

Just two developer consortiums are now left in the running to supply Morocco with its long mooted 200 MW of wind power. With vast tracks of open land and lots of wind, a visionary dream is being painted by enthusiasts of Morocco wheeling wind power under the Mediterranean to provide Europe with up to half its electricity needs

MOROCCO SHORTENS THE SHORT LIST

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Forget planning problems, competition for land and offshore waters, and fighting the vested interests of policy makers: the EU's energy and environmental problems may be solved by events now taking place outside its borders. The bidding contest for two huge new Morocco wind farms could turn out to be the latest step in a process that will turn North Africa into an "offshore" wind farm supplying much of Europe with cheap electricity.

The decision on who will build Tangier and Tarfaya wind farms is expected to be announced this summer, although no date has yet been given by the Moroccan utility, the Office National de l'Electricite (ONE). The bidding process has taken longer than anticipated in the 1999 call for tenders which envisaged the wind farms coming on stream by 2004.

The 140 MW Tangier wind farm will be built on two sites: Sendouk (65 MW) and Dhar Sadane (75 MW), both near the village of Ksar Essghir, about 15 kilometres from Tangier. Tarfaya wind farm, 60 MW, will be situated outside the town of the same name on the Atlantic coast, in the Addwikhia region. Together the two wind farms are expected to have a maximum of 334 turbines and to produce an annual average of 600 GWh, equivalent to 2% of the country's electricity needs. Tangier and Tarfaya, however, have the potential to be expanded to a combined 400 MW, which would make them one of the world's largest private wind power installations.

Nine consortiums passed the pre-qualifying stage of the call for tenders: British developer M&N Wind Power, together with AES, Acciona and Danish wind turbine company NEG Micon; Britain's National Wind Power, with National Power, turbine supplier Bonus Energy of Denmark and Akwa Holding; Spanish utility Union Fenosa, with Bazan (Bonus), and Energia y Recursos Ambientales (EYRA); local company Enercorp, with Oismine Holding (Somepi Group) and turbine maker Enron Wind (GE Wind); International electrical engineering group Alstom with German wind turbine company Nordex; Californian wind project developer SeaWest, with Marubeni, Cinergy Global Power and its oft-used turbine supplier, Mitsubishi; Electricidad de Portugal together with Spanish utility Iberdrola, Enernova, Ibernova and German wind turbine supplier Enercon; Spain's Endesa utility with its wind turbine subsidiary, Made; and Spanish wind company Gamesa, together with Sinae, Ersia Eolica Europeas and Cabinet Germa, the only company with direct experience of wind farm development in Morocco.

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MARC BALLANDRAS

ONE intended to announce the winner in October 2000 but when that passed it became clear that the selection process had overrun its original schedule and that no clear end was in sight. In February 2002, ONE asked for four consortiums to present revised bids, the rest were eliminated. The most surprising casualty was Cabinet Germa, recently merged with La Compagnie du Vent (WINDPOWER MONTHLY, May 2002). "Although we are out of the bidding this time," says Jean-Michel Germa, "We would be keen to act as contract managers for the winners."

Two of the short list of four were subsequently eliminated and the final choice of contractor is between the two remaining consortiums—Union Fenosa with Izar (formerly Bazan), EYRA and Denmark's Bonus; and Enercorp/Somepi Group, together with Britain's Renewable Energy Systems and new choice of turbine supplier from their original bid, Vestas of Denmark. At the same time, ONE announced that it would be concentrating exclusively on the Tangier wind farm, which may be as large as 194 MW, if the Enercorp bid is accepted. Tarfaya will be developed only after the first wind farm is complete.

DOWN TO DETAILS

Marc Ballandras of Enercorp believes that although price is the key driver, other factors could influence the final decision. His consortium is the only one involving a Moroccan company, Somepi, a private energy conglomerate and one of the largest companies of its kind in Africa. "A locally led investment proposal will retain more profitability and capital for the country and create greater social and economic benefits," he argues, stressing that one of the attractions of his bid would be a potential technology transfer: manufacturing could take place in Morocco at a later stage, subject to a feasibility study by Vestas, bringing the country some much needed industry.

Whoever wins the contracts this time around, Morocco will take a step towards self-sufficiency and meeting a growing demand for electricity. Today the country imports 85% of its energy needs and 25% of its foreign earnings go to pay its petrol bills. It needs to reduce its dependence on imported energy if it is to supply the 40% of homes still without electricity in the country. The government is planning to supply 25 million more people with electricity by 2010.

A gradual liberalisation of the electricity market is seen as one way to bridge the gap between supply and consumption. Morocco has only a short history of private power generation—and an even shorter history of wind

power—but since 2000 it has been official policy to supply 10% of its energy needs from renewables. The country has only one wind farm, Koudia al Baida, which was built by Cabinet Germa, leading a French consortium that included France's principal utility Electricité de France, and which came into operation in 2000 using Vestas turbines. It's 50.4 MW, however, forms a significant part of the country's total power generating capacity of 4516 MW.

Ballandras is keen to remind outsiders of Morocco's achievement in building Koudia al Baida: "This is the largest private wind farm in operation in a developing economy and this is an enormous accomplishment, particularly when compared with some European countries, let alone the difficulties of a developing economy."

The 200 MW to be supplied by Tangier and Tarfaya only scrapes the surface of wind generation potential. "Morocco enjoys one of the world's strongest and most consistent wind regimes, especially in the north—close to Spain—and the south in the Saharan provinces," says Ballandras. "It is a potentially exploding market with a potential to install thousands of megawatt."

Average wind speed over 90% of the national territory is 5.3 m/s, according to Morocco's Centre for the Development of Renewable Energy, which has been doing wind resource research since 1982. Annual electricity production for each kilowatt of wind power installed is estimated at anything from 2250 kWh to an unlikely 5000 kWh.

LOTS OF LAND AND WIND

Despite the slow progress in developing Tangier and Tarfaya, wind developers have started talking of a much more exciting prospect than merely making Morocco more energy self-reliant. Morocco has some specific problems of its own but it lacks some of the problems plaguing European countries. "It has lots of land and lots of wind," Ballandras points out. Khalid Benhamou of Saharawind.com agrees: "There are huge areas with excellent wind conditions where the population densities are about one-hundredth of the European population densities, and where the same can be said about electricity needs. The West Saharan coastal plateaus represent the largest, least populated and windiest sites available that are within the reach of Europe's electricity grid. The Saharan coast that spreads for over 2000 kilometres could supply huge amounts of renewable electricity to the European Union. Large scale wind energy production on these lands may provide an alternative to the saturation of the densely populated areas currently used for wind energy production in Europe."

This vast deserted land, where planning restrictions are barely an issue, has been connected to the EU across the Straits of Gibraltar since 1997. Mostly the electricity flows one way, out of the EU and into Morocco, but when a sudden cold spell induced power cuts in Spain in December, Morocco was able to bail its northern neighbour out with the extra electricity it needed.

A more high powered connection will be needed if larger amounts of power are supplied. The feasibility of making Morocco into an exporter of wind powered electricity has been demonstrated by a simulation by Gregor Czisch of the ISET renewables research institute in Kassel, Germany. His results suggest that a single, very large 5 GW high voltage DC line could be built all the way to Ger-

many, delivering electricity at an acceptable price.

Saharawind.com's Benhamou explains the reasoning behind Czisch's idea. For large electrical capacities, he says, the existing High Voltage Direct Current (HVDC) technology enables transmission losses to be less than 15% over a distance of 4500 kilometres. The added costs per kilowatt hour of such a long transmission line are in the order of €0.02/kWh, he claims. With a wind turbine spacing of 2.4 MW a square kilometre over the 2000 kilometres of coastline from Morocco to Mauritania, a production of more than 1000 TWh a year can be achieved. This would be sufficient to cover almost half of the entire yearly production of the EU, 2300 TWh, explains Saharawind.com. Assuming a yearly average production of 3400 full load hours, a price per installed kW of wind power of €1000, money borrowed at 5% real interest rate, a 20 year plant lifetime, yearly operation and maintenance costs at 2% of total investment, the wind power pro-



Potential: The 50 MW farm at Al Koudia al Baida is Morocco's only large scale wind power station, though if all goes well national capacity will soon be boosted by 200 MW

duced would cost under €0.03/kWh. The price would come down still further, says Benhamou, if the windiest sites were used, where he claims an impressive yearly production of 4500 kWh per kilowatt installed can be achieved.

To transfer the power from Mauritania (the extreme south of the territory) to the centre of Germany, continues Benhamou, would require a 4400 kilometre HVDC line and 40 kilometre sea cable. For this case, the total costs of wind generated electricity from the Sahara desert, delivered all the way to Germany, are calculated to be €0.045/kWh. It is not clear if the total costs of the cable are shouldered by wind alone, or with other generation.

"Therefore the use of wind generated electricity produced at low costs in North Africa to supply Europe is technically possible and would represent a win-win situation for all countries involved," he says. Given the right conditions and drawing on the lessons of experience, Morocco, currently Africa's leader in renewable energy, may even have the potential to produce the cheapest wind energy in the world.