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EDITOR'S DESK

OCTOBER 2017

Spotlight on blades, gearboxes, and turbine inspections

We're a month into fall, and the days continue to shorten. The winds may be blowing colder, but they're still blowing against those turbine blades creating clean energy for millions of homes and businesses.

The October issue of *Wind Systems* has quite a few interesting articles that proves just how strong those winds are and what that means to the wind industry.

This issue focuses on topics essential to almost every part of an asset: blades, gearboxes, and turbine inspection.

On the blade front, we have an article from LM Wind Power. The industry is discovering that the wind in colder climates is ideal for energy production. The downside is that those climates can cause ice to form on blades, which not only can disrupt energy production, but also inflict major damage as well.

The article from LM Wind Power discusses what's being done to de-ice a blade as well as keeping ice from forming in the first place.

The Timken Company is one of the leading businesses that makes bearings found in gearboxes and other parts of a turbine. In our company profile, an expert with Timken discusses what it has done for wind and the innovative products it will soon unveil to further revolutionize the industry.

Predictive maintenance is a rapidly growing niche in determining when parts of a turbine need replacing. It is saving companies millions in O&M costs.

In this month's Conversation, Sonny Garg with Uptake talks about what his company is doing to detect problems before they start.

There's always something new and interesting going on in wind. This issue of *Wind Systems* reflects just a small cross-section of the ingenuity that continues to make wind an exciting industry.

Thanks for reading!



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There are reasons wind is big in Texas

Courtesy of AWEA

- Texas leads the U.S. with more than 21,000 MW of installed capacity.
- Texas has more than 22,000 wind workers.
- 40 factories in Texas build wind-related parts.
- Almost 12,000 turbines are online in Texas.
- Texas generated enough wind energy to power the equivalent of 5.3 million homes in 2016.

The American Wind Energy Association (AWEA) is the premier national trade association that represents the

interests of America's wind energy industry. For more information, go to www.awea.org



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DIRECTION

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DNV GL: A cleaner, more electrified world is within reach by 2050



An era of abundant and cleaner energy lies ahead, according to DNV GL's modeling of the world energy system. (Courtesy: DNV GL)

DNV GL recently published its first Energy Transition Outlook (ETO): Renewables, Power and Energy Use. The industry implication report is part of DNV GL's new suite of Energy Transition Outlook publications. The report reviews global energy demand and energy supply and summarizes the implications for the power and renewables sector and large industrial energy users.

An era of abundant and cleaner energy lies ahead, according to DNV GL's modeling of the world energy system. The key findings of the report emerging globally over the forecasting period include:

- Electricity consumption increases by 140 percent by 2050, becoming the largest energy carrier, followed by gas. Other energy carriers such as coal experience significant reductions, while oil and gas consumption increase only slightly.
- 85 percent of global electricity production in 2050 comes from renewable sources — Solar PV will provide around a third of the world's electricity by 2050,

followed by onshore wind, hydropower, and offshore wind, in that order.

Despite this optimistic outlook, the report finds that the world is not on course to achieve the climate objectives of the Paris agreement.

DNV GL forecasts that humanity will exhaust the 2 degrees C carbon budget (the amount of CO₂ that can be emitted without triggering dangerous climate change) by 2041, pointing toward a global warming of 2.5 degrees C above pre-industrial levels by the end of the century, a level which is likely to force dangerous climate change.

The growth of electricity consumption is one enabler to speed up the global decarbonization. This includes the rapid uptake of electric vehicles, generating energy savings and emissions reductions. DNV GL forecasts that electric vehicles will achieve cost parity with internal combustion vehicles in 2022 and, by 2033, half of new light vehicle sales globally will be electric.

“Our report shows that the energy industry, more than any other, has the power and knowledge to manage the world's carbon budget in a smarter way,” said Ditlev Engel, CEO at DNV GL-Energy. “Until 2050, the electricity share of energy demand will grow from 18 percent to 40 percent, yet this transformation is not happening fast enough. Speeding up the acceleration by decarbonization of heat and transport will be one vital measure to put the brakes on global warming. In fact, all industries should maximize the decarbonization of their operations. But the climate challenge is not only an engineering challenge, but also one of governance. We call upon all stakeholders to maximize the decarbonization of their operations.”

To achieve the target of a low-carbon world, there is no single solution. Instead, multiple achievable actions must be taken both locally and globally, involving collaboration within the energy sector and across industries:

WINNING THE BATTLE AGAINST BEARING WEAR

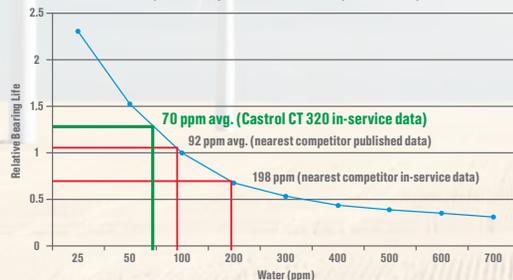
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*WEU Operations and Maintenance Report 2016.
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- Invest in testing and verification of systems to secure robust electricity supply.
- Provide flexibility, balancing, and cost-effective integration solutions.
- Optimize grids to facilitate growth of renewables.

Action 2: Greater and earlier electrification of heat and transport.

- Drive the uptake of decarbonization of heat.
- Broader adoption of electric vehicles contributing to energy savings and emissions reduction.

Action 3: Greater improvements in energy efficiency.

- Invest in strategic energy management.

Action 4: Change in personal behavior.

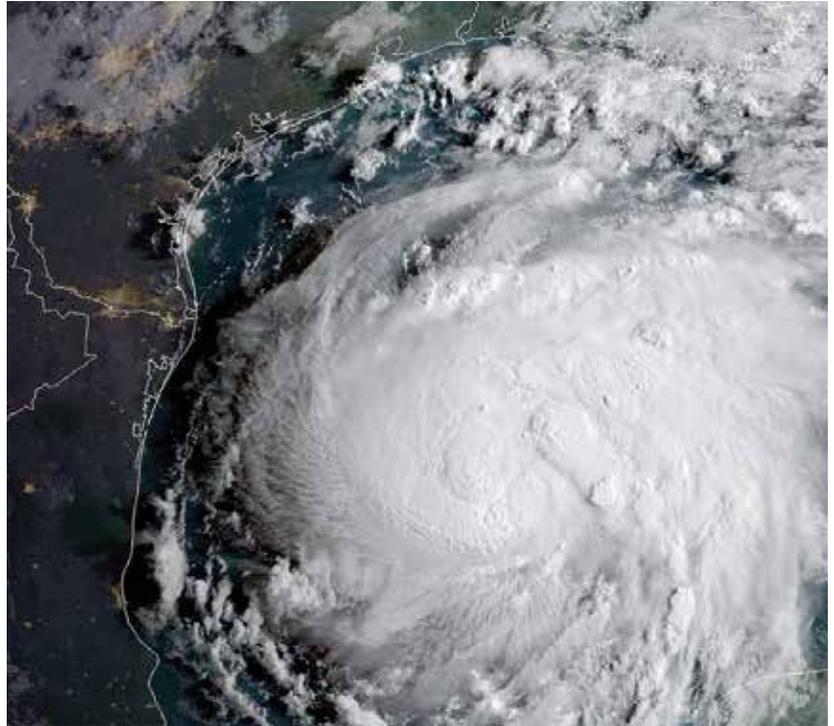
- Increase the level of public acceptance to shape consumer behavior.
- Availability of subsidies.

DNV GL's ETO report was prepared by a dedicated research team, which received input from hundreds of energy experts from inside and outside the organization.

The report arms all relevant sectors with a wealth of factual ammunition to adapt strategies, and be bold in making evidence-based decisions to transform energy systems. ↪

Source: DNV GL

For more information, go to eto.dnvgl.com/2017/download



Money donated by the wind industry will support repairs and rebuilding efforts in areas affected by Hurricane Harvey, which first made landfall August 25 near Corpus Christi, Texas. (Courtesy: NOAA)

American wind companies pledge \$1 million for post-Harvey recovery

Companies in the American wind-energy industry recently announced they will donate \$1 million to Hurricane Harvey repair and rebuilding as keystone partners of Habitat for Humanity's Habitat Hammers Back initiative.

Participating companies include Apex Clean Energy, Blattner Energy, Duke Energy, EDF Renewable Energy, EDP Renewables, Enel Green Power North America, Inc., E.ON, Goldwind Americas, Hannon Armstrong, Invenegy, Leeward Renewable Energy, MAP Royalty, Pattern Energy, TPI Composites, and the American Wind Energy Association.

The money will support repairs and rebuilding efforts in areas affected by the storm, which first made landfall August 25 near Corpus Christi, Texas. The wind companies had also planned to send volunteers to help with the rebuilding effort. Texas has a quarter of U.S. wind-power capacity and more than 22,000 Texans work in the industry, among 102,500 wind jobs nationwide. The state's more than 12,000 wind turbines themselves emerged unscathed from the storm.

"The EDF group has 400 employees in Houston serving various sectors of the energy industry, including our regional wind-project development team," said Tristan Grimbert, president and CEO of EDF Renewable Energy. "As Texas wind is an important contributor to our nation's energy mix, and Houston in specific is the center of energy diversity, we are committed to the ambition to offer our resources in the recovery and rebuilding efforts."

"Our thoughts and prayers continue to go out to everyone along the Texas Coastal Bend and in Houston who was impacted by this storm," said Patrick

Woodson, chairman of E.ON North America. “Several E.ON employees around our Papalote Creek Wind Farm lost their homes, and even more saw their communities devastated when the hurricane made landfall. Habitat for Humanity will play a critical role in helping people rebuild their homes and communities. With Texas as the nation’s leader in wind energy, it is only right that we and the wind industry be a leading force to help Texans rebuild and recover.”

“More than 22,000 wind workers are in the state of Texas, so this has hit very close to home for us,” said Steven C. Lockard, president and CEO of TPI Composites. “We all feel the need to help with this rebuilding effort. I am especially proud participating companies from across the United States and their associates are committed to volunteer their time in addition to financial resources.”

“Habitat for Humanity is committed to helping families recover from Hurricane Harvey, and we wouldn’t

be able to do it without the support of our partners like these American wind-energy companies,” said Habitat for Humanity International CEO Jonathan Reckford. “Their gift is an investment in the long-term recovery of these communities.”

Habitat is already at work responding to Hurricane Harvey, helping families clean up and prepare for the rebuilding effort to come. Habitat will work with its local offices throughout the hurricane-affected regions to assess the shelter and housing needs and develop response options. In addition to long-term housing repair and construction, Habitat’s response includes organizing volunteers and resources to help with the cleanup of homes damaged by wind and flood waters. ↵

Source: American Wind Energy Association

For more information on Habitat for Humanity and American Wind Rebuilding Texas hurricane response program, go to habitat.org/American-Wind-Energy/Harvey

Gearbox Express signs framework agreement with Eickhoff Bochum

Gearbox Express (GBX), the only independent company in North America focused on providing down-tower, multi-brand wind gearbox remanufacturing services, recently announced it has signed a framework agreement with Eickhoff Bochum to become its preferred North American partner for all up- and down-tower service both in and out of warranty, parts supply, and new replacement gearboxes.

“Currently, Eickhoff has more than 800 wind-turbine gearboxes in service in North America, and this partnership gives Eickhoff much needed service capabilities,” said Bruce Neumiller, CEO of Gearbox Express. “Gearbox Express will serve as their North American service and repair partner, ensuring the Eickhoff gearboxes keep running. We look forward to working together as partners for many years to come.”

Eickhoff has been in the gearbox business since 1864, and takes the care and maintenance of their product seriously.

“We had to prove our capabilities to handle the work,” Neumiller said.



Gearbox Express will become the preferred North American partner for all up- and down-tower service both in and out of warranty, parts supply, and new replacement gearboxes for Eickhoff Bochum. (Courtesy: Gearbox Express)

“The GBX team is highly trained; our equipment and parts are state of the art, and our quality of service sets the industry standard.”

The collaboration is in line with Eickhoff Bochum’s strategic goal to provide service all around the globe.

“We are looking back on many years of cooperation with GBX and value them as a reliable and experienced partner,” said Christi-

na Gierga, head of service at Eickhoff Bochum. “The official collaboration is a logical step toward our goal of meeting the needs of our customers in the USA with high quality standards and OEM spares made by Eickhoff.” ↵

Source: Gearbox Express

For more information, go to gearboxexpress.com



The SWT-2.3-108 model turbine will be used to upgrade two Texas wind farms. (Courtesy: Siemens Gamesa)

Siemens Gamesa to repower two Texas wind farms

Siemens Gamesa Renewable Energy (SGRE) has been selected by NextEra Energy Resources to repower two wind farms in Texas. The newly repowered wind farms are expected to deliver up to 25 percent more annual energy production, boost reliability and efficiency, and extend service life.

The two wind farms feature Siemens SWT-2.3-93 model turbines. The repowering program will upgrade them to the SWT-2.3-108 model. Project completion is expected by year-end, and the wind farms will remain operational during the repowering process.

“We are very pleased to continue our work with NextEra Energy Resources,” said Jacob Andersen, head of Onshore North America for Siemens Gamesa Renewable Energy. “Through Siemens Gamesa’s repowering program, we’re making it possible to optimize our customers’ assets and extend their service life — maximizing the value of their investments.”

Harnessing its expertise in both turbine technology and turbine operation and maintenance services, SGRE has developed a comprehensive and customizable repowering program. The program offers solutions in all phases of a repowering project including siting guidance, financing, planning, construction, service, and operation. SGRE further offers a turbine overhaul option designed to upgrade the electrical and electronic components of wind turbines from other turbine suppliers, improving performance and increasing energy production.

“Siemens Gamesa is a valuable partner, and we look forward to working with them on these important projects,” said Armando Pimentel, president and CEO of NextEra Energy Resources. *▲*

Source: Siemens Gamesa

For more information, go to www.gamesacorp.com/siemensgamesa

ZF Wind Power puts wind energy in motion

Merging ZF’s extensive experience in developing innovative designs with advanced digital technology, results in a modular gearbox solution approach for geared wind turbines.

With more than 55,000 gearboxes shipped, ZF’s installed base exceeds 100 GW covering 25 percent of the globally installed base. This makes the company a leading partner in the wind-power sector.

ZF powers more than 50 percent of the global 3-MW onshore installations and is the first supplier with a serial production of more than 8-MW gearboxes for offshore installation. A 9.5-MW upgrade is being developed.

ZF Wind Power officials said they are convinced that in the future wind energy will become even more pivotal than it is today. “We will need bigger, better, and more powerful turbines to provide the world with affordable electricity.”

ZF’S MODULAR GEARBOX SOLUTION

“With the development of our modular gearbox solution, ZF can now cover new turbine platforms in the 3- and 4-MW range,” said Jan Willem Ruinemans, head of ZF Wind Power Business Unit. “We assure that new generation wind turbines can grow significantly in torque requirements,

“ We are very pleased to continue our work with NextEra Energy Resources. ”

within the same nacelle dimensions. And thanks to our integrated intelligent performance solutions, our gearboxes can automatically sense the best way to optimize energy generation and improve turbine economics for any wind-site condition.”

SERVICE FOR WIND ENERGY IN MOTION

ZF offers a strong, global partnership and enhanced multi-brand full service for wind turbine gearboxes and drivelines, enabling its customers to successfully stand ground amongst the competition.

“Our full offering combining on-site, ZF and non-ZF mechanical drive-train repair, and insight engineering partnership is fundamental in leveraging our global knowledge base to reduce costs and down-times,” said Antti Turunen, head of Global Wind Power Service. “As a further evolution in service,



(Courtesy: ZF)

ZF sees an important role for connected devices to actively control gearbox performance and health status during operation. As part of this vision, ZF offers an intelligent

gearbox retrofit as a new method to reduce service bills.”

Source: ZF Wind Power

For more information, go to www.zf.com

Siemens Gamesa names new chief cyber security officer

Siemens Gamesa Renewable Energy has appointed Alan Feeley as its new chief cyber security officer. In addition to his current responsibilities as chief information officer, he will expand and manage the company’s operational framework for cyber security and will consolidate all security developments in the context of the digital transformation of SGRE after the merger of Gamesa and Siemens Wind Power. In this role, Feeley will work closely with the technology and product security departments, corporate security, and HR.

Cyber security vulnerabilities and threats present tangible risks and challenges to companies and to the operations they support for their customers. The complexity of this topic requires coordination and orchestration across many parts of large companies, including IT, product design, security, and data protection, to name a few.

Siemens Gamesa helps its customers to take advantage of technology advancements while simultaneously minimizing exposure to risk. An optimal security solution can only be implemented if it is continuously adapted to new threats. With the new position, Siemens Gamesa has implemented cyber security in its



Chief Information Officer Alan Feeley takes over additional role. (Courtesy: Siemens Gamesa)

top management to be prepared for future challenges and to address any potential security issues both internally as well as for its customers.”

Source: Siemens Gamesa

For more information, go to www.gamesacorp.com/siemensgamesa

inFOCUS

Baby, It's Cold Outside

Technologies exist that can melt ice on a wind-turbine blade or keep it from forming in the first place

By Dr. Rosemary Barnes

In the sleepy town of Lunderskov, Denmark, there's a 22-meter-long room that is climate controlled at minus-30 degrees Celsius. Dubbed the Ice Lab, it's a place where LM Wind Power engineers can study the effects of freezing weather conditions on wind-turbine blades and determine how best to mitigate them.

As wind energy gains prominence around the globe, major wind-turbine manufacturers are researching strategies that would allow their technologies to work in the coldest of climates. Because of their high winds and increased air density — not to mention their lower populations — colder regions are ideal for wind-energy production.

Challenges abound, though, and in 2002, the International Energy Agency (IEA) Wind Task 19 began gathering and coordinating recommended practices on cold-climate wind energy. One area on its radar is blade icing, a problem that has been tackled by a number of manufacturers in recent years. For when ice builds up, energy production goes down, and it can even come to a halt altogether.

MANY WAYS TO GET RID OF ICE

You'd think it would be easy to keep ice from building up on a wind-turbine blade. Try a little anti-freeze coating. Paint the blade black. Maybe try salting the blade like they do on icy roads. Unfortunately, none of these much-researched "easy" fixes has actually worked, according to the October

2012 edition of IEA Wind Task 19's State-of-the-Art of Wind Energy in Cold Climates.

Instead, many manufacturers have turned to electro-thermal heating, a conductive mat or mesh usually made of carbon fiber added to the blade's surface. The mat heats up when electricity is applied. These systems apply heat precisely to the ice layer, and they can be used in harsh environments.

Several other companies went a different direction, however, to a hot-air system — a technology many believe offers lower maintenance and greater reliability compared to electro-thermal heating.

Here's how the hot-air technology from LM Wind Power works: A heater fan unit is located at the root of the blade. Because all LM Wind Power blades are custom designed, the heater fan size can vary, depending on the blade size. An insulated duct sends the hot air through the blade's interior, all the way to the tip. Holes in the leading edge (LE) web direct hot air onto the blade shell. The holes are placed according to design needs, and flow and heat distribution can be tailored to local heat transfer conditions. The length of the de-icing zone varies, too, depending on requirements. Finally, the air returns through the LE cavity and an insulated return duct, the length of which is chosen based on the length of the desired ice mitigation zone and power requirements.

Compared to electro-thermal technologies, LM Wind Power's ice mitiga-

tion systems don't increase manufacturing cycle time. In addition, there's less chance of damage because all components are internal.

Finally, electro-thermal technologies are conductive, which can attract lightning and potentially damage the blades, and the warming technologies aren't extended to the blade tip for that reason. With a hot-air system, since no metal components are used beyond the blade root, there's no impact on lightning





protection, making it possible to remove ice very close to the tip.

DEVIL IN THE DETAILS

Numerous studies have shown that ice builds up at the LE and the tip more than in other areas, but these also are the most critical areas to aerodynamic performance. One challenge with hot-air technology: If the heater fan unit is at the root, the tip is the hardest area to reach, and the air can cool by the

time it reaches there. The smaller internal area at the tip means that pressure losses are high by the time the air reaches there as well.

LM Wind Power was able to maintain a high air temperature by using an insulated supply duct. In addition, engineers increased the internal heat transfer coefficient by increasing the local velocity and turbulence of the air, using methods such as impingement holes to direct the hot air flow at the LE and other

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procedures to increase turbulence locally. For a hot-air system that heats the inside of the blade, it is essential that the heat transfer through the blade shell matches the heat transfer from the blade to the air. The most efficient system will exceed this slightly to keep surface temperatures just above zero.

Additional design enhancements come with each customization. LM Wind Power works with its customers to design a blade for their particular turbine, and the company puts a lot of effort into determining where the hot air is most needed every time. Each turbine has different requirements, and the geometry of the blade can greatly affect air flow. Creating just the right design is critical to efficiency.

DESIGN DEVELOPMENTS CONTINUE

Many manufacturers begin their design research using analytical models. LM Wind Power's sophisticated flow model uses compressible flow equations to accurately model flow distribution, but turbulence and other local flow effects aren't captured with this model. A global heat-transfer model can estimate power requirements, while a local heat transfer model estimates local ice buildup potential and is used for structural calculations.

Another design method is computational fluid dynamics,



As wind energy gains prominence around the globe, major wind-turbine manufacturers are researching strategies that would allow their technologies to work in the coldest of climates. (Courtesy: LM Wind Power)



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The goal of any ice mitigation system is to get the blade surface hot enough to either melt ice or prevent it from forming. (Courtesy: LM Wind Power)



The battle against ice on blades will continue as wind-energy markets expand into colder regions. (Courtesy: LM Wind Power)

or CFD, which basically splits a volume of space into sections to simplify a complicated 3D flow into a series of simpler flow analyses. For instance, CFD can be used to simulate external flow to determine heat-transfer requirements and internal flow steady state and transient analyses, to calculate surface temperature distributions, impingement from web holes, and internal heat transfer coefficient distribution. A number of these analyses might be used for a new blade design, depending on how novel the design or application is compared to previous designs.

ENTER THE ICE LAB

With its Ice Lab, LM Wind Power takes its research an additional step. Located 14 kilometers from the company's headquarters in Kolding, Denmark, the lab can be used to study the effects of cold climates on the most critical part of the blade — the tip. Instrumented with temperature, pressure, and sensor flows, the lab can provide data logging for transient analyses and is used to validate CFD and analytical models and to test new designs.

For most of LM Wind Power's new

designs, the main focus is on maximizing heat transfer in the tip region. The goal of any ice mitigation system is to get the blade surface hot enough to either melt ice or prevent it from forming. The heat transfer requirements toward the root are generally much easier to achieve, so the company is concentrating on the tip.

With hot-air technology, it's hard to target specific areas, and LM Wind Power has focused on matching the flow and temperature distribution to local heat transfer requirements, she said.

LM Wind Power is also challenged by scaling effects, because as the blades get longer and slenderer, it is harder to get enough flow at a high enough temperature at the tip.

And there is another consideration:

Hot-air technology uses more energy than the electro-thermal technique, so it is important to optimize this as far as possible.

UPGRADING TO ANTI-ICING

The blade typically is stopped while de-icing takes place — up to several hours per blade — depending on conditions. Anti-icing technology, on

the other hand, literally prevents the ice from building up in the first place, so the turbine continues to run. Since heavy icing sites can have ice accumulating up to 70 days per year, anti-icing technology has the potential for annual energy production gains at these locations.

With hot-air technology, researchers are using CFD analysis to determine the heat transfer required to keep the blade surface water in a liquid state. Compared to a de-icing blade, an anti-icing blade needs more insulation to maintain higher temperatures, an increased heat transfer coefficient at the tip, a higher flow rate overall, and an especially higher flow rate at the tip, which means a larger fan is needed to provide more flow and greater pressure gain.

UP TO THE CUSTOMER

The battle against ice on blades will continue as wind-energy markets expand into colder regions. When entering a new region, blade manufacturers need to work closely with customers, alongside meteorologists, to deepen their understanding of the weather conditions blades will face throughout their 20-year lifetime. Demand for systems to combat ice is growing, and the pressure to decrease the levelized cost of electricity (LCOE) from wind will drive ongoing improvements in the cost and efficiency of the technology.

To continue to compete in colder climates, research is key. So, as long as the winter winds blow outside, engineers will be found inside LM Wind Power's Ice Lab developing the next generation of de-icing and anti-icing technologies. *✍*



Dr. Rosemary Barnes is a senior engineer focused on de-icing at LM Wind Power. In 2016, she joined the Product Engineering and Blade Sub-Systems team at LM Wind Power's headquarters in Denmark. Previously, Barnes worked in her home country, Australia, as a design engineer and project manager in renewable energy and sustainability industries. She holds a Bachelor's Degree in Systems Engineering from The Australian National University in Canberra, and a Ph.D. in Composite Materials Structures from the University of New South Wales.

Chasing the Value

Innovation and industry maturity have brought additional options to gearbox repair and replacement.

By Brian Hastings

In any industry, value is often in the eye of the beholder. What works for one company may cost another significantly.

Five years ago, Gearbox Express (GBX) introduced Revolution for the Sle platform because a majority of those turbines were 5 to 8 years old. The theory was these assets would run 20-plus years in a market where power-price increases would be the norm and reliance on the Production Tax Credit (PTC) would phase out.

Fast forward to today and:

- Wind has become very competitive. According to Make Consulting, LCOE (levelized cost of electricity) is expected to fall below \$35/MWh within the next five years, outstripping both coal and natural gas.
- Current development boom being fueled by the phase out of the PTC. PPAs (power purchase agreements) are coming in extremely low (sub \$20/MWh in many circumstances). This underscores long-term importance of OPEX (operating expenses).
- Given low power prices, independent power producers in a post-PTC environment (after year 10) find it difficult to justify gearbox and or main-bearing replacement.
- Regulated utilities have a rate base used to justify upgrades and increased reliability. They continue to develop and expand wind largely as a long-term hedge against other forms of power generation while the PTC remains nice to have.
- A major “repower” wave is surging through the more than 8-year-old turbine market, exclusively driven



The total replacement cost for gearboxes needs to be reduced to make wind a more sustainable technology. (Courtesy: Shutterstock)

by the PTC 80/20 rule. Over 7 GW is expected to undergo some sort of repower activity, qualifying for a second 10 years of PTC providing relief to OPEX pressures.

The total replacement cost for gearboxes needs to be reduced to make wind a more sustainable technology. Yes, power prices are likely to rise, but for wind to be sustainable long term, these costs have to be fundamentally lower while at the same time not sacrificing reliability. Owners of post-PTC turbines not repowering could be lured into chasing a low cost /used gearbox, only to quickly find out the value of its reliability is not there.

WHAT ARE THE OPTIONS?

Address the in-and-out cost.

- Traditional cranes are expensive. Wind is maturing, and newer

technologies are now on the market that are cutting the in-and-out cost in half. Newer, self-hoisting systems can do the job for \$75,000 to \$100,000 while a traditional crane would cost \$125,000 to \$175,000. As acceptance in the industry increases, up-front capital cost will reduce, and the in-and-out cost could be as low at \$50,000 to \$75,000.

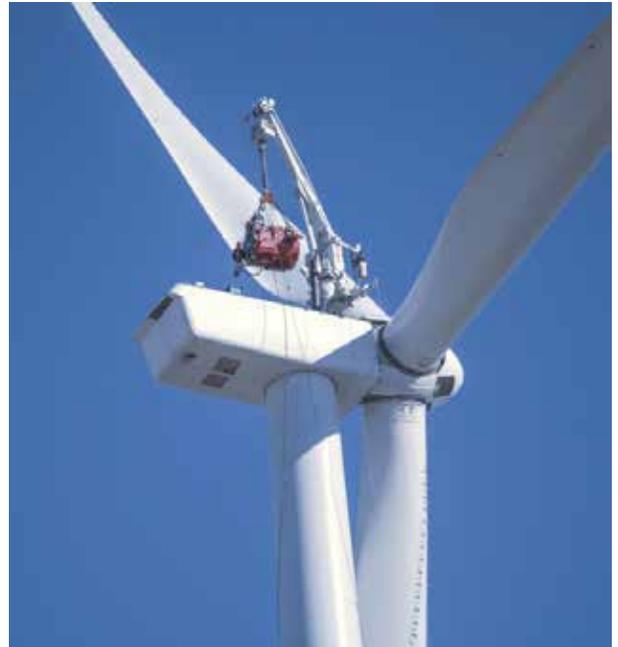
- Predictive maintenance is key. It is possible to use condition monitoring as a tool to manage time between failures with de-rating strategies. Turbines can produce power safely until it makes sense to perform the change-out, avoiding costly down time. Furthermore, economies of scale can be realized on the crane mobilization by lumping multiples together.
- Make smart investments. Certain

wear debris sensors have become cost effective. They now cost a third to half the price of a traditional full-blown vibration system.

Reduce the cost of the gearbox repair while understanding the reliability tradeoffs.

- A full set of replacement gearing represents approximately half the costs of a complete remanufacture. Re-using gears therefore presents a significant opportunity to save cost.
- Used gears can be successfully used if properly inspected to ensure within backlash tolerance and reground to 100 percent clean up (meaning it looks like a new gear). Using gearing as-is or without proper inspection is a recipe for disaster. This is the crux of the material aspect of any warranty: ensure the language is clear, as any gray area implies assumed risk. Make sure suppliers providing a guarantee are transparent with their specifications.
- It's reasonable to expect a properly reconditioned used gear will run another five to 10 years while a new gear would be expected to last 20 years. For example, if a turbine is 11 years old and the goal is to run beyond 20 years, additional investment must be made up-front so new material can be used. If the goal is only to run another nine years (to year 20), recertified gearing may be a better option. As an example, if the upfront purchase cost of a gearbox with all new gearing was \$180,000, a gearbox using recertified used gearing could be \$120,000.
- Bearings represent about a quarter to a third of the cost of a complete remanufacture. Paying 20 percent to 30 percent more for upgraded bearings in a few of the positions (planets, high speed, intermediate) will only marginally increase the cost of the gearbox (approximately 5 percent), but substantially improve reliability.
- The remaining cost of the gearbox relates to labor, lube system, seals, and a load test leaving little room for additional savings.

Value is often in the eye of the beholder. As an owner, value takes on different definitions over the life of the turbine. The good news is innovation and industry maturity has brought additional options, and more importantly, transparency, so all risks can be weighed and the true value found. ↙



A Liftra Self-Hoisting Crane® in action. Newer, self-hoisting systems can do jobs for much less than a traditional crane. (Courtesy: Gearbox Express)



Material fatigue can cause serious wear, limiting the lifespan of a used gear vs. new. (Courtesy: Gearbox Express)



Brian Hastings is a founding partner and CFO of Gearbox Express. He has a Bachelor's of Science in Mechanical Engineering from the University of Toledo. Hastings has been an active participant in the wind industry since 2009.

PROFILE

The Timken Company

For decades, The Timken Company has been a global leader in bearings and mechanical power transmission, continually improving performance, reliability, and efficiency.

By Kenneth Carter
Editor | Wind Systems

Products made by The Timken Company have powered many of the world's largest wind turbines, traveled to Mars with the Curiosity rover, and supported drilling of the world's longest rail tunnel.

But when all is said and done, it's not about what Timken makes; it's about the know-how that goes into making it.

"We make it about our knowledge and not just about our bearings," said Richard Brooks, manager — energy markets with Timken. "We are an engineering company, and you see our know-how and innovation in our products."

Brooks is responsible for Timken's energy businesses including bearings and related products for wind-turbine maintenance and reliability.

WIND — AN IDEAL MARKET

Although Timken and its subsidiaries have a hand in many different industries, it's in wind that it has found a simpatico business relationship.

"Wind is an ideal market for us essentially because it matches the types of markets that have high-demand, challenging applications," Brooks said. "The forces involved in wind are pretty spectacular. They need high reliability because these things are



An interactive display in the Timken product showroom conveys product information at various levels of technicality. (Images courtesy: The Timken Company)

The Timken Company

Founded:
1899

Headquarters:
North Canton, Ohio.

Website:
www.timken.com

operating by themselves, hundreds of feet in the air, and repairs are expensive. Our goal in wind is continuing to grow and maintain our position as

a major supplier for new turbines, as well as their key system sub suppliers like gearbox suppliers."

Over the past eight years, Timken has acquired about a dozen businesses that include related products and services, according to Brooks.

"About half of these have some play in wind energy," he said.

Timken has two major divisions: mobile industries and process industries. About 25 percent of process industries are for OEM-based new equipment. For example, equipment sold to a turbine builder or to a brand new steel mill or cement plant.



The Timken Company, a global industrial technology leader, applies its deep knowledge of materials, friction management, and power transmission to improve the reliability and efficiency of industrial machinery and equipment all around the world.

The remainder of that is the after-market where distribution of services comes into play, Brooks said.

End markets Timken works with include general industry, automotive, rail, energy, defense, agriculture, metals, mining, civil aerospace, construction, and paper/aggregate.

Energy makes up about 9 percent of those total markets.

“About half of that energy space is wind,” Brooks said. “It’s the largest of the energy segments and the most rapidly growing.”

A GLOBAL FOOTPRINT

All of those industries give Timken a global footprint among 28 countries, 57 sales offices, and 75 plants and service centers, but it still remains a major North American-based bearing company.

Roughly 60 percent of Timken’s business is in North America.

So it’s easy to see just how Timken’s products and services have stretched around the world, according to Brooks.

“We’ve grown globally, over the last two decades,” he said. “We really expanded throughout the world, growing in Latin America, Europe, and Asia.

The core of Timken’s business has always been engineered bearings, according to Brooks.

But Timken has been expanding into mechanical power transmissions and industrial services surrounding that drive train.

“We’re looking to grow what we do, still focusing on the challenging part of the drivetrain but adding on couplings or lubrication systems or other services,” Brooks said.

RELATIONSHIP WITH THE WIND OWNERS

When it comes to the wind industry, Timken maintains a constant relationship with the actual wind owners, he said.

“In addition to working a lot with turbine builders and gearbox builders, we have very close relationships with turbine owners,” Brooks said. “All those really big end users who own thousands of these turbines have learned a lot in the last 15 years. It’s still a new industry in many ways, and, therefore, there are a lot of problems with some of the existing turbines where we can bring our technology to bear. We’ve had a very collaborative effort with a lot of these end users to take the technology and the higher end products that we have, figure out where they’re having problems, and solve those problems.”

NEW INNOVATIONS

That technology is responsible for

several new innovations that Timken plans to unveil this year.

“We have a new grease for main bearings that’s launching this fall,” Brooks said. “We’ve been a little bit cautious in bringing on a grease in wind like we have in many other industries simply because we wanted to make sure it met the needs of the market.”

Timken also expects to launch a new line of generator bearings designed to address some common failures in generator bearings from electrical arcing, according to Brooks.

“There’s a common phenomenon where, instead of the electric current going where it’s supposed to, it ends up going through the bearings and damaging them,” he said. “So we have a new line of generator bearings that are electrically isolated.”

Brooks said in the last year Timken released a new main bearing design — called a TDI — that is designed to solve a lot of problems in many common turbine models.

The design is already being used in specific turbines, and Timken is looking to broaden that offering to even more assets, he said.

FROM KILOWATTS TO MEGAWATTS

An example of these turbine problems Timken’s new design should



The atrium of Timken's new building features a distinctive staircase.

correct stems from when the industry began to grow from kilowatts to megawatts.

“Essentially, what they did is they took the existing designs that worked pretty well at 150 feet and 500 kW and scaled them up to 300 feet in the air at 2 MW,” Brooks said. “The forces involved caused a lot of application problems that were not foreseen.”

A typical design for a 1- to 2-MW turbine uses a spherical roller bearing in its main shaft for the main rotor bearing, which is the bearing that sits right behind the blade and supports both the weight of the blade as well as the thrust from the wind, according to Brooks. That spherical roller bearing can handle the weight, but dealing with the wind thrust proved difficult.

“So working with those end users, we learned that they’ve seen poor performance,” he said. “The turbines were failing long before they were expected to. They wanted them to

last 25 years, and they’re having to replace them at eight years. And the real problem is that, although that bearing may be a \$20,000 bearing, you have to bring in a quarter-million dollar crane to replace that \$20,000 bearing. So it’s pretty much a disaster on their operating budget.”

BEARING UPGRADE

To help solve that problem, Brooks said Timken has come up with two different upgraded offerings for that spherical roller bearing.

One of those options is an upgraded spherical roller bearing equipped with a diamond-like carbon coating that can reduce specific problems and extend the life of the asset, he said.

“The other would be this TDI that I mentioned where we’re basically completely redesigning it and replacing the spherical roller bearing with a tapered roller bearing,” Brooks said.

Timken is constantly striving to stay at the forefront of technology in

order to maintain operational excellence for industries that are used to working in extreme harsh environments.

“The Mars rover is a great example where it’s a pretty extreme application. And talk about reliability — it’s got to operate for years in a place where no human will ever see it again. That’s about as extreme as you can get from the reliability side of things,” Brooks said. “Along similar lines are offshore wind turbines. We are involved with most of the wind turbines in the world to one extent or another. So wind is a great example of how we showcase what we do.”

MATERIALS EXPERTISE

Timken has been able to take its decades-long history with dealing with materials and combine it with innovation and apply it to the wind industry.

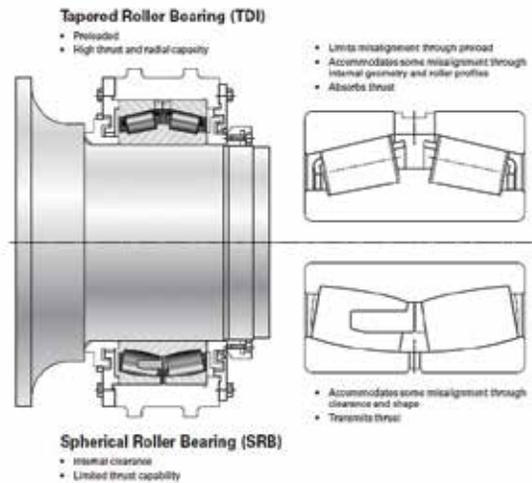
“One of the areas where we’re leading the industry, specific to gearboxes, would be our history with

steel and material science,” Brooks said. “The way we’ve innovated in the gearbox side of things is taking that materials knowledge and materials science and applying it to the problems that the industry has been seeing in gearboxes and bringing in better-made bearings with better materials to combat a lot of the existing problems in the field. We’re one of the leaders in working with the gearbox builders as well as the turbine builders to apply these better technologies and higher quality materials to gearboxes to design out the problems that they’re having.”

But that history of knowledge is only part of the equation. Another is Timken’s hands-on collaboration with its end users, according to Brooks.

“We’ve got technicians in their turbines every day, trying to figure out what’s wrong, and then working with their engineering teams to say, ‘OK, you’ve got problems here; let’s fix it,’” he said. “Let’s just not keep replacing that bad bearing; let’s replace it with a better bearing that’s not going to fail next time. And that collaborative process differentiates us as well.”

Even with all the growth and advancement Timken has experienced, Brooks said the company still prides itself as a family environment.



“Our story began with Henry Timken back in the 1890s,” he said. “And even though we’re a publicly traded company, we have fifth-generation members of the Timken family still involved with the company. It’s kind of interesting in that you get the best of both worlds being a part of a large publicly traded company but still having that family sort of feel to it.”

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CONVERSATION

Sonny Garg

Global Energy Solutions Lead
Uptake

“Our products work on any asset, made by anyone.”

What do you do with Uptake?

I lead Uptake’s energy team. That includes everything from generation to distribution all the way down to how energy is used by customers, big and small.

Uptake is in eight different industries: agriculture, aviation, retail, mining, construction, energy, equipment dealers, and rail. Through predictive analytics, my team challenges the possibility of something we all depend on daily: energy.

The early work of Uptake’s energy team, although we have other efforts across the energy supply chain, has been on the first part of that journey: generation. Earlier this year, two of Berkshire Hathaway Energy’s subsidiaries chose Uptake’s predictive analytics software for their wind fleets.

What does Uptake do for the wind industry?

Uptake’s predictive analytics products turn data coming from a wind turbine into real-time, real-world insights people can act on to stop problems before they start. That means less downtime and more energy.

Knowing problems before they occur increases the reliability of wind turbines and the energy they produce. By increasing reliability, Uptake is creating new opportunities for



the wind industry that have been out of reach.

The first opportunity is reduced costs — making wind energy even more competitive with other energy sources.

Knowing about a failure before it happens lowers maintenance costs. Small problems don’t turn into more serious and costly problems — or cascade and cause more problems. That allows you to plan maintenance more strategically and reduce overtime costs.

The second real opportunity is that with greater reliability, wind operators and owners can participate and sell more in the day-ahead energy markets.

That second opportunity is connected to the third: moving to a cleaner energy stack faster. Gener-

ating more wind power gets us to that goal, but when you add greater reliability to wind power, utilities don’t have to fire up as many carbon-heavy power plants.

For every 1 percent increase in reliable wind or clean-energy output, 1 percent less energy is needed from energy sources that emit carbon dioxide.

How has predictive analytics changed the wind industry?

I’d say we are just getting started, but already seeing the effects of predictive analytics.

Just months after Uptake first ingested data from one of the wind farms we are monitoring, our software identified a potential problem. The maintenance costs that had to be performed were about \$5,000. But had that problem been allowed to fester, it would have cost \$250,000 and a few days of downtime on a turbine. In just four months, Uptake has generated predictive insights on 10 percent of the wind turbines with our software installed.

When we find problems like the one we did in Iowa before they happen, it starts to have a cumulative effect. So that’s why I think the impact of what we are doing is just getting started.

What pushes Uptake to the top of the list when it comes to predictive analysis in wind turbines?

Before I came to Uptake, I was the chief information and innovation officer at a Fortune 100 company. I had a \$1 billion annual budget. That's a large amount of money, but it always felt like not enough.

Part of that reason for the heads-they-win, tails-I-lose feeling was that what we paid for the technology was never tied to an outcome or value. It was mostly just a sunk cost.

At Uptake, we have challenged and redefined that model. We sell data-driven, user-created and user-centered software that creates proven value; that increases wind-energy production and the reliability of that energy production. Others in the market right now are simply selling a piece of technology and don't share any of the risk whether it works or not.

Our incentives are the same as our customers, and part of that is because we are also independent and not tied to one brand of turbine. Our products work on any asset, made by anyone. With Uptake, you don't have the same people who build the machine auditing its health. We are independent.

Uptake brings everything together for customers: proven leaders with deep experience running wind businesses and operations, industry-leading data scientists who understand nuanced energy data. All of that works within the processes and workflows that customers have already.

When people think about enterprise software, the first thing they

think about probably is what they dislike the most. And that is largely due to the fact that the software is built around the technology, not the user. We are challenging and changing that at Uptake. We start with the user and design the software around them and how it can help that person do their job better. We go out and talk to people. We aren't sitting in an office and saying this is how this is going to work. We want this to be intuitive.

Here's the thing: Insights are interesting but useless without action.

Based on the potential of what we are creating, we joke here that the future of wind started in the Windy City. But we really do believe that. We are in the Industrial Heartland and surrounded by wind farms.

Why do you think the wind industry is turning to predictive analytics right now?

There are a few forces at play right now. The first is that predictive analytics is a very real thing now. Sensors got cheap enough to put them everywhere. Cloud computing and storage prices fell. Connectivity is everywhere and affordable. So it's first the fact that it is possible.

In the United States, there remains uncertainty at the federal level on energy policy. You also have the phase-out of the Production Tax Credit coming. That's the financial pressure side, and it will necessitate new sources of revenue and better, more nimble technology, both hardware and software together.

On the policy and demand sides,

nearly three-dozen states have established renewable energy standards. People are more conscious of how their energy is generated and demanding more energy from renewable sources.

What is happening largely in the energy industry and where do you see it going?

I joke about this, but I generally believe that if you brought back Alexander Graham Bell and showed him an iPhone, he would have no idea what it was.

But I bet Thomas Edison could probably run most utilities in America today.

We are just starting to see the energy industry as a whole change through innovation that hasn't been there for the last 100 years. With that, we are seeing the old, centralized model — where you produce megawatts in a central location, send power over large transmission lines and you plug things into the wall and you have your electricity — be completely disrupted.

It is moving to a centralized plus decentralized model that allows for rooftop solar, intermittent renewable sources, and electric cars. The consumption and production is fundamentally changing and becoming more complicated. For that new model to work, you have to have more production and more reliability. And you have to do both of those without sacrificing safety and security. That's really where predictive analytics will make this new model possible. ↴

For more information, go to www.uptake.com



Knowing about a failure before it happens lowers maintenance costs.



MAINTENANCE

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AEI Cables provides link for offshore wind project

Specialist supplier AEI Cables has completed the supply of specialist fire performance products for control and instrumentation at the £1.5 billion Galloper Wind Farm Project off the Suffolk coast.

The products were supplied to ensure protection against flame propagation, smoke, and acid gas emissions for 56 wind turbines in a challenging environment.

Working with main contractor Petrofac, the AEI Cables' products meet the requirements of BS 6883 and BS 7917 for fire performance, providing power for lighting and important equipment once the wind farm is operational next year.

The project, a joint partnership between innogy SE, UK Green Investment Bank (GIB), Siemens Financial Services, and Macquarie Capital, is progressing toward completion in March when operation of the farm will start 16 miles off the coast.

Main contractor Petrofac is providing topside and jacket foundation designs, fabrication, transport, and installation of the offshore substation and offshore logistics to support hook up and commissioning.

"Working with the project partners, we were able to design cables specifically for these needs in this



Building the Galloper Wind Farm project. (Courtesy: AEI Cables)

environment," said Stuart Dover, commercial manager at AEI Cables. "This has been a particularly successful project and has progressed well, with everyone working closely to meet the project goals."

The Galloper Wind Farm project is generating positive economic benefits for businesses and will create about 700 jobs during construction and 800 U.K. jobs during its 25-year operational and maintenance phase.

AEI Cables has a history of product development for the de-

manding environment of oil and gas platforms and has previously supplied cables to the re-developed Piper Alpha platform and to the BP Clair platform.

All AEI Cables' products are supplied with approvals from independent bodies including BASEC and LPCB covering design, manufacture and supply. ↵

Source: AEI Cables

For more information, go to www.aeicables.co.uk

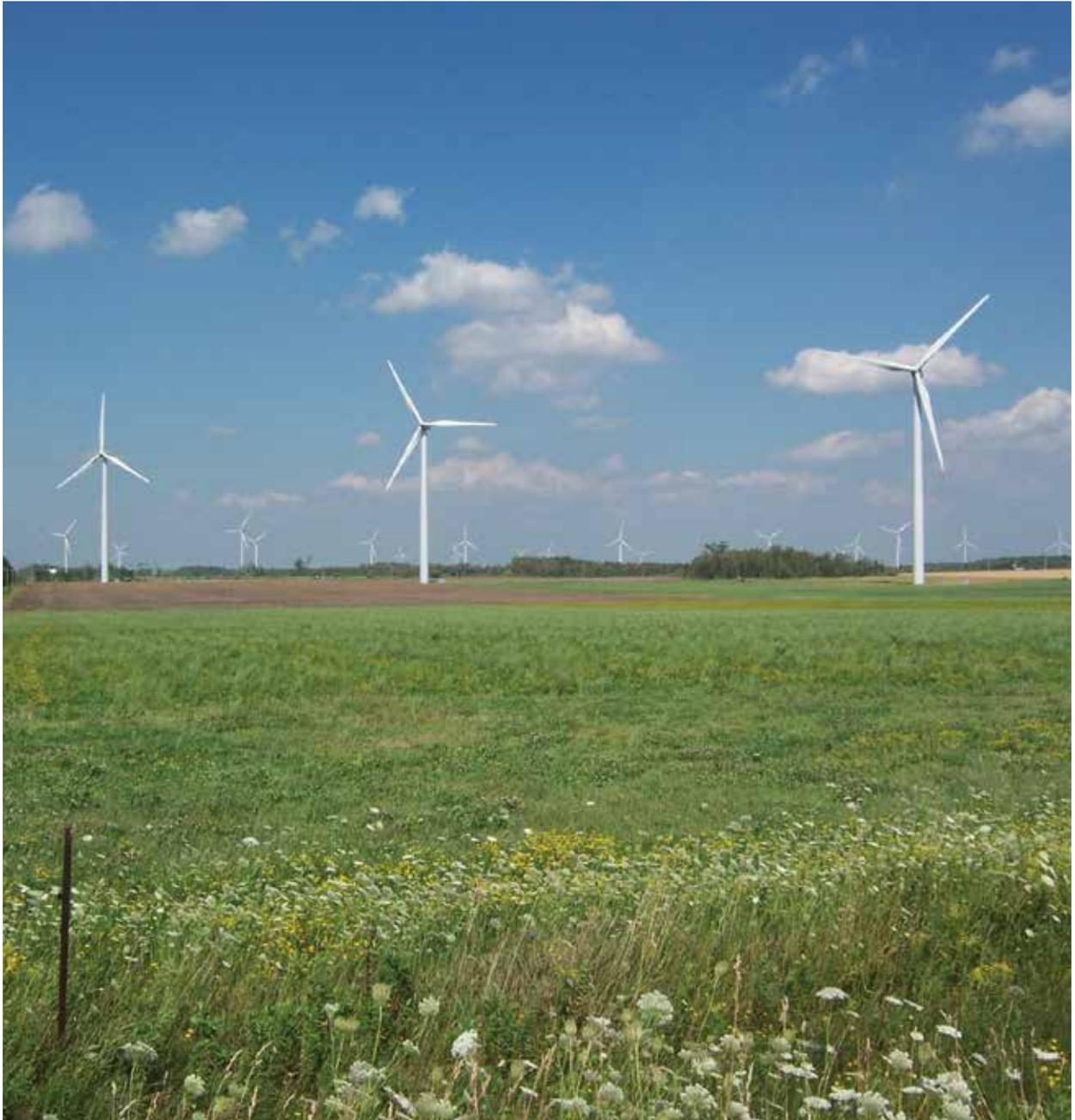
Bachmann awarded condition-monitoring contract for Canadian wind farm

Bachmann Electronic has been selected as the condition monitoring system (CMS) provider to one of Canada's largest power producers.

TransAlta commissioned an upgrade to its Melancthon wind farm in Ontario, Canada. The wind farm, near Shelburne, went online in 2008 and was Ontario's first utility-scale wind site. With 133 wind turbines and

200 MW of power, it is one of the largest wind parks in Canada.

Bachmann Electronic will be upgrading a number of the existing GE 1.5 sle turbine controllers to the new MC205 line and installing its fully integrated CMS units across the entire site. TransAlta, who has been an industry leader in CMS implementation and a long-standing



TransAlta commissioned an upgrade to its Melancthon wind farm in Ontario, Canada. (Courtesy: TransAlta)

champion of condition monitoring, made the decision to retrofit the turbines with Bachmann CMS in order to improve turbine availability for the site.

“Having a fully integrated CMS unit allows you to utilize the existing turbine controller to operate your condition monitoring system,” said Nicholas Waters, Bachmann’s key account manager of North America. “You’re not paying for an additional CPU to oper-

ate your condition monitoring data acquisition system. Fully integrated CMS means future-oriented systems, which open the door to smart turbine automation driven by individual turbine diagnostics.” ↵

Source: Bachmann Electronic

For more information, go to www.bachmann.info

Crane Rental places large order for Demag® crawler cranes, all terrain cranes

Poland's Crane Rental is adding three new Demag® CC 3800-1 lattice boom crawler cranes, two Demag AC 220-5 all-terrain cranes, and a Demag AC 300-6 all-terrain crane. This large order will help Crane Rental continue to provide outstanding service and support to

its customers. The new cranes are scheduled to be built and delivered over the next several months.

Crane Rental's three 650 metric ton capacity Demag CC 3800-1 crawler cranes are easy to transport and, once at the jobsite, quickly rigged. These new units use the

latest crane technology and innovative solutions, as well as high safety standards to keep the operator productive and protected.

The two 5-axle Demag AC 220-5 all-terrain cranes and 6-axle AC 300-6 crane are the most compact models in their respective classes. The AC 220-5 crane has an outstanding reach with a main boom length of 78 meters and a maximum system length of 99 meters. The larger 300-metric-ton capacity class AC 300-6 model has a maximum main boom length of 80 meters and system length of 118 meters. ↵

Source: Terex Corporation

For more information, go to www.terex.com



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The Demag CC 3800-1. (Courtesy: Terex)

Sterling expands popular WorkPro static rope series

Sterling Rope Company Inc. has developed an entirely new approach to rope construction using mixed materials. With a polyester sheath and nylon core, the WorkPro offers a balanced elongation in the core and sheath, so they share the load evenly. This makes the WorkPro series stronger than other ropes of similar diameters while retaining a small but important amount of elongation.

These kernmantle ropes are dual certified to EN 1891 Type A and NFPA 1983 (Technical for 3/8" and 7/16", General for 1/2") standards. They also meet ANSI Z133 standards.

"I've used the 7/16" WorkPro extensively this past year, and I'm happy to see Sterling is coming out with a 1/2" diameter that has the same performance and handling characteristics," said Ed Carpenter, owner and lead instructor for North American Training Solutions. "As an arborist, the larger diameter is easier on my hands when I climb and is more compatible with the gear I use."

The WorkPro series of static ropes is available in 3/8", 7/16", and 1/2" diameters. Each model comes in multiple colors and lengths.

Sterling Rope Company Inc. is a leading manufacturer of life-safety rope, cord, and hardware. Made in the U.S., Sterling has worked hard to develop the best product for use in climbing, rope rescue, arbor, fire, industrial safety, work access, and OEM markets. ↴

Source: Sterling Rope Company Inc.

For more information, go to sterlingrope.com



The WorkPro series of static ropes are available in 3/8", 7/16", and 1/2" diameters. (Courtesy: Sterling Rope Company Inc.)



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New connector gives workers flexibility to anchor in multiple orientations



The new 3M™ DBI-SALA® Comfort Grip Connector. (Courtesy: 3M)

Working at height requires movement. Workers need to connect and reconnect their snap hooks dozens — or even several dozens of times — a day. The new 3M™ DBI-SALA® Comfort Grip Connector from 3M™ Fall Protection improves connecting and disconnecting while providing flexibility to anchor efficiently and comfortably in multiple orientations.

“The search for a connector that can be tied off in multiple directions is over,” said Nate Safe, product development specialist at 3M Personal Safety Division. “Many of the hooks on the market can be a nuisance to open where the operator’s hand is placed right in the opening creating a pain point. The Comfort Grip Connector opens and closes easily and comes with a hand guard so knuckles are protected while making a connection.”

Designed and certified to arrest a fall when loaded in multiple orientations, the Comfort Grip Connector helps

provide a 5,000-pound tensile strength as well as up to 3,600 pounds in transverse and gate strengths. When connected to a vertical or transverse application, such as a pipe, the hand-guard pin shears in the event of a fall to allow the connector to align with the direction of the fall and remain securely anchored.

The 3M DBI-Sala Comfort Grip Connector is available on some of 3M Fall Protection’s most popular products, including:

- 3M™ DBI-SALA® EZ-STOP™ Lanyard.
- 3M™ DBI-SALA® Shockwave2™ Lanyard.
- 3M™ DBI-SALA® Nano-Lok™ Personal SRL.
- 3M™ DBI-SALA® Nano-Lok™ Edge Personal SRL. ↪

Source: 3M

For more information, go to www.3m.com/workersafety

New clutches have excellent torque transmission features

Miki Pulley's CS Electromagnetic actuated clutches are durable, versatile and have excellent torque transmission features.

CS Clutches provide an efficient connection between a motor and a load providing low inertia, minimal drag, and quiet operation. They function using the magnetic force generated by the energized coil providing engagement of input and output members of the clutch.

Available with three different armatures, Miki Pulley CS Clutches consist of a clutch stator, rotor, and armature assembly. They feature an integrated bearing design making mounting fast and easy while ensuring application concentricity and excellent system runout. CS Clutches operate well in temperatures from 14°F to 104°F (-10°C to 40°C).

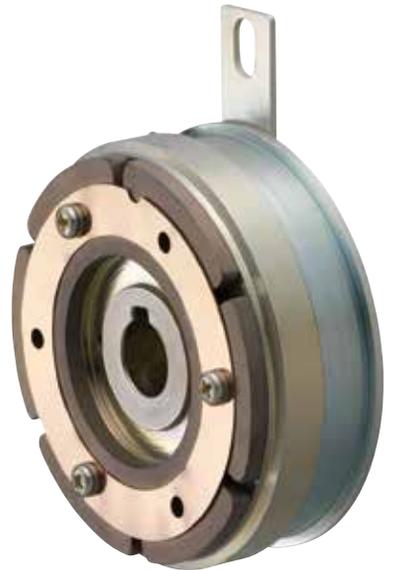
Available in bores ranging from

10 mm to 15 mm, with brake torques ranging from 3.687 ft. lbs. to 236.02 ft. lbs. (5 Nm to 320 Nm). The CS Clutch uses corrosion resistant materials and is RoHS compliant like all other Miki products.

"Miki Pulley's CS Clutches stand apart from competitor's models, in that they incorporate specialized composites and alloys promoting durability and longer operational life," said Jon Davidson, Miki Pulley sales specialist. "Miki Pulley's friction-type design operates smoothly and quietly, making them an ideal choice for digital printing systems, and similar equipment requiring near noiseless operation." ↵

Source: Miki Pulley

For more information, go to www.mikipulley-usa.com



CS Electromagnetic Clutches from Miki Pulley are quiet operating and have zero-backlash features. (Courtesy: Miki Pulley)



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Cable ties help maintain position in high-vibration applications

Ty-Met™ stainless steel retained-tension ball-lock cable ties, new from Thomas & Betts® (T&B®), a member of the ABB Group, feature specially formed spring crimps that help maintain consistent tension on the tie after installation.

Consistent tension enables the cable tie to remain in position, even under high-vibration conditions.

“Ty-Met retained-tension cable ties won’t slide down the bundle of cables after installation,” said Ralph Donati, product marketing director, Installation Products, at ABB Electrification Products. “The spring crimp was engineered to provide positive clamping in high-vibration applications, such as manufacturing, heavy equipment operation, oil and gas processing, renewable energy generation, and shipbuilding.”

The formed channel provides a path for trace wire that protects against crushing and short circuits. Other features include the ball-lock fastening mechanism that is easily assembled and adjusted for tension. Ty-Met stainless steel retained-tension ball-lock cable ties are available in Type 304 stainless steel and marine-grade Type 316 stainless steel.

Ty-Met stainless steel retained-tension ball-lock cable ties can be installed with T&B DAS-250 application tools. ↴



Source: Thomas & Betts Corporation

The Ty-Met™ stainless steel retained-tension ball-lock cable tie. (Courtesy: Thomas & Betts Corporation)

For more information, go to www.tnb.com

MANUFACTURING

Production • Fabrication • Components • Supply Chain • Materials • Tooling • Machinery

Senvion installs first prototype of new turbine

Senvion, a leading global manufacturer of wind turbines, has successfully completed the installation of the first 3.6M140 EBC (Eco Blade Control) turbine prototype at the Windtestfeld Nord near Husum, in Schleswig-Holstein, for 4testwind GmbH. The Senvion 3.6M140 EBC is one of Senvion's biggest on-shore turbines designed for moderate and strong wind speeds.

The new turbine is equipped with the innovative load-reducing pitch control system Eco Blade Control (EBC) technology, which enables optimized load management even in challenging wind conditions. The 3.6M140 EBC also features a newly designed steel tower and a larger rotor diameter of 140 meters which generates high yields even at lower wind speeds.

The rotor blades are equipped with the new Rodpack technology, which ensures a lighter blade design. At a hub height of 110 meters, the turbine can power up to 3,400 households per year and has an extended lifetime of 25 years.

The Windtestfeld Nord, near Husum, is just three kilometers away from the North Sea. This location offers the ideal wind conditions for the testing and the certification of the turbine.

"Senvion is committed to reducing the levelized cost of energy," said Jürgen Geissinger, CEO at Senvion. "With this new turbine, we have combined core product developments to create a machine that is targeted toward optimal energy efficiency. The combination of the 140-meter rotor diameter



A cross section of Senvion's 3.6M140 EBC. (Courtesy: Senvion)

and the upgrade to 3.6 MW allows additional output at the same site. Even with the larger 68.5-meter rotor blades, the 3.6M140 EBC can be installed in the same amount of time as a smaller turbine, ensuring an effective solution for our customers."

The wind-farm owner, 4testwind GmbH, is a co-development from the iTerra GmbH & Co. KG and Betriebs und Beteiligungsgesellschaft Senvion mbH.

"Throughout this very demanding project, we have always been able to remain on track and keep focused together with our manufacturing partner, Senvion," said Dr. Peter Brodersen, managing director at iTerra Wind GmbH & Co. KG.

"Even the change to a newer type of plant was possible and despite all the adversities we were able to commission the prototype in time before the HUSUM Wind 2017. I would like to thank Senvion and all the others who have fought for the project. This determination and positive cooperation were the guarantors of success."

Senvion presented the 3.6M140 EBC turbine at Hamburg Wind-Energy in September 2016. Serial production for the turbine already has begun with further installations planned for this year. ↵

Source: Senvion

For information, go to www.senvion.com

GE Renewable Energy unveils its largest onshore wind turbine

GE Renewable Energy recently unveiled its new 4.8-158 onshore wind turbine, GE's largest high efficiency turbine to date. Featuring the largest rotor in the segment and innovative blade design, the 4.8-158 offers a significant improvement in Annual Energy Production (AEP), reducing the cost of energy for customers with low to medium wind-speed sites.

"The 4.8-158 design is an important next step in turbine technology and efficiency, and we're excited to introduce this turbine at this moment in time," said Pete McCabe, president and CEO of GE's Onshore Wind Business. "It is well suited for low to medium wind-speed regions worldwide — examples include Germany, Turkey, and Australia — as well as for mechanisms like auctions, as countries around the world are putting an increased emphasis on lowering the cost of energy."

The new 4.8 MW wind turbine, GE's first onshore entry in the 4MW space, is equipped with a 158-meter rotor and a range of tip heights up to 240 meters. The combination of a larger rotor and tall towers enables the turbine to take advantage of higher wind speeds and produce more energy.

GE's latest turbine features high-tech blades, improved loads and controls, and taller, more cost-effective towers. These new innovative features have been developed thanks to close partnerships with LM Wind Power, Blade Dynamics, and GE's Global Research Center.

The 77-meter-long carbon blades leverage the strong track record and material innovations of LM Wind Power and are their longest onshore blades to date. These carbon blades will enable flexibility, allowing GE to offer its customers a high efficien-



GE's latest turbine features high-tech blades, improved loads and controls, and taller, more cost-effective towers. (Courtesy: GE Renewable Energy)

cy product while continuing to drive down LCOE. The blades also feature one of the industry's smallest bolt circle diameters, keeping manufacturing and logistical costs to a minimum.

"This turbine is a great example of what we can achieve through the GE Store, combining technology and development with innovative design and expertise from the Global Research Center, LM Wind Power, and Blade Dynamics," McCabe said. "We collected input from more than 30 customers around the world to ensure we are meeting their specific turbine needs with this product as they work to provide lower-cost renewable energy."

The 4.8-158 leverages the best of GE's 2MW and 3MW platforms, including the proven DFIG — doubly-fed induction generator — and a robust drivetrain architecture. The turbine meets a lower standard of noise emission levels, achieving a 104-dB level during normal opera-

tions. The newly designed machine head reduces the needs for a larger crane while facilitating up-tower repairs and troubleshooting with its up-tower electrical system.

GE's most powerful onshore turbine is built to leverage the intelligence gathered from across the company's 30,000-plus fleet of wind turbines. Data analyzed from this large installed base powers the 4.8-158 with GE's next generation control system. By using GE's Predix core applications including asset performance management (APM), cybersecurity, and business optimization (BO) solutions, its customers realize business outcomes, including lifecycle extension of the customers' windfarms and improvement of farm economics. ↵

Source: GE Renewable Energy
For information, go to www.gerenewableenergy.com

Senvion wins 62 MW orders in Austria



Senvion's 3.2M114 will be erected at the Prinzendorf III wind project. (Courtesy: Senvion)

Senvion, a leading global manufacturer of wind turbines, has signed contracts to supply 20 wind turbines with a total output of 62 MW for four projects in Lower Austria. The contracts have been signed with Windkraft Simonsfeld AG, which has had an established business relationship with Senvion since 2011.

The two companies have previously worked together on four projects in Austria with a total output of approximately 65 MW.

With the orders for the four wind farms, Hipplers II (MM100), Dürnkrot II (3.2M122), Poysdorf-Wilfersdorf V (3.4M140) and Prinzendorf III (3.2M114), Senvion shows the strength of its broad turbine portfolio,

which enables optimized solutions for different wind regimes from strong-wind all the way to low-wind scenarios. The wind turbines will be installed at hub heights ranging from 100 meters to 160 meters to suit the local conditions and further optimize the yield of the wind farms. In doing so, Senvion will be celebrating two firsts in Austria: The Senvion 3.2M122 will be making its debut on the market during the projects and will be installed at hub heights of 119 meters and 139 meters. The 3.4M140 low-wind turbines will be installed at a hub height of 160 meters for the first time.

“We are very much looking forward to these projects,” said Jochen Magerfleisch, Managing Director of

Senvion EU Central. “They will further reinforce our partnership with Simonsfeld. The projects demonstrate that flexibly adapting the turbines from location to location is the way to achieve the highest yield. With a combination of low-wind and strong-wind turbines from the Senvion portfolio at various tower heights, we are helping Simonsfeld to implement the most efficient solutions for all four locations.”

“We are delighted to continue the excellent partnership with Senvion that we have built up over the last five years and expect the new turbine generation to deliver performance just as stable and productive as in the past,” said Markus Winter, head of wind-power engineering at Simonsfeld.

“With the planned electricity production from the new wind farms, we will be able to increase our overall production by more than half in the next few years,” said WKS CEO Martin Steininger. “That will help us to contribute to the process of expanding renewable energy and achieving climate targets.”

For all four projects, Senvion has signed full-service contracts lasting 15 years with extensions for up to 20 years. The wind farms are expected to be constructed between 2018 and 2021. ↴

Source: Senvion

For more information, go to www.senvion.com

Vestas gets 100 MW order in India



The Vestas V110-2.0 MW turbine is part of the Indian order. (Courtesy: Vestas)

Vestas’ progress in India continues with a 100 MW turnkey order.

Leveraging Vestas’ extensive experience from more than 100 turnkey projects across the globe, the order includes delivery, installation, and commissioning of 50 V110-2.0 MW turbines as well as the project’s civil and electrical works. The order follows the inauguration of Vestas’ blades factory in Gujarat and the 54 MW Periyapatti order earlier this year, adding to Vestas’ continued progress in India.

The order also includes a 10-year Active Output Management 4000 (AOM4000) service contract and VestasOnline® Business, its unique SCADA system for data-driven monitoring and preventive maintenance.

“This order underlines the broad range of capabilities and offerings that Vestas has to offer in the Indian market now and in the future,” said Clive Turton, president of Vestas Asia Pacific. “Our extensive experience from around 4 GW of turnkey projects across the globe has been key in securing this order, which is another significant step forward in a key market.”

Turbine delivery is expected to start in late 2017, with commissioning by first half 2018.

At the customer’s request, the customer and project names have not been disclosed at this time. ↴

Source: Vestas

For more information, go to www.vestas.com

CONSTRUCTION

BOP/EPC • Project Status • Siting • Equipment • Project Due Diligence • Services

Dong Energy awarded contract to build world's biggest offshore wind farm



The Hornsea Project One. (Courtesy: ABB)

Dong Energy has been awarded a contract to build its Hornsea Project Two offshore wind farm, at the lowest-ever price for offshore wind in the U.K.

At GBP 57,50/MWh, the strike price for the Contract for Difference (CfD) is 50 percent lower than the previous round of CfD allocations just two years ago, demonstrating the rapid reduction in cost across the industry.

With a massive capacity of 1,386 MW, enough to power more than 1.3 million U.K. homes, Hornsea Project Two will become the world's biggest wind farm, even surpassing the 1,200 MW giant Hornsea Project One which Dong Energy is currently constructing.

Hornsea Project Two will be built 89 kilometers from the Yorkshire coast and is expected to be operational in 2022.

Hornsea Project Two will contribute significantly to Dong Energy's ambition of reaching a total offshore wind capacity of 11-12 GW by 2025.

"We're delighted to be awarded a Contract for Difference for Hornsea Project Two, which is another important step towards fulfilling our vision of making offshore wind the most competitive form of electricity generation," said Samuel Leupold, executive vice president and CEO of Wind Power at Dong Energy. "We have always promoted size as a key driver for cost. The ideal size of an offshore wind farm is 800-1,500 MW, and therefore it is natural that Hornsea Project Two will deliver record-low costs to society. At the same time, the low-strike price demonstrates the cost saving potential of developer-built offshore grid connections, which in the U.K. is included in the project scope."

"We remain fully committed to financial discipline, and Hornsea Project Two will be value creating to our investors," he said.

"This is a breakthrough moment for offshore wind in the U.K. and a massive step forward for the industry,"

said Matthew Wright, managing director for Dong Energy U.K. “Not only will Hornsea Project Two provide low cost, clean energy to the U.K., it will also deliver high quality jobs and another huge boost to the U.K. supply chain.”

“Successive governments deserve great credit for providing the certainty for continued investment in offshore wind, enabling it to become the thriving renewable industry it is today,” he said. “Costs are falling rapidly, long-term and highly-skilled jobs are being created across the North of England, and the U.K. supply chain is going from strength to strength. We’re now really seeing the benefits of this commitment to offshore wind, and there is still so much more to come. Indeed, it has the potential to play a key part in the realization of the U.K.’s industrial strategy.”

Dong Energy already is constructing Hornsea Project One and has started the consultation process for Hornsea Project Three, underlining the huge potential of this area of the North Sea for offshore wind.

Cost-drivers enabling the bid for Hornsea Project Two include:

- **Scale:** Dong Energy’s pipeline of construction projects across the U.K. (Race Bank and Walney Extension in 2018, Hornsea Project One in 2020, and Hornsea Project Two in 2022) creates economies of scale. And with 1,386 MW, Hornsea Project Two has the scale required to secure low costs per MW of construction, and low costs per MWh during a lifetime of operations and maintenance.
- **Risk reduction:** Dong Energy already has several years of experience from developing Hornsea Project One in the North Sea. This reduces construction and operation risk of Hornsea Project Two.
- **Synergies:** Operations and maintenance on both Hornsea projects will be conducted from Dong Energy’s new hub in Grimsby, which also serves other Dong Energy offshore wind farms on the U.K. east coast.
- **Maturing industry and technology:** Innovation of offshore wind turbines, new installation equipment and methods, continuous improvements of foundation design, improved cables with higher capacity, and a growing and competitive supply chain.

With the allocation of the CfD, Dong Energy has now taken a final investment decision on Hornsea Project Two. ↘

Source: Dong Energy

For more information, go to www.dong.com

950 MW offshore wind project in U.K. gets long-term contract

EDP Renováveis, S.A. (EDPR) and ENGIE recently announced that Moray Offshore Windfarm (East) Limited, a joint venture company owned by EDPR (77 percent) and ENGIE (23 percent), has been awarded a 15-year Contract for Difference (CfD) for the delivery of 950 MW of offshore wind generation at £57.50/MWh (in real 2012 terms). The contract was awarded by the U.K.’s Department for Business, Energy & Industrial Strategy (“BEIS”) following its latest CfD auction.

EDPR and ENGIE are jointly developing this project, which is off the northeast coast of Scotland. Upon conclusion of the development phase and the selection of all partners and suppliers for the different stages of construction and operation, the project would then move toward the construction phase. Completion and the commencement of commercial operation is expected in 2022.

“With (the) announcement, EDPR increases its growth options in offshore wind in an attractive market, thereby enhancing and diversifying the company’s long-term profitable growth options while maintaining a balanced risk profile,” said João Manso Neto, CEO of EDPR. “EDPR’s sustained commitment to the U.K. offshore wind market through Electricity Market Reform and the transition to CfD auctions has enabled dramatic cost reduction from £150/MWh in 2014 to £57.50 /MWh today.”

“This auction has demonstrated the real progress in cost reduction, and our result shows how affordable offshore wind can be compared to other technologies, including new thermal generation,” he said. “The U.K. needs more low carbon generating infrastructure to maintain security of supply against an increasingly uncertain future. EDPR has demonstrated what can be done at this site. It is in the UK’s interests to enable us to continue this achievement at other sites”

“We are delighted that the Moray East offshore wind farm has received this CfD, which is an important step in taking this project forward,” said Wilfrid Petrie, CEO for ENGIE in the U.K. and Ireland. “This will be ENGIE’s first offshore wind development in the U.K. and complements our growing global offshore wind portfolio with projects in France, Portugal, and Belgium, as well as our existing renewables operations in the U.K.”

“ENGIE is committed to investing in sustainable energy solutions and innovative services in the U.K.,

including renewable energy generation,” he said. “Moray East will make a significant contribution toward helping the U.K. meet its decarbonization targets, and it will also support ENGIE’s ambition for 25 percent of its global energy portfolio to be renewable by 2020.”

“Moray East’s success in this auction will enable us to bring a high-quality, high-value offshore wind project to the U.K., and I would like to thank all of the organizations, individuals, and communities with an interest in the Moray Firth with whom we have worked to reach this vital milestone,” said Dan Finch, managing director

of Moray Offshore Renewables. “Moray East also brings major economic opportunities to our supply chain. Innovation and co-operation have enabled the cost reduction which ensured success in this auction. Electricity from Moray East will be produced at the lowest cost of any offshore wind farm around the U.K., with exceptional benefits to consumers.” ↵

Source: EDP Renewables

For more information, go to www.edpr.com

CWind awarded TP gate contract



CWind will retrofit the TP Gates at Borkum. (Courtesy: CWind).

CWind, a leading provider of services to the offshore wind industry, recently announced it has been awarded a contract by Dong Energy, to install new and retrofit existing gates on the transition pieces (TPs) at the Gode Wind and Borkum Riffgrund offshore wind farms in the North Sea off the coast of Northern Germany.

CWind, which is part of the Global Marine Group and delivers the company’s power capabilities, will use its own crew transfer vessels, assets, and engineering expertise to help ensure the project is completed successfully and on time.

The CWind Phantom, a 27.4m catamaran, will undertake the work on Gode Wind’s 97 turbines

and Borkum Riffgrund's 77 turbines. Work began September 1, with the first phase expected to be completed in eight weeks.

The entire project has been scheduled for completion within one year and will call upon the skills of eight of CWind's experienced electrical engineers and mechanical technicians, all of whom have benefited from training at the company's in-house facility, the NW-FTC (National Wind Farm Training Centres). Extensive navigational lighting and cable rerouting will be required to accommodate the new gates, demonstrating CWind's electrical engineering capability and capacity.

"We have worked with Dong Energy for many years, including extensive prior work at Gode Wind, and we are pleased to continue our close business relationship," said Lee Andrews, managing director of CWind. "The decision to utilize the same site team for the new project, to ensure consistency, has been well received by the client. Our aim is to always deliver successful projects with excellent customer service. The fact that Dong Energy has returned to CWind demonstrates our can-do attitude and our ability to get things right first time." ↵

Source: CWind

For more information, go to www.cwind.global

Lagerwey enters Belgian market with order for Fortech



Lagerwey turbines are characterized by their direct drive technology, excellent grid compatibility, and high availability. (Courtesy: Lagerwey)

The delivery of two 2.5 MW wind turbines to Fortech represents Lagerwey's first steps into the Belgian market. The two L100 turbines, which have a hub height of 99 meters, will be at the Goeiende wind farm next to the E17 motorway near Zele. The aim is to have the park operational at the end of 2017.

Using the motto "what's not inside, cannot break down," Lagerwey has developed a wind turbine with fewer components compared to normal turbines. Lagerwey turbines are characterized by their direct drive technology, excellent grid compatibility, and high availability.

"Lagerwey is delighted to realize its first wind project in the Belgian market," said Ronald Boerkamp, sales director for Lagerwey. "We would really like to thank Fortech and Triodos Bank for their cooperation, and for the fact that they share our passion for engineering, simplicity and innovation."

"When realizing our projects, we want wind turbines that offer advanced technology and are capable of maximizing energy production within the scope of the license," said Chris Derde, manager with Fortech. "Lagerwey's wind turbine emerged as the best option from our evaluation. In addition, we found a very committed team of specialists within Lagerwey, who shared our values."

"Wind energy supplied by the turbines will be distributed to families, (agricultural) businesses, and municipalities in the region by the Wase Wind cooperative," said Kris Aper, chairman of Wase Wind. "It is also possible for cooperative members to participate financially in the wind farm. For instance, a dividend of 5.5 percent has been paid in recent years." ↵

Source: Lagerwey

For more information, go to lagerwey.com

New flat top tower crane boasts 22-ton capacity

Terex Cranes recently introduced a new addition to its growing tower crane family, the Terex® CTT 472-20 flat top tower crane. This new Terex 22-ton class crane expands maximum jib length to 80 meters (262.5 feet) and increases load charts over previous models offering the same lift capacity on the whole jib length, with a maximum load at the full length of the jib tip of 4.4 tons.

“Fresh off the introduction of our new hammerhead tower crane at CONEXPO-CON/AGG, we offer our customers the new CTT 472-20, an extremely versatile and robust flat top tower crane with great features requested by our customers,” said Marco Gentilini, vice president and general manager for Terex Tower Cranes. “The CTT 472-20 gives the market a flexible solution to meet complex lifting challenges. With Terex fully committed to the tower crane business, we are accelerating new tower crane product development to meet our customers’ needs. This includes a new tower crane cabin that will advance operating efficiency and comfort for our new CTT 472-20 crane.”

Offering a 470 ton-meter load moment, the new CTT 472-20 crane delivers extremely high lift capacities throughout its load chart and 11 different jib configurations from 30 to 80 meters (98.4 to 262.5 feet) to meet varying jobsite needs. Its hoist, slewing, and trolley speeds allow operators to quickly and precisely move and position heavy loads. All jib sections come preassembled with a lifeline for quick, safe installation at height, while galvanized jib walkways deliver long-lasting quality.

The CTT 472-20 can be configured with H20, HD23, and TS212



The Terex® CTT 472-20 flat top tower crane. (Courtesy: Terex)

Terex mast section thanks to the transfer masts with the combination of them.

“Here, Terex offers superior value for the customer, as this gives companies operating multiple Terex tower crane models the ability to efficiently manage component inventory and cost effectively meet their tower needs,” Gentilini said.

The CTT 472-20 flat top tower crane offers a competitive maximum freestanding height to reduce erection time and lower costs. Optimized for transport, these tower segments come preassembled with aluminum ladders for fast erection and increased durability.

The CTT 472-20 is the first tower crane model to include the new Terex cabin that will be installed on all flat top, hammerhead, and luffing jib models. It puts the operator in a fully adjustable comfort seat and has joystick controls with a short stroke length, providing a pleasant and comfortable working environment. The large full-color 18-centime-

ter (7-inch) display with anti-glare screen provides critical operating data and information required for troubleshooting. Built-in heating and air conditioning maintains consistent cabin temperature.

A new control system offers expanded configuration options to meet different jobsite needs. Offering quick set-up, the new controls boast the exclusive Terex Power Plus feature that can temporarily increase the maximum load moment under controlled conditions (e.g. smooth hoist movements) giving the operator extra lifting capacity, by an additional 10 percent, when needed. Power match allows the operator to choose between operating performance or lower consumption to fit lifting needs. An optional radio remote control expands crane-operating efficiency by giving the operator a choice in how he wants to work. ↵

Source: Terex Corporation

For more information, go to www.terex.com



The Seacat Intrepid is a 26-meter catamaran. (Courtesy: Seacat Services)

Seacat Services starts intrepid charter for BOWL

Offshore Energy Support Vessel (OESV) operator Seacat Services has secured a contract with Beatrice Offshore Windfarm Limited (BOWL) to support the construction of Scotland's second major offshore wind farm. The contract comprises a 730-day logistical support charter for the 26-meter catamaran, Seacat Intrepid, that began September 25. Intrepid will be joined by its sister vessel, Seacat Courageous, early next year.

BOWL is owned by SSE (40 percent), Copenhagen Infrastructure Partners (CIP) (35 percent), and Red Rock Power Limited (25 percent). Under development in the Outer Moray Firth in the north of Scotland, the wind farm will produce 588 MW of power. It will receive onshore support from the new operations and maintenance (O&M) hub at the Port of Wick, currently undergoing construction.

With considerable planned investment and opportunities in the Scottish offshore wind sector, the industry is seeking to maximize the benefit of lessons learned and transferrable knowledge accrued in the wider U.K. and European markets. As the first deepwater utility-scale projects come online in challenging waters off the Scottish coast, assembling an experienced project team is a key focus for asset developers and owners.

Having previously established a long-term relationship with project stakeholder SSE at the Greater Gabbard wind farm off the coast of East Anglia, and with vessels under contract supporting construction and O&M activity at project sites throughout U.K., German, and Danish waters, Seacat Services is well-placed to support BOWL throughout the time and resource-intensive construction phase.

In practical terms, at 26 meters, Seacat Intrepid and Seacat Courageous are at the larger end of the OESV scale, providing them with high capability, without compromising on maneuverability and responsiveness. Both vessels benefit from extensive fuel and cargo-carrying capacity, and operate at a service speed of up to 26 knots.

The proven versatility and reliability of these vessels will be essential in driving the efficiency of crew and equipment transfers, while the technicians' familiarity with the vessels will ensure their safety and enable them to complete their jobs to the best of their ability.

More broadly, the deal between Seacat Services and BOWL provides further evidence of the strength of support delivered by the U.K. maritime supply chain to offshore wind developers and operators.

"Beatrice is our first Scottish project, and we're looking forward to setting a benchmark for future wind farms in the region," said Ian Baylis, managing director, Seacat Services. "In doing so, we'll be aiming to benefit from lessons learned on U.K. projects, further strengthen collaboration and long-term relationships, and support opportunities for the regional economy. We currently have 13 vessels and their crews operating off the east coast of the U.K., and will always look to recruit locally where possible." ↴

Source: Seacat Services

For more information, go to www.seacatservices.co.uk

Trelleborg completes its leg can system portfolio



A skirt pile gripper. (Courtesy: Trelleborg)

Trelleborg's engineered products operation is growing its portfolio of offshore floatover solutions, with a custom designed skirt pile gripper. Add to this its grout seal, diaphragm closure, and grout packer products, and Trelleborg customers can now specify a total sub-structure leg can system from one source.

The skirt pile gripper (SPG) is welded onto the upper section of a platform's jacket skirt pile sleeves and is designed to create a temporary connection between the pile and jacket during the grouting process. With unique biting teeth for increased contact area, Trelleborg's innovative design delivers a firmer grip. This fixing method reduces risks during platform installation, as it guarantees stable working conditions, even in inclement weather.

"Jacket installation of a substructure into the seabed is an operation that requires product reliability and on site expertise," said J.P. Chia, engineering manager for Trelleborg's engineered products operation. "Until the grout between pile and jacket has set and the installation is completed, the SPGs hold the jacket's piles firmly in place to provide temporary retention of the jacket's elevation position during levelling operations and grout setting. By growing our portfolio to offer a total leg can system solution, customers can benefit from streamlined procurement, reliable functionality, and interfacing of the entire system from purchase through to delivery from one solution provider."

Trelleborg's custom-made SPGs can be designed to have a holding capacity of between 500 and 3,000 metric tons and are compatible with all offshore oil and gas and windfarm HVDC jackets. Working at operating pressures of 200 bar and higher according to customer testing requirements, and water depths to 250 meters, Trelleborg's SPGs exceed all relevant client standards and is DNV GL certified.

Trelleborg's SPGs are fully developed and tested in-house at its facility in Singapore. Full scale testing, biting teeth friction testing and pressure holding testing are all carried out and exceed client specified standards to ensure Trelleborg's SPGs perform during the critical grouting process. ↴

Source: Trelleborg

For more information, go to www.trelleborg.com



2017 SUMMER & FALL EVENTS

REGIONAL WIND ENERGY CONFERENCE - NORTHWEST

July 25 - 26 | Renton, Washington, USA

WIND RESOURCE & PROJECT ENERGY ASSESSMENT CONFERENCE

September 27 - 29 | Snowbird, Utah, USA

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October 25 - 26 | New York, New York, USA

WIND ENERGY FALL SYMPOSIUM CONFERENCE

November 7 - 9 | Albuquerque, New Mexico, USA

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Reducing its carbon footprint

It's been 10 years since Jiminy Peak revved up its wind turbine, and now the resort is 100 percent powered by renewable energy.

In 2007, when Jiminy Peak installed a \$4 million 1.5 MW wind turbine on the western flank of its mountain, many thought the 70-year-old resort was taking a huge financial risk.

But 10 years after the switch was thrown, Brian Fairbank, chairman of The Fairbank Group that runs the resort, looks back at a risk worth taking. The 253-foot high turbine paid for itself in seven years, and today, combined with a 12-acre 2.3 MW solar field and 75 kWh cogeneration unit at the slopeside, Country Inn at Jiminy Peak in Hancock, Massachusetts, can claim to be one of the few resorts in the U.S. powered 100 percent by renewable energy.

When asked whether a second turbine is planned, Fairbank said they already have all the electricity they need.

“We’re now focusing on drastically reducing our carbon footprint and greenhouse gas emissions,” he said. “Conservation is the most cost-effective form of energy-use reduction, cost control, and containment.”

The installation of the turbine was met with great fanfare, music, flags, and speeches. Rotor bearings were replaced about 45 days into its service life, but since then, the turbine has run without major issues.

Today, the “Zephyr,” as it’s nicknamed, is the first megawatt-size turbine at a ski resort and remains



The Jiminy Peak wind turbine recently turned 10. It helped the resort become one of the few in the U.S. powered 100 percent by renewable energy. (Courtesy: jiminypeak.com)

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Giving Wind Direction

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the largest. It has become a symbol of the resort, as much as the barn is to Steamboat Ski Area, or the snowfields are to Sugarloaf.

Zephyr is also a social media star, a veritable selfie magnet, with a strong online presence. Employees wear turbine pins and school groups visit to tour the site and view an educational documentary called “Forever Green.”

DEPENDABLE POWER PRODUCER

“It has been an exceptional, dependable power producer for us,” said Jiminy’s Jim Van Dyke, vice president of environmental sustainability, and a veteran 43-year employee. “The turbine handles 33 percent of our energy needs on an annual basis, up to 66 percent in the winter when the winds blow strongest.”

“As far as electricity is concerned, we’re already at 100 percent renewable power,” he said. “We’re good. Excess power not needed by the resort goes out on the national grid, for which the resort receives credit to use when the turbine is working at less than full capacity or when the resort’s need exceeds the turbine’s capacity.”

“Our focus now is upon reducing our carbon footprint,” Van Dyke said. “We’re still burning gasoline and diesel to run snowcats, still using propane to heat, and on busy weekends, 1,500 cars are in the parking lots, most with internal combustion engines.”

To that end, he points to a number of steps already underway to further reduce the resort’s impact on the planet. These improvements include:

- Installation of a 2.3-MW community solar project with Massachusetts-based project developer and owner Nexamp, Inc. The solar field, near the base of the mountain, significantly expands Jiminy Peak’s renewable energy commitment while extending the environmental and cost-saving benefits of solar energy to the community.
- Replaced the entire 450-gun snowmaking arsenal with energy-efficient Snowgun Technologies “Sledgehammer” snowguns. The new guns convert more water with less air and at warmer temperatures than traditional snowguns. This means the resort runs air compressors for fewer hours, consuming less electricity, while producing 100 percent more snow (assuming Mother Nature cooperates).
- Jiminy Peak has equipped two PistenBully groomers with digital mapping and GPS to tell drivers exactly how much snow is beneath their treads, blades, and rollers. The maps are based on aerial photography captured during summer, and are accurate to within two inches (5 cm).

“Rather than eyeball it, the SNOWSat technology allows us to more precisely gauge depth and place more

snow where the cover is thin, and less where the cover is already sufficient for skiing or riding. This means fewer passes by groomers,” Van Dyke said, noting that Jiminy Peak is one of only a few resorts in the U.S. using the new technology.

CAT’S MEOW

Speaking of groomers, Jiminy Peak is purchasing the new energy efficient Pisten Bully 600 E+ snowcat, one of three in use in the Northeast. Built by the German company Kassbohrer, Pisten Bully’s “Green Machine” 600E+ is the world’s first groomer with a diesel-electric drive. One of the most significant advancements in snow-grooming technology over the past two decades, the 600 E+ uses a diesel engine to drive two electric generators, which power electric motors that turn the tracks and the snow tiller.

It reduces the emission of nitrogen oxides and carbon dioxides by 20 percent, produces 99 percent fewer sooty particles, and registers a 20 percent fuel savings over its standard 600 model.

Other energy savings include:

- Installation of four EV charging stations, working with an Albany, New York, EV Drivers Club, with support from Tesla. Van Dyke said EV car owners, in addition to saving on fossil fuels, will be recharging with renewable electricity generated by both solar and wind.
- More than 230 slope-side lights have been replaced with lighter, brighter, more energy-efficient LED lighting covering 60 percent of the mountain. The difference has been likened to that between a manila envelope and a white envelope.
- By using propane for both hot water and electricity, the Country Inn’s 75 kWh cogeneration unit eliminated one propane burner. At the same time, 658 lights in the Country Inn were converted to LEDs to be more efficient.
- Excess heat from two snowmaking compressors is used to warm three Village Center buildings, a total of 34,000 square feet, thus reducing propane and electricity consumption.

“We’re getting down to the granular level, including waterless urinals in all base lodges. Each one saves 40,000 gallons per year,” Van Dyke said. “Conservation makes perfect business sense today, just as the turbine did 10 years ago. We save money, besides which, it’s the right thing to do.”

“Massachusetts’ beauty and health are an integral part of our business,” he said. “We live here so working to maintain it comes naturally.” ↵

Source: Jiminy Peak Resort
For more information, go to jiminypeak.com



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