

Renewables powerhouse

Morocco's efforts to make good on its ambitious renewable power targets are now paying dividends.

Ian Lewis reports.

Morocco is in the vanguard of countries seeking to achieve 100% electricity generation from renewable energy, thanks in large part to copious amounts of sunshine, 3,500km of windy Atlantic coast and a progressive energy policy designed to reduce the kingdom's reliance on fuel imports for its power sector.

Bereft of significant quantities of fossil fuels, the Maghrebi state has long seen the benefit of bolstering home-grown power generation, rather than costly imports. Primary energy consumption in this nation of more than 35m people has been rising at around 5% a year since 2004, according to government data.

Back in 2009, a target was set for renewables to account for 42% of power generating capacity by 2020. Then in 2015, when renewables had reached a 32% share, the government upped the ante.

It committed the country to increase the share of renewables capacity in the generating mix to 52% by 2030 – 20% of this solar energy, 20% wind and 12% hydropower. Achieving this required the addition of some 10,000 MW of power capacity in 2016–30, comprising 4,560 MW solar, 4,200 MW of wind and 1,330 MW hydro.

Already, the sector has put on weight. By the end of 2018, Morocco is expected to have 887 MW of operational solar power capacity, 1,207 MW of wind power and more than 1,700 MW of hydropower capacity, with a lot more wind and solar on the way.

Policy push

Expansion has been underpinned by three major planks of government policy: a legal framework designed to liberalise the investment environment for the power sector; the creation of a series of new institutions to speed up the energy transition, and reform of energy subsidies. The latter had kept fossil fuel prices artificially low to the detriment of renewables investment. Since 2015, the price of all fuels, with the exception of butane, has been market-led.

The most high-profile result of the reforms has been the development of one of the world's largest concentrated solar power facilities, Noor Ouarzazate, to the south of the Atlas Mountains in the centre of the country. Mustapha Bakkoury, Managing Director of the Moroccan Agency for Sustainable Energy (MASEN), said in April that the 580 MW complex, which has been built in phases, is due to be fully operational by October 2018.

The project has been producing from a 160 MW concentrated solar power (CSP) development, using parabolic troughs, since early 2016. Adding to this, some 200 MW of capacity, using parabolic troughs, and 70 MW of solar photovoltaic energy was due to be commissioned in May. The final phase, producing 150 MW from a solar thermal tower is scheduled to be operating by October. Financing has primarily come from MASEN, underpinned by support from development institutions led by the World Bank and the African Development Bank.

More renewables are coming soon. Among them is the 800 MW Midelt solar project, for which groups led by Engie,

EDF Energies Nouvelles and Saudi-based ACWA Power International put in bids last December.

Meanwhile the government said in April that initial tenders for the Noor PV II project would be announced later in the year, encompassing facilities on several sites around the country. The project, which is expected to be completed in 2020, could be backed by domestic or international bonds.

The construction of some 850 MW of wind power is also due to be started in 2018, according to the government. They will build on the success of projects such as the Tarfaya wind farm. Built by a partnership of Engie – then called GDF Suez – and local firm Nareva holding, Tarfaya was Africa's largest wind project when it opened on Morocco's southwest coast in 2015, with a capacity of around 300 MW.

Falling generating costs

None of this is being done contrary to economic logic. Solar PV and wind tenders in Morocco feature some of the lowest costs in the world – around \$0.03 kWh in some cases, which is well under half the average cost of fossil fuel imports over recent years. CSP remains more costly, but getting cheaper as more plants are built.

Morocco underscored its green credentials by hosting the COP 22 climate change talks of November 2016 in Marrakech, leading a drive to champion the goal of achieving 100% domestic renewable electricity production, encapsulated in a document signed by 48 countries. Given its access to hydropower resources to provide base load or electricity that can be dispatched rapidly during periods



Noor Ouarzazate, one of the world's largest concentrated solar power facilities.

of peak demand, Morocco is in a better position to push for a higher share of renewables than many countries.

New hydro schemes include a pumped storage hydroelectric plant (PSP), near Agadir, to be built by French firm Vinci Construction at a cost of around \$350m. Water stored in an upper basin will be sent through a pipe down a vertical drop of about 550 metres to a lower basin, with a 350 MW hydroelectric plant installed in the middle. In reverse mode, the project will also be able to pump water back up to the higher basin at off-peak times to maintain levels.

Water problems

But the country doesn't have enough hydropower resources to fully balance out intermittent solar and wind and nor can it rely on them to produce at full capacity in the future. Changing climate patterns have caused water levels in some of the country's main dams to drop significantly in recent years.

In the future, advances in grid-scale battery storage may be able to smooth out grid fluctuations from renewables, but for now an alternative is needed. In 2015, around a third of power capacity in the country was fired by coal imports, around 10% came from diesel, some 20% came from hydro and 25% from imported gas, with most of the rest coming from wind and solar. The country also imported electricity directly from Spain. The aim now is to boost gas power to oust more polluting coal from the energy mix and bring in more flexible power production to complement renewables.

As part of gas-to-power plans, Morocco announced earlier this year it would push ahead with a long-mooted LNG import terminal at Jorf Lasfar near the port of El Jadida. The \$4.6bn project, to be funded by a mixture of public and private finance, is envisaged opening in around 2023. It includes facilities to handle imports of up to 7bn cubic metres a year of gas by 2025, and gas-fired power capacity of 2,400 MW.

The flexibility offered by Jorf Lasfar's gas to smooth out solar and wind energy variability would provide yet another important cog in the wheel, allowing Morocco to remain among the world leaders in renewable energy. ●