EWEA 2013
DAY ONE
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Photograph | Reuters

Starace urges industry to look beyond Europe

CHRISTOPHER HOPSON
LONDON

Europe's offshore wind sector is perfectly poised to boom, but onshore should brace for a slowdown, says the chief executive of Enel Green Power (EGP).

Conference chairman Francesco Starace, *left*, tells *Recharge* that wind has long been a strong investment growth area in Europe. Today, though, "this is a mixed story", he says.

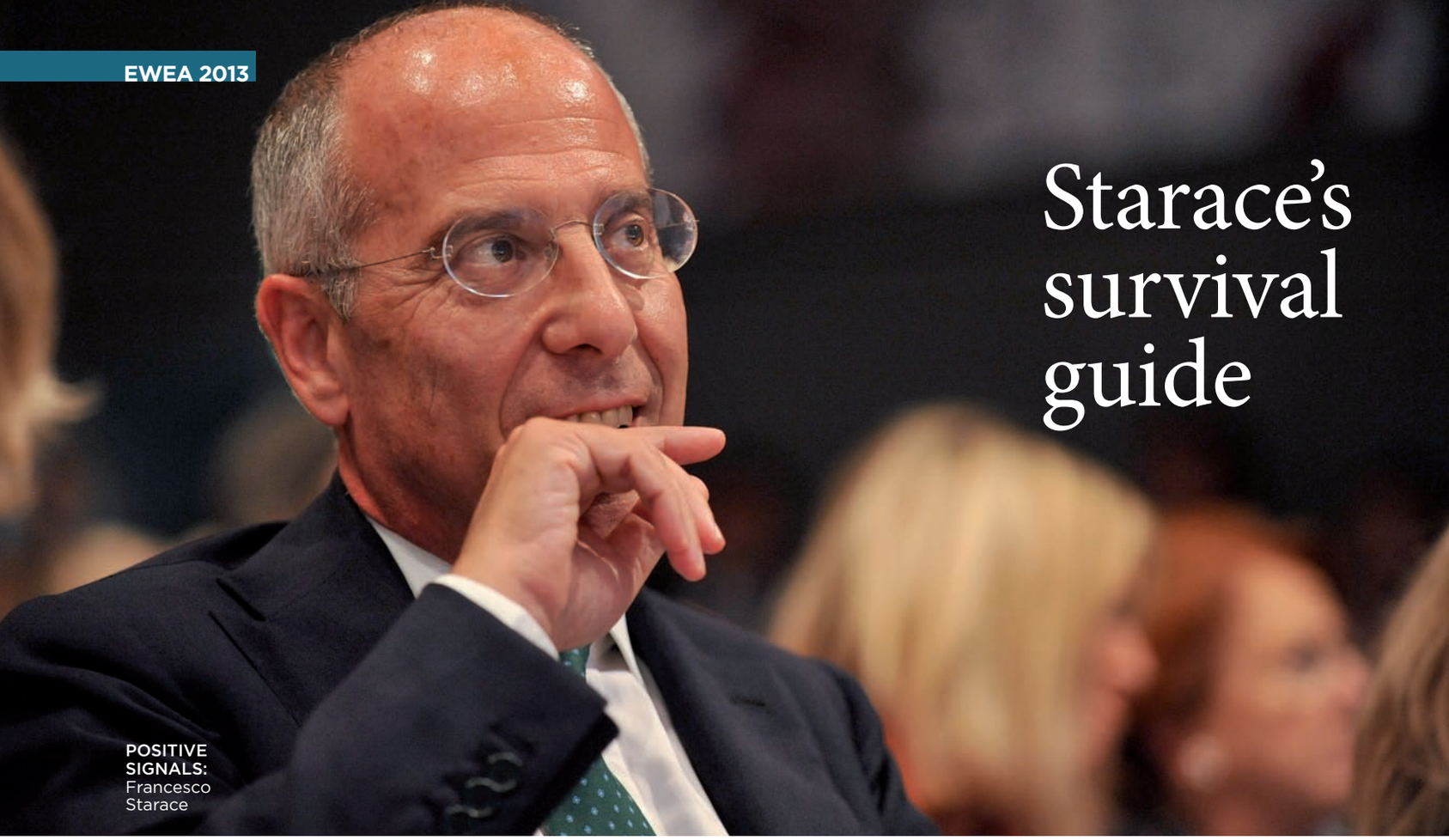
"Offshore wind in Europe has by far the [world's] largest growth potential these days, [but] as far as onshore wind goes, I think there is a slowdown, due to the eurozone crisis, and partly due to the saturation [of wind in] a large part of the countries that started the onshore wind development many years ago in Europe," says the Italian.

"As far as the investment community is concerned... it is a big opportunity for offshore wind, and a little less for onshore, where there is a little bit of a slowdown.

"As far as the manufacturing industry is concerned... the

Continued: Page 2

Starace's survival guide



POSITIVE SIGNALS: Francesco Starace

From front page

offshore business today technologically is by and large a European story", but "the onshore wind business needs to look outside Europe for growth opportunities".

In the short term, Starace says, major growth opportunities are unlikely in mature European markets, although promising signals are coming from Eastern Europe.

He believes that Spain and "probably Italy" are going to experience zero or moderate growth, with "some slowdown in Romania next year".

"Germany has slowed down in terms of onshore wind installations. We also think there is some good potential in France, where the government has done a good deal of work to try to stimulate more growth in onshore wind, and also in the northern part of Europe.

"But all over Europe, it is a slowdown story for onshore wind, while offshore wind is strong in the North Sea and Baltic Sea area. And it is that growth which is going to grow."

Starace says EGP is not active today in the offshore business, but strongly believes that in five to ten years' time, this will be a strong, reliable market and investment opportunity.

Meanwhile, there is room for EU states to stimulate renewables growth by making progress on the 2020 targets in national action plans through increased co-ordination and a sound policy framework at European and national level.

"Overall, I think, on average, the EU's 2020 targets will be achieved... it is possible to get there, and we will see the end of the road... it is very important at European level that the commission keeps to the course it has set itself and that there are no situations which can go wrong at the last moment."

During this difficult period, the industry remains resilient. Turbine manufacturers are adopting survival strategies by upgrading turbines, while developers focus on building higher-margin projects.

He says the next 30 years will be exciting. "I see wind becoming a mainstream contributor to the electricity portfolio in many parts of the world, not only in energy production, but also in the ancillary services that thermal generation is providing today.

"In a lot of countries, cost reduction and grid integration will allow wind to play the role that combined-cycle gas turbines play today.

"Floating wind farms will be installed off many coastal areas, coupled with marine-energy generating stations.

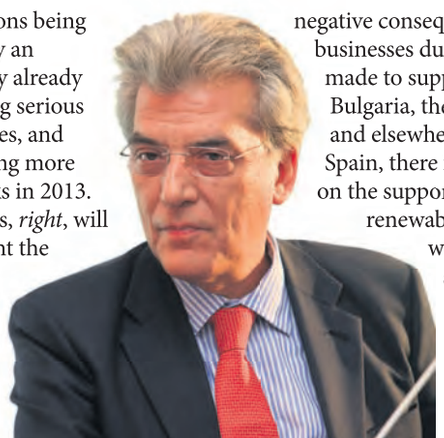
"Industry consolidation will have resulted in larger, more globally integrated players and specialised niche technology providers."

Zervos to warn against retroactive cuts to wind support schemes

CHRISTOPHER HOPSON

A stark warning will be delivered today to Europe's politicians about attempts to introduce retroactive changes to vital national support schemes.

In his opening address to the conference, EWEA president Arthouros Zervos will highlight the extremely tough business conditions being faced by an industry already suffering serious job losses, and expecting more cutbacks in 2013.



Zervos, *right*, will highlight the negative consequences for businesses due to changes made to support schemes in Bulgaria, the Czech Republic and elsewhere in Europe. In Spain, there is a moratorium on the support given to new renewables projects, while in Portugal, support is being cut as part of government austerity measures.

The EWEA president believes such moves are bad news for both the European economy and job prospects, as they discourage potential investors.

He will point out that the wind industry can be a significant driver for growth in both jobs and exports — but not if policy changes drive away investors.

Photography | Uman Foundation | Jason Bickley/EWEA

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LIFE MATTERS

Europe sails to offshore record

UK led the way in a year that saw France and Germany slip behind their targets, reports **Christopher Hopson**

FULL SPEED AHEAD: Britain added 854MW of offshore wind last year. *Below*: EWEA's Justin Wilkes

The UK added 73% of Europe's offshore wind capacity last year, with Dong and Siemens maintaining their positions as the industry's leading lights.

According to EWEA figures, Britain accounts for 58.9% (2.95GW) of Europe's total installed offshore capacity — way ahead of second-place Denmark (18.4%) — after adding 854MW last year.

However, the number of turbines being installed in European waters is lagging behind national targets by nearly 1GW. A total of 4.99GW of offshore capacity is producing electricity in Europe's waters, but the EU had targeted 5.83GW by now.

France and Germany especially are falling heavily behind their goals. Not a single turbine was installed in French waters last year, despite a target of 667MW, while Germany installed only 80MW, to reach 280MW of the 792MW cumulative goal it was aiming to hit by the end of 2012.

France launched its first tenders for offshore wind only last year; in Berlin, questions over liability for delays in connecting North Sea projects to the grid scared off investors.

Despite the slow progress, offshore developers installed 1.17GW last year, beating the 2010 record of 883MW. The North Sea saw 80% of those installations, the Baltic Sea 4% and the Atlantic Ocean basin (including the Irish Sea) 16%.

Across Europe, 293 offshore turbines were installed and fully grid-connected at nine wind farms last year, bringing the continent's offshore capacity to nearly 5GW. That is 90% of the world's 5.5GW total, with China accounting for 9%.

EWEA says prospects for the next two years are positive, with projects currently under construction due to add a further 3.3GW, bringing Europe's offshore capacity to 8.3GW.

Some 1,662 turbines are installed and connected to the grid at 55 offshore wind farms in ten countries. This is a 31% increase on the 1,371 turbines, totalling 3.83GW, installed by the end of 2011.

Denmark's Dong Energy remains the leading developer in European waters, with 19% of installations last year, followed by Statoil and Statkraft (12% each), RWE (9%), SSE (8%) and Bard and E.ON (6% each).

Siemens was the top turbine supplier last year, with 74% of the market. Historically, Siemens and Vestas have dominated the European market, with a combined 86% of all installed offshore turbines. However, the Danish manufacturer failed to have any of its turbines installed off Europe last year, while Siemens machines were used in 860.4MW of new capacity.

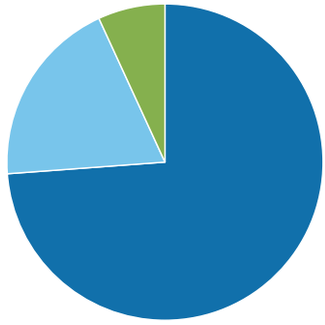
Bladt was the leading substructure supplier; Nexans and JDR led the way with infield cables; and Prysmian was first for export cables.

Confirming the sector's trend towards larger machines and bigger projects, the average installed turbine size last year was 4MW, due to the continued dominance of Siemens' 3.6MW machine.

The average size of the 18 wind farms under construction in 2012 was 285.6MW — 43% bigger than the previous

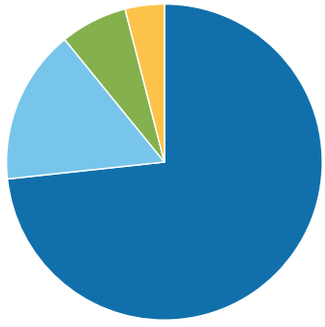
Photography | Sisse Brimberg & Cotton Coulson | EWEA/Jason Bickley

Turbine share, 2012



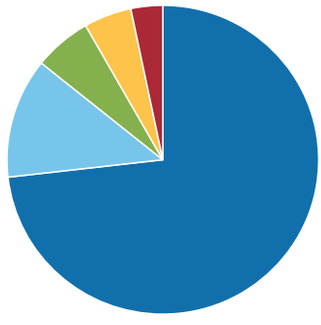
- **Siemens** 860.4MW | 74%
- **REpower** 225.1MW | 19%
- **BARD** 80MW | 7%

Added capacity, 2012



- **UK** 854.2MW | 73%
- **Belgium** 184.5MW | 16%
- **Germany** 80MW | 7%
- **Denmark** 46.8MW | 4%

Top substructures, 2012



- **Monopile** 355MW | 73%
- **Jacket** 61MW | 13%
- **Tripod** 29MW | 6%
- **Tripile** 24MW | 5%
- **Gravity** 16MW | 3%

year; the average water depth for installations was 22 metres, slightly less than in 2011; and the average distance from shore was 29km, almost a quarter further.

Financing activity in the sector outpaced overall growth last year, says EWEA, with a healthy increase in both the number of transactions and the amount of money committed to the industry.

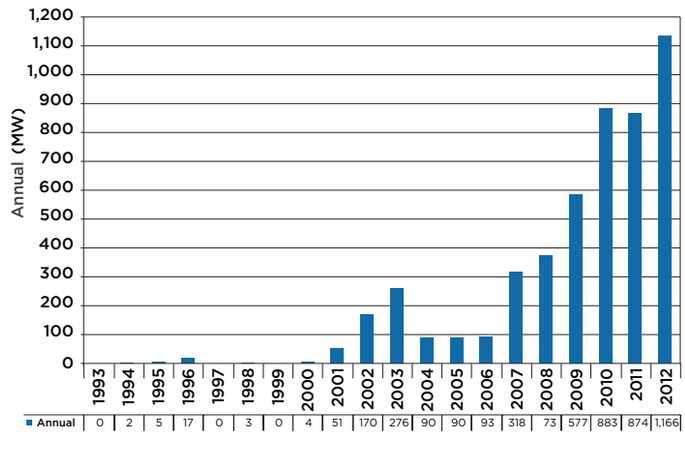
Last year saw four debt-financing transactions closed, involving almost 20 banks. Seven equity deals were also struck, which saw a broader pool of companies buying into the sector.

"Offshore wind power is growing solidly," says EWEA policy director Justin Wilkes.

"But solid installation figures do not alter the fact that the wind industry is being hit by political and regulatory instability, the economic crisis, the higher cost of capital and austerity.

"Europe is a world leader in offshore wind energy and could be creating even more jobs if governments gave greater policy certainty to investors and resolved grid-connection problems."

European annual offshore wind installations



Source | EWEA

WIND LOAD: The Siemens 6MW turbines at dockside, on their way to Gunfleet Sands 3

Thumbs up for Westermost Rough

DARIUS SNIECKUS
BRISTOL

Dong Energy is going ahead with the 210MW Westermost Rough wind farm in the North Sea, taking the first 35 Siemens SWT-6.0-154 turbines under a 300-machine framework deal.

The €1bn ($1.36bn) Round 2 development, in depths of 16-26 metres, 8km off the northeast coast of England, will mark the first use of the German company's 154-metre-diameter-rotor version of the direct-drive turbine. Dong's decision means construction will begin next year, with switch-on in the first half of 2015.

"With the decision to build Westermost Rough, we expand our position as world-leading in the development, construction and maintaining of offshore wind farms," says Dong chief executive Henrik Poulsen, *right*.

"The size and location of the project is very well suited as the first large-scale project with the new Siemens 6MW turbine. We are sure that this project is a good foundation in our continuous work to bring down the cost of offshore wind."

Two 6MW units fitted with 120-metre-diameter rotors are being commissioned at Dong's Gunfleet Sands 3 demonstration project off southeast England, which is on track to start generating electricity this spring.

Dong is testing the turbines at the site with an eye on its "small" UK Round 3 sites — the 1GW Njord and 2GW Heron projects.

The SWT-6.0-154 — Siemens' first model designed specifically for offshore use — will use the company's 75-metre B75 blades. One of the machines has been running onshore at Denmark's Østerild test centre since last autumn.

REpower signs historic 350MW Canadian deal

BERND RADOWITZ
BERLIN

REpower has won the biggest contract in its history — a 350MW order for a Canadian wind farm.

The Suzlon-owned manufacturer will provide 175 of its 2MW MM82 and MM92 turbines to the Canadian arm of EDF Energies Nouvelles (EDF EN) for its Rivière-du-Moulin project in Lac-Pikauba and Lac-Ministuk, north of Quebec City.

Construction of the first 150MW phase starts this year, with commissioning set for December 2014. The second 200MW phase is due to begin operating in December 2015.

"This contract is a milestone for REpower as it is our biggest to date," says Andreas Nauen, chief executive of the German company.

The contract is part of a framework agreement of up to 954MW that REpower signed with France's EDF EN in 2009.

"Together, our companies have commissioned 1.275GW throughout North America," says Al Kurzenhauser, chief operating officer of EDF EN Canada.

Phase two of Thornton Bank comes on line

RWE Innogy has commissioned the 148MW second phase of Belgium's Thornton Bank offshore wind farm.

The 24 REpower turbines are fully operational and connected to the grid. RWE Innogy has a 26.7% stake in the wind farm, 30km out to sea in depths of up to 30 metres. The third phase is due for completion in the summer.

Photography | A2Sea | Dong

GREEN ENERGY: Ed Davey, *left*, and Pat Rabbitte sign the wind-export memoradum of understanding in Dublin

Regulations pose challenge to Irish wind export plan

KARL-ERIK STROMSTA
LONDON

If a plan to flow vast amounts of Irish wind energy to Britain by 2020 fizzles out, it will be because of regulatory rather than economic stumbling blocks, claims Irish energy minister Pat Rabbitte.

Speaking to *Recharge* a week after signing a memorandum of understanding in Dublin with UK counterpart Ed Davey that could lead to the mass export of wind energy across the Irish Sea, Rabbitte says he does not believe their meeting will prove the initiative's high-water mark.

"It would appear that Britain is conscious of the fact that they have onerous, obligatory renewables targets to meet, and they can do so more economically by sourcing some of that supply in Ireland," he says.

In the meantime, "there are a number of developers of scale here in Ireland who have taken it as far as making down payments with [transmission operator] National Grid in Britain in terms of projects they're assembling in Ireland".

Between them, Mainstream Renewable Power and Element Power have secured 8GW of firm access to the UK grid as part of their rival Energy Bridge and Greenwire concepts for exporting Irish wind energy.

Far more difficult than the economic case, Rabbitte concedes, will be thrashing out the regulatory problems.

The issue is complicated by British Prime Minister David Cameron's pledge to hold an "in/out" vote on EU membership before 2018 — a move that could see the UK's renewables targets modified or abandoned.

> "This is complex terrain. It hasn't been done before, and we have to get the design right

While the EU's mandatory Renewables Directive permits one member state to sell excess clean electricity to another country, "there is no real template for doing this", Rabbitte notes. "This is complex terrain. It hasn't been done before, and we have to get the design right."

Some in Ireland bemoan the notion of "spoiling" the Irish Midlands with turbines because Britain is unable to build enough wind farms on its own soil in time to meet its targets.

"If you proposed building a wind farm at every crossroads in Ireland, then you'd have a problem," Rabbitte says. "But no-one is proposing to do that.

"We have tens of thousands of acres of cut-away bog, areas under reforestation. We have a peat company, Bord na Móna, that is running out of mission because peat is a finite resource.

"We have a capacity to construct wind farms that are not visible to the eye and don't intrude on domestic communities."

Rabbitte says he has "stayed well away" from boasting about the number of jobs that might be created from a huge Irish wind build-out, insisting that the debate must be anchored by a sense of realism.

"But there isn't any doubt that we have the capacity to develop an important export trade sector here," he says.

"We're a country that's a price-taker on energy, an importer of fossil fuels, an isolated island. It makes sense to exploit our indigenous resources."

Photograph | Jason Clarke

Happening today

Financing wind in a finance-constrained world: Challenges and new solutions

11:00 - 12:30, (Room Strauss 1-3)

Finance — everybody is talking about how to get it, but the gap in understanding between wind energy and the finance community is wide. The Finance Track will kick off with a debate comprising leaders from the financial and wind worlds. The panel will discuss the emerging sources of finance: pension funds, insurance companies, debt funds and others.

This year's Finance Track is certainly not to be missed. It is chaired by Tom Murley, director and head of renewable energy, HgCapital, who brings together leading wind financiers to examine current and evolving structures to finance wind in turbulent times (*see page 14*).

Conference session tickets: There is still a chance to attend even if you are not a conference delegate. Participants can purchase up to two conference session tickets per person at the registration desks.

Beer reception

16:30 - 18:00, Hall A

Participants are invited to the beer reception to nurture relationships with existing clients and develop new business opportunities. Join ZF Wind Power (stand A-F50) and CG (stand A-F55) to sample a few of the best Belgian and German beers on offer.

Opening reception

19:00 - 21:30, The Vienna City Hall, Innere Stadt Vienna

What better place to kick off a focused event than at the opening reception, where wind-energy professionals from around the world will gather to meet? Join us for this reception at the end of the first day of the event and take advantage of this dedicated time to interact with top industry professionals, while enjoying some regional specialties.

This event is open to ticket holders only. If you have not already purchased a ticket, you can enquire at the registration desks.

Don't miss tomorrow

Early rise: Join the business run

Good for your health and business networking. Flensborg & Associates and the Danish Wind Industry Association have organised a fun run to raise money for Renewable World.

Starting at 7:30am at the Äusseres Burgtor, the port entrance to the Heldenplatz (5km and 10km distances).

The participation fee of €25 is donated entirely to Renewable World (www.renewable-world.org, supported by EWEA). If you have not already registered, sign up at the registration desk.

High-level panel debate: Boom and bust – North, South, East

9:00 – 10:30 (Room Strauss 2-3)

This session will illuminate the differences between established and emerging markets. In this high-level panel debate, leading industry figures comprising developers and utilities will share their views on where, and how, the European wind-energy sector will develop.

Conference session tickets: There is still a chance to attend even if you are not a conference delegate. Participants can purchase up to two conference session tickets per person at the registration desks.

Emerging markets workshop

Part 1: Tuesday 5 February, 13:00 – 17:00
Part 2: Wednesday 6 February, 9:00 – 13:00
(Room Strauss 1 with breakfast, 8:00 – 09:00)

Exploring the most effective ways to operate profitably in emerging markets, you will improve your understanding of these new markets and maximise the role that emerging markets play in your company's overall success. This two-day workshop covers everything from political framework to financing wind energy, legal aspects, opportunities, challenges and best practices in developing wind in emerging markets.

All participants will receive a free copy of a new market study on investment opportunities in emerging markets (*Eastern Winds* – EWEA's new report on Emerging European wind power markets).

Programme

Tuesday 5 February

- **Session Opening** (13:00)
- **Panel Discussion — Political Framework in Emerging Markets** (13:15 - 14:00)
- **Financing Wind Energy in CEE** (14:10 - 15:30)
- **How to Supply a Growing Market — Solutions for a Renewable Market** (15:45 - 17:00)

Wednesday 6 February

- **Pre-workshop breakfast** (8:00 – 9:00)
- **Legal Aspects of Planning and Operating Wind Farms in Emerging Markets** (9:00 - 10:15)
- **Renewable Energy and the Grid — Challenges and Opportunities for Emerging Markets** (10:30 - 11:45)
- **Hurdles and Best Practices in Developing Wind — Why Some Grow and Some Don't** (12:00 - 13:15)

To find out more and to purchase a ticket, you can enquire at the registration desks.

Project workshops

EWEA participates in a number of EU projects. At EWEA 2013, project workshops are open to all participants free of charge.

European Energy Programme for Recovery (EEPR) workshop
10:00 – 12:00 (Business suites 1 & 2, 1st floor)
This workshop will present projects that have been supported through the European Energy Programme for Recovery.

TPWind workshop 15:30 – 17:00 (Business suites 1 & 2, 1st floor)
This event will provide participants with an update on how the EU supports wind-power R&D and fosters the development of the sector.

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Germany added 2.4GW last year

BERND RADOWITZ
BERLIN

The German wind industry grid-connected 2.44GW in 2012 — all but 80MW of it onshore — as the nation reached a total capacity of 31.3GW.

Last year represented a 21% increase on the 2GW added in 2011, says a study for the German Wind Energy Association and engineering trade body VDMA Power Systems.

"Germany is a pillar of strength in a turbulent global market where wind energy is concerned," says Thorsten Herdan, managing director of VDMA, which is predicting a global decline in installations of up to 10% this year.

"Both the expected slump of the US market in 2013 and the progressive isolation of the declining Chinese market are forcing manufacturers to focus on the European core markets."

Herdan says this makes reforms to the German Renewable Energy Sources Act and the country's electricity market all the more important. "If these goals can be achieved, the framework conditions on the German domestic market will act as a model for Germany's export markets."

PUSHING MORE CUTS: Chancellor Angela Merkel

Photograph | Getty

Last week, environment minister Peter Altmaier proposed a series of "emergency" measures to keep rising costs for renewables output from pushing up consumers' power prices.

The renewables surcharge has jumped by 50% from 2012 to 2013, raising concerns that rising power prices will undermine public support for the country's transition away from nuclear power.

To freeze the surcharge this year and next, Altmaier has suggested imposing a moratorium on feed-in tariffs for new renewables projects, or even temporary cuts in payments for existing projects.

Industry groups rejected the measures and complained that the minister made no plans to modify the electricity market, which has distortions that drive up prices for most consumers while exempting large industries from the renewables surcharge.

Most new onshore wind in 2012 was added in northern Germany's windy coastal states of Lower Saxony and Schleswig-Holstein, with 361MW and 333MW respectively. But Bavaria, a southern wind-power laggard, managed to connect 201MW last year.

Enercon: don't blame onshore wind for rising bills

BERND RADOWITZ

In a swift reaction to government plans to put a brake on support for renewable energy, German turbine maker Enercon said onshore wind is not to blame for driving up power costs.

Managing director Hans-Dieter Kettwig said in a statement: "The build-up of onshore wind energy hardly can be called a decisive driver of the increase in the renewable-energy reallocation charge in recent times."

The statement does not specify what the decisive factors might be.

But officials from German wind companies often privately claim that PV, not wind, is the main cost driver in the country's feed-in-tariff (FIT) system.

Investors, operators and producers of wind projects need investment and planning security, Kettwig cautioned.

An uncertain and overly complicated FIT system would lead to insecurity in the sector and slow the further build-up of wind energy, he warns.

Enercon has opted to stay away from the offshore wind market, which it deems too expensive, instead concentrating on the country's buoyant onshore sector.

Denmark unveils 1.5GW tender

HERE'S ONE WE MADE EARLIER: The Horns Rev 2 wind farm

Photograph | Medvind

KARIN JENSEN
COPENHAGEN

Denmark has unveiled its schedule for 1.5GW of offshore wind tenders, including the 400MW Horns Rev 3 and 600MW Kriegers Flak developments, as it prepares to start talks with potential bidders.

As anticipated, the grid-connection date for Kriegers Flak has been pushed back to July 2018 as a result of the need to balance additional offshore wind with a surge of new PV capacity in Denmark.

The connection date for Horns Rev 3 has been set for January 2017.

The tender for the project is expected to be awarded by early 2015, but bidders for Kriegers Flak will have to wait until the second half of that year to find out who is successful, according to a timetable issued by the Danish Energy Agency (DEA).

The timetable for completion of the Kriegers Flak tender is among the issues the government will discuss with potential bidders this summer.

Both wind farms must be fully operational by 2020.

Another 500MW is planned for near-shore wind farms in six locations, 50MW of which will be used to test new turbines.

The DEA says concessions for the six plants are expected to be awarded before the end of 2015. The results of an environmental assessment are due no later than 30 April next year.

The DEA plans to increase the awareness of the Danish tenders through an international information campaign, including a presentation at EWEA 2013.

Denmark's biggest offshore wind project, Dong Energy's 400MW Anholt, is on track to be completed this year.

Danes lead world with 30% of power from wind

KARIN JENSEN

Wind accounted for 30.1% of Danish electricity consumption last year — the highest proportion in the world.

That represents a rise of two percentage points on the 2011 figure, according to the Danish Wind Industry Association, maintaining the country's position at the head of the global wind leaderboard.

"An increase of two percentage points may not sound a lot, but it is on par with what we expect in order to reach the official target of 50% by 2020," says Sune Strøm, the association's chief economist.

"We will see a slightly bigger increase in 2013 as Anholt is completed, and then further increases when we connect the coming offshore parks and near-coast turbines in 2017-20."

Wind's increased share in 2012 was due to 170MW being erected on land and 50MW offshore as the 400MW Anholt started production. Old turbines with a total capacity of 11MW were taken down.

Installed capacity reached 4.16MW — 3.24MW onshore and 922MW at sea. That total is expected to reach 4.7GW this year.

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Card no. .....
Expiry date ..... CVC code .....

Signature .....

TESTING THE WATERS: PensionDanmark is a pioneer in wind investment among institutional funds, with its half-share in Dong Energy's Nysted (Rødsand 1) offshore project

Photography | Dong Energy | HgCapital

Your chance to hear money talk

Let's listen more to the guys who sign the cheques, Tom Murley tells **Philippa Jones**

Tom Murley wants to let money do the talking in the Finance track of EWEA 2013. He is aiming for fewer advisers and more principal investors as he tries to get to the heart of new approaches to financing wind projects.

"In the past, only about a third of the panellists in the Finance track were the people with the money, and two thirds of them were advisers," says Murley, head of renewable energy at HgCapital, who is in charge of the funding sessions.

"This year, we will turn things round. About 75% of the speakers will be people who actually sign cheques. I want industry to understand how these people think."

He says everyone knows the challenges associated with financing wind projects: banks are lending less, and when they do lend, it is increasingly based on shorter terms with increased costs. Moreover, public markets remain unreceptive to renewables companies.

However, "there are some new solutions, such as pension and insurance companies, that are doing deals". Murley agrees that this is a positive development, but he wants delegates to understand exactly how and why this is happening and thereby avoid potential disappointment.

"Many in the industry expect pension funds and insurance companies to come riding to the rescue, and from discussions in this track, attendees will understand that they may do. But at the same time, these institutions are cautious and do not move quickly," says Murley.

He also wants delegates to gain a better understanding of why pension funds and insurance companies decide to invest in wind and why they may not always find it attractive.

One of the highlights of this discussion will be the chief investment officer round table, featuring leading pension fund and insurance executives, including Torben Pedersen from PensionDanmark, Stephan Breban from City Capital Partners and Christoph Müller from Swiss pension fund Nest. They will discuss their investment stance on wind compared with other areas, as well as risk perceptions, investment structures and rates of return.

Finance track chair **Tom Murley** leads HgCapital's renewables team. He chairs the British Private Equity and Venture Capital Association's Cleantech Board, and sits on the steering committee of the UK Low Carbon Finance Group, which provides policymakers with advice on attracting capital to low-carbon energy industries

"Our research shows that from a pretty low basis, there has been a 30% compound annual increase in major financial investors putting their money in EU renewables in the past nine years," Murley says.

Moreover, all but one of the speakers on the pensions and insurance panel are "people who have invested in wind projects and who hadn't five years ago".

This is obviously good news, but he warns that this change is still not happening fast enough to offset investment losses from more traditional players.

"One of the things these investors are most wary about is regulatory risk. They can be biased against subsidised businesses, and so the wind industry needs to continue its good work aimed at bringing costs down so that subsidies too can fall."

LIFT-OFF: The nacelle for the SeaAngel prototype, fitted with the new drivetrain

Photograph | Mitsubishi

7MW drivetrain aims to slash cost of energy

Digital hydraulic design to be lighter and more efficient

DARIUS SNIECKUS

Japanese industrial heavyweight Mitsubishi has kicked off testing of the pioneering drivetrain and generator concept that will power its 7MW SeaAngel offshore wind turbine.

The company's innovative computer-controlled hydraulic-valve-based design, being trialled at its Yokohama Dockyard & Machinery Works, is designed to cut the cost of next-generation super-turbines by reducing the weight of the nacelle and boosting output efficiency. And with transmission systems accounting for up to 20% of a turbine's total price — and 34% of the operations and maintenance spend offshore — cheaper, more reliable units could carve a sizeable slice off a wind farm's total cost of energy.

The drivetrain concept, developed by UK outfit Artemis Intelligent Power, is being fine-tuned for installation in demonstration turbines at Hunterston, Scotland, in June, and offshore of Fukushima, Japan, in August 2014.

MHI aims to have a commercial model ready for serial production in 2015.

Retrofitted into an MHI MWT100 gear-driven design, the new "digital displacement" drivetrain powers a pair of off-the-shelf synchronous generators via a high-pressure oil-hydraulic concept found in many industries' motors, brakes or torque-limiting technologies.

The concept trims 20% out of the weight of the nacelle while giving the turbine a higher output efficiency by replacing two historically problematic drivetrain components: the step-up gear — which turns the average ten revolutions per minute (rpm) of the rotor into 1,000rpm inside the generator — and inverter.

"The new system offers numerous advantages over earlier systems. Adoption of the hydraulic drivetrain, for example, realises outstanding efficiency and reliability through elimination of the conventional step-up gear and inverter, components that have been an issue in the quest for large-scale wind-power generation systems," says MHI.

> The concept replaces two historically problematic drivetrain components: the step-up gear and inverter

"Also, the new configuration offers superlative cost performance as a result of its incorporation of widely adopted hydraulic equipment and materials and relatively inexpensive alternators."

The digital displacement drivetrain uses a circular arrangement of piston cylinders that open and close valves using computer-controlled, electronic latches to adjust the flow of hydraulic fluid to pumps powering the generator.

This means the system has the ability to "instantaneously adapt" to changing winds and keep the generators turning at a steady rate even in gusty offshore environments.

The transmission can work at anything from full displacement — where every cylinder's upstroke pushes high-pressure oil to the external system — down to a low-pressure "idle" where the valves are not "energised", leaving hydraulic oil to circulate at low pressure into and out of the cylinder.

In operation on a full-scale wind turbine, a system can have some cylinders pumping while others power the high-speed motors.

The SeaAngel is being advanced through the Efficient Offshore Wind Programme (EOWP), a £33m ($52m) project launched last year by a consortium comprising Mitsubishi Power Systems Europe, Scottish utility SSE and contractors Technip and Wood Group.

The new drivetrain is doing double duty in the EOWP. It is being trialled as a technology "in evolution", as well as being a test case in supply-chain management, to see how a full-service contracting chain might be forged.

As part of the wider project, a new jacket design is being fashioned for the SeaAngel through Wood Group's offshore oil and gas engineering arm, Mustang. Expectations are that a standardised steel foundation — with the flexibility to accommodate different soil conditions and water depths ranging from 25-50 metres — will be chosen.

Meanwhile, the transport, installation and electrical infrastructure elements are being studied by Technip.

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