Decentralized Solar in Jordan

Streamlining administrative procedures to maximize socio-economic benefits

Report to the Friedrich-Ebert Stiftung | July 2019

SolarPower Europe | EDAMA Energy, Water & Environment | Friedrich Ebert Stiftung

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EDAMA is a Jordanian business association that was founded in 2009. The word EDAMA was derived from the Arabic word, which means sustainability. We envision Jordan as the regional hub and successful model for green growth, furthermore, an NGO recognized for creating a thriving green economy. EDAMA empowers businesses to play a leadership role in transforming Jordan's energy, water, and environment systems.

Friedrich-Ebert-Stiftung is the oldest German political foundation. The Regional Climate and Energy Project of Friedrich-Ebert-Stiftung MENA aims at combating climate change with partners in the MENA Region, advising on energy transitions, supporting urban sustainability and discussing climate justice.

SolarPower Europe is the voice of the solar industry in Europe, with more than 200 members active along the whole solar PV value chain. Awarded Overall Best European Association at the European Association Awards in 2019, SolarPower Europe's mission is to shape the regulatory environment and enhance business opportunities for solar in Europe and beyond. It develops award winning business intelligence and best practices reports on markets, industry and technologies, informing its members and external stakeholders on the latest trends of the solar PV industry.

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Thanks to improved and more accessible solar PV technologies, decreasing costs, and an enabling environment created by the government, solar has been successfully deployed in Jordan during the last years, in the form of both distributed and utility-scale solar installations. The share of solar in the Jordanian electricity mix reached 11% in June 2019, as reported by the Ministry of Energy.[1] This also generated significant economic value in Jordan; according to the government a total of $4 billion of foreign investment will have been attracted to the country thanks to renewable energies by 2020.[2]

Yet, decentralized solar installed on rooftops of households, businesses, public spaces, or small parcels of land, remains an untapped potential despite its many advantages. Experiences and studies show that decentralized solar brings many benefits, including:

Decentralized solar has the potential to support an easy and fast deployment of renewables in Jordan: Thanks to its modularity and its small size, it can be easily integrated in urban areas. It enjoys lower costs of capital and shorter construction times compared with utility-scale installations. It can or may occupy unused spaces on rooftops and buildings, therefore avoids issues with access to land, and enjoys high levels of public support.

Decentralized solar also comes with socio-economic benefits at society level: Small-scale solar provides economic savings for the consumers or businesses that realize savings and improves competitiveness and profitability (resulting in increased income, job creation, investment). De-centralised solar also stimulates job creation, in engineering, installation and maintenance, as smaller-scale installations are more intensive in these activities. It also supports the modernization of buildings, as it goes hand in hand the roll-out of smart and digital solutions in buildings such as energy management systems or storage. This can support Jordanian innovations and companies in this sector.

Finally, decentralized solar has many benefits from a grid perspective: Small-scale solar requires proportionately less grid reinforcement as it is often installed in urbanized areas where the grid is already developed and does not require costly transmission network upgrades; and useful in rural areas where losses are high at the edge of the grid. Because it is close to consumption points, it reduces the need for grid use and reduces grid losses. In Europe, Agora Energiewende has found that the cost of grid reinforcement is on average EUR6.5/MWh for ground-mounted PV against EUR4/MWh for rooftop PV.[3] Further, the smart management of decentralized solar coupled with consumption points (load shifting for instance) and battery storage solutions, and smart grid solutions can even provide added flexibility and reliability for the network, by displacing feed-in times when it is the most appropriate, reducing peak demand, or providing quasi instantaneous back-up power.

Because they influence the costs, adoption and ease of the construction process, administrative procedures are key to support deployment. Sound and tailored administrative procedures should therefore be developed, together with strategic initiatives, along the following lines, whereby specific recommendations are presented at the end of the report.

Herein is a summary of recommendations to further enable decentralized solar systems. The recommendations are based on research (included herein) and EDAMA member surveys that explores international best practice in context of the Jordanian experience. The report also examines the current administrative and regulatory procedures and proposes adjustments that would improve adoption.

- **A one-stop-shop online application system:**
It has become common practice to use on-line applications to submit, process and followed-up on, and receive notifications on the dates of inspection and operation, as well as to monitoring and evaluate with live data and indicators. In addition, all documents will be stored in the system. If implemented, this system will bring clarity to the process and will promote a faster and more efficient application experience.

- **Transparency in application-related approvals, applying entities, granted capacities and open slots on the grid:**
This is carried out through the same e-system that assigns serial numbers to projects, where all project applicants should be dealt with in a transparent manner, while availing information to all.

- **Simplified application procedures for small and zero-feed-in systems:**
In case of on-grid systems that are less than 10 kW and systems that depend on the principle of zero-feed-in to the grid, the procedures need to be simplified into a one-step application "one-stop-shop" (similar to what is stipulated in the EU Renewable Energy Directive 2018/2001/EU that entered into force in December 2018), followed by notifying the electricity company of the installation of the system. In the case of an application to install renewable energy systems in locations that are commonly known to have been over-exploited in terms of electricity grid capacity, then a different timeframe is proposed for those concerned with the necessary technical studies in a manner that does not affect the progress of the normal procedures.

- **Inclusion of all the procedures, entities and costs which an applicant is expected to go through within the EMRC guidelines:**
It is necessary for the entire application process to be clearer, so that it lists all the entities that are involved in the application process that an applicant must seek out to obtain the required approvals and permits while clarifying justifications and respective costs.

- **A unified practical implementation and interpretation of legislative stipulations with clear and reasonable deadlines:**
Unifying practices related to the text of the guidelines among the three distribution companies, and set more reasonable abiding deadline for the different steps and procedures through the application process.

- **Coordination with other entities and reduction of the amount of permits needed:**
Facilitating administrative procedures calls for increased coordination with other concerned entities and the need to restudy the necessity to carry out said steps, such as changing land classifications, public works permits, leases, sales tax, customs, Greater Amman Municipality, MPW, JREEEF, JEA, civil defence in terms of requirements that are not specifically or rather remotely related to renewable energy project, and study the possibility of merging them into the suggested online system.

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1 Ministry of Energy and Mineral Resources (2019), statements by the minister:
http://www.jordantimes.com/news/local/
jordan-targets-20-power-renewables-2020-%E2%80%94-zawati

2 Ministry of Energy and Mineral Resources (2018), statements by the minister:
http://www.jordantimes.com/news/local/
renewable-energy-investments-jordan-reach-4-billion-2020-%E2%80%94-zawati

3 Agora Energiewende (2015). The Integration Cost of Wind and Solar Power.
An Overview of the Debate on the Effects of Adding Wind and Solar Photovoltaic into Power Systems.

Jordan is one of the top three emerging markets globally for clean energy investment according to Bloomberg New Energy Finance's Climatescope 2018 report. Thanks to the significant decrease in the cost of solar PV technology and to public support from institutions, solar has been successfully deployed in Jordan during the last years, in particular in the form of large, utility-scale solar installations. This success is the result of legislative reforms, which made it possible for Jordan to achieve a renewable share of 11% in its electricity mix by June 2019.

Yet, Jordan has further potential for solar that remains untapped: decentralized solar, installed on the rooftops of households, businesses, public authorities etc. This report looks at experiences in and outside of Jordan in order to better understand the benefits of small-scale solar installations. It then examines the current administrative procedures in order to identify administrative barriers to the deployment of small-scale solar and provides recommendations for the improvement of the regulatory and procedural framework, in order to contribute to maximising socio-economic benefits related to decentralized solar.

This report marks the beginning of a partnership between EDAMA and SolarPower Europe. It was developed in close collaboration between the experts of both associations, sharing knowledge and benefitting from each other's experience. Our ambition is to establish a lasting partnership to promote the energy transition, and solar in particular, in Jordan and Europe. EDAMA and SolarPower Europe will continue this collaboration to exchange knowledge, best practices and market information and to create new solar business opportunities in Europe and Jordan.
We invite you to join this endeavor.

Foreword signed by:

Dr. Dureid Mahasneh
Chairman on behalf of EDAMA

Walburga Hemetsberger
CEO, SolarPower Europe

Franziska Wehinger
Deputy Resident Director on behalf of FES

In spite of a number of challenges, the development of renewable energies in the past few years, in particular solar, can be considered a Jordanian success story. In fact, Jordan is one of the top three emerging markets globally for clean energy investment according to Bloomberg New Energy Finance's Climatescope 2018 report.

This success is a result of the early adaptation of a streamlined legislative framework, which created opportunities for renewable energy to enter into the overall energy sector. The electrical energy generated from renewable sources accounted to 11% of the gross production of electricity in June, 2019. The work in this sector commenced with the issuance of the Temporary Renewable Energy Law of 2010, followed by several guidelines and instructions that structured the work in the sector.

The regulating entities of the renewable energy sector adopted several policies to incentivize renewable energy deployment and to guarantee continuous sector growth. The policies involved a reasonable decrease in support thanks to increasing sector maturity and accumulation of industry experience. Support mechanisms based on tariffs or quantities were used, due to their noticeable impact in attracting investment. Direct proposal schemes or competitive bidding were among the most important systems that Jordan adopted; this allowed exporting electricity from large renewable energy projects to the electricity grid via long-term power purchase agreements (PPA). In addition, wheeling and net-metering schemes were introduced for end-consumers and for the support of smaller-scale and decentralized systems.

In 2012, in the year of the issuance of the Permanent Renewable Energy Law, the Energy and Mineral Resources Commission (EMRC) issued guidelines on authorization and connection rules of renewable energy projects with net metering and wheeling systems. In 2013, 430 new applications were submitted to connect decentralized solar systems to distribution grids, which led to the installation of 292 systems with a total capacity of almost 3 MW.[4] This progress continued to accelerate. At the end of 2018, the total number of installed (net-metering and wheeling) solar systems reached 9,720 with a total capacity of 360 MW,[5] compared with 542 MW installed solar systems through direct proposals.[6] The following Figure shows the distribution of the decentralized solar systems over the three distribution companies.

Decentralized Solar Systems Connected to the Grid End of 2018

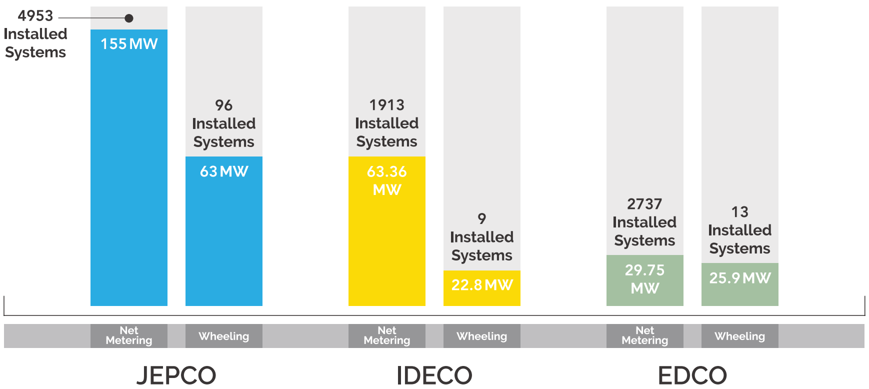


Figure 1: The distribution of the decentralized solar systems over the three distribution companies
Source: Energy & Minerals Regulatory Commission (EMRC)

Jordan has three electricity distribution companies, each operates within separate geographical service areas. Jordan Electric Power Company (JEPCO) provides their services to the central region of the country, Irbid District Electricity Company (IDECO) provides their services to the northern region, and Electricity Distribution Company (EDCO) provides their services to the Southern region.

4 Energy and Mineral Resources Regulatory Commission (2013), Annual Report.

5 Energy and Mineral Resources Regulatory Commission (2018), Annual Report.

6 Ministry of Energy and Mineral Resources (2019), Renewable Energy Projects List.

The Sukhna Solar Farm:

Jaber Batah owns a farm in Sukneh area in Zarqa governate, where he has a farming and a ranching activity. He has replaced his former diesel generator system by an off-grid solar installation of 10kW which provides electricity to pump water out of Zarqa river to irrigate his farm. The transition from only depending on the grid to the PV system enabled Jaber to cut his 300 JODs monthly electricity bill. Thanks to this, he was able to expand the farm by leasing an extra 20 donums , which allowed him to increase the return on investment, in addition to employ workers from local community to help out in the farm.

After the farm was expanded, the solar system covers only 50% of the electricity needs, Mr. Jaber is studying the expansion of the system to cover 100% as he says the system has been a successful experience and a very beneficial one.

Al Siddeeq Mosque:

Alsiddeeq mosque and its Islamic cultural center are located in Dahiyat Alrasheed area inside the Capital Amman. They serve as a place of worship, but also host cultural activities and contain housing areas. The mosque's board decided to install a 25 kW PV system to off-set their monthly electricity bill of approximately 500 JODs. They were encouraged by a joint grant program for mosques from the Jordan Renewable Energy and Energy Efficiency Fund (JREEEF) and Ministry of Awqaf and Islamic Affairs, where the grant covers 50% of the PV system cost, and the other 50% is upon the mosque's board to cover. After the system was installed, the electricity bill was drastically reduced to an average of 32 JODs. This enabled the mosque to apply maintenance works and provide better conditions to the worshipers during their prayers by using air conditioners.

Orjan School:[7]

The Orjan's Secondary Girls School was selected jointly by JREEEF and The Sustainable Energy and Economic Development Project in Jordan (SEED) as part of Public Schools Heating initiative. The project covered energy efficiency mitigation measures and the installation of a 26 kW solar system. In addition, an Energy Lab for educational purposes was created, fully equipped with educational tool kits on energy efficiency and renewable energies applications, which serves the school in addition to nearby schools. This project enabled the school to save around 7700 JODs in the first year: 4000 JODs from Electricity Bill and 3700 JODs from kerosene heaters fuel.

Photo courtesy of JREEEF

7 Jordan Renewable Energy and Energy Efficiency Fund (JREEEF).

6.1 What is Decentralized Solar?

Affordability is one of the most important challenges facing transportation. Transportation costs can be Decentralized solar refers to small-scale solar installations, connected to the low- to medium-voltage distribution grid and located close to the consumption points it serves. This is in contrast to large utility-scale plants connected to consumption points via large high-voltage power lines, which are part of the traditional centralized electricity systems that developed historically.

In most cases, decentralized solar is located on rooftops and buildings. Although decentralized solar is often perceived as solar roofs on residential buildings, in reality decentralized solar includes a wider range of systems, for instance rooftop solar on small and medium-sized enterprises' (SMEs), offices' or commercial and industrial buildings and structures. A general understanding of decentralized solar includes:

- The residential rooftop segment, typically below 10kW capacity
- The commercial segment, between 10 and 250kW capacity
- The industrial segment, between 250 and 1MW capacity

Because it is close to consumption points and often installed and owned by the power consumers themselves, decentralized solar is linked to **the notion of prosumer**. This concept, derived from the words producer and consumer, refers to the shift from the passivity of the consumer in the energy system, limited to the mere act of receiving and consuming energy, to a more active participation in the energy system, by producing one's own energy, consuming energy smartly or limiting consumption depending on the grid constraints, or even owning a storage battery and providing balancing energy to the grid operator.

6.2 Trends in Decentralized Solar

The last years have shown a significant cost decrease for solar due to solar panel efficiency improvements, falling material costs and economies of scale in panel manufacturing, making utility-scale solar cost-competitive with conventional generation technologies such as gas, nuclear or coal. Although this cost decrease is the most impressive in the utility-scale sector, it has also important repercussions on business cases in the rooftop segment.

Latest estimates by the consultancy Lazard[8] illustrate this trend. The figure below shows the latest evaluation of the Levelized Cost of Electricity (LCOE), without considering the environmental costs of conventional generation (carbon pricing, waste management for instance) or the socio-economic benefits of decentralized energy (environmental benefits of renewable energy, job creation). The figure shows that utility-scale solar is cheaper than gas, nuclear and coal in most cases and that even rooftop solar photovoltaics (PV), particularly in the commercial and industrial (C&I) segment, has become cost-competitive with conventional generation. The reason why power produced by utility-scale solar power plants is cheaper than power produced by smaller scale C&I or rooftop installations is simply economies of scale.

8 Lazard (2018), *Lazard's Levelized Cost of Energy Analysis - version 12.0.*

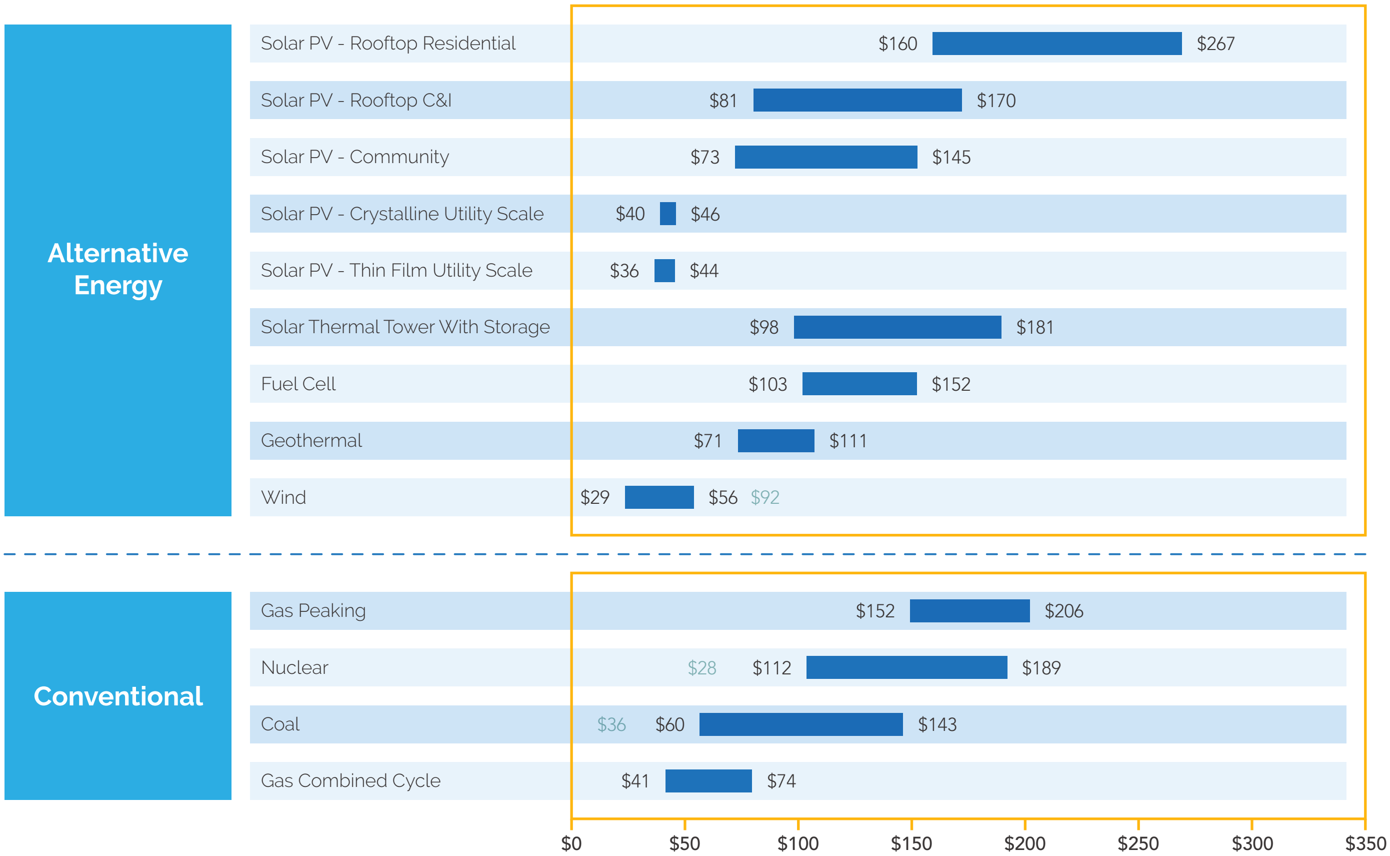


Figure 2: *Lazard (2018), Lazard's Levelized Cost of Energy Analysis – version 12.0. Levelized Cost of Energy Comparison – unsubsidized analysis (USD/MWh)*
Source: *Lazard (2018)*

Despite not reaching grid parity as utility-scale installations, decentralized solar also benefits from the decrease of cost of the PV technology. It is important to note that to evaluate the business case and cost-competitiveness of decentralized solar, it is the retail electricity tariff that needs to be considered, not the generation cost of gas, coal or nuclear. In many countries, the retail electricity tariff is higher than the actual power generation cost, as it includes additional charges such as taxes and network fees. Thus, the analysis of the cost-competitiveness of rooftop PV systems depends on the country's characteristics (especially the retail electricity price): in general, rooftop PV is more cost-competitive in countries where the average retail electricity tariff is high, whereas it is less cost-competitive in countries where the retail electricity tariff is low due to measures such as subsidies. A study by IRENA[9] has shown that in 2016 residential solar has already reached grid parity (i.e competitiveness with the retail price of electricity withdrawn from the grid) in several locations of the US and Germany (see Figure 3 below).

9 IRENA (2017). *Irena Cost and Competitiveness Indicators: Rooftop Solar PV,* International Renewable Energy Agency, Abu Dhabi.

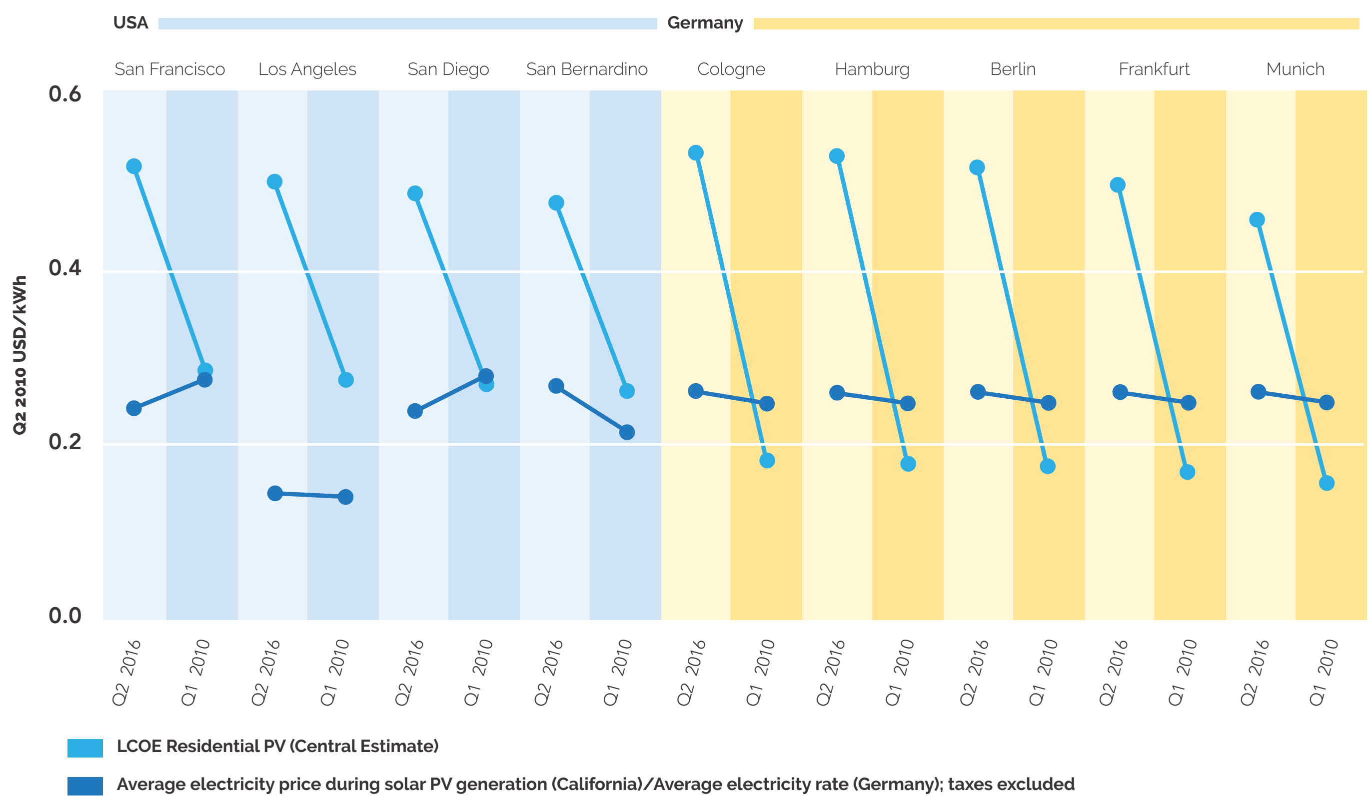


Figure 3: *Median residential solar PV LCOE and median effective residential electricity rates in different metropolitan locations in California and Germany, Q1 2010 and Q2 2016*
Source: *IRENA (2016)*

In parallel, **battery storage technologies** have also achieved important cost reductions. A study published by Bloomberg New Energy Finance in December 2018[10] revealed that Lithium-Ion battery storage's average price has fallen by 85% between 2010 and 2018 and have reached an average of USD176/kWh. These cost trends are driving the emergence of competitive smaller-scale or home battery packs offers, such as the Tesla Powerwall launched in 2015, boosting the market of solar and storage offers in the residential and commercial & industrial segment.

6.3 Decentralized solar models: net-metering, wheeling and self-consumption

Decentralized solar has developed historically in Europe and in Jordan through **net-metering and wheeling models.** Net-metering and wheeling models are billing schemes that allow solar PV systems owners to inject the electricity they have generated into the grid and to balance the self-generated electricity with the electricity they have consumed from the grid, over a definite time period (often a year or a month). Customers are finally billed on the "net" energy use, irrespective of the ratio of electricity that was physically directly consumed.

In the "net-metering" scheme the renewable energy system is "on-site", i.e. both the generation and the consumption are at the same location (such as in the case of a rooftop solar PV system). In contrast, "wheeling" is a scheme with the same accounting logic, but where the renewable energy system is connected to the electricity grid "off-site", i.e. away from the consumption location.

10 Bloomberg New Energy Finance (2018). *Ninth Battery Price Survey.*

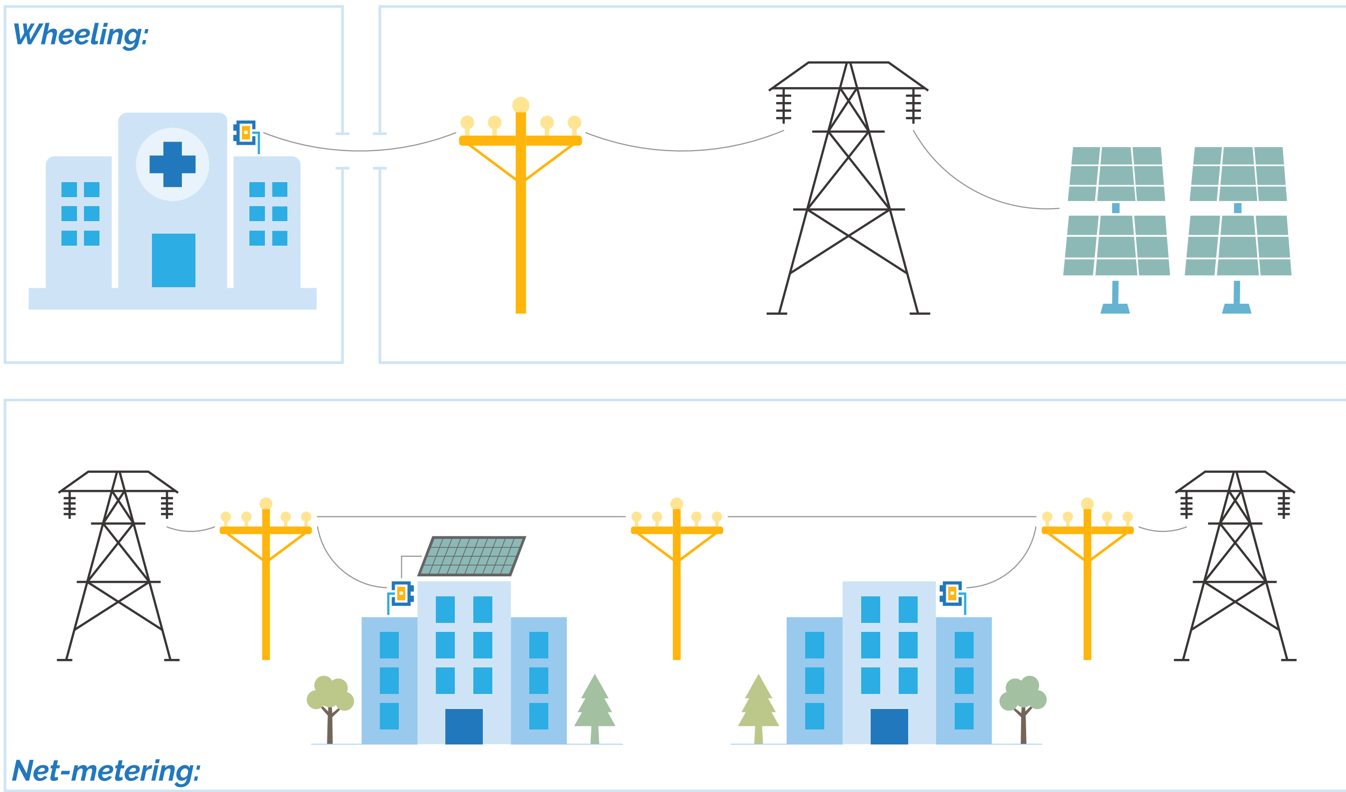


Figure 4: Illustration of net-metering and wheeling.

This report also refers to "self-consumption", where the solar system is directly connected to the consumption point and supplies part or all of the electricity to the consumer without injecting in or withdrawing from the grid, i.e. the consumption happens "behind the meter". In that case, the self-generated electricity does not use the grid. The ratio of self-generated electricity consumed by the consumer is called the "self-consumption ratio" and can be total or partial, depending on the consumer's profile. When there is no consumption, the solar system injects in the grid and gets remunerated on the electricity market. Self-consumption is therefore a scheme where the calculation of the amount of self-consumed electricity takes into account the physical reality of electricity flows. It is therefore more likely to integrate grid constraints (revealed through grid tariffs for example) and to avoid congestions on the low and medium voltage grid.

Key enabling technologies can support the business case of decentralized solar self-consumption

Storage technologies allow the 'de-coupling' of onsite generation from consumption, by enabling to store the electricity generated on-site when the consumer does not consume, to a later moment of consumption. At decentralized level, storage technologies include stationary battery storage, but can also include non-stationary batteries as the electric vehicle battery or heating systems such as hot water boilers or heat pumps.

Co-locating storage technologies with solar PV allows an increased self-consumption rate, in particular in the residential sector when there is a higher de-coupling between solar PV generation times and consumption times. In addition, solar and storage can incentivize the consumer to use the full potential of its rooftop: rooftop installations are often undersized to fit with their peak load and to avoid costly grid upgrades. In such situations, storage can enable the self-consumer to store the excess production of a larger PV installation to consume at a later stage.

The graph below illustrates schematically the benefits of storage for self-consumption. The storage can absorb the solar supply (yellow curve) that does not match with the load curve (blue curve) and release it at a later time when the consumer needs energy. This allows an improved self-consumption ratio without using the grid.

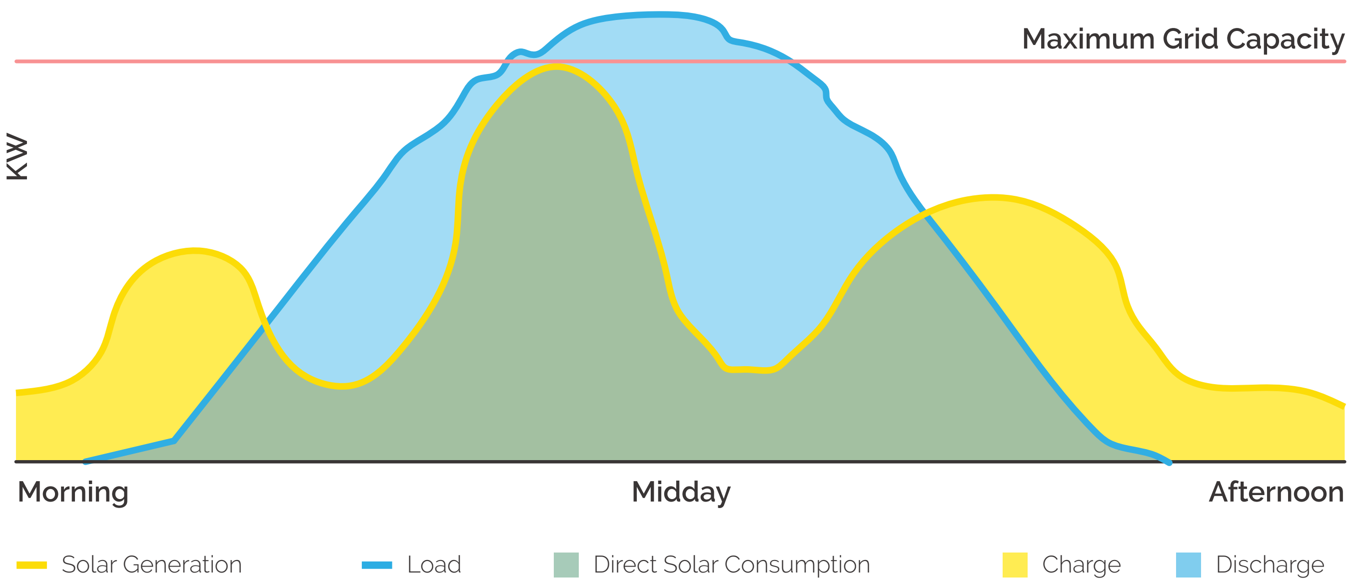


Figure 5: Illustration of the optimisation of solar supply thanks to solar & storage. SolarPower Europe (2018), Global Market Outlook.
Source: SolarPower Europe

Moreover, storage allows an optimized sizing of the grid connection. Historically, grids are designed depending on peak demand and peak generation. By storing the excess electricity generated at peak times, storage can significantly decrease the peak generation of the solar systems, the so-called 'peak shaving' effect. It therefore avoids costly network reinforcements that would have been needed to accommodate with the peak solar generation (top of the yellow curve).

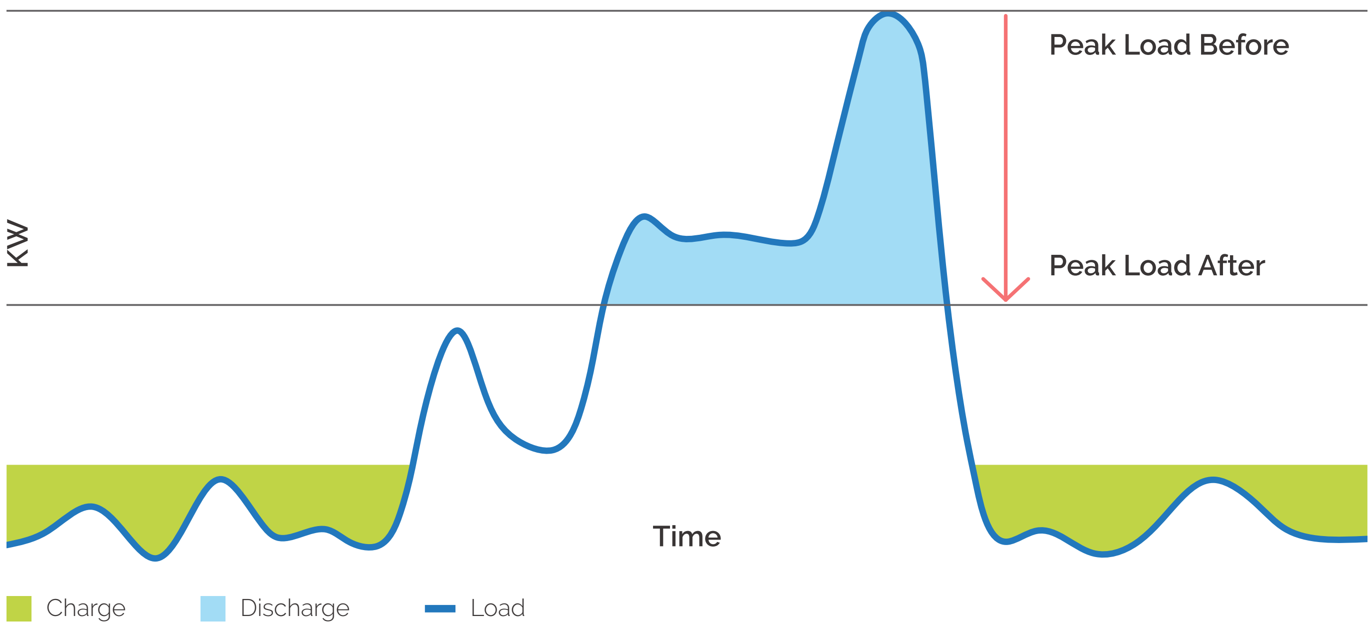


Figure 6: Illustration of the reduction of network costs thanks to solar & storage. SolarPower Europe (2018), Global Market Outlook.
Source: SolarPower Europe

Storage can present very specific benefits for self-consumption in off-grid systems. The latter are excellent solutions to electrify with clean energy remote or rural areas. However, these off-grid self-consumption systems suffer from current instability: combining it with storage can stabilize the current and present a key solution for these systems.

Energy management systems are systems that can automatically control the energy consumption of a building (electrical loads, heating and cooling systems), while reacting to external factors such as electricity prices, grid tariffs, consumer preferences. They can also manage electricity generating systems, storage facilities or heating and cooling generators. They allow 'load shifting', i.e. the displacement of consumption in time, which allow the reduction of energy consumption when it is technically challenging or economically not interesting to consume to a later point in time. They are essential to maximize the self-consumption rate, for instance by displacing loads to times when the on-site PV systems is generating but can also unlock building flexibility.

6.4 Socio-Economic Benefits of Decentralized Solar Consumers

Decentralized solar is easy to deploy, thanks to its modularity and short construction time.

Decentralized solar is characterised by the small size of its installation and the modularity of the systems which can be tailored to fit perfectly the need of the consumer. The size and design of the solar installation can be tailored to fit perfectly with the land available or the consumer needs, which makes it easy to deploy a large number of installations in urban areas, on rooftops or on existing buildings. In addition, because it is easy to install, decentralized solar enjoys short construction time. Small solar installations can therefore support a fast deployment of renewable energies in Jordan.

Decentralized solar avoids competition on land use.

One of the key issues emerging with the development of utility-scale solar is the competition on land use. Indeed, ground-mounted PV uses large amounts of land that are difficult to access to, and that factor undermines public acceptance of renewable energy growth. In addition, land availability is limited and can constrain the development of solar in the medium to long term.

On the contrary, decentralized solar makes the most of unused, passive surfaces, such as rooftops, carports, buildings' walls. It maximizes the use of these surfaces to produce electricity and unlocks new land potential for the development of additional solar energy projects.

Again, from a land use perspective the desert countries and first and foremost Jordan are made for decentralized solar. Many remote communities and households cannot cultivate agricultural products anymore because of water scarcity and climate change – others, such as the Bedouin families never could as they are living in the desert. These people and families can finally use their deserted land in order to generate their own electricity. In many cases this has enabled tourism in remote areas such as the desert and therefore empowers poor communities in Jordan.

Decentralized solar makes the most of indigenous sources of energy and reduces energy dependence from neighboring countries.

Solar PV generates electricity with a fuel that is available within the country, without restrictions: the sun. It therefore reduces the dependence of the country on fuels imports from neighbouring countries and avoids risks of shortage due to weather events or due to the politico-economic context. That is one of the reasons of the public support to renewable energies in Europe, as well as in Jordan – a country, which is highly dependent on energy imports as of 2019.

Decentralized solar allows economic savings for both citizens and businesses.

Decentralized solar allows self-consumers to generate electricity at zero marginal costs and therefore consume their own energy for free. It allows the consumer to reduce the volume of their power supply contract for the remaining electricity and to avoid extra grid reinforcement. In addition to savings on the energy part of the bill, the consumer usually benefits from a reduction or an exemption on the tariffs and taxes linked with the use of the grid, due to the fact that he reduces his reliance on the grid – such as the fuel difference item.

Therefore, once the investment is paid off, the solar self-consumer is able to make important savings on its energy bills. This brings benefits not only to residential households, but it can also allow local companies and industries to decrease their energy costs and support their competitiveness.

In 2019, the European Union has adopted a revised energy legislation, as part of the so-called Clean Energy Package. The new legislation[11] states that solar self-consumers with an installation below 30kW are exempted from grid tariffs on the electricity that is consumed "behind the meter" and that does not use the grid.

In addition, various European countries exempt the self-generated electricity that is consumed behind the meter from certain taxes, as excise duties or taxes related to the financing of the energy transition.

- In Sweden, solar self-consumers with a capacity below 255kW are exempted from the tax on energy consumption ('excise duty') on the electricity that remains behind the meter.

- In Germany, solar self-consumers below 10kW and which produce less than 10MWh/year are exempted from the EEG surcharge, the tax on the consumption of electricity which finances the support schemes for renewables. Larger self-consumption systems may pay a small amount of the EEG surcharge.

- In France, solar self-consumers with an installation below 1 MW and which produce less than 240GWh/year are exempted from taxes.

When the PV system is generating at times when the consumer is not consuming, solar self-consumers can export the electricity self-generated by the solar panel and get additional revenues from it, as any regular generator. For small installations, the self-consumer often receives a remuneration for the electricity injected in the grid which is sustained by a public support scheme, either a fixed tariff or a supplement on the sale of the electricity on power markets. However, remunerations for the electricity injected in the grid are set in a way that encourages self-consumption rather than grid injection.

Similarly, in net-metering schemes such as the Jordanian one, if system owners injected in the grid more than they consumed over the billing period they are entitled to receiving a fixed tariff for the excess electricity they produced, which represents the difference between the annual consumption and the annual production. This fixed tariff is set at 120 Fils/kWh.[12] It should be noted, however, that this "excess electricity" is not identical to the electricity that is physically injected in the grid.

Typically, in the residential sector (less than 10kW capacity), rooftop solar covers 20 to 35% of the electricity self-consumption of a household, depending on the extent to which the consumption and solar production pattern are synchronised, while the remaining generation is exported to the grid.

11 Directive on common rules for the internal market in electricity, article 21

12 Instructions for the sale of electric power generated from renewable energy sources issued by the Council of Commissioners of the Electricity Sector Regulatory Authority (13) for the year 2012. Article 4(B)

A rooftop solar installation linked with a storage facility can increase the self-consumption rate to between 60 to 90%.[13]

Residential rooftop PV has initially developed in single household homes rather than multi-dwelling apartments which presented higher challenges in terms of billing and sharing of the electricity produced by the PV rooftop. However, advanced metering technologies and legal innovations have led to the development of "collective self-consumption" models, enabling self-consumption for multi-dwelling apartments but also facilitating self-consumption for various buildings owned for instance by a public authority.

In the commercial and industrial sector, decentralized solar also makes economic sense. As commercial or industrial buildings consume electricity during the day, their consumption profile matches even better the generation profile of Solar. Therefore, commercial and industrial buildings can achieve a complete self-consumption rate and cover a larger part of their electricity consumption with the self-generated electricity. It enables them to achieve savings on their energy bills and benefits their competitiveness. In addition, it also hedges them against price volatility by providing them with stable electricity prices for a part of their bill.

In warm countries such as Jordan, decentralized Solar generation, which reaches highest generation levels during the summer period, can cover the electricity consumption of air-conditioning systems that are consuming at the same peak-time as solar is generating.

In Jordan electricity tariffs are very high, which hampers the competitiveness and development of many small and medium enterprises (SMEs). By consuming their own electricity, SMEs can make savings on their electricity bills enabling them to reduce their costs by up to 60%.

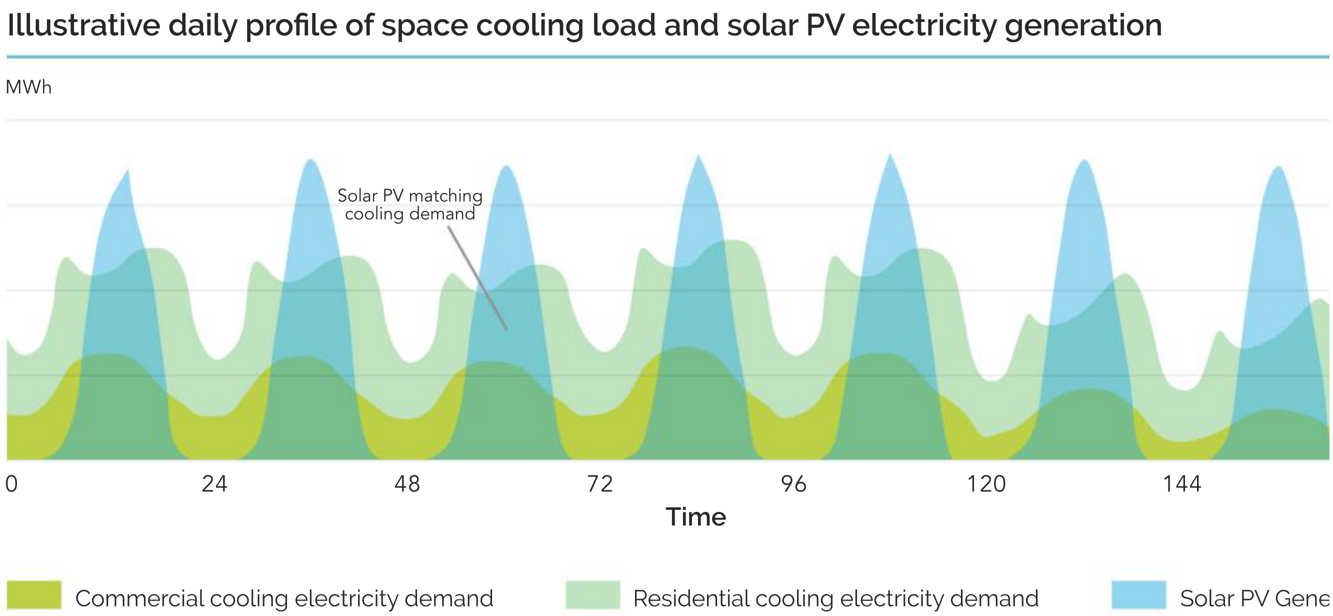


Figure 7: *Illustration of the optimisation of solar supply thanks to solar & storage. SolarPower Europe (2018), Global Market Outlook.*
Source: *SolarPower Europe*

13 Lightsource, Foreseight, Good Energy, KPMG (2015) *The Decentralised Energy Transition.*

Decentralized solar is financed by local and citizen's investment and benefit from lower capital costs than utility-scale projects.

Decentralized generating sources enjoy lower capital costs per project, compared to large central power plants. It is therefore less costly to invest into decentralized solar projects, compared to larger projects. In addition, decentralized solar is often developed by local consumers, citizens and businesses, which invest their own resources into the projects. Decentralized solar is a good investment in a country like Jordan, where power consumers such an citizens and businesses are exposed to relatively high electricity tariffs.

Decentralized solar comes with highly skilled and local jobs creation.

A study conducted by the consultancy Ernst&Young for SolarPower Europe in 2017[14] on the European market showed that rooftop PV was particularly more job intensive than ground-mounted PV. Indeed, ground-mounted PV involves more MW per installation and can achieve economies of scale in engineering, installation and maintenance. At the same time, a given installed capacity of rooftop PV will generate more jobs and value added than the same installed capacity of ground-mounted PV.

Rooftop PV is particularly more intensive in added value in the downstream segment of the solar PV value chain (see illustration below). The design and development of a solar PV solution requires detailed engineering, studies, sales activities, and administrative activities. Rooftop PV also requires trained electricians, who will deal with the installation and maintenance of the solar panels.

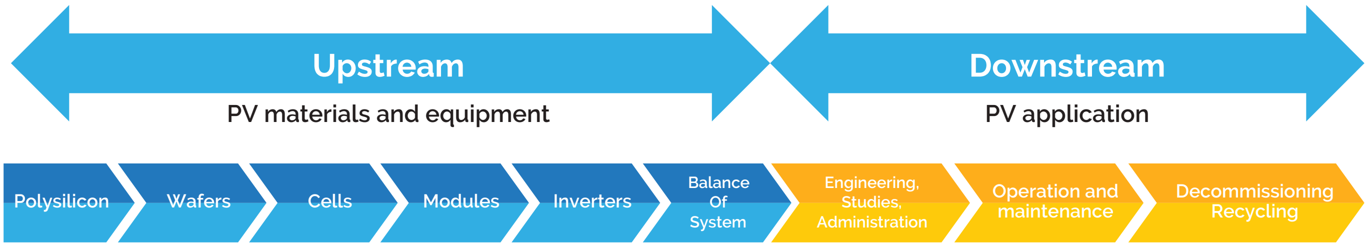


Figure 8: *Breakdown of the solar value chain and related activities.*
Source: *SolarPower Europe, Ernst&Young (2017)*

Downstream activities, such as installation, and operation & maintenance, are entirely sourced locally, as these activities need to be adapted to the local regulatory norms and economic context and are services that cannot be imported. Therefore, decentralized solar is particularly beneficial in terms of highly skilled job creation at a very local level.

For Jordan, this is one of the most convincing arguments. Jordan has many well qualified engineers and environmental scientists. The decentralization of the energy sector could open the market for the creation of many small Jordanian companies, not only for selling panels and building the installations, but also for energy demand and supply management, on maintenance etc.

This case was proven in many countries. The decentralization of the energy system in Germany for example led to a massive redistribution of income in the energy sector. Not only big energy providers, but farmers, SMEs, churches, municipalities and cooperatives had suddenly the chance to increase their revenues through investing in clean energy.

14 SolarPower Europe, Ernst&Young (2017). *Solar PV. Jobs and Value added in Europe*

Decentralized solar stimulates the development of highly innovative digital energy solutions and PV technologies often developed by start-ups.

Decentralized solar can see its efficiency increased when coupled with energy management solutions or smart homes systems, technologies that are often developed by start-ups. These systems are able to manage the various loads in the house (e.g the water boiler or the washing machine) according to the generation profile of the PV systems and in response to grid prices and tariffs.

Besides, decentralized solar can also stimulate the use of highly innovative PV technologies, especially to cope with space constraints or specific economic activities. For instance, in the building sector, building-integrated photovoltaic solutions can be used to replace traditional building materials. Transparent photovoltaic glass can be used in office building, using the wall space to produce electricity for the building while replacing traditional glass. Similarly, photovoltaic thin-films, which are lighter and more flexible, can be integrated in the agricultural sector, on warehouses for instance, or the transport sector, on carports or on the vehicles themselves.

Decentralized solar supports sector coupling, by adapting to all end consumer's needs and supporting decarbonisation in all sectors of the economy.

Thanks to the modularity and the scalability of PV modules, decentralized solar can come in various tailored solutions able to adapt to the end-consumer needs and in synergy with the sector. It therefore enables the coupling of different sectors, such as energy and electricity, transport, industry and building sector. For instance in the transport sector, parking lots and carports present a high potential for the installation of Solar and could be later integrated with electric vehicles charging stations. Solar charging stations or bundled offers of rooftop solar and charging stations are examples of how solar and electric mobility could be integrated.

On the other hand, the batteries in EVs can store electricity overnight, when the car us not in use. This only works in a decentralized system with small batteries.

Jordan is predestinated for this with its pioneering example in electric mobility. With nearly 18.0000 electric vehicles on the streets, it has more batteries than any other country. The energy transition and the mobility transition should be planned in a combined way in Jordan, so that the energy transition can as well benefit of how far the EVs already got, thanks to an incentive schemes that has cut out high custom duties on electric cars in Jordan.

Finally, decentralized solar increases the public acceptance of the energy transition and the democratisation of the energy system.

As renewable energies have been increasing worldwide, some countries, notably in Europe, have acknowledged rising issues linked with public acceptance. These issues stem from the visual impact of renewable installations, their competition on land use (see above), or the perception of the cost of the energy transition.

Decentralized solar solutions can provide advantages with regards to this public acceptance issue. By getting closer to the consumer and even providing them with direct economic benefits, citizens develop a sense of ownership of the energy transition and benefit from its economic advantages (financial savings on their energy bills). Solar PV systems owners proactively exchange knowledge and experiences and advocate for the energy transition often by means of social media. Decentralized solar becomes more visible and concrete and can even be used for educational projects.

Decentralized solar is also a key element of the democratisation of the energy system and ensure that the energy transition can equitably benefit all segments of society. Decentralized smart solar puts the power (both literally and figuratively) in the hands of the "prosumers".

6.5 Smart Decentralized Solar from a Grid Perspective

From a grid development perspective, decentralized solar has limited impact, especially in urban areas, and can even optimize grid use.

Transmission and distribution of electricity over long distances generate electricity losses, mostly due to the so-called 'Joule effect' when the electricity's energy is lost as heat in the power lines.

By locating generation closer to consumption points or even directly connected to it, decentralized generation allows for a reduced use of the grid, and therefore limits the grid losses. This is particularly interesting in the cases of optimized physical self-consumption models.

In Jordan, according to National Electricity Company (NEPCO) annual report 2017, 13.73% of the electrical output is lost in transmission and distribution in Jordan. The grid sometimes is overstrained, because of the unexpected high generation of RE energy due to very high irradiance in Jordan. It is important to underline that decentralized solar could alleviate grid bottlenecks, as less electricity needs to be moved from A to B and electricity instead is produced and consumed locally.

In addition, decentralized solar requires proportionate grid reinforcement and reduces the need for costly transmission network expansion.

Transmission infrastructure reinforcement project such as the Green Corridor are important to enable the deployment of utility-scale solar. However, because decentralized solar is connected locally, close to the consumption points (typically on the rooftop of a building), it does not require building large transmission and distribution lines to carry the energy to the end consumer.

Moreover, when decentralized solar is installed in urbanized areas, the distribution grid is already significantly developed in order to match the load volume. In such optimal cases, the grid connection requires very little or no grid reinforcement, as the existing infrastructure will be used. Yet, in rural areas where the grid is not developed, the grid connection costs can be more important as they will require additional cable upgrade.[15]

In certain cases, negative grid costs may even appear, for example when rooftop solar producing during the day is used to supply day-time consumption of air-conditioning systems and results into a lower peak demand. Similarly, in the context of electrification of transport, rooftop solar can be used to supply the electricity demand of electric vehicles. Electric vehicles are indeed posing a challenge to the grids, as they will require a large amount of power in a small amount of time. However, with smart charging system, the charging process of the electric vehicle can be matched with the PV generation time and alleviate the grid constraints. By reducing the peak demand of the electric vehicle, smartly managed rooftop PV can also avoid the costly upgrade of the grid connection that would have been needed with the installation of an electric vehicle charging station (see figure 3).

For example, the German think tank Agora Energiewende has estimated the grid costs for rooftop and ground-mounted PV in Germany and in Europe and has found that ground-mounted PV results in higher grid costs than rooftop PV (on average EUR6.5/MWh for ground-mounted PV against EUR4/MWh for rooftop PV)[16]. A similar study should be conducted in Jordan.

Finally, decentralized solar unlocks a flexibility potential that can support the integration of renewable energies in the grid and optimize the use of the networks.

15 EPIA (2012). *Connecting the Sun. Solar Photovoltaics on the road to a large scale grid integration..*

16 Agora Energiewende (2015). *The Integration Cost of Wind and Solar Power. An Overview of the Debate on the Effects of Adding Wind and Solar Photovoltaic into Power Systems.*

The flexibility potential is here understood as the ability of a unit to modify its generation or consumption profile to cope with network constraints.

Indeed, decentralized solar solutions coupled with smart energy management systems can enable load shifting, i.e. displacement of demand to times of the day when on-site solar is producing, therefore reducing peak demand.

But an important potential lies in solar and storage systems. Solar and storage systems also allow for a reduction of peak demand, by storing the self-generated electricity and allowing to use it later in the night at peak times. But storage batteries can also turn out to be very effective flexibility resource by providing close to instantaneous back-up green power in case of power need in the grid.

Such flexibility can be triggered by 'simple' price signals, thanks to time-of-use tariffs reflecting the grid constraints (higher network tariffs for peak load times and lower tariffs for off-peak load times) or dynamic electricity prices, reflecting the availability of energy in the system. Various demonstration projects also foresee the possibility for storage to actively provide balancing services to the system operators, as very short-term frequency regulation. Barriers still exist to such a use, mainly due to the difficulty for decentralized storage to access balancing markets and the need to have adequate metering equipment. However, lessons learned from first pilot projects will increasingly allow for the use of solar and storage systems as a flexibility resource, especially through aggregation of decentralized solar and storage batteries: a pool of solar and storage systems is remotely controlled by a third-party and can provide an aggregated flexibility resource. Successful demonstration projects developed by the European companies Next Kraftwerke and sonnen have taken place in the Netherlands and Germany.

As an example, Greenpeace has in 2018 estimated the net value of small-scale solar in a scenario of large-scale development of decentralized solar in Spain at between €48/Mwh and €59/MWh, stemming from savings on fossil fuel costs, CO_2 emission savings, avoided operating costs for fossil fuels and nuclear plants, and power grid distribution savings.[17]

Finally, a key challenge to unlock the potential of decentralized solar flexibility lies in the consumer's engagement and the possibility to achieve behavioral changes. Yet, time-of-use tariffs have already proven very effective to incentivize load shifting and reduce peak load, for instance in France. Besides, automation of energy management systems and Internet of Things (IoT) simplify the interface with the consumer and optimizes the control of loads: this is promising to unlock additional decentralized flexibility.

Decentralized solar can therefore bring many benefits for the grid operator.

This requires a transformation of the role of the distribution system operator (DSO) on low and medium voltage grids. Historically, the role of the DSO was to ensure the supply of electricity from the centralised generation to the end consumer. With an increased connection of distributed generation to the medium and low voltage grids, bidirectional power flows appear on the grid. An increase of decentralized solar will therefore require the DSO to evolve: grid operators need to become more active in the grid planning and management, integrating the potential of flexibility resource (flexible loads, storage), and in preparing the distribution grid in the long term for the development of distributed generation.

In addition, most benefits of decentralized solar will be unlocked with digitalization of energy. Equipment of new buildings with smart energy management systems, which can optimize the loads of the various equipment in the buildings, are key enablers to optimize the physical self-consumption ratio and reduce the peak demand.

17 Greenpeace (2018) The Value of distributed solar PV

7.1 Moving Forward: Improving Administrative Procedures

Transition towards energy generation via decentralized solar systems challenges the structure of the conventional energy sector. Accordingly, it needs to adapt legislative, financial, technical, and administrative policies to accelerate this change.

Improving administrative procedures will create incentives for businesses by avoiding unnecessary costs and procedures, as well as supporting different sectors to continuously adapt to the changes while ensuring a smooth transition. The stakeholder feedback collected by EDAMA on administrative processes, in one way or another, reflects the need to develop clear, transparent and effective sector-regulating instructions and sheds light on some technical challenges that face different stakeholders.

We seek, through this report, to put forward key recommendations that would improve administrative procedures in renewable energy projects. This report reviews the current guidelines of the Energy and Mineral Resources Commission (EMRC) consisting of four documents governing the administrative procedures of the application process related to net-metering and wheeling projects connected to the transmission and distribution grids. The following diagram shows the legislative map in the renewable energy sector in Jordan.

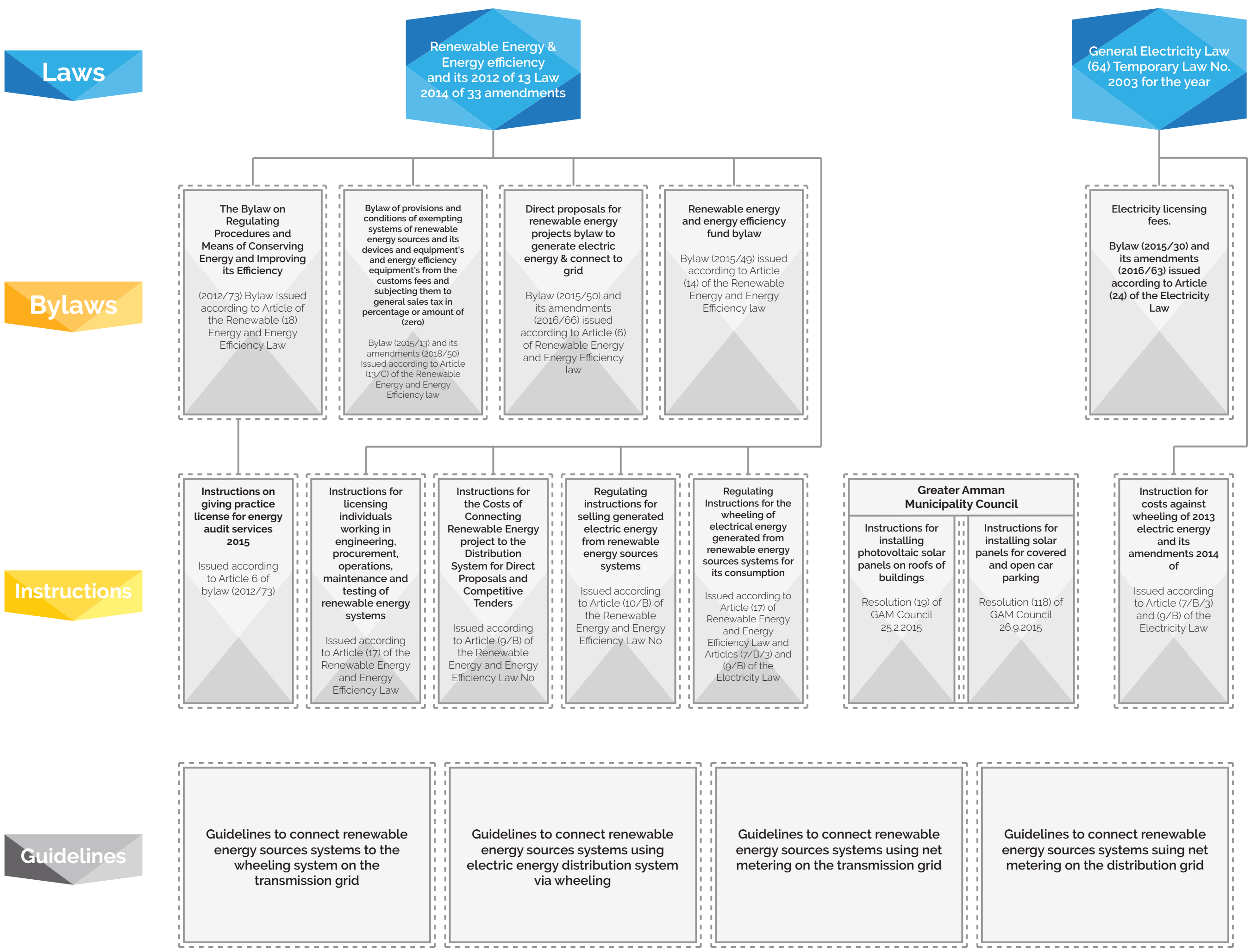


Figure 9: Legislative map in the renewable energy sector in Jordan
Source: EDAMA Database

7.2 Obtaining Permits to Install Renewable Energy Projects

The EMRC guidelines stipulate that the application process includes several phases illustrated in the following figure. This application process applies to all net-metering and wheeling projects, with mild differences in the submitted technical studies, which are only required for projects larger than 10 kW, and differences in the additional approvals and permits depending on the project type and size. The following diagram shows the general steps that the applicant must go through.

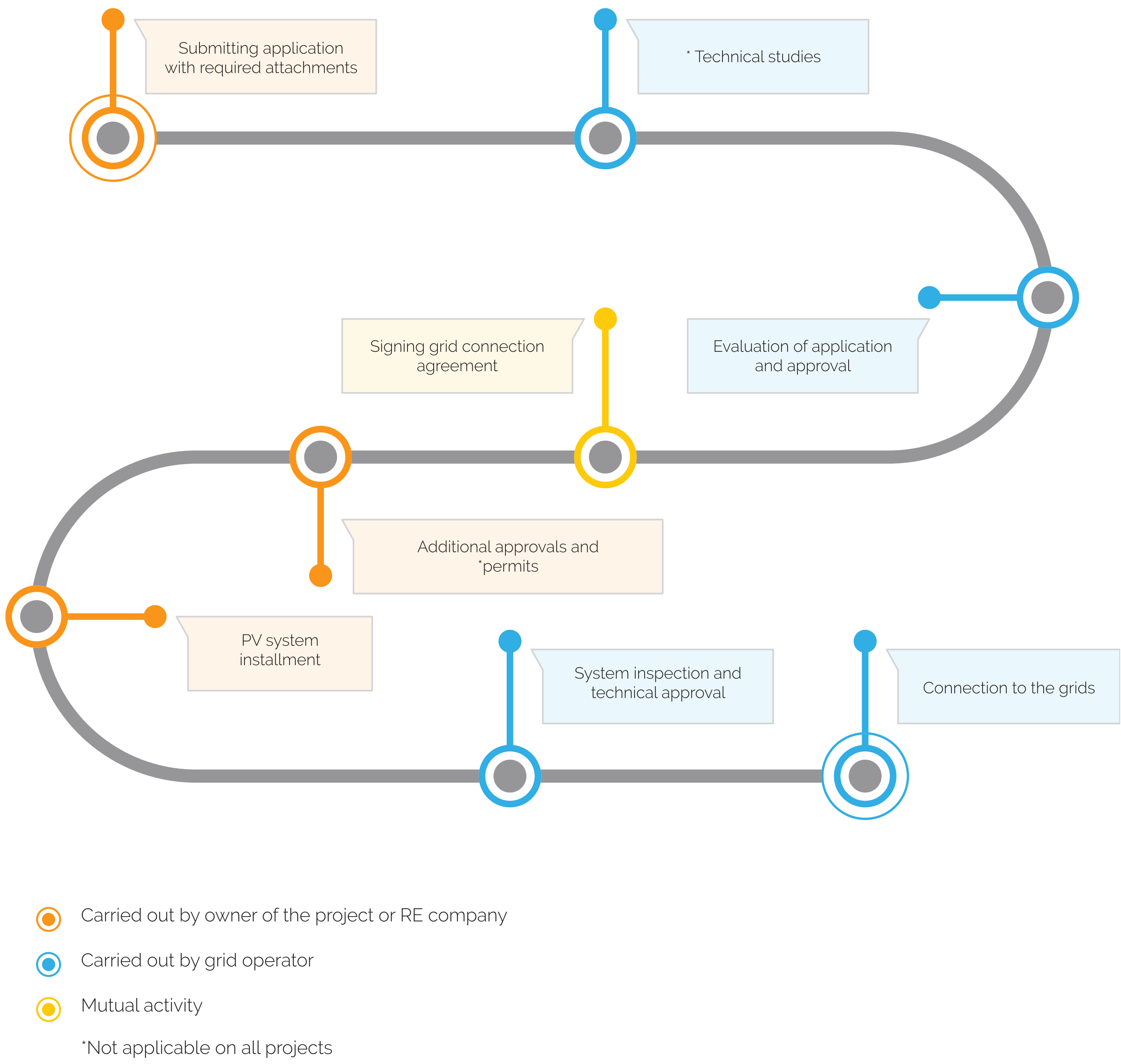


Figure 10: *The application process for net-metering and wheeling systems stipulated by the EMRC guidelines*
Source: *Energy & Minerals Regulatory Commission (EMRC)*

Following a survey to seek the opinions of a selected sample of stakeholders working in the renewable energy sector, the following suggestions were collected pertaining to the current procedures:

7.3 Specific Recommendations

7.3.1: Submitting application with required attachments

<u>Timeframe:</u>

The timeframe mentioned in the guidelines for reviewing the applications (5 days to a maximum of 3 months) is not respected if the two parties agree that it is an over-exaggerated period.

- A reasonable timeframe should be introduced that electricity companies can meet so that renewable energy companies can propose an acceptable timeframe through which they are able to commit to servicing potential clients.

<u>Required Documents:</u>

Some documents, such as installer permits and equipment data sheets, are repeatedly requested by electricity distribution companies.

- Electricity distribution companies should have a list of certified manufacturers and products. There is no need to require these documents from each applicant.

<u>Notification of Complete/Incomplete Application Status:</u>

Applicants are not notified once the application has been completed or deemed incomplete. There is an overall lack of a joint and effective communication channel to inform applicants of their application status.

- There should be a clear follow-up or tracking system in place for the application process with specific timelines and dates for each step of the process.

- An effective method of communication must be created to facilitate every step of the application process.

<u>Financial Clearance:</u>

Electricity distribution companies require financial clearance documentation from the renewable energy system owner when applying for a system installation approval, or before connecting it to the grid.

- The financial clearance documentation should not be a condition to installing renewable energy systems, but rather give the system owner three months after connection to the grid to pay back dues based on the saving from the installed PV system. Should the owner fail to do so, then the distribution company would have the right to disconnect the system.

<u>Connection to Mid- or Low-Voltage</u>

Some of the companies connect projects exceeding 1 MW capacity on mid-voltage, while other companies go for low-voltage.

- Clarify whether or not the reason behind that decision is technical.

The Applicant's Copy:

An applicant cannot have a copy of the application, inclusive of the connectivity agreement.

- After getting final approval, the applicant should be given the opportunity to request a copy of all documentation.

7.3.2: Technical Studies

Inspection After Submission of Application:

The distribution companies visit the site to inspect the facility for any signs of tampering or change in the circuit breakers, which is a practice that is not outlined in the guidelines.

- This step can be included under the inspection phase of the renewable energy system after installing it.

Results of the Preliminary Study:

After concluding the application, the applicant is notified of the preliminary results, and whether or not there are adjustments to the required capacity or the need to strengthen the electricity grid on site, without making available alternative choices for the applicant.

- There should always be options made available for the total required capacity, while noting what needs to be done in terms of strengthening the grid or any other technical requirements.

- Connection costs should be specific, clear and publicized, with clarity as to whom the ownership belongs to of any installed connection devices on account of the applicant.

Grid Impact Study:

The set timeframe is not respected. The applicant does not get a copy of the study results. This study is carried out at the electricity companies. There are several challenges that do not make it possible for the study to be carried out by a third party.

- A reasonable timeframe should be agreed upon that electric companies can meet so that renewable energy companies can, in turn, propose an acceptable timeframe that will allow them to commit to servicing clients.

- Applicants should be given the opportunity to request a copy of the study as soon as it has been concluded.

7.3.3: Additional approvals and permits

<u>GAM Approval:</u>

Approvals by the Greater Amman Municipality (GAM) for renewable energy projects require a valid public works permit and a system notary-signed guarantee conditional to non-usage for alternative purposes during the system's operational life span.

- The requirement of including a public works permit in the renewable energy documents should be abolished as it is an extra step set by GAM to ensure that building owners intending to install a renewable energy system have paid all their building-related taxes. GAM has many different ways to collect these taxes, but attaching these taxes to renewable energy procedures just prolongs the permit procedure and discourages people from investing in renewable energy systems.

- The notary guarantee should be replaced by a signed bank guarantee. The guarantee should be divided into two parts: in the first part, the renewable energy company expresses its commitment to the right elevations, installation quality assurance, and in the second part, it vouches to abstain from using system spaces, in the second part. Ultimately, the system owner has to commit, accordingly, for the entire duration of the project life span.

<u>Ministry of Environment Approval:</u>

The Ministry of Environment's approval is required for wheeling projects, including rooftops.

- This approval from the Ministry of Environment for rooftops installed systems should be abolished, as environmental risks are mainly present in ground mounted systems, while other related risks to rooftop projects are already covered by the GAM approval.

- The procedures for ground mounted projects should be shortened.

<u>Lease:</u>

The lease of the land or the building on which the energy system is to be installed is requested.

- It should be sufficient to have an electric meter subscription to prove the ownership of the building on which that the system is to be installed, given that the subscription always indicates ownership.

<u>EMRC License:</u>

This license is requested for projects exceeding 1 MW capacity.

- Fees against this license should be revised, with the consideration to eliminate annual fees and reduce the amounts required when the license is applied for.

<u>The Ministry of Municipalities Affairs (MoMA) Approval</u>

MoMA approval is required for wheeling projects, the aim of which is to ensure the land classification of the intended renewable energy project is medium-size industrial use. If the land classification is any other classification, then it must be converted to a medium-size industrial use. The approval also guarantees abiding by MoMA instruction design standards.

- There is no need to change the classification of the land on which the system is installed, since it is possible to exclude lands on which renewable energy projects are installed from any prohibitive instructions related to land use..

- It is also possible for the electricity meter to belong to the building or institution that is being supplied with electricity and not the land on which it is built.

7.3.4: System Inspection and Connection to the Grid

<u>**The Timeframe to Inspect the System:**</u>

There is no set date for inspecting the renewable energy system.

- The applicant should be notified of the date of inspection beforehand.

<u>**Comments About the System:**</u>

The inspection parameters of the system are unclear. There is no reference that identifies the methodology of inspection or the items to be inspected. Furthermore, the comments are not formally introduced to the energy company.

- A clear list of the items to be inspected should be in writing. Comments should also be entered formally into the system concerning the applicant.

<u>**Endorsing Contracts:**</u>

For some electricity distribution companies, a connection agreement is signed only with the system owner, while others sign the connection agreement with the authorized company assigned by the owner.

- Unify the methodology.

<u>**Reading the Meter Upon Operating**</u>

The exported (feed-in) energy is computed based on the connection date.

- The observed amount must be computed according to the meter, regardless of the operating date.

<u>**Connecting with the Collection Department:**</u>

After connecting the system to the grid and a new meter being installed, the Collection Department is notified to compute exported (fed-in) and imported energy. There is a time gap until the collection department takes notice, during which there is no computation of exported (feeding-in) energy into the grid.

- Notifying the collection department and system connection procedures must be done simultaneously.

7.3.5: Other

<u>Obtaining Customs Exemptions:</u>

Approvals by the Greater Amman Municipality (GAM) for renewable energy projects require a valid public works permit and a system notary-signed guarantee conditional to non-usage for alternative purposes during the system's operational life span.

- Exemptions should include input from all renewable energy projects, inclusive of special machinery for cleaning solar panels, construction costs, surveillance and security equipment, and all system cables.
- It is necessary to have a clear list of materials and services that are used in projects, with the status of each as to whether it is exempted or not; this list should be issued periodically by the Customs Department and circulated to all concerned departments.
- Study the option of applying for exceptions after the completion of the project, where exempted materials are identified through invoices.
- The time required for customs clearance procedures should be reduced by increasing the number of working committee members and conduction of periodic meetings.

<u>A General View on Procedures for Obtaining Approvals:</u>

- The guidelines do not include all procedures that an applicant goes through. The guidelines are limited to procedures at electricity distribution companies.
- Having a guide map that illustrates all relevant entities, permits, and approvals needed to install new renewable energy systems will make the procedures easier for applicants and will help in identifying costs and thereby facilitate a more accurate estimate of the budget and timeframe of each project.

7.4 General Recommendations

Based on the aforementioned details on the method of attaining renewable energy project permits and continuous practices as of the issuance of the concerned guidelines, the most important recommendations to streamline administrative procedures are the following ones – keeping in mind that some of these recommendations have both technical and legislative dimensions that have to be taken into consideration:

- **A one-stop-shop online application system:**

It has become common practice to use on-line applications to submit, process and followed-up on, and receive notifications on the dates of inspection and operation, as well as to monitoring and evaluate with live data and indicators. In addition, all documents will be stored in the system. If implemented, this system will bring clarity to the process and will promote a faster and more efficient application experience.

- **Transparency in application-related approvals, applying entities, granted capacities and open slots on the grid:**

This is carried out through the same e-system that assigns serial numbers to projects, where all project applicants should be dealt with in a transparent manner, while availing information to all.

- **Simplified application procedures for small and zero-feed-in systems**:

In case of on-grid systems that are less than 10 kW and systems that depend on the principle of zero-feed-in to the grid, the procedures need to be simplified into a one-step application "one-stop-shop" (similar to what is stipulated in the EU Renewable Energy Directive 2018/2001/EU that entered into force in December 2018), followed by notifying the electricity company of the installation of the system. In the case of an application to install renewable energy systems in locations that are commonly known to have been over-exploited in terms of electricity grid capacity, then a different timeframe is proposed for those concerned with the necessary technical studies in a manner that does not affect the progress of the normal procedures.

- **Inclusion of all the procedures, entities and costs which an applicant is expected to go through within the EMRC guidelines**:

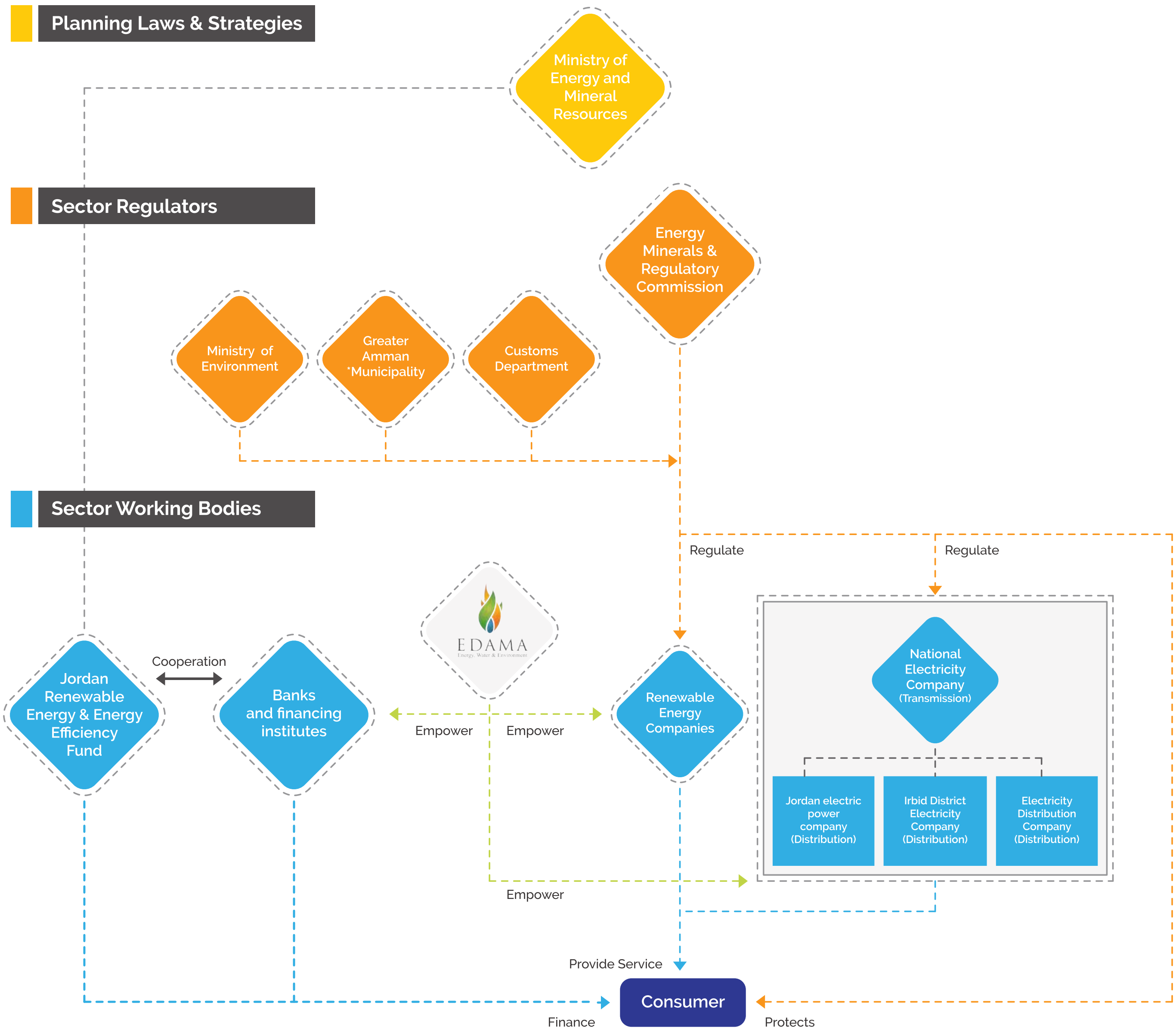
It is necessary for the entire application process to be clearer, so that it lists all the entities that are involved in the application process that an applicant must seek out to obtain the required approvals and permits while clarifying justifications and respective costs.

- **A unified practical implementation and interpretation of legislative stipulations with clear and reasonable deadlines**

Unifying practices related to the text of the guidelines among the three distribution companies, and set more reasonable abiding deadline for the different steps and procedures through the application process.

- **Coordination with other entities and reduction of the amount of permits needed**

Facilitating administrative procedures calls for increased coordination with other concerned entities and the need to restudy the necessity to carry out said steps, such as changing land classifications, public works permits, leases, sales tax, customs, Greater Amman Municipality, MPW, JREEEF, JEA, civil defence in terms of requirements that are not specifically or rather remotely related to renewable energy project, and study the possibility of merging them into the suggested online system.



Annex One: Stakeholders Map
Source: EDAMA Database