

## Morocco off-grid systems

Morocco is a large country with 446,000 km<sup>2</sup> and a variety of habitats including mountains, coastal Mediterranean and desert, one reason its used for so many film locations. 60% of the country is classed as agricultural but most people (60%) live in urban areas. Morocco has a sizeable and growing economy - 5th in Africa and worth \$298 billion. There is a substantial tourist industry and its now increasingly integrated with the EU with many satellite industries serving European economies including textiles, clothing and motor vehicle assembly.

Morocco also has substantial mining industry including phosphates, zinc, manganese and iron ore. Agriculture too is oriented to the EU and is part of the supply chain for products like citrus fruit, wine and juices which are sold all over Europe.

Morocco is the most advanced north African country in its use of solar energy with 5 plants of PV and CSP (550 mW) being built near Ogarzazate and ironically the Saudis are the main contractors. Morocco has twice the regional growth of any country in north Africa much of it to do with its proximity to Spain.

Electricity generation in 2016 was 35 tWhrs and this is expected to grow to 80 tWhrs by 2050. Rural access was only 18% in 1995 but by 2016 this has increased to 99.42%. Future growth can only come about by the application of renewable energy. In 2016 coal accounted for 58% of power needs with gas at 20% and oil at 10% accounting for most of the balance. 60% of power is provided by private sources with the National Energy Strategy allowing for private investment and JV schemes.

Morocco expects 42% of its power from solar, wind and hydro by 2020 and 52% by 2030 : Ambitious targets. There are many opportunities for solar both in the large cities and rural area as well as resorts and in national parks. As in Tunisia small scale grids can offer real solutions but Morocco is following the same route as Egypt towards a large scale grid distribution system. Western Sahara could generate all its power with solar and Morocco's but Morocco is occupying the country and its control is not recognised by the UN so impossible to secure multilateral funding.

More than half the country has high levels of solar insolation - in excess of 2,000 kWhrs/m<sup>2</sup> per annum. Large scale development of solar generation can be fed into the European grid through Spain and become an important income earner for the country. The first part of the overly ambitious Desertec scheme has been started in Morocco.

In the meantime solar containers have a lot of opportunities in the rural areas linking up remote rural areas and along the coastline in and around Agadir (also an earthquake zone) in all the large resort hotels and other commercial buildings.

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