



EDAMA
Energy, Water & Environment

**Renewable Energy Sector
Development in Jordan**

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Overview of the Renewable Energy Sector ¹

The renewable energy (RE) sector represents an extraordinary Jordanian experience, indicative by the level of national institutions and private sector capabilities that kept up-to-date with emerging technological advancements and global trends, when supported by strong political will and fostering cooperation within clear and flexible legislations.

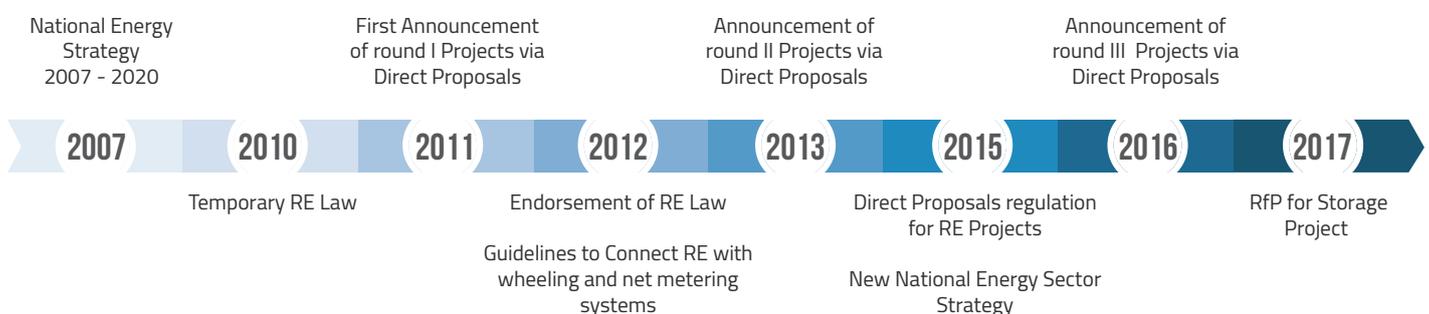
In 2007, the Royal Energy Committee in Jordan, reviewed and updated the National Energy Strategy , 2007 - 2020, main aim of which is to diversify the resources in addition to enhance the reliance on local energy. The strategy necessitated reaching 7% of renewable energy (out of the energy mix by 2015, and 10% by 2020.

In order to ensure realization of this Strategy, the legislative entities promoted this direction by issuing the Temporary Law for Renewable Energy in 2010; this was later amended and endorsed, as a Permanent Law, in 2012. The Law appropriately paved the way for renewable energy entering into the total energy mix; it availed the opportunity for the Ministry to issue Requests for Proposals (RfP) and attract competitive offers that would develop one or more sites to produce energy; and for investors to submit their bids to the Ministry or concerned party; over and above the existing bids issued through government tendering. This was followed by issued regulating instructions to both wheeling and net metering systems, marking the start of substantial work, on the sector.

In 2013, and for the first time, attention was directed towards building large renewable energy power plants, that are completely built by the private sector, void of any costs borne by the Government. Proposals were received from companies via “direct proposals” for round I, following a Governmental Request for Proposals (RfP), for the first time in 2011. The Cabinet’s Resolution was issued in 2014 to fix the purchasing price at 12 Piasters per kilowatt hour (kWh), for round I projects.

Following the legislative efforts, the Direct Proposals Regulation was issued in 2015 for renewable energy projects, in regard to connection to the grid and renewable energy generation. The methodologies were clarified, whereby the concerned party would announce for “Letters of Interest” of specific capacities and timeframes.

In 2015, the 2015-2025 Strategy was updated, aiming to reach about 9% in terms of renewable energy (RE) out of the total energy mix, by 2025. This was followed by successive sector-level development; requests for direct proposals were announced for round II, in 2013, round III in 2016, and for the first time, Energy Storage RFP by the Ministry of energy and mineral resources (MEMR), end of 2017.



On the level of solar and wind energy, out of the total produced electricity, it ranged between 0.6% in 2015 to about 8% in 2018.²



The transition to renewable energy

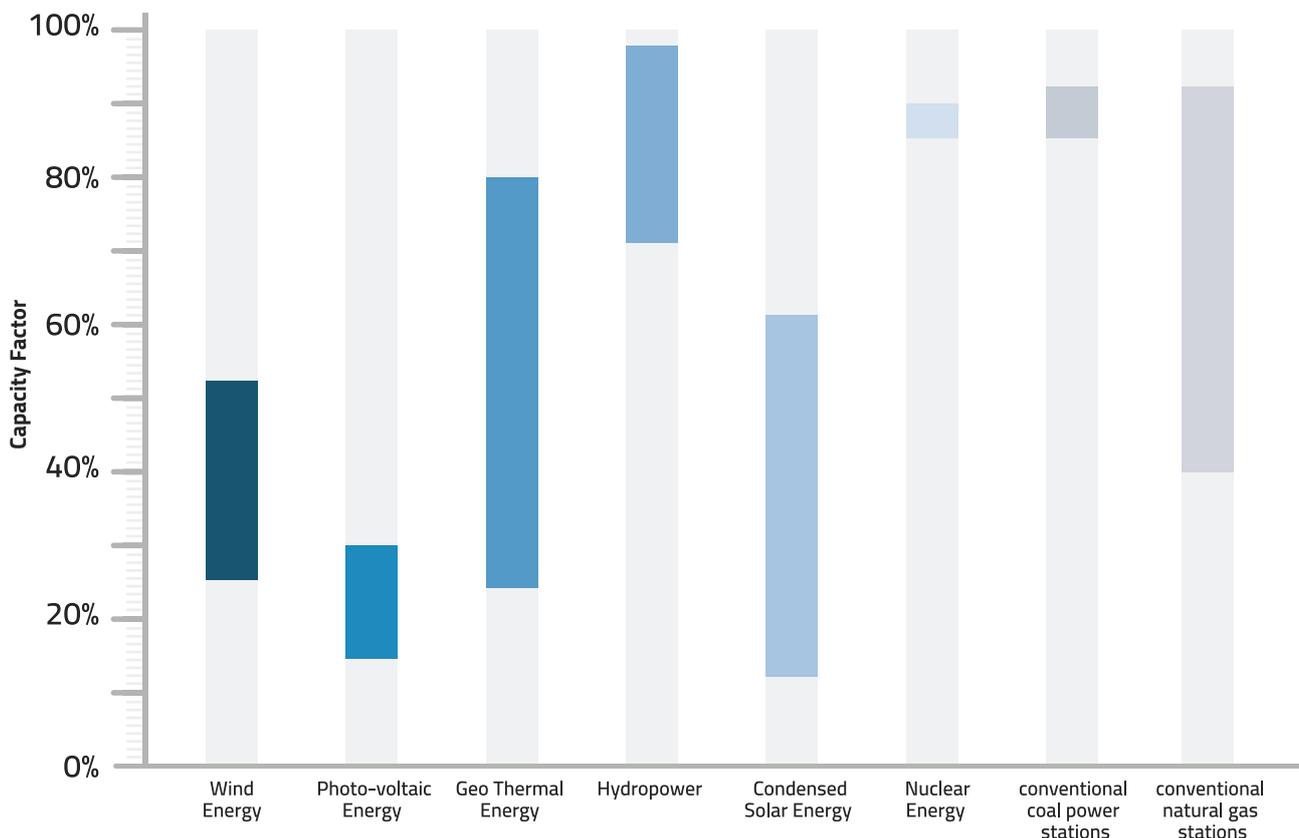
- Why should we Shift to renewable energy?

The transition to RE or in other words, to produced energy from local resources is no luxury. As per MEMR report for 2017, Jordan is still importing 94%³ of its energy, despite earnest efforts to be self-reliant and independent. Reliance on local resources in producing energy has become a universal and local directive, since the traditional concept of energy security and supply has changed for countries that do not have fossil energy resources; it has therefore become possible through renewable energy technologies, to change the rules of the game toward self-reliance. Everyone agrees on the renewable energy strategic importance for a country like Jordan, amidst an area of instability, having had several interruptions of its conventional fuel supplies, one of which resulted in an estimated loss amounts to 6 billion US\$ on the National Electricity Company during the Egyptian gas interruptions.

- Understanding the different natures of renewable energy systems.

The renewable energy is different in its nature from conventional energy that is produced by fossils fuels, this is mainly attributed to the fact that renewable energy is an intermittent source that does not continuously produce energy, which calls for several procedures to ensure that renewable systems can compensate for the conventional ones, in case it was decided to increase renewable energy dependences

The Capacity Factor expresses the fundamental difference among these systems, by pointing out the difference between what the system can produce in terms of energy, based on the Installed Capacity in comparison with what is actually produced. In case there was a comparison between a solar and a traditional energy system with similar Installed Capacity, then the first difference to focus on would be the Capacity Factor, that varies between 15% - 30% for the solar system, 26% - 52% for all types of wind energy and 40% - 95% for the conventional system.⁴



Source: NREL, 2015



This concept reflects on how to calculate the share of renewable energy in the electricity mix, where in case of Jordan, the installed capacity of the renewable energy is estimated at 625 MW (15%), for 2017, whereas only 5.3% of electric energy was produced. ⁵

- Absorbing transition phases from conventional to renewable systems reliance.

The world is acceleratingly turning towards renewable energy, as the installed capacity of renewable energy reached about 2,197 Gigawatt (GW) globally by the end of 2017, at an annual growth of about 8.3% whereas, the growth of photovoltaic energy was estimated at 32% and the wind energy at 10% in the same year. ⁶

Studies show that the transition towards renewable energy reliance, is a process in which several factors intervene, and requires a management with vast flexibility and adaptation to the variables, and multi-level coordination among different sectors. This process undergoes several phases. Phase I, where the contribution of the renewable energy in the total energy mix varies between 0% - 20%, ⁷ is focused on setting the legislative framework by issuing laws and regulations to regulate the work of this new sector, in addition to acquainting the market with the renewable energy systems.

This phase is characterized by the commencement of electric grid development, to enable it receive electricity from the new sources; however, conventional generation resources remained as is, without being replaced, since the installed volume of energy projects did not reach the level whereby it can replace the former.

The following phases are focused on strategies that promote electrification of all conventional energy systems; while incorporating new technologies that promote energy management, like storage systems and smart grid applications that will increasing the flexibility of the electrical system, and lead to complete renewable energy dependence.

Phase I, is considered to be one of the most important phases that pave the way for a well studied and regulated transition process, the hardships of which is in its coincidence with most of the world countries, together with the maturity of renewable energy technology. At the beginning investments face difficulties given high risks of investing in totally new systems and high capital costs, without having previous experiences that can be considered as guarantees of success of this new technology.

- The transition path to renewable energy in Jordan ⁸

The concerned parties have prepared a pioneering legislative framework that regulated entry of renewable energy into the electrical grid at the right time. while prepared the appropriate environment for competitive market through the 3 direct proposals rounds, in which the door was opened wide to all local and global entities to come forth with their financial and technical bids in order to compete for the projects at locations depicted upon by the Ministry of Energy, and in accordance to the electricity system needs. It offered to buy the electrical energy, in a way that guarantees entry of financial institutions into contractual agreements with the investors, with least minimum possible risks, during that establishing phase. The following table summarized the progress of the three rounds of direct proposals, which observes the extend of trust-building in the sector and those over-seeing the sector.



Direct proposals Rounds						
	Round 1		Round 2		Round 3	
First Announcement	5/2011		8/2013		12/2016	
Applicants Letters of Interests	64		83		45	
	Solar energy	Wind	Solar energy	Wind	Solar energy	Wind
Eligible	22	12	47	6	31	14
Applicants: both financial and technical proposals	12	N/A	24	Project Cxld	16	N/A
Number of signatories on power purchase agreements (PPAs)	12	7	4	=	2 or 3 (not yet set)	N/A
Installed Capacity (MW)	200	535	200	-	150	50
Operation	second half/2016	End 2020	End 2018	-	2020 (expected)	-
Investment Volume (Million US\$)	580	1,171	325	-	N/A	-
Average Purchase Price/Tariff (Piaster / KW Hr)	10.5*	12	8.36**	4.817 (2015)	-	1.768 (2018)
	2013					

(*) According to Energy Purchasing Agreement between the Ministry of Energy and Shams Maan Company, comprising 25% of the Installed Capacity of Phase I Projects
(**) Average Wind Energy Purchase Price in 2017

Direct proposal projects - Phase I

During the first round of the direct proposal projects, the Energy and Minerals Regulatory Commission (EMRC) suggested defining the feed-in-tariff rate, based on several studies that were carried out for compatibility and comparatively purposes of the world countries price per kWh, at a time when the oil barrel price was about 110 US\$, hence the cabinet resolution was issued to fix the price according to these studies.

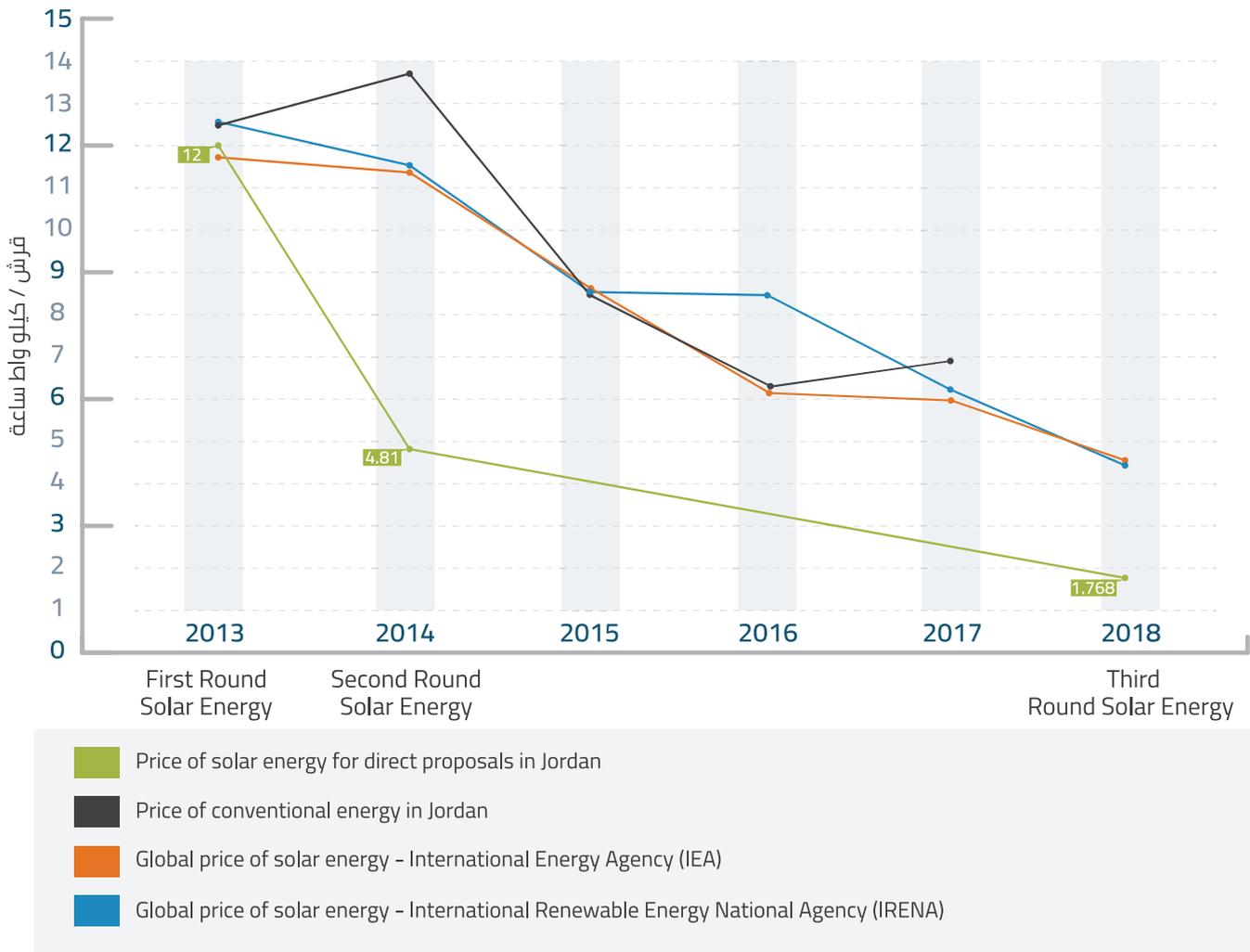
These projects formed the corner stone of the sector in Jordan and the region, whose contributions reached 2% of the total produced electricity energy; and paved the way to financing the projects through international financing institutions, at a share of 70% of the project's capital values, over periods of 15 - 18 years; whereas, the duration of power purchasing agreements (PPA) signed by the sector developers with the Ministry of Energy and Minerals (MEMR) is 20 years.

The net metering and wheeling scheme

With the legislative framework in place for the net metering and wheeling projects, the national institutions and industries were able to attain funding to install renewable energy (RE) systems, so that 6,566 net metering projects were installed, with total capacity of 154 Megawatts (MW), and 61 wheeling projects, at 48 Megawatts (MW), up until the end of 2017 ⁹. These projects greatly contributed to a decrease in the bill of those sectors, which is directly connected to the cost of production, hence promoted the competitiveness and continuity, as well.



This development, came in line with the global trends in terms of the legislative framework, utilized technology and global prices where Jordan was able to get competitive prices across all the developmental phases of the renewable energy, as the studies show in the next figure.



Jordan portrays a success story, by going through Phase I towards full transition to renewable energy, which reflects its capability to be a part of all the global changes, and its capability to attract competitive prices, and set an attractive climate for investors and funding agencies, as it attracted investments that will reach 4 billion US Dollar¹⁰, by 2020. Furthermore, it employed more than 7,928 employees, until the end of 2016. More than 300 companies were registered, as per the latest statistics at the Energy and Minerals Regulatory Commission (EMRC), and 1400 companies were registered, at the ministry of Commerce and Industry, not to mention the large number of contracting companies and financing institutions; ultimately, this has led to the production of local energy at 16% of the total produced electricity in 2019, and for the first time in the history of Jordan.



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