworthy new financial instruments appearing recently in the Arab region are the bonds and Sukuk. Green bonds are a fixed-income security designed to raise capital for low-carbon or clean energy investments, while Sukuk is a form of Islamic compliant bonds. The Moroccan Agency for Solar Energy (Masen) has issued Morocco's first green bond to help to finance the country's development of solar power. The 1.15 billion-dirham ($118 million) bond issue to finance three schemes that form part of the NOOR PV 1 solar power project of at least 170 megawatts. The Arab's first corporate green Sukuk was launched by the UAE's company Majid Al Futtaim and was listed on the Nasdaq stock exchange in Dubai and valued at $600 million (Dh2.20 billion). The investment will aim to finance and refinance the company existing and future green projects, including green buildings, renewable energy, energy efficiency, and sustainable water management.

5.2 RE Investment Growth

The Arab region has become among the most attractive regions worldwide for private investments, reflecting a higher level of investor confidence in the legal system, institutions, supporting mechanisms and, above all, the profitability of RE projects.

All Arab countries have opened or in the process of opening its markets to private investments. At least four countries created state-backed private sector companies to invest in RE projects, such as Masdar in UAE and Masen/SIE in Morocco, SKTM in Algeria and lately Libya. Morocco, Jordan, Egypt, UAE, KSA and Algeria lead Arab RE competitive markets, other countries are following with sizable project calls such as Tunisia and Kuwait. International funding institutions are active in the region (WB, KfW, AFDB, EIB, IFC, EBRD, JICA, etc.). Most of private sector projects are moving more towards solar PV technologies then wind. The region has worldwide flagship solar and wind projects, with very competitive electricity prices, especially in KSA, UAE, Morocco and Egypt. Such prices are possible because of the excellent solar and wind energy resources, backed by some concessional finance coupled with policy measures to reduce the various risks and to encourage investment. Jordan, Tunisia, Palestine and Lebanon leverage decentralized investments with pioneering financial solutions. The following table gives a snapshot; as of 2018, for private sector capacities including those tendered and awarded and under construction. The table covers projects above 10MW capacity.

Table 24: Solar installations offered for private investments for projects above 10MW capacity in 2018

	Awarded/Tender	Construction/Operation
Algeria	200	368
Bahrain	100	-
Egypt	1000	1894
Iraq	700	-
Jordan	252	125[a]
Kuwait	1500	60
Lebanon	900	40
Libya	20	5
Morocco	800	925
Oman	600	1021[b]
Qatar	700	-
Saudi Arabia	30	458[a]
Tunisia	644	10
UAE	950	2350
Yemen	-	400

(a) Includes projects below 10 MW
(b) This is an EOR project, measured in MWth
(Sources: MESIA, RCREEE)

In countries like Egypt, Tunisia and Lebanon, the increased level of private sector investments in renewable energy projects was perceived as a sign of improvement for the general investment climate. In Egypt, the total investment in FiT and BOO IPP schemes have exceeded USD 2 billion, through more than 30 consortiums, pledging their own equity as well as debts from international and commercial lenders such as the International Finance Corporation (IFC) providing USD660 million in funding to 13 FiT projects in Benban, near Aswan out of projects total investments of USD730 million. The European Bank for Reconstruction and Development (EBRD) contributed to the finance of a total of 16 FiT solar projects through pledging USD500 million. In Lebanon, the first round of IPP wind projects where three projects signed PPAs with a total exceeding 200MW, represents a historical milestone as these are the first IPP projects in the Lebanese power sector in general. The projects are being followed by another wind round of up to 400MW, and two solar projects rounds of 180MW and 360MW respectively. In Tunisia, the bidding and auction schemes have not relied on state sovereign guarantees, reflecting the trust in the utility (STEG) as reliable energy offtaker. All GCC countries, as well as Morocco and Algeria, created very attractive investments conditions with support of the strong financial positions and partnerships offered by their utilities and the size of the renewable projects tendered. Most of the projects awarded or tendered were solar PV projects. The surge in PV investment across the Arab region is expected to continue as countries are setting ambitious targets, together with policies addressing both utility scale commercial installations as well as decentralized rooftop installations.

It is predicted that, the 20 largest PV markets will account for 83% of new global demand up to 2023 – among these fastest movers are Egypt and Saudi Arabia[12]. Not only the markets are attractive, but also the Arab investors have positioned themselves solid in the renewable energy market. Consortiums led by Masdar, ACWA Power, Abdul Latif Jameel and others have won several utility scale solar and wind projects of hundreds of megawatts all over the region through teaming with reputable international companies and ensuring finance conditions that lead to very competitive cost of electricity. In conclusion There is clear Pan-Arab commitment to embrace strong forward-thinking policies and capture the immense value of the RE business. the market response to the Arab region renewable energy business has been overwhelmingly positive, demonstrating market confidence in the region's vast renewable energy potential and investment environment[13].

[12] https://www.woodmac.com/news/editorial/10-trends-shaping-the-global-solar-market-in-2019

[13] For example, a consortium of Masdar, Green of Africa and EDF Renewables was named successful bidder for Morocco's Noor Midelt Phase 1 multi-technologies solar power plant of 800 MW, offering advanced hybridization of CSP and photovoltaic PV technologies. Masdar and EDF Renewables are also partners in Shua'a Energy 2, led by Dubai Electricity Water Authority (DEWA) for the 800 MW third phase of the Mohammed bin Rashid Al Maktoum Solar Park in Dubai, and are also partners in Saudi Arabia's Dumat Al Jandal 400 MW wind farm.

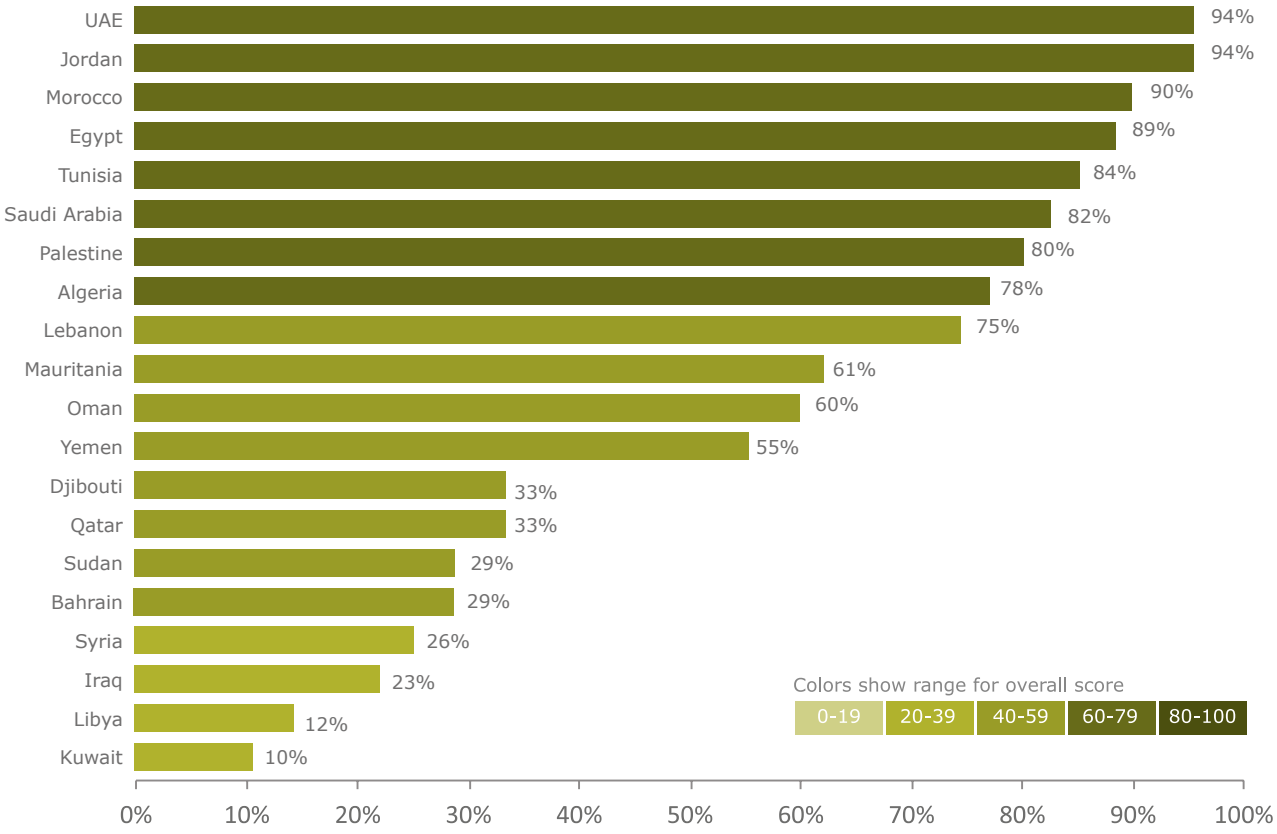


Figure 34: Finance and Investment Final Scores and Ranking

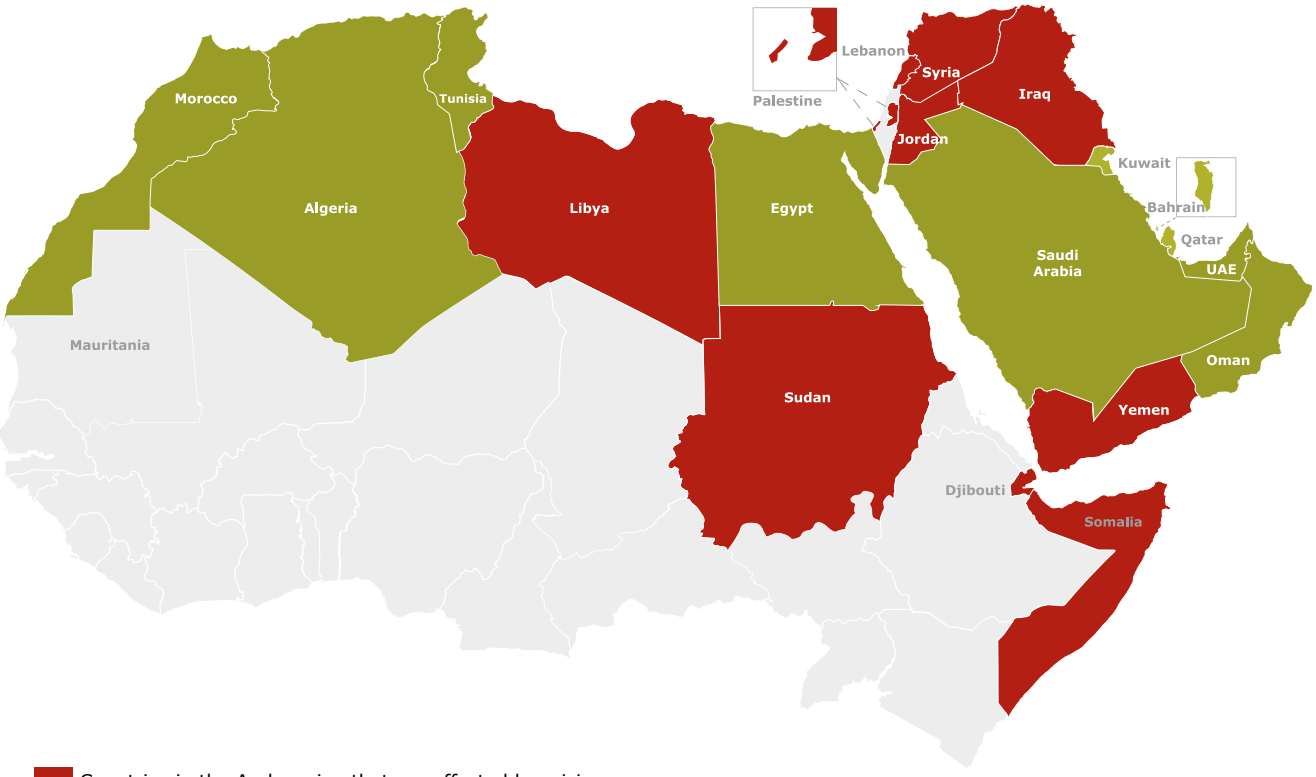
Policy Framework

6 Renewable Energy in Crisis Contexts: Closing the Energy Gap

While the four core pillars noted above – market structure, policy frameworks, institutional capacities and scaling up finance – are foundations for accelerating renewable energy solutions across the region, their application is particularly challenging when it comes to the crisis contexts. Sustainable Development Goal 7 (SDG 7) on energy calls on countries to "ensure access to affordable, reliable, sustainable and modern energy for all." Among those most in need are the record number of refugees and internally displaced persons (IDPs) in the Arab region resulting from conflict.

Energy has arisen as a key challenge for countries facing conflict as well as those seeing growing levels of fragility owing to influx of refugees and internally displaced persons (IDPs) from neighboring countries. This includes Djibouti, Iraq, Jordan, Lebanon, Libya, Palestine, Somalia, Sudan, Syria and Yemen, most of which already faced strained levels of energy security prior to the expansion of crisis. In all such countries, the ability of communities to cope with and rapidly recover from crisis hinges in many ways on their ability to regain access to energy. Rather than reverting to expensive, import dependent solutions such as diesel or oil, increasingly these countries seek solar solutions to meet community needs while building foundations for a sustainable energy future.

In crisis contexts, energy helps achieve community access to water, to social services like health and education, to transport and communication needs, and is critical for regenerating livelihoods and local economies. But too often countries affected by crisis are unable to bring back online the type of energy systems needed for an effective recovery. Constraints often exist to extend energy access to displaced communities, either owing to ongoing conflicts and destruction of power grid infrastructure, or from lack of fiscal space and limited ability to expand already-stretched energy supplies. In such contexts, decentralized renewable energy solutions are now receiving greater attention, as a way of meeting the needs of affected communities while setting the foundations for resilience.



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In such communities, expanding use of decentralized energy solutions is important not only for short-term needs, but also form a longer-term development perspective as it helps reduce pressures on host communities and fiscal pressures on the State. As in other countries in the region, the ability to scale-up renewable energy solutions in crisis contexts is also dependent on the four AFEX pillars. The ability of countries in crisis to establish market structures, policy frameworks, institutional capacities and investment models tailored to their unique political, social and economic risk profiles is in many ways a litmus test for achieving SDG 7 and expanding sustainable energy solutions in a way that leaves no one behind.

This is a core focus for UNDPs cooperation in the region. Out of $500 million of UNDP grant assistance projects today in Arab countries on climate change, energy and the environment, about $200 million is dedicated specifically for meeting the dire needs of communities in crisis contexts. A main focus of this cooperation in crisis contexts is on strengthening policy and institutional capacities to overcome barriers to greater investments into solar solutions, and to scale up tangible investments for solar solutions that meet emergency needs at the local level. This includes a tailored approach that addressed high levels of complexity, reduced clarity of institutions and policies, constraints in domestic finance and private sector participation in crisis country markets, and lack of data on energy needs for effective response. One-size-fits-all approaches do not work in such settings, given the highly contextualized needs of communities hosting refugees and IDPs.

What follows is a brief overview of some of the solutions now emerging across the region where solar solutions are helping crisis affected communities address needs for irrigation and food security, refrigeration needs in clinics for medicines and other vital supplies, lighting for household and education needs, and stable energy for small businesses to generate income and livelihoods.

Energy Access and the Syrian Crisis

The crisis in Syria has caused tremendous devastation within Syria itself, and it has also had significant impacts in neighboring countries in the Arab region. While efforts have been underway to establish more effective global cooperation, today over 90% of all Syrian refugees are hosted within neighboring countries. In places like Jordan and Lebanon, most refugees reside not in camps, but in host communities. Meanwhile, both countries lack significant domestic energy reserves, with additional refugee populations having created new pressures on already stretched energy supplies and extra fiscal burdens from rising import needs. The protracted nature of the Syrian crisis and its impact on neighboring countries has galvanized a growing realization that proper responses are needed not only for immediate humanitarian needs, but also for medium- and long-term development challenges.

Sustainable energy is now emerging as one example of a solution that can help forge a nexus between humanitarian and development tracks of cooperation. Sustainable energy solutions can help meeting the immediate energy needs in host communities, while also reducing broader risks to stability and development in countries like Jordan and Lebanon increasingly affected by the conflict in Syria. Sustainable energy solutions are increasingly seen as a part of broader resilience-based approaches to the crisis, helping to ensure that countries can cope with increased demand in host communities, and that local development trends and social cohesion can be maintained.

Jordan for example hosts over 1.3 million Syrian refugees, while at the same time being one of the region's most energy insecure countries. The growth in energy demand from the refugee influx has resulted in recent years in an expansion of fossil fuel imports meant to ensure energy security and stability for the entire Kingdom. With Syrian refugees residing in cities and towns across Jordan, additional energy demands have resulted in increased pressure on public budgets and risks to fiscal stability and national resilience. Recognizing the important role of energy in achieving resilience, the Government in recent years has put in place a Jordan Response Plan to the Syrian crisis (JRP; 2018-2020), the national pillar of the Regional Refugee and Resilience Plan (3RP).

The JRP covers various elements of the crisis response challenge, including for example access to health and education services in refugee host communities, and it also includes an important pillar on sustainable energy solutions with USD hundreds of millions of new investments foreseen as part of the broader UN appeal. The energy pillar in the JRP was designed through a lead role of UNDP and sister UN agencies, helping the Government assess the social and economic vulnerabilities from by formed by the lack of energy access and setting forth a series of interventions to build resilience. This emerged as the first national response plan under the 3RP with a dedicated sustainable energy focus and serves as a model for other countries in the region, and globally. Through this policy and institutional support, national partners were enabled to mainstream sustainable energy solutions into crisis response and recovery at the upstream policy level, with plans for resilience building able to meet host community energy needs for livelihood, health and education goals, offset rising energy demands with new energy efficiency and renewable energy measures, and reduce the fiscal burden of rising import needs.

In neighboring Lebanon over 1.5 million Syrians have taken refuge, now constituting more than a quarter of the overall population in Lebanon. This brings various risks to Lebanon's development pathway, with energy insecurity as increasingly important issue. Like in Jordan, pre-existing challenges of energy insecurity have been exacerbated by the rapid onset of new energy demand. UNDP has likewise played an important upstream role in Lebanon, helping integrate sustainable energy into the new Lebanon Response Plan to the Syrian crisis (2017-2020). With support of the Netherlands, UNDPs Energy for Crisis Recovery (CEDRO) programme has helped the Government assess the incremental demand placed on the national energy supply from the crisis, the energy needs of Syrian refugee families, and recommend ways to expand sustainable energy solutions for host communities.

Eco-friendly briquettes in Lebanese refugee host-communities. Photo: UNDP CEDRO Programme

This upstream support was also coupled with a series of downstream actions under CEDRO, supported by the Netherlands, Germany and Saudi Arabia, to build community resilience through renewable energy for household lighting, heating and street lighting needs in host communities. This included some of the most vulnerable areas of Lebanon facing increased pressures from host community needs alongside significant levels of energy insecurity. Decentralized solar systems were installed in over 750 households beneFITing thousands of individuals in areas most in need. Solar powered street lighting systems were also installed across 30 towns in rural areas, while energy efficient stoves that run on environmentally - friendly briquettes made from carpentry and agriculture waste were distributed to over 600 households.

Energizing Social Services in Palestine

The Occupied Palestinian Territory faces serious challenges of energy access as a result of state of the occupation. The Gaza strip in particular, faces a dire situation following series of military campaigns over the past decade and a comprehensive blockade of Gaza that started in 2007. Communities in the region suffer from high levels of social exclusion, poverty, one of the world's highest unemployment rates, and insufficient infrastructure. The lack of access to energy hinders these and other developmental needs and has emerged as a crisis in its own right. This started in 2006 when fighting in Gaza damaged major infrastructure including the areas of facilities, leaving the community with a chronic energy shortage. With little success in recovery over the past decade, the lack of energy access in Gaza has become a protracted crisis. By 2016, the electricity deficit in Gaza reached 61%, with between 8-12 hours each day of power cuts affecting the entire 1.7 million population in the Gaza Strip.

Palestine receives an abundance of solar radiation, with an average of 320 days of sunshine per year in the Gaza strip. With the right set of policies to integrate solar solutions into crisis recovery efforts, energy security can be enhanced for critical areas of need and broader goals of community resilience. To this end, UNDPs Renewable Energy Generation programme has supported local partners in Gaza to expand access to solar energy in schools, health centres and water facilities, improving the reach of key social services to women, children and vulnerable populations impacted by crisis.

Empowering Resilience in Gaza. Photo: UNDP PAPP

Through the support of the OPEC Fund for international Development (OFID), solar solutions were deployed in four schools including Basheer Al Rayes in Gaza city, Akka in Khanyounis, Raba'a Al Adawiyah in Rafah, and Al Falouja in Jabalia. Teachers previously had to teach in the dark are now able to access lighting during power cuts. In Bashir El Rayyes High School for example around 1800 female students experienced greater educational attainment thanks to new energy access. Through this process, communities were empowered, and greater awareness was built on the important role of sustainable energy in achieving resilient recovery in Palestine.

Through this cooperation, UNDP and OFID also helped scale-up development benefits for broader livelihood results. Solar ovens were deployed to households to support women's empowerment through commercial income generating activities. Two maternity health care clinics Hassan Al Harazeen in Gaza city and UAE Red Crescent clinic in Rafah also benefited from solar electrification, while solar water pumps were deployed to vulnerable communities helping mitigate chronic shortages. This included a solar water pump to increase water access for facilities supporting children with Down's syndrome.

Energy for Emergency Needs in Yemen

The ongoing war in Yemen has resulted in more than 2.5 million IDPs, an unprecedented situation in the country's history. With over seven million people suffering from extreme food insecurity, and rapidly deteriorating health conditions, Yemen is now the world's worst humanitarian crisis. Even before the conflict, Yemen was one of the world's most energy insecure countries, with 23% energy access rates in rural areas, where 75% of the national population lives. The ongoing war and blockade of supplies to many areas have made the situation dramatically worse.

Energy access in Yemen has traditionally been heavily dependent on local diesel generators for meeting the needs of small businesses, schools, clinics and irrigation. With lifting of public energy subsidies in the years just before the onset of the conflict, diesel costs rose significantly. The war has exacerbated this situation, with supply of diesel and other forms of energy cut off altogether to many areas in the country. For the millions of IDPs across the country, lack of energy access affects their ability to meet basic needs.


Solar for emergency needs in Yemen Photo: UNDP

Decentralized energy solutions can help IDPs access emergency health services, irrigation pumping needs, and bolster rural livelihoods. To this end, UNDP supported a socio-economic and energy gap analysis in eight districts in 2016, showing that public energy services support just 3% of needs in four of the districts, and maximum of 25% coverage in the other four districts. The analysis also revealed that over half of people had no access to energy for basic household needs such as lighting, with households' becoming dependent on kerosene and/or candles. Compounding the challenge is the gender divide in energy access. In most areas, women experience energy poverty more severely, a critical factor with up to 30% of displaced households headed by women.

To act on these and other urgent challenges facing Yemen, UNDP launched in recent years the Enhanced Rural Resilience in Yemen (ERRY) programme with support of the European Union (EU), and in partnership with the World Food Programme (WFP), the International Labour Organization (ILO) and the Food and Agriculture Organization (FAO). The joint UN programme supports rehabilitation of community infrastructure and livelihoods, and via the programme UNDP also supports the deployment of decentralized solar technology to expand energy access in schools and health facilities, use of solar solutions for small businesses to regenerate community livelihoods, and expanded use of solar irrigation pumps for agricultural livelihoods and food security.

Initial results included solar systems in 20 schools, 800 households, two food markets, 20 public agencies, 20 health clinics and 24 solar vaccine refrigeration units, further scaled-up to reach a further 31 schools, 55 health facilities, 9 markets, 4 drinking water facilities and lighting needs for 2,400 households. In addition, the initiative has introduced energy efficiency measures in the education sector, including new energy efficient fans and lighting which result in cost savings redeployed to other pressing needs. These activities are now being further scaled-up to meet the growing needs of IDPs across Yemen, as the impacts of war expand and suffering increases.

Energizing Recovery in Sudan and the Horn of Africa

Sudan hosts over two million IDPs, one of the world's highest concentrations of displaced persons, converging with high levels of poverty and energy insecurity. Despite benefiting from very high levels of solar radiation, only one third of the national population has regular access to electricity. Expanding decentralized sustainable solar solutions can help to expand energy access in general as part of resilience building efforts under national poverty reduction initiatives, and it can also support the critical needs of refugees, IDPs and returnees of conflict.

In the Darfur region of Sudan for example, the area is now seeing returnees of the devastating conflict of past years. As IDPs return to Darfur, many recovery and development issues have arisen, including energy for household needs and for re-generation of livelihoods. In response, UNDP with support of Qatar and in partnership with UNIDO, WHO, UN-Habitat and national partners implemented a Darfur Solar Electrification programme to help implement the Darfur Peace Agreement and build resilience for returnees of conflict. Through the initiative, solar solutions were deployed across 70 villages in Darfur, enhancing health clinics and schools, street lighting and solar water pumping, and directly benefiting 7,000 returnee households, with additional dividends for neighboring 35,000 households in target areas.

In other regions of Sudan, durable sustainable energy solutions are also being explored as the means of building resilience. UNDP has helped the Government to assess the opportunities solar solutions bring for Sudan's health sector for example, with pilot projects underway to energize primary health care units, health centers and rural hospitals, emergency wards, surgery and delivery rooms, and refrigeration in medicine dispensaries. Through these initiatives, solar solutions are increasing access to health services for vulnerable communities, while also reducing the energy bills of health facilities with cost savings redeployed to other patient needs. In addition to bottom-up solutions, UNDP is also providing advisory support to the Government to scale-up results into broader policy frameworks and partnership platforms to expand the role of sustainable energy in achieving the SDGs.


Solar irrigation for livelihoods. Photo: UNDP Sudan

Neighboring Somalia has witnessed many years of protracted crisis including a convergence of conflict and cycles of drought and famine. As the country puts in place response measures, a key challenge has been to build the resilience of crisis affected communities, many of which have existed in states of protracted poverty and exclusion following successive cycles of crisis. To engage the role of energy in building resilience, and with support of Japan, UNDP has helped local partners implementing sustainable energy initiatives that deploy solar solutions in public hospitals for the benefit of poor, displaced and vulnerable communities.

Solar power is now meeting 75% of electricity needs in participating hospitals, allowing steady power for surgery and emergency operations, and redeployment of saved energy costs to improve other hospital services. Expanded cooperation holds the prospect for scaling-up solar power in health clinics, IDP camps, police stations and other important areas of need. Building on these downstream efforts, UNDP is also now developing more upstream initiatives to enact policies and engage the private sector in scaling-up renewable energy solutions in crisis contexts.

In Djibouti, high levels of energy insecurity are coupled with the broader pressures from hosting thousands of refugees from Yemen and other countries of departure. Incoming populations largely reside in host communities in the region of Obock, one of the poorest and most resource insecure parts of the country. With growing demands, expanding sustainable energy solutions has emerged as a critical issue for managing risks to the country's development outlook. The Obock region is currently supplied by just a small number of diesel generators, with limited community connectivity or benefits. UNDP has helped undertake a series of assessments to explore this challenge in Obok, defining response options and opportunities for resilience-based systems of energy access, and convening dialogues among UN agencies and potential donors for future interventions. This would include solar solutions for cooking, lighting, refrigeration and groundwater pumping, all important issues for Yemeni refugees and local fisherman and nomadic communities that together seek a more sustainable future.

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Annex A. Methodology

The structure of AFEX Renewable Energy is based on three main components to derive a final index score. It consists of 25 quantitative and qualitative indicators, which combine to provide higher-level results for 11 factors. The factors are aggregated to the highest level, supplying results for 4 categories. When the results of all categories for all countries are combined, the final index result is achieved.

AFEX Renewable Energy uses the OECD methodology for constructing composite indicators (OECD, 2008). The technical parts of the index construction are performed with guidance from the Joint Research Center's 10th JRC Annual Seminar on Composite Indicators.

Data are organized in accordance with the established conceptual framework. Each indicator is assigned a desired direction depending on its nature and value, where '1' indicates a higher score is better and '-1' indicates a lower score is better. The indicators are assigned weights depending on their importance in relation to each other under the same category. The weights are then re-scaled to unity sum. Once data are organized, necessary statistical descriptors such as missing values, minimum, maximum, mean, standard deviation, skewness and kurtosis are calculated for each indicator.

In order to negotiate the direction and to be able to aggregate the data to develop index scoring, the 'min-max method' is used for indicator normalization. The directions and weights of the individual indicators are taken into account during this normalization. The following formula is used for normalization:

$$\text{new value} = \frac{(\text{old value} - \text{min})}{(\text{max} - \text{min})*\text{direction}} + 0.5*(1 - \text{direction})$$

where:

new value is the indicator's resultant value after normalization;

old value is the indicator's value supplied by measurement, statistical data, survey or other collection technique;

min is the minimum value observed in the 20-country group for the indicator;

max is the maximum value observed in the 20-country group for the indicator;

direction is the value of either 1 or -1 that indicates the direction of scoring for the indicator.

The normalized values for each indicator are combined to provide scores for each factor, and factors are combined to score each category. Results for the four categories are combined to develop final index scores and ranks based on the min-max method.

Ranks for individual indicators are also calculated, but not displayed in the report. Ranks are useful while interpreting the results and to argue why one country has performed better than another within a category. When the raw data are normalized using ranks, the directions of the indicators are also taken into account.

The arithmetic mean, applying variable weight to each normalized indicator value, is used to develop the rank and the performance of each country for the given set of indicators. Weights are assigned to each indicator, summing to unity for each category. The assignment is based on the relative impact each indicator is perceived to have upon the category being measured, and is based on the experience of RCREEE's regional experts.

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