



Europe Looks South

As Europe refashions a political union with the Middle East and North Africa, *Crispin Aubrey* looks at the promising potential for wind power and other renewables around the south and east Mediterranean.

When French President Nicolas Sarkozy launched his vision of a 'Union of the Mediterranean' last July, it was welcomed in the media with an impressive degree of enthusiasm. Over 40 heads of state from Europe, North Africa and the Middle East gathered in Paris to sow the seeds of what was heralded as a new era of economic and political cooperation.

A step change forward from the original Barcelona Process – the 1995 initiative aimed at creating links between Europe and North Africa – the 21st century version has a more inclusive approach. Co-chaired by the French and Egyptian foreign ministers, the aim is to find common ground between countries with a total population of 800 million people. "The new union activates the principle of joint ownership, which existed only in theory in the Barcelona process," said Egyptian Foreign Minister Abul Gheit before signing the accord.

There are clearly many issues which potentially divide the countries that border the Mediterranean. But the newly-fashioned union has decided not to plunge straight into the region's more intractable problems, such as how to resolve the conflict in the Middle East. Instead it is concentrating on specific economic links and practical initiatives. Among these is energy supply.

For Europe, two big questions stand out. One is how the non-EU Mediterranean countries will develop their future energy markets, especially as fossil fuel supplies diminish. The second is to what extent they may be able to contribute towards Europe's future energy security.

Fossil fuels are clearly high on the agenda for EU policy-makers. Africa could provide a useful alternative source of gas for its European neighbours to the north – a hedge against the uncertainties of supplies from Russia. One proposal is for a \$6 billion trans-Sahara pipeline to transport gas all the way from Nigeria to Algeria and then under the sea to Europe.

But North Africa could also become a major powerhouse for renewables. With vast stretches of desert and a steadily beating sun, giant solar powered arrays could provide enough electricity not just for the region's immediate needs but for Europe as well. Every year, according to the research group Desertec, each

square kilometre of desert receives as much solar energy as that contained in 1.5 million barrels of oil.

While solar power has been recently branded as the great white hope of renewable energy supply in northern Africa, however, the running so far has in fact been made mostly by wind. From Morocco across the north African coast to Egypt and Turkey, wind power is already showing the potential for a serious commitment to the regional energy mix.

Energy insecurity

There is no energy supply symmetry between the countries outside the European Union which border the southern and eastern fringes of the Mediterranean. To the west, both Morocco and Tunisia are heavily dependent on imports. Morocco, which has virtually no indigenous oil or gas, imports 90% of its energy supply. Travel further east and the oil fields start to flow, enabling countries like Egypt and Algeria to keep their electricity prices deliberately low, at least for the time being. This has not yet encouraged a shift towards renewables.

Turkey, on the other hand, with a population of more than 70 million, has a desperate need for new supply options and is also 90% dependent on imports. The country's energy insecurity was underlined at the end of 2007 when gas supplies from Iran were reduced and then temporarily cut off following a dispute between the Iranians and Turkmenistan, the original source of the supply. Natural gas fuels half of Turkey's electricity.

Among the available renewable options, hydroelectricity already makes an important contribution in some countries, especially in Egypt and Turkey. But it is unlikely to expand extensively because of the environmental issues surrounding large dam construction. One common feature of all these growing economies, however, is that electricity demand is rising faster than GDP – driven by a mixture of industrial expansion, greater access to the grid and a higher standard of living. Turkey's demand, for example, has been increasing by 9% per annum.

For wind power, the first moves in North Africa were taken by Morocco, with a Renewable Energies Development Centre established as long ago as 1982. The country has some excellent sites

The day ends but the turbines keep turning
at the Essaouira wind farm, Morocco

Photo: ONE



Photo: Stockxpert

Wind, sand and sun endlessly redesign the unforgiving Egyptian desert

for wind exploitation, especially along its 3,000 kilometre coastline stretching from Tangiers opposite the tip of Spain round the long Atlantic shore to the edge of the Sahara Desert.

All developments have so far taken place under the aegis of the national electricity generation company, ONE (Office National d'Electricité). A series of competitive tenders have attracted European developers and turbine suppliers. The first of these – 50 MW at Al Koudia Al Baida near Tetouan in the north – went up in 2001, at that time supplying 2% of the country's electricity. Since then progress has been slow, although last year saw the 60 MW Essaouira wind farm go up. This was financed by ONE, with support from the German overseas development bank KfW, and also registered under the Kyoto Protocol's Clean Development Mechanism.

Two recent changes suggest that Morocco could be about to step up a gear. One is the decision by the government to set a firm target for 1,000 MW of wind capacity to be installed by 2012. Together with 440 MW of new mini-hydro projects, the aim is for renewables to contribute 20% of electricity supply (10% of all energy) by 2012.

Encouraged by this more supportive climate, a 140 MW project at Tangiers, first mooted in 2000, is now finally moving ahead. Turbines have been ordered from Spanish company Gamesa and construction is scheduled to start in early 2009.

The second shift is the country's first venture into private renewable energy generation. Called the Energipro initiative, companies are allowed to commission wind farms to satisfy their own power demand. ONE is supporting this by both transporting the power to the point of consumption and by buying back any surplus electricity generated.

The first company to take advantage of this scheme is the French-owned Lafarge cement company, which has started by ordering six 2 MW turbines from Gamesa. Up to 850 MW of new capacity is expected to result from this initiative, according to ONE (see interview, p.32).

Windy deserts

The other North African country which has taken wind energy particularly seriously is Egypt. Driven by the commitment of the country's New and Renewable Energy Authority (NREA), a series of wind parks have been built along the coast of the Gulf of Suez,

The Mediterranean Route to Renewables

- Fossil fuels (oil, gas and coal) currently account for 90% of energy supply in the countries of the south and eastern Mediterranean (SEMC).
- Carbon dioxide emissions from energy consumption in the SEMC are expected to increase by 119% between 2006 and 2025.
- Electricity demand in the SEMC is expected to increase 2.6 times between 2006 and 2025, much faster than overall energy demand and population growth
- The Mediterranean Strategy for Sustainable Development, adopted in 2005 by the 21 signatories to the Barcelona Convention, aims to reduce energy intensity by 1 to 2% per year by 2015 and increase renewable energy supply to 7% of total energy demand.
- "The Mediterranean has a sunshine ranking among the highest in the world, sites favourable for wind turbines are multiple, geothermal resources are appreciable (as in Turkey), the possibilities for development of small-scale hydropower are significant and the use of biomass is an energy option for a good part of these territories."
- The OME (Observatoire Méditerranéen de l'Energie) estimates that the combined potential for wind energy in Egypt, Tunisia and Morocco is 28,000 MW.

Source: "Plan Bleu", Mediterranean Action Plan, United Nations Environment Programme – www.planbleu.org

where average wind speeds can reach more than 9 metres/second.

By the beginning of 2008, installed capacity at the Zafarana site – a desert area 150 km south-east of Cairo – had reached a total of 305 MW, with blocks of turbines commissioned with the support of the Danish (using Vestas machines), German (Nordex and Gamesa) and Spanish (Gamesa) government overseas aid agencies. Zafarana has also provided valuable experience about how to operate turbines in hot, dry and sandy conditions.

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The most recent proposal is to expand Zafarana by a further 240MW, with support from both the Danish and Japanese governments, this time again using Gamesa turbines. The first 120MW phase was mid-way through construction at the end of 2008, with the second phase due for completion by 2010. The turbine supplier Gamesa describes Egypt as “an area of major potential within the wind energy sector”.

An even more ambitious project is in the pipeline, however. Further south along the Gulf of Suez at El-Zayt, a largely uninhabited area of 656 square kilometres has been earmarked by the NREA as having the potential for more than 3,000MW. Average wind speeds across most of this area are above 10m/s.

Apart from the scale, the difference here is that both government-backed and private company bidders are being invited to get involved. For private companies, although the first projects will be commissioned through competitive tenders, with the incentive of winning a long-term power purchase agreement, the price achieved in these initial tenders will then be used to decide the level of an ongoing national feed-in tariff. This would enable Egypt to establish a private sector market in renewables development much like those in Europe.

So far, interest in El-Zayt has been expressed by a number of international public and private groups. On the public side, the German foreign aid bank KfW,



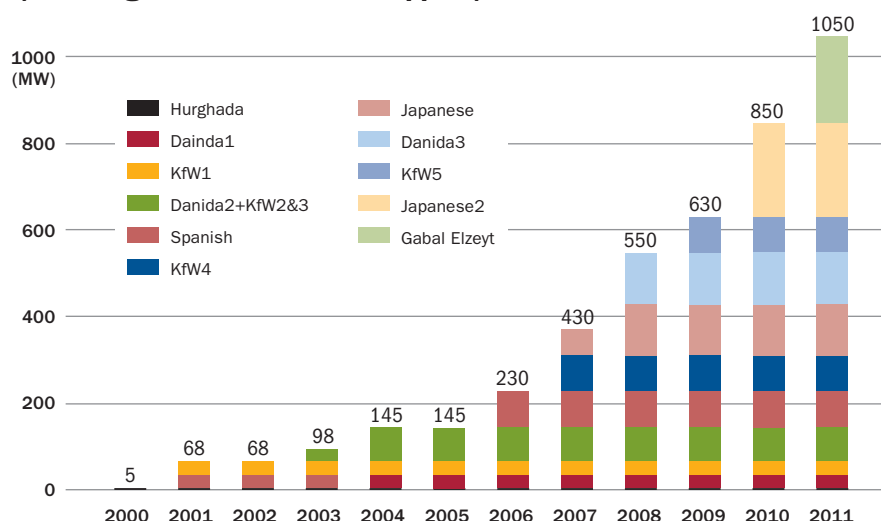
Tradition and modernity meet at a wind farm being assembled in Egypt

the European Investment Bank and the EU are jointly backing a 200MW development, with consultants about to be appointed. The Japanese government has a parallel 220MW proposal. On the private side, an Italian cement company and an international oil company have expressed interest. The NREA says it will decide by next year whether to launch bidding for a smaller (200-300MW) privately financed project or a more ambitious 1,000MW plus. One issue to be clarified is that part of the area

falls within an important migratory route for birds from Africa through the Middle East to Europe.

These prospective developments at El-Zayt will also help Egypt to reach its newly announced target for up to 20% of the country's electricity to come from renewable sources by 2020. Of this more than half – about 12% – would come from wind power. To achieve the target the NREA estimates that a total of 7,200MW of grid-connected wind farms will be required, demanding an annual installation rate of 600MW.

Projected wind capacity in Egypt up to 2011 (with origin of international support)



Turkish surge

The third front-runner in the non-EU Mediterranean is Turkey. A candidate for EU membership whose progress is being held up by human rights discussions and EU politics, Turkey has both a large energy demand and an excellent wind regime. The OECD estimates that Turkey has a technical potential for 160TWh of power to come from the wind, much more than the country's total demand. So far, however, exploitation of this has been hindered by an unnecessarily bureaucratic licensing system coupled with a BOT (Build Operate Transfer) model which has seen many approaches to the market, including from European companies, founder at the first hurdle.

This situation changed with the passing of a law to liberalise the electricity



Photo: Bert Wiklund



Flags embrace the wind next to a turbine at the Essaouira wind farm, Morocco

Photo: ONE

market in 2001 and then the country's first Renewable Energy Law in 2005. The latter not only simplified the licensing system and guaranteed access to the grid but introduced the security of 10 year power purchase agreements linked to a fixed price. In practice, many wind farm developers have found the wholesale price for electricity, which has been in the range of 7-10€cents/kWh, a better bet than the fixed price of 5-5.5€cents.

The result has been a surge of interest in obtaining licences for Turkish sites, almost entirely from domestically based companies. When the licensing

process was opened again by EMRA (the Electricity Market Regulatory Authority) in November 2007, after a dormant period, applications were made in a single day for more than 78,000MW of potential wind capacity. Even though some of these will have been duplicate claims on the same site, this is still an indication of how attractive the market has become.

The overall status of Turkey in August 2008, according to the Turkish Wind Energy Association, was that 333MW of wind capacity was already up and running, 143 MW in the process of being built and a further 1,070MW of projects with a turbine supply contract enabling them

to move to construction. By the end of 2008, Turkey had 433MW of installed capacity. This means that the country could see more than 1,500MW in operation by 2010, pushing it well into the lead around the south and eastern Mediterranean rim (see box "Turkish Delight").

Middle East promise

Other countries in the region are also steadily building up their wind potential. In Tunisia, which currently has 54MW of installed capacity, the national company Société Tunisienne de L'Electricité et du Gaz (STEG) recently announced a €200 million order for 91 turbines from Made, →p.23

Turkish Delight

Turkey has become one of the strongest wind power markets in the region, and is only now being slowed by the knock-on effects of the global economic crisis. So says Norbert Dwenger, Mediterranean Sales Director for Nordex, which recently entered the Turkish market. "It's a good environment to do business in".

The transformation started in 2005 with a law guaranteeing payment for electricity from renewables, eventually establishing a minimum

fixed price. "Before that there were good intentions to foster the market in the 1990s, with a BOT (build, operate, transfer) model, but nobody bought into it," says Dwenger. An even better price of over 8€cents/kWh has since been available on the wholesale electricity balancing market.

"This produced a fantastic environment for investors," says Dwenger, "especially with excellent wind sites in the west and south, and east of Ankara, with wind speeds above 8.5 metres/

second." Even with Turkey's rapid inflation reducing the value of any income, the return looked good.

The result was the wind rush of 2005-2007, when concessions for 2,500MW of wind capacity were issued by the Energy Market Regulatory Authority (EMRA). Following a four month moratorium, while the authorities dealt with the backlog, applications for a record 78,000MW of capacity were made in a single day in November 2007.



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Turbines break up the endless desert landscape

Photo: Vestas

a subsidiary of Gamesa. The machines will be installed in two wind farms in the Bizerte region with a combined capacity of 120MW. Financial support has come from the Spanish government's development aid fund.

As in Morocco, there are proposals to encourage heavy energy-consuming industries to set up wind farms to generate their own electricity. A number of cement producers and other companies have already expressed interest, encouraged by the incentive that STEG will transport the electricity to the point of consumption and buy any excess.

The Italian company Moncada Energy Group also has plans for a 500MW wind farm on the Mediterranean coast, with the potential for exporting the power to Sicily through a dedicated 200 km line built by the developers. According to the Tunisian Environment Ministry the country could install 310MW of wind capacity by 2010 and 1,130MW by 2020.

In the Middle East proper, there have been sorties into wind power in both Israel and Jordan. Israel installed turbines on the Golan Heights, overlooking Syria, over 15 years ago, but is now seeing a new wave of activity prompted by a premium payment system introduced in 2005.

Leading the pack is a consortium of mineral water business Mey Golan, which built Israel's first wind farm, and US energy company AES, which wants

to develop a further 400MW across the Golan Heights. Afcon Industries, which recently built a gas-fired power station, has plans for 50MW in the Arava desert and 100MW in the north of the country. The national target is for 300MW by 2012, producing 5% of the country's electricity.

Neighbouring Jordan has a strategy to get 10% of its energy from renewables by 2020, with wind making a contribution of 600MW. To advance this, the World Bank's Global Environment Facility has allocated \$6 million towards creating a wind power market, with the aim of drawing in a further \$130 million of private finance. The initial focus is on developing a 60-70MW wind farm at Fujeij, the country's first substantial project. Just 2MW of capacity is operating at present.

The Energy Ministry is also planning the bidding process for tenders to construct two other wind farms – 30-40MW at Karamsheh and 40-50MW at Wadi Araba. A proposed renewable energy law would meanwhile establish a competitive bidding process for projects backed by a range of investment incentives, including free grid connection, free use of public land and income tax breaks.

Very few of the non-EU Mediterranean countries have any manufacturing facilities for wind technology. Towers are produced in Egypt, for example, but only one country has a plant for specialised components. This is the Enercon factory

in Turkey, a joint venture with local company Demirer Holdings which produces blades for the German manufacturer's turbines. Vestas, Nordex and GE are also active in the Turkish market and Gamesa is supplying turbines to Egypt, Tunisia and Morocco.

Solar potential

While wind continues to make progress along the south and eastern Mediterranean, the main focus of the new "Euro-Med" agreement has been on two issues of direct relevance to renewables – encouraging the development of a liberalised market that will enable renewable energy to flourish and exploiting the vast solar potential of North Africa and the Middle East.

The ultimate aim is that a market structure is created in each of these countries as effective in encouraging renewables as those in Europe. This means both opening up the energy supply and distribution markets away from centralised state control and introducing an incentive to bring in private investment to the renewables market.

As a result of the new Renewables Directive it will be possible for developers in the non-EU Mediterranean to benefit from the European Union's member state support schemes. This means, for example, that a Spanish company could invest in a renewables project in Morocco, sell its electricity output into the Spanish



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grid and receive the same feed-in tariff payment as if it were generated within the country. The conditions are that the projects must be new, the electricity must be consumed in the host EU country (in this case Spain) and that its origin as a genuine renewable source is guaranteed.

“What is clear is that there’s a regulatory framework established with the new Renewables Directive and a political commitment through the Euro-Mediterranean dialogue,” says European Commission energy spokesman Ferran Terradellas. “For these two reasons I think these projects in North Africa have a lot of potential.”

In terms of technology, the centrepiece of what is called the ‘Mediterranean Solar Plan’ is the idea of developing vast arrays of Concentrating Solar Power (CSP) plants spread across the desert regions of North Africa. CSP works differently from the more familiar solar photovoltaics (PV) in that it is based on utilising the heat from the sun’s rays to generate electricity in a conventional turbine or engine.

The most commonly used technology involves concentrating the sun’s rays in a series of parabolic trough-shaped reflectors from which the heat is piped by oil or another medium to a traditional generator. Alternatively, hundreds of mirror collectors are focused on a central collecting tower where the concentrated heat is then used to make steam and generate electricity. The heat can also be stored in a medium such as molten salt and then used to generate power when supply is required. This turns CSP into a more controllable source and therefore suitable for balancing demand on a national or international grid.

The most mature CSP plants have been operating in the United States for more than 20 years. But the technology has taken a leap forward recently in Spain, supported by both the Spanish feed-in tariff and European Commission research grants. An 11 MW solar tower and a 50 MW parabolic trough power plant are already in operation in Andalucia, with 250 MW of further CSP plants under construction around the country. A 20 MW CSP extension to a gas-fired power station is also being considered in Morocco.

“The technology is mature,” says Ferran Terradellas, “and it’s very good for places where land is cheap and you have

The Mediterranean Solar Plan

A major expansion of renewable energy in the countries of the south and east Mediterranean is envisaged under the Solar Plan. Up to 20 GW of new capacity could be constructed in these countries by 2020, it anticipates, 20 times the present amount. Their output would be used both by the countries themselves as well as exported to Europe, contributing to the EU’s 20% renewables target.

The first stage is the identification of potential projects. So far, 64 have been proposed, with an installed capacity of 5,500 MW and an investment value of €15 billion. Most of these either involve wind energy or concentrating solar power (CSP). These will then be whittled down to a shortlist of about 20 of the most economically viable.

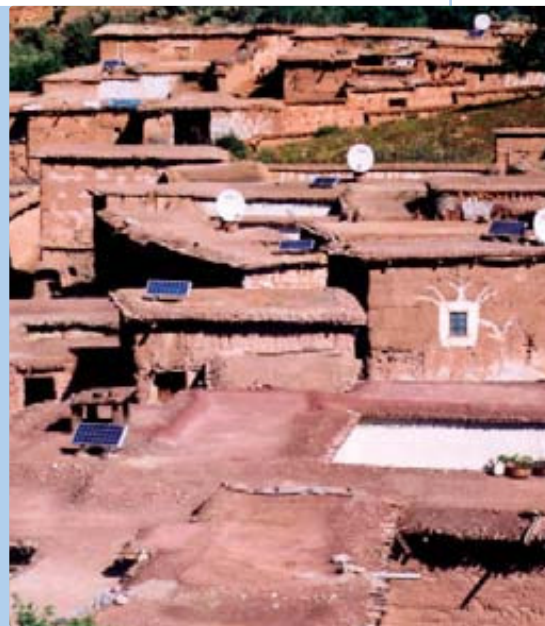
A parallel bundle of projects will be focused on reducing energy consumption in the region by 20% over the same time horizon.

The Plan is also addressing the need for better grid interconnection between the south and east Mediterranean and the rest of Europe. A number of projects are to be studied here, most likely including a strengthening of the links between Spain and Morocco and Turkey and the EU as well as a new link from Tunisia to Italy.

Announcing the details last November in Paris, the French Environment Minister Jean-Louis Borloo described the initiative as “the first concrete translation of a new page in the history of the Mediterranean”. Especially with the enormous potential of solar power in

large quantities of sun. This is what you have in North Africa.”

In terms of broader renewables development, CSP plants in North Africa also promise to make a crucial contribution to a much grander plan. Once built, they could be linked into a network of bulk supply renewables spread right across the European continent and its neighbours – from large offshore wind farms in the North Sea to geothermal power in Turkey



Panels soak up the sun in order to power this Moroccan village

Photo: ONE

the region, more than 150,000 jobs could be created by 2020, he added.

A list of priority projects is scheduled to be presented at a ministerial conference of the 43 Mediterranean Union member governments to be held in Monaco in March.

On economics, the Solar Plan says that the cost of producing electricity from CSP power stations should rapidly decrease as the scale of development expands. It is unclear, however, exactly how these initiatives will be financed – apart from through the incentive of exporting the power to an EU member state and benefiting from the receiving country’s renewables support mechanism.

For more information:

www.developpement-durable.gouv.fr

and hydro plants in Norway (see illustration). The result would be a super-grid for renewable energy capable of supplying most of Europe’s power.

This is the vision elaborated in a report from the German Aerospace Research Centre (DLR), which has a specialist renewable energy unit. “Many of these sources – offshore wind parks in the sea, solar power in North Africa, hydropower in Norway – are remote from demand,” says

Euro-Med Energy Initiatives Backed by the European Commission

OVERALL PROJECT: Mediterranean Solar Plan

AIM: Increase domestic production of renewables and export potential to EU through regulatory changes, greater energy efficiency and solar capacity building.

OVERALL PROJECT: Mediterranean Gas and Electricity Ring

AIM: Linking Europe's electricity and gas grids to Africa and Middle East. Includes plans for a Trans-Sahara gas pipeline to Nigeria.



Photo: Nordex

PROJECT: Euro-Arab Gas Market

AIM: Creation of regional gas market in Middle East and completion of Arab Gas Pipeline linking Egypt to Europe.

EC FUNDING: €6 million

PROJECT: Maghreb Electricity Project

AIM: Creation of electricity market between Morocco, Tunisia and Algeria, progressively integrated with EU internal market.

EC FUNDING: €5.6 million

PROJECT: Energy Efficiency in Construction

AIM: Boost energy efficiency and use of solar power in construction industry across North Africa and Middle East.

EC FUNDING: €4 million

PROJECT: Regional Centre of Excellence for Renewable Energy and Energy Efficiency

AIM: Development of renewables and energy saving in southern Mediterranean.

EC FUNDING: €12.3 million (plus €14m from Danish, German and Egyptian governments)

the DLR's Project Manager, Franz Trieb. "The idea is to connect them all up to a grid and make them available all over Europe. So you tap the resources where they are best available and you connect them to the centres of demand where they are most needed. This cannot be done by the conventional AC grid because of the transmission losses over longer distances, so we need the equivalent of an interstate highway for electricity. It requires something like HVDC."

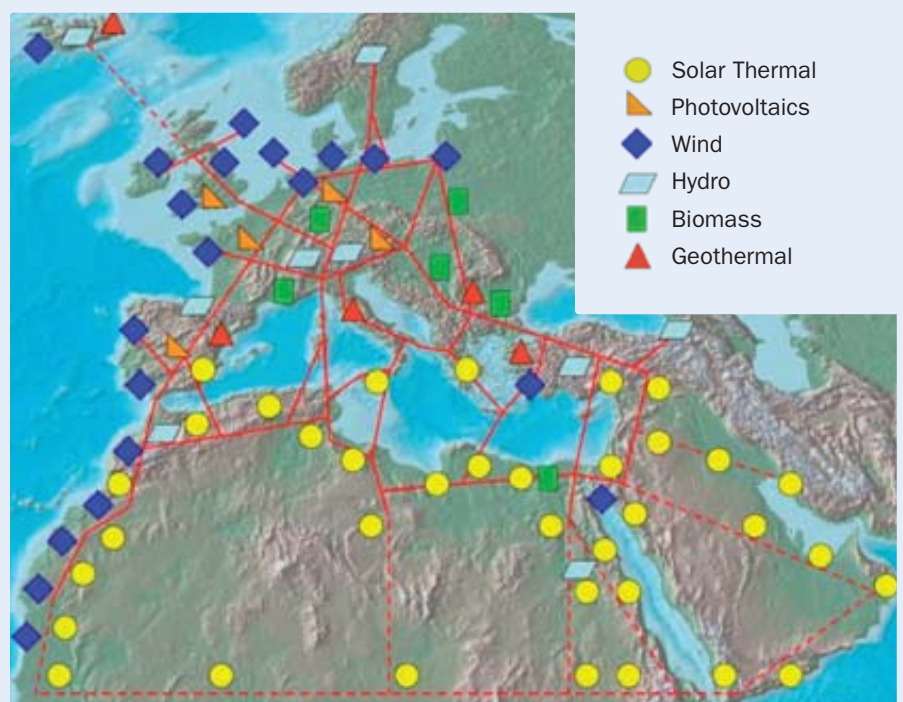
Using High Voltage Direct Current (HVDC) cables would reduce transmission losses to just 10% over the 3,000 kilometre distance from the Middle East and North African production regions to a European centre of demand like London, says Trieb. The cost of installing the grid, about €45 billion, would be spread over the whole period up to 2050, by which time it's envisaged that 700TWh of electricity a year – enough to meet 15% of EU demand – would be coming from solar electricity alone. Building this grid and exploiting continent-wide renewables would still be much cheaper than a business as usual fossil fuel strategy, Trieb argues, and with the added advantage of reduced carbon emissions.

The "super-grid" idea is now being seriously considered by the European Commission, with background lobbying from organisations such as the web-based e-Parliament. "The first step that needs to be taken is to have a thorough technology and economic study of how such a grid could be realised," says Arnulf Jäger-Waldau of the Commission's Institute for Energy. "This is something we are now trying to trigger. With the political driver of the Mediterranean Union the aim is to break through the bottlenecks and see whether we can get one step closer to realisation of such a network. This would be beneficial for all renewable energies."

Wind's contribution

To what extent wind power production in the southern Mediterranean countries could contribute to this network is still unclear. The Mediterranean Solar Plan has a target for installing 20,000MW of renewables capacity across North Africa and the Middle East by 2020. Trieb believes that wind would probably be better used as a local resource in North Africa and the Middle East, meeting the growing demand for electricity. Others have more ambitious proposals.

Euro-Supergrid with a EU-MENA-Connection: Sketch of possible infrastructure for a sustainable supply of power to Europe, the Middle East and North Africa (EU-MENA)



Source: Desertec



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The Sahara Wind project, for example, envisages transferring the power from wind farms in the Saharan plateaus of Tarfaya, in the far south of Morocco, all the way to Germany or other high demand European centres, again using HVDC. Supported by a grant from NATO's Peace and Security programme, the project has already submitted a proposal for 400-500 MW at Tarfaya to the United Nations Development Programme and the World Bank's Global Environment Facility funding arm.

"We realised that the productivity at sites in the south of Morocco could be extremely high," says Khalid Benhamou of Sahara Wind, "but local demand is comparatively limited and wind power difficult to integrate into the grid. This led us to consider supplying some of the output to local industrial users, and then for export. We also have peak winds in the summer, which balances out the peak winds in winter in much of Europe."

Productivity at a Sahara site could be as high as 4,500 full load hours – compared to less than 2,000 hours at some

German sites – according to Sahara Wind calculations, keeping the cost of delivered electricity to Europe, even after transmission charges, as low as 4.4 €cents/kWh.

Specific projects

The Euro-Med initiative is meanwhile progressing a number of specific projects from its energy agenda. At a meeting last November in Paris, a list of more than 70 renewable energy proposals was presented as pilot contributions to the Mediterranean Solar Plan. One proposal is for three 20 MW pilot solar plants to be installed in North Africa. Some funding towards projects could come from the European Investment Bank.

On the grid, although the trans-European highway is still some way off, there is pressure to complete what are called the "Mediterranean rings" for both gas and electricity. Starting with the existing grid connection between Morocco and Spain (with a 1,400 MW capacity), the electricity ring loops right across North

The Mediterranean basin has been exploiting its huge wind resource for centuries



Vision for a Pan-European Renewables Network

A well balanced mix of renewable energy sources backed by fossil fuels could provide a sustainable, competitive and secure electricity supply for Europe, according to a study commissioned by the Germany Environment Ministry from the DLR (German Aerospace Centre) technology research unit. Vital to this is the creation of an interconnected grid linking Europe, the Middle East and North Africa, especially to exploit the opportunity to import large volumes of solar power. The conventional grid is not capable of efficiently transferring these large amounts of electricity, so it is necessary to use a combination of the existing AC grid and HVDC (High Voltage Direct Current) transmission technology.

The DLR scenario starts with an assumed share of 20% renewable electricity across the region in 2000 and increases this to 80% by 2050. By the end of the period, 20 power lines of 5,000 MW capacity each

could provide about 15% of Europe's electricity demand by solar imports, motivated by their low cost of around 5 €cents/kWh and their high flexibility for variable load operation.

The study puts the total economic potential of renewables in Europe at about 145% of expected future electricity demand. By 2050 the main contributions would come from wind, solar PV, geothermal, hydroelectric, biomass and marine (wave/tidal) power, with the additional import of concentrating solar power (CSP) from North Africa. The scenario assumes that the use of gas and coal will be minimised by then and both oil and nuclear phased out for electricity generation.

"In contrast to the common belief that for every wind park a backup power plant must be installed," the study says, "the analysis shows that the need for peaking plants is relatively constant, even though the share of fluctuating sources (PV and wind) increases. No extra capacities are

needed as long as the fluctuating renewable energy share is smaller than the existing peaking capacity, which is the case in our scenario. Wind and PV plants cannot seriously reduce the required installed capacity of conventional power plants, but they will reduce their consumption of fossil fuels."

Starting with European support to the Middle East and North Africa (MENA) for the market introduction of renewables, the study envisages a political process in which a renewable energy partnership and a common free trade area for renewable energies is created in the region, culminating in a Community for Energy, Water and Climate Security. An indirect effect of this would be that by reducing pressure on the use of fossil fuel resources in MENA it would increase the reliability of their supply to Europe.

The reports "Concentrating Solar Power for the Mediterranean Region" and "Trans-Mediterranean Interconnection for Concentrating Solar Power" are available at www.dlr.de.



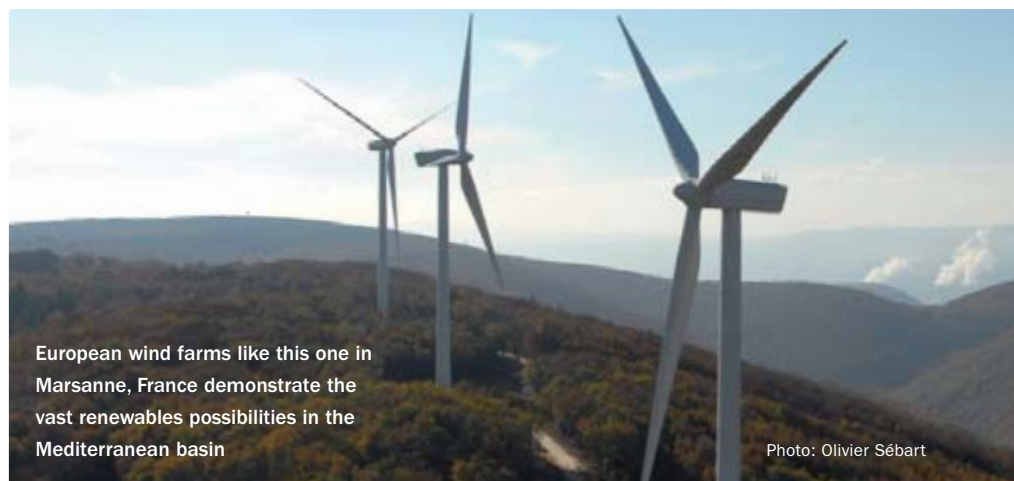
Photo: Stockxpert

Africa, through the Middle East and back into the EU via Turkey. The main missing links at the moment are in Israel and Syria. The expectation is that the ring will be completed during 2009.

There is also a plan to link Tunisia to Italy, via Sicily, with a submarine cable enabling the transfer of up to 1,000MW of power capacity. This would allow the export of electricity from such projects as the 500MW wind farm planned in Tunisia by Italian company Moncada Energy.

Finally, funding has been made available for a Regional Centre of Excellence for Renewable Energy and Energy Efficiency based in Cairo, which will serve as a clearing house for new ideas and technology developments. With total funding of €26 million spread over five years from the European Commission and the German, Danish and Egyptian governments, the Centre will focus on improving the regulatory framework for renewables in the region.

The Centre's goal is to "develop and disseminate policies which are favourable for renewable energies and energy efficiency and which further support the growth of a regional industry in that area," according to a Commission report.



European wind farms like this one in Marsanne, France demonstrate the vast renewables possibilities in the Mediterranean basin

Photo: Olivier Sébart

Country profiles

	Population	Electricity supply balance (2005)	Wind power installed capacity:	National target:
Egypt	75.6 million	fossil fuels 87% hydro 12% other renewables >1%	310 MW (end 2007)	1,050 MW by 2011 7,200 MW by 2020
Israel	7.3 million	fossil fuels 99% hydro >1% other renewables >1%	8 MW (end 2007)	300 MW by 2012
Jordan	5.6 million	fossil fuels 99% hydro >1% other renewables >1%	2 MW (end 2007)	600 MW by 2020
Morocco	31.2 million	fossil fuels 92% hydro 7% other renewables >1%	124 MW (end 2007)	1,000 MW by 2012
Tunisia	10.3 million	fossil fuels 98% hydro 1% other renewables >1%	19 MW (end 2007)	310 MW by 2010 1,130 MW by 2020
Turkey	70.6 million	fossil fuels 74% hydro 25% other renewables >1%	146 MW (end 2007)	1,050 MW by 2011/12

It will also support pilot projects in new technologies. "RCREEE is dedicated to making a difference and will focus on projects which produce concrete results," the report adds.

Wind is already producing concrete results in a number of the southern and eastern Mediterranean countries, notably Turkey, Egypt and Morocco. The test for the Euro-Med initiative will be whether it is able to encourage the market conditions and infrastructure improvements needed to really bring the region together as a new hub of large scale renewables generation.

For more information:

- Turkish Wind Energy Association
www.ruzgarenerjisibirligi.org.tr
- Tunisian National Energy Agency
www.anme.nat.tn
- Egyptian New and Renewable Energy Authority
www.nrea.gov.eg
- Sahara Wind project
www.saharawind.com
- Solar power from deserts
www.desertec.org

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From Romans to renewables: a brief history of the Mediterranean

By Chris Rose

In the history-rich Mediterranean basin, where great empires once soared, clashed and burned, a new type of entrepreneur is sifting through ghosts for wind and solar energy to help provide Europe's future power needs.

A meeting point of three distinct geographic areas each with varying tribal, cultural and religious histories, the Mediterranean region has from antiquity experienced greatness and despair, war and peace, growth and decay, birth and rebirth.

The area surrounding the Mediterranean Sea has been profoundly influenced and shaped by trading initiatives that not only resulted in the exchange of money and goods, but also a non-stop flow of ideas between what would eventually be called Europe, Africa and the Middle East.

And once again, at least according to proposals that have recently been promoted by governments and private business enterprises, the Mediterranean may soon be experiencing another seismic shift in its multi-layered development.

This time, instead of transporting the silks, spices, dyes, pottery, glass, olive oil, foodstuffs and timber of antiquity, the race is on to move energy of all kinds – wind and solar power, oil and gas – back and forth across the bustling region.

This latest proposal shouldn't be surprising, however, considering that the great blue sea has always provided a guided pathway for explorers, traders, armies, navies, kings, queens, entrepreneurs, pirates, scoundrels, fishermen, vacationers and dreamers.

The list of empires leaving their mark along and around this vital waterway is long and impressive.

The Egyptians formed the first great civilisation in the area, according to Wikipedia, and spread from the mouth of the Nile River between 4,000 BC and 3,000 BC.

Throughout the years, trade around the Mediterranean increased significantly, as did the influence of growing coastal settlements, especially

those belonging to the Minoans, the Greeks, and the Phoenicians. The Carthaginians dominated briefly until being defeated by the region's most powerful and influential empire of all time – the Romans. Wikipedia notes that when the Roman Empire was founded, the Mediterranean Sea was referred to as *Mare Nostrum*, or "our sea."

After the fall of Rome came the Byzantine Empire, which was largely replaced by much more powerful Muslim forces. In turn, the Ottoman Turks began gaining territories as did the city states of Italy and emerging European nations. France and Britain began to colonise North Africa in the 19th century, and Italy conquered Libya in the early 20th century.

The dreams of Italian and German expansionism were in ruins by the end of the Second World War. Israel was proclaimed a country in 1948, setting the stage for the incredibly acrimonious feud with the Palestinians and other Arab nations that continues today.

Yet the desire to explore, build, cultivate, exploit, enslave, liberate, enrich and populate the Mediterranean region has always been present, from time immemorial to the relatively recent.

For a long time now, many people have thought of North Africa and the Middle East in mainly political and religious terms, a mosaic of poverty, strife and diminished expectations, a place that was great once but is no longer.

Now, however, dreamers and traders have turned their attention to the amazing wind potential North Africa offers, along with a seemingly unlimited amount of solar power locked up in the region's unrelenting desert heat.

The exportation of that electricity from renewable energies along a proposed supergrid to northern Europe, combined with the oil and gas still to be exploited,



may well usher in a new era for the entire Mediterranean basin.

And while there are differences between then and now, there are also constants, too: the lapping water, the enduring wind, and the never-ending sun that defines the Mediterranean remain with us still, as always a beacon to those searching for a better tomorrow.

Mediterranean facts

The Mediterranean covers about 2.5 million square kilometres. It is 3,540 kilometres long and 970 kilometres wide. Its connection to the Atlantic is only 14 kilometres wide. It has an average depth of 1,500 metres and its deepest point is 5,267 metres. Its coastline is about 48,000 kilometres long. It is connected to the Sea of Marmara and the Black Sea on the east. The 163 kilometre Suez Canal connects it to the Red Sea and the Indian Ocean.

Sources: Wikipedia, Encyclopedia of Earth, World Book Encyclopedia.