

November 2016

# Morocco's renewable energy ambitions

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Deprived of hydrocarbon reserves on its soil, Morocco imports more than 90 per cent of its energy resources. The country has set itself ambitious renewable energy targets and aims to generate more than half of its electrical power from sustainable sources by 2030.

In 2008, Morocco launched the National Renewable Energy and Efficiency Plan, an energy programme aiming at having 42 per cent of its total energy produced from renewable sources (solar, wind and hydroelectric sources) by 2020. During the Climate Summit (COP 21) held in Paris in 2015, King Mohammed VI announced that Morocco will achieve 52 per cent of its electrical power from renewable energy in 2030. It is the most ambitious renewable energy programme in the region.

To become a green-power leader, the Kingdom of Morocco made significant efforts to strengthen the legal and regulatory framework in order to facilitate the development of the renewable energy sector in the country (especially through a modernisation of the Laws applicable to the Private Finance Initiative and to the Renewable Energy).

In the sector of thermal and photovoltaic solar energy, the Kingdom of Morocco offers a wide range of investment opportunities. Indeed, solar resources are abundant, with a potential of 2,600 kWh/m<sup>2</sup>/year.

In the sector of wind energy, the potential of the country is largely untapped. In 2013, only 5.05 per cent (< 500 MW) of electricity produced in Morocco was generated through wind power and the wind energy potential in the country is estimated at 25,000 MW.

Moreover, Morocco has a strategic position as it is a regional energy hub with a connection to Algeria and the Spanish electrical grid through two electric lines (400kV/700 MW).

## Morocco's Solar Power Programme and Noor Project

As Morocco gives priority to reducing dependence on fossil fuels, the country launched the Moroccan Solar Plan in 2009. This Plan is one of the world's largest solar energy projects and aims at building 2000 MW of solar capacity by 2020.

L'Agence Marocaine pour l'Energie Solaire (the Moroccan Agency for Solar Energy - MASEN), a public-private venture established by the Renewable Energy Law No.13-09, and the Morocco's Office National de l'Electricité et de l'Eau Potable (Moroccan electricity and water utility company - ONEE) are in charge of the development and implementation of the Moroccan plan for solar energy.

This plan is implemented through the "Noor project" which aims to build and operate several plants based on solar photovoltaic as well as solar thermal power. Two technologies, Concentrated Solar Power (CSP) and Photovoltaic, are designated to be used at these stations. All of the plants are supposed to include molten salt storage systems that enable them to continue generating power without sunlight.

At this stage, five locations have been preselected: Ouarzazate, Midelt, Laâyoune, Boujdour and Tata.

This major plan for solar energy is supposed to increase by 14 per cent the role of solar energy in total electricity capacity by 2020 and prevent the emission of 3.7 million tons of CO<sup>2</sup> per year.

## The Noor project in Ouarzazate

The hybrid solar power project located in Ouarzazate, composed of four phases, will have a total installed capacity of 580 MW in 2018.

Once all phases will be in operation, the Noor Solar Complex will be the largest solar power production facility in the world and will provide electricity to more than one million homes.

## Noor Midelt

In January 2016, a call for expression of interest for the development of the first phase of the Noor Midelt solar power project was launched and MASEN launched the prequalification process in July 2016.

Noor Midelt Phase 1 concerns the implementation of two CSP and PV plants (each of the plant having a capacity between 150 and 190 MW). This project will be implemented under an IPP scheme. The financial closing is expected to occur in 2017 and the construction works will start by the end of 2017.

## Noor Project launched by ONEE

Another solar power programme has been set up by the Morocco's Office National de l'Electricité et de l'Eau Potable (Moroccan electricity and water utility company - ONEE) and calls for the development of 400 MW in three phases by 2018.

### Noor Tafilalet:

The first phase, the Noor Tafilalet solar power project, consists in three solar power plants of 25 MW each and sited in the southeastern part of Morocco. For this project, the bids were launched in July 2015.

In September 2015, it appears that 49 companies and consortia from 19 countries have already taken part to the pre-qualification phase. The bids have been submitted; however the contract has not been yet awarded. The commissioning of Noor Tafilalet is scheduled for 2017.

The overall cost of Noor-Tafilalet is estimated at EUR 158 million, of which EUR 148.95 million will be provided by the World Bank.

## The Noor PV I project

The Noor PV I project aims to develop three PV plants with an aggregate capacity of about 170 MW by 2019: Noor Boujdour (20 MW), Noor Laâyoune (80 MW) and Phase 4 of Noor Ouarzazate (70 MW).

After launching an international tender for this large-scale solar power project, the Moroccan Agency for Solar Energy has already pre-qualified 20 bidders.

### Noor Atlas:

Besides the Noor Tafilalet solar plan, the Noor Atlas programme is under studies. This 200 MW solar power complex will comprise eight PV plants of 10 MW to 30 MW each in the southern part of the country in Tata, Tahla (Bouizakarne), Tan Tan, Ain Beni Mathar, Boudnib, Bounanae, Outat El Haj and Boulmane (Enjil).

The tender procedure for the Noor Atlas plan is expected to be launched in the second half of 2016.

### Noor Argana:

The Noor-Argana project is the third phase of ONEE's photovoltaic programme for 500 MW by 2020.

The Noor Argana solar complex capacity is estimated between 200 MW and 225 MW. At this stage, the selected locations for the development are: Boumalen, Tinghir, Errhamna and Essaouira.

The 200 MW Noor Argana project has been announced and the ONEE is taking the final steps to organize the tender. The call for pre-qualification bids for Noor-Argana should take place at the end of 2016 or at the start of 2017. Commissioning is scheduled to start in 2018.

## Other notable solar projects

**PROMASOL:** Morocco has also launched a specific programme for solar water heaters (PROMASOL) involving an installation of 440,000 m<sup>2</sup> of thermal solar sensors in 2012 and 1.7 million m<sup>2</sup> in 2020. This will represent 1190 GWh of thermal energy produced annually by 2020.

**Ain Beni Mathar:** The country set up a 470 MW hybrid solar-gas plant, the Ain Beni Mathar project. It is the first plant to be constructed with cylinder parabolic mirror technology in Morocco. The plant entered into service in 2010.

## Morocco's wind energy programme

In order to support the development of renewable energy and energy efficiency in the country, Morocco has undertaken a vast wind energy programme, the Moroccan Integrated Wind Energy Project.

This programme, launched in 2010 for a duration of 10 years and requiring an investment of approximately US\$3.7 billion, will enable Morocco to bring the installed capacity, from wind energy, from 280 MW in 2010 to 2,000 MW in 2020, will increase the share of wind power in the national energy balance (to 14 per cent by 2020), will achieve a production capacity from wind power of 2 MW and annual production capacity of 6,600 GWh, will allow savings of 1.5 million tons of fuel per year and, finally, it will prevent the emission of 5.6 million tons of CO<sup>2</sup> per year.

## Tarfaya Wind Farm

This 301 MW wind farm built by the Tarfaya Energy Company (TAREC), a 50/50 joint venture between GDF Suez and Nareva Holding, is spreading over an area of 728 hectares and consists of 131 wind turbines with a 2.3 MW capacity each. To achieve it, GDF Suez and Nareva have signed a 20-year long-term Power Purchase Agreement (PPA) on a build, own, operate and transfer (BOOT) basis.

## Wind farm projects under development

To implement the Moroccan Integrated Wind Energy Project, the Morocco's Office National de l'Electricité et de l'Eau Potable (Moroccan electricity and water utility company - ONEE) has recently tendered two wind farm projects.

The first one deals with the construction of five wind farms with a total capacity of 850 MW. The wind farms will be located in: Tanger II (150 MW); Midelt (100 MW); Jbel Lahdid (Essaouira) (200 MW); Tiskrad (Laâyoune) (300 MW); Boujdour (100 MW).

The second one deals with a 150 MW wind farm at Taza, northern Morocco. This wind farm will be constructed on a build, own, operate and transfer (BOOT) basis. In 2014, the Japanese and French companies, Mitsui and EDF Énergies Nouvelle, have been named preferred bidder.



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