

# Wind



Photo: Richard Cummins/Corbis

# power conquers the globe

Europe threatens to be overtaken by China and the US as the leading wind power market. In fact, China is producing more wind turbines than ever and could even end up supplying the European wind industry.

| by *Annemieke van Roekel*

'We're not going to wait for Europe,' says Andreas Nauen of Siemens Wind Power in the ceo session at this spring's European Wind Energy Conference (EWEC) in Brussels. 'We will go to wherever we can do business. That's China, India, the US, Canada and Australia. Europe will have to seize the opportunity or it will be too late.' Nauen believes that wind energy is by far the most promising renewables option. 'Solar and geothermal will be playing a minor role for the time being.' Ian Mays, managing director of the British RES Group, which builds wind farms in the US and the UK, feels the same way. 'Wind will take the lead in the renewables mix,' he says. Nauen has observed that the general public is becoming more positive about wind. 'Wind turbines are even popping up in car commercials. The public is keen. Windmills are considered good and clean. They have a high fun factor.'

Over half of the world's wind capacity is currently installed on European soil: 57 GW out of a world total of almost 100 GW. Europe's wind capacity target is 180 GW by 2020, generating enough electricity for half of all EU households. But even these ambitious growth figures pale into insignificance when compared with the ambitions of the most important growth

markets for wind energy – China and the United States.

Although Europe's target of 20% renewables by 2020 seems enormously ambitious, Arthouros Zervos, president of the European Wind Energy Association (EWEA), puts the figure of 180 GW installed capacity into context: 'It isn't that ambitious if you compare it to what's happening on a global scale.' By that he means the US and China will generate a lot of wind energy in the future, and in the case of China become a major turbine manufacturer. Nowadays, more and more wind turbines or their components bear the label 'Made in China'. During the wind energy conference, the chief executives pledged to keep an open mind about China, which could prove an important trading partner at a time when wind turbines are scarce. In this way China could give the European wind industry a boost, Nauen believes. Because of the current demand for turbines, project developers have to order wind turbines several years in advance and that has put a halt to expanding installed capacity. Expectations are that the equilibrium between supply and demand will be restored by the end of 2009. In addition the wind sector – just like the oil and gas industry – is battling with a serious shortage of engineers.

## Made in China |

China is very interested in European wind technology, according to consultant Chris Westra from We@sea. Westra, who has been involved in setting up wind projects since the earliest pioneering days, regularly gives Chinese delegations to Europe a peek behind the scenes. 'They want to know everything so that they can subsequently implement it in their own country,' he says. 'They're reliable customers who pay promptly.' In line with other experts, he predicts a boom in China's installed capacity. 'Infrastructure development is racing ahead. Take the Shanghai Delta mega-project, for example. Here they've built the Donghai Bridge to link the mainland to an island that will become the world's biggest seaport. Flanking the bridge will be China's first offshore wind farm. Container lorries will join and exit a six-lane motorway planned for the 32 km bridge. Together with China, we'll be swept away in a tide of economic progress.' He predicts that Europe will have lost its pole position in wind to China within ten years.

Vic Abate, Vice President of Renewables at GE Energy, predicts that within a few years China will have become the world's leading turbine producer. Like Vestas and Gamesa of Spain, GE Energy is active in China. Chinese domestic production

overtook foreign production for the first time last year, accounting for 60% and 40% respectively. Leading local producers were Gold Wind and Sinovel. The Chinese Renewable Energy Industry Association (CREIA) predicts that China will have installed capacity of 50 GW by 2015, still significantly less than the amount predicted for Europe. According to EWEA's most pessimistic forecast, Europe will achieve 100 GW installed capacity by 2015, including offshore; the most optimistic estimate is 140 GW. The EWEA emphasises however that forecasts of installed capacity in Europe are heavily dependent on developments in offshore.

Whether it turns out to be a problem for Europe that it will have to make way for upcoming markets has yet to be seen. Wind energy is set to play an important role in the energy mix for electricity production. After natural gas, wind has been the primary source of new power generation since 2000, as shown by statistics from EWEA and Platts PowerVision. The share of electricity generated from gas has grown

by 81 GW, followed by wind at 47 GW: gas and wind together account for 85% of the total energy growth in EU countries. In the US, electricity from wind is the fastest grower after gas. The expectation is that wind energy will continue to make a substantial contribution to the overall energy mix for electricity production in the future. That's already the case in some European countries. Over 20% of electricity is generated from wind in Denmark and in some German states, such as Schleswig Holstein and Saxony, that percentage tops 30%. 'With 45 GW onshore plus 10 GW offshore, some 20 to 25% of German power will be generated from wind by 2020,' says Claudia Gotz of the German Wind Energy Association, a Berlin-based lobby for turbine manufacturers and wind energy producers. 'For Germany, onshore wind will remain by far the most important. We can still harvest a lot of potential onshore,' says Gotz. 'The federal states are now busy revising the maximum percentages of land use for wind farms. Onshore wind energy is simply a lot cheaper than offshore.'

## China: moving up

China has surprised the world with its rapid pace of industrial development. But wind energy, too, is developing apace. After the US and Spain, China installed the most wind capacity last year (a hefty 3.5 GW) thereby ranking fifth in installed capacity. The Chinese government stipulates that 70% of turbine components must be of domestic manufacture, which puts a cap on imports and the establishment of foreign subsidiaries. Chinese production of wind turbines in 2007 amounted to an equivalent of 5 GW (of which more than half was by some 40 local production companies) and is expected to double within a few years thanks to major producers such as GoldWind, Sinovel Windtec and Dongfeng. Market dominance of foreign turbine imports is a thing of the past. Thanks to its extended coastline and vast interior, China offers enormous potential for the exploitation of wind energy. No country in the world except China has so far made mention of a terawatt (1000 GW) installed capacity. China has ambitious plans for renewables, including hydro- and solar power as well as wind energy. Its National Plan for Renewable Energy Development sets a target of 15% wind-generated electricity by 2020 – a challenging objective in a country with rapidly increasing energy consumption and in which electricity is primarily generated by coal-fired power plants. Because many favourable wind locations are situated in remote and poor regions, wind energy can play an important role in the development of rural areas.



Windmills in Shanghai. Photo: Ryan Pyle/Corbis

## Offshore horizon |

Despite the high costs, Europe is looking expectantly to wind energy at sea. There is plenty of room here for large farms and in a windy region such as the North Sea, far more wind electricity can be generated per installed megawatt. Europe intends to build 40 GW offshore by 2020 and 140 GW by 2030. But connecting to the grid is a stumbling block for the realisation of offshore wind farms in Europe, says European Commissioner Andris Piebalgs. In the absence of an effective policy, new sea cables would have to be laid for each farm and that would constitute an enormous waste of money. Germany is tackling the network problem head on. Its future wind farms in the North Sea are planned in four clusters, with each cluster being jointly connected to the grid. A number of European projects are contemplating a combination of wind generation and transport in order to cut costs, says Westra. 'You can see new grid constructions of this type at the Kentish Flats offshore wind farm in the Baltic between Sweden and Germany, for example, and at the Belwind offshore wind farm between Britain and Belgium. With offshore farms you can't avoid thinking about the architecture at sea.'

Many wind developers complain about the high costs of offshore wind. They believe this leads to project delays or to investors pulling out. The cables linking offshore wind farms to land account for around 10 to 15% of project costs. Wind developers



feel that it is unfair that they should have to cover these costs in view of the already high costs of offshore farms: at €3.5 million per megawatt, they are about double that of an onshore equivalent. In a number of European countries, such as Denmark, the costs of connection to the national grid are not ranged under the project budget. The undersea cables for Horns Rev and Nysted were financed by the transmission system operator. In Germany, too, transmission system operators are required by law to finance the cabling from sea to shore under the Infrastructure Act of 2006. 'By "socialising" these costs you effectively place the provision of the network infrastructure outside the political arena, so that the issue doesn't become a point of debate every time there is a change of government. In developing sustainable energy, one cannot be dependent on a non-sustainable policy-making model,' says Westra. The privatisation model popular in the US is no guarantee of success, he believes. According to proponents of privatisation, this model has made the oil state of Texas a leader in US wind generation. 'Privatisation can also work against you because a lot of companies are forced to work together,' Westra counters, seeing more benefit in the German model.

But even in Germany, there is a debate raging over the main grid for wind and who should finance it. Out of sheer frustration, wind producers in the wind-energy rich federal state of Schleswig Holstein recently decided to invest in a low-voltage network themselves, in order



Dabancheng offshore wind farm in China.  
Photo: Bob Sacha/Corbis

## Europe: slowing growth

The growth of wind capacity in Europe continues to lag behind worldwide growth. In the past five years, European installed capacity grew by an average of 20% annually against 25% globally. In absolute terms, Europe doesn't do too badly, thanks largely to the spectacular growth of Spanish wind power. Spain's efforts last year accounted for nearly half of Europe's new installed capacity. With an installed capacity of 15 GW, Spain has risen to number three in the world league table after the US (17 GW) and Germany (22GW). Portugal is also establishing a name as a rapid developer within Europe but total installed capacity is still just 2 GW. Growth has stagnated in Denmark, the wind energy pioneer. The countries with the most ambitious offshore plans are Germany and Great Britain, although Britain, unlike Germany, has skipped the on-shore phase. The British are facing a setback after Shell pulled out of the London Array offshore farm in the outer estuary of the Thames. At 1 GW, this is set to become the biggest offshore farm in the world. Shell cited rising construction costs, largely due to spiralling steel prices, as its primary reason for pulling out. Eon UK and Cores, the two other principal financiers of the €2 billion project, are now having to look for alternative financing and it remains to be seen whether they will be successful, an Eon spokesman told British daily *The Guardian*. UK politicians and environmentalists have accused Shell of behaving irresponsibly and critics are talking about a PR disaster for the company. London Array, planned for 2011, is slated to make a substantial contribution to British wind energy targets.

to secure the sale of excess wind energy in the event of overproduction. In the windy winter months of 2008, utilities Eon and Vattenfall of Sweden pulled the plug so that the turbines were turning for no reason. The German electricity grid – both high- and low-voltage networks – is urgently in need of an upgrade and the wind farms suffer the consequences of overdue maintenance. The wind producers charge the country's main electricity players with pocketing hefty subsidies for upgrading the grid while failing to maintain it. 'Another factor delaying the grid upgrade in Germany is the fierce public debate about spoiling the skyline and radiation from electricity masts,' explains Grotz. 'That's why the option of installing lines below ground instead of above is currently being considered.'

## Sand and gravel |

Wind energy seems to have become a byword for interminable planning procedures. The Dutch Q7 wind farm

that opened officially on June 4 was over a decade in the making. The bureaucratic machinery turns exceedingly slowly and costs a lot of money. But Filip Martens, of Belgian wind developer C-Power, says that the construction of new offshore wind farms will likely happen faster – at least in Belgium. Thanks in part to the Thornton Bank "farshore" project, legislation has finally been put in place for wind farms off the Belgian coast. Ten years ago, Martens' wind project was still subject to a sand and gravel concession. 'More than 500 kilograms of paper, 120 public hearings, 24 permits and €17 million went into the preparations alone and now we're ten years down the line, but the Thornton Bank wind farm will be built.' The first three foundation poles, manufactured on-shore and measuring 44 m high, have since been positioned on the seabed. Martens makes light of his seemingly endless bureaucratic ordeal with the remark that 'long procedures force a professional attitude'. He declares that it is to the

sector's advantage. 'All parties in offshore are colleagues; a bad project would be our biggest enemy.' The public's acceptance of wind farms has greatly improved over the years, Martens believes. 'The residents of Zeebrugge and Ostende were negative at the start of the project but nowadays they talk about "our farm".' Thornton Bank, which will comprise 60 Repower turbines of 5 MW each, will provide electricity to over 600,000 Belgian households over the coming years. The wind farm represents the first commercial exploitation of

Repower's 5 MW model. The turbines perform optimally in high winds – upwards of 14 metres per second – to gale force, and switch off automatically in extreme weather conditions. The Thornton Bank wind farm lies 30 km out to sea, outside the twelve mile zone, and cannot be seen from the shore.

Commissioner Piebalgs confirms Martens' view that public acceptance of wind farms is on the increase. In formulating the new EU directive for sustainable energy, Piebalgs

says he experienced no hindrance from an anti-wind lobby. His main concern, aside from the grid and planning, is the financing. 'Good financial incentives are the key to success,' he says. Grotz makes the case for the European Union leaving national financing schemes intact. This summer the German parliament is expected to approve the revised Renewable Energy Act, which stipulates a tariff of 14 eurocent per kWh for energy generated from wind at sea, compared with a price of between five and eight cents for wind energy generated onshore. To qualify for the higher offshore tariffs, construction of the farm should have been begun by 2011. Germany wants to have 10 GW of offshore up and running by 2020. By 2030, that amount should increase to 20-25 GW.

## The United States: high targets

The political climate in the US is increasingly favourable for renewables, including wind energy. Following in Europe's footsteps, Americans are also becoming increasingly anxious about possible climate change. Thanks in part to the Production Tax Credit (PTC), installed capacity has grown by a hefty 5 GW this year, an increase of 45%. In 2007, the majority of wind farms were built in Texas and during the first quarter of 2008 another 1.4 GW had already been added. But it remains to be seen if installed capacity will continue to grow, as this is largely dependent on whether the US decides to extend the PTC, which is officially set to cease at the end of this year. The US Department of Energy has said that expecting 20% of electricity to be generated by wind by 2030 is 'realistic'. To achieve this target, the growth of installed capacity over the next ten years has to increase steadily to 18 GW a year. Realising a target of 20% wind-generated electricity (the energy equivalent of 140 million cars) would create 150,000 jobs in the wind sector in the US alone, plus an additional 300,000 jobs in related industries. The wind sector's role in boosting employment is also a key argument in Europe and China. The industry currently employs around half a million workers in Germany.



Wind Farm in Tehachapi Pass, California. Photo: Lester Lefkowitz/Corbis

## Test park |

Although Germany is characterised by strict and lengthy procedures for the development of offshore wind farms, this spring saw construction work begin on the test-farm Alpha Ventus, to the north of Borkum island. Twelve 5 MW turbines by the German manufacturers Repower and Multibird will be tested on their performance in North Sea conditions. Alpha Ventus won't be the first farm to use Repower's 5 MW machines. Aside from Thornton Bank, two of these turbines currently supply power to oil platforms in Scotland's Beatrice oil field as part of the EU's demonstration project of the same name. Even so, the Repower turbines have to be tested in Alpha Ventus because of the different foundations in the different sites, a spokesman for the manufacturer explains. Westra thinks it is sensible to test offshore turbines extensively in different sea and seabed conditions, as Germany is doing. 'There were a lot of technical problems with the adapted land turbines at Denmark's Horns Rev and Arklow Bank in the Irish Sea.' The Netherlands' new offshore wind farm Q7 will also use adapted onshore turbines,' says Westra. Sixty V80 Vestas of 2 MW each will be situated 23 km off the coast of IJmuiden. Westra also says the push for existing technology comes primarily from the investors because they see it as a way of reducing the financial risk. ■