Giving Wind Direction

WIND SYSTEMS

IN FOCUS

Condition Monitoring ◤ O&M Maintenance

PROVIDING PREDICTIVE HEALTHCARE

PROFILE

James Fisher Renewables

JUNE 2021
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SECTIONS

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FROM THE EDITOR

Time to move toward normal again

Last year was a wild ride not just for the wind industry, but for the world at large.

Wind Systems was not immune to the challenges that the pandemic forced on us, but now that millions are vaccinated, it really appears that much of the world is returning to some semblance of normalcy.

And even though CLEANPOWER was a virtual event this month, it looks like, as travel restrictions loosen up, trade shows are on the horizon once again.

And that's a good thing. Virtual conferences helped keep the industry up to date on important developments, but it can't replace one-on-one, face-to-face interaction. Watching a piece of equipment on a computer screen pales in comparison to observing ground-breaking technology live and in person.

To that end, this month's *Wind Systems* takes a look at a couple of important issues for owner-operators to consider for their wind farms: condition monitoring and proper maintenance.

In our cover article, experts from Brüel & Kjær Vibro reveal a day in the life of a diagnostic service provider for wind turbines.

In order to properly maintain wind assets, inspection becomes a frequent and necessary task, and drones can make those inspections safer. An article from AX Control, Inc., shows how drone technology can change traditional offshore inspections by offering long-term cost benefits, improved efficiency, and a safer work environment.

Lidar has become much talked about when it comes to wind measurement, but met towers aren't going anywhere anytime soon, so the need to keep them working properly becomes clear.

ColdSnap Towers co-owner Sam Mohler discusses how met tower maintenance is an important part of an owner-operator's fiscal budget.

You'll find that and much more in this month's issue. I hope you find it as interesting as I did.

Lastly, as we take the plunge into a, hopefully, normal summer, I'd like to take this moment to remind you to let *Wind Systems* be your eyes, ears, and, most importantly, your voice. Through the pandemic and beyond, we are here, first and foremost, to shine a spotlight on your valuable products, services, and know-how.

Whether it's a powerful ad or an expert article, let us share your insights with the people who are searching for it.

Stay safe and healthy out there, and, as always, thanks for reading!

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Giving Wind Direction
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U.S. clean-power industry starts 2021 big

From American Clean Power

The Clean Power Quarterly Market Report, recently released by the American Clean Power Association (ACP), shows U.S. project developers installed nearly 40 percent more wind power in the first three months of 2021 than in the first three months of 2020, the strongest year ever for clean power. This amount of development also represents nearly three times the amount of wind added to the U.S. grid in the first quarter of 2019. Utility-scale solar and energy storage also had strong first quarters, keeping pace with or exceeding historic levels.

"These numbers add up to one word: momentum; we are already exceeding the pace from the strongest previous year ever for clean power," said Heather Zichal, ACP CEO. "This trend will only grow when more closely aligned with smart policy in Washington."

Thirteen new wind projects, 15 utility-scale solar projects, and two energy-storage projects became operational during the first quarter, enough to power nearly 1 million American homes. The top five states for first quarter additions include Texas (791 MW), Oklahoma (555 MW), California (519 MW), South Dakota (462 MW), and North Dakota (299 MW).

America's first wind project in federal waters, Dominion Energy's 12-MW Coastal Virginia Offshore Wind project, became operational during the first quarter. Meanwhile, federal regulators released their final assessment of the planned 800 MW Vineyard Wind project, the first utility-scale offshore wind farm in the country.

The Biden-Harris administration also announced an achievable goal of 30,000 MW of offshore wind in the U.S. by the end of this decade. These developments during the quarter are helping set the stage for the country's transition to majority renewable energy by the end of this decade.

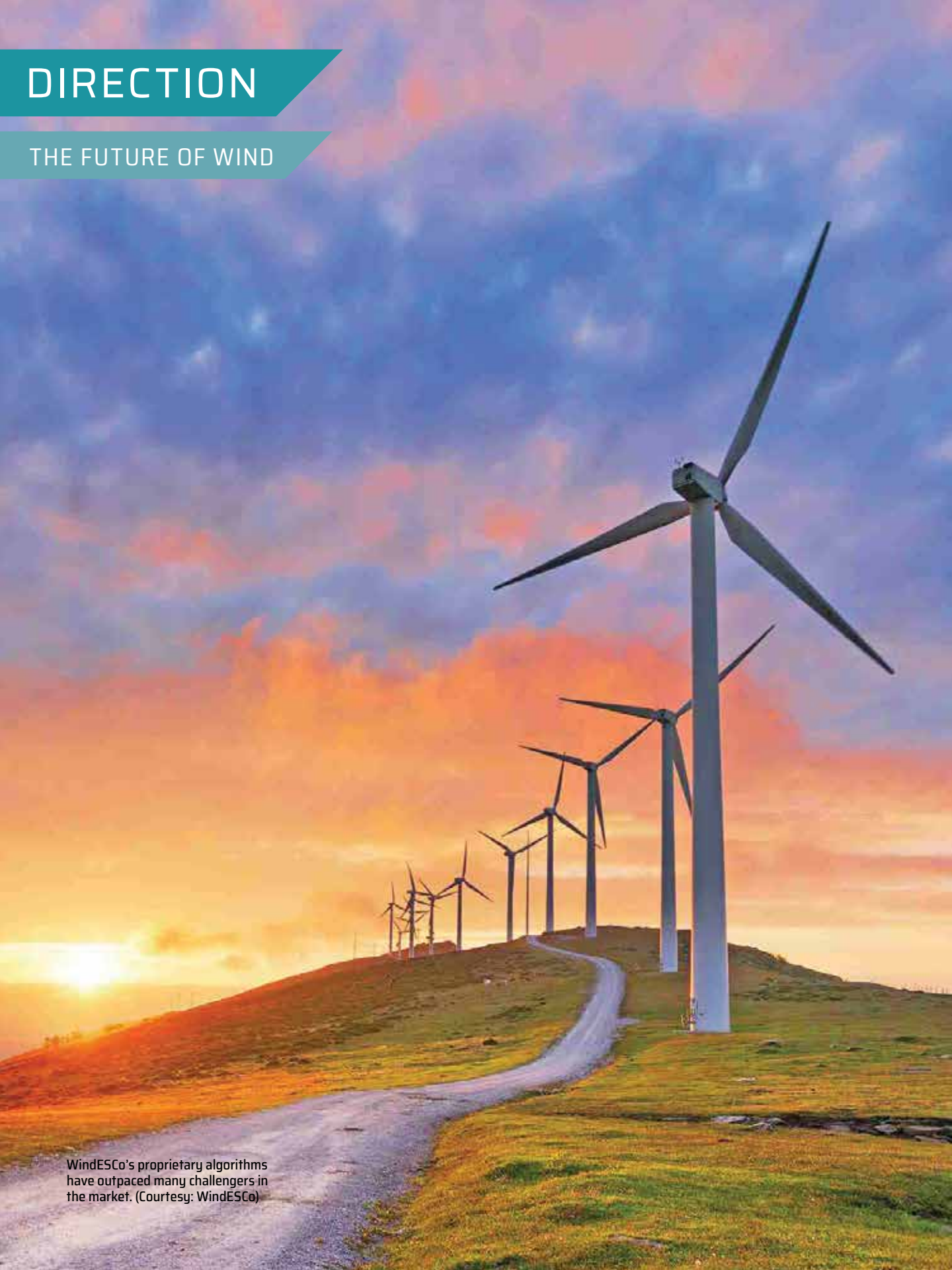
In total, there are now over 173,000 MW of clean-power capacity operating in the U.S, enough to power more than 50 million homes across the country and more than double the U.S. capacity just five years ago.

AMERICAN CLEAN POWER

American Clean Power is the voice of companies from across the clean-power sector that are powering America's future. For more information, go to www.cleanpower.org

DIRECTION

THE FUTURE OF WIND



WindESCo's proprietary algorithms have outpaced many challengers in the market. (Courtesy: WindESCo)

WindESCo exceeds 50% growth in partnerships during first quarter of 2021

WindESCo, a pioneer in innovative renewable energy optimization technologies, has confirmed a benchmark increase in assets under management through the first 90 days of 2021. The partnerships comprise an increase of more than 50 percent against the closing months of 2020, with locations in North America, Asia Pacific, Europe, the Middle East, and Africa.

The milestone marks a significant evolution in the continuing maturation of the wind industry, as investors seek to improve their revenue and bolster balance sheets through a rigorous understanding of their annual energy production. Growth occurred primarily in the North American market, along with the opening of new customer opportunities in both Europe and India.

"Investors in the wind market are facing new challenges in terms of increasing revenue as the sector simultaneously grows more expensive, more populated, and more complex," said Blair Heavey, CEO of WindESCo. "In a climate of uncertainty, we are proving ourselves as a trusted partner, driving beyond top-line data monitoring to suggest improvements, affect change, and deliver real value for customers."

WindESCo's proprietary algorithms have outpaced many challengers in the market by identifying and resolving restrictions to output through leading-edge hardware and controller modifications, as well as measuring AEP improvements and delivering revenue gains within a full-service optimization offering.

The company's first quarter performance echoes its key innovations in the market, using proprietary machine learning technology to enact real change and tangible gains for investors, with a mission to maximize the performance of wind-farm assets by ensuring every turbine achieves its optimum energy production and reliability.

Efficiency has emerged as a critical commercial advantage for wind-farm operators as the cost profile of the sector transforms. The increasing size of wind farms, and their component parts, has driven up overall costs in the last decade — a phenomenon compounded by the influx of larger entities into the market. Improved profitability through increased operational efficiency of existing assets is a natural counter to the potential decline in financial viability of new projects.

"Our software service is built on deep wind-turbine expertise and first-hand understanding of how complex wind dynamics, turbine controls, and wind loads impact revenue," Heavey said. "Our ability to evidence these conditions with our proprietary algorithms and act on them to positive effect has been crucial to our industry credentials and growth and the success we have delivered for our customers. We're incredibly proud to start 2021 at such a high point, delivering more real revenue value for our customers, and we look forward to continuing this trend throughout the year and beyond."

> In a climate of uncertainty, we are proving ourselves as a trusted partner. driving beyond top-line data monitoring to suggest improvements, affect change, and deliver real value for customers.

WindESCo recently announced its approval from DNV for its Energy Improvement Analysis Method, marking a significant advancement in machine learning technologies for measuring performance change at wind plants. Using this measurement methodology, WindESCo's services have demonstrated returns of up to seven times the investment. Furthermore, operators generally realize payback from WindESCo's services within 12 months.

WindESCo was also selected from a field of more than 150 entrepreneurs to participate in the 26th Annual Innovation Growth Forum (IGF) sponsored by the U.S. Department of Energy's National Renewable Energy Laboratory (NREL), which took place April 21-22. It is one of the nation's premier events for clean-tech entrepreneurs and other industry experts, wherein a final shortlist of 40 of the world's most promising start-up companies, elected through an extensive selection process, present their innovations to potential investors and industry experts. More than 600 clean-tech investors, entrepreneurs, and industry representatives attended this year's IGF.

MORE INFO www.windesco.com

Southern Power acquires Glass Sands Wind Facility

Southern Power, a leading U.S. wholesale energy provider and subsidiary of Southern Company, recently announced the acquisition of its 15th wind project — the 118-MW Glass Sands Wind Facility — from Steelhead Americas, Vestas' development arm in North America.

"We are proud to announce this new addition to our generation portfolio," said Southern Power President Bill Grantham. "Glass Sands is a great project for Southern Power as we continue to provide clean, renewable energy resources to meet the needs of our customers."

The project, in Murray County,

The Glass Sands Wind Facility is Southern Power's 15th wind project. (Courtesy: Southern Company)

Oklahoma, is Southern Power's fifth wind facility in the state and contributes to the company's growing fleet of clean-energy resources from California to Maine. Glass Sands was developed by Steelhead Americas and is expected to use 28 wind turbines manufactured by Vestas. Construction, executed by Mortensen, is underway, and the project is expected to achieve commercial operation in the fourth quarter of this year.

Once operational, the electricity and associated renewable-energy credits generated by the facility will be sold under a power purchase agreement with Amazon.

With the addition of Glass Sands, Southern Power's wind portfolio consists of more than 2,533 MW of wind generation. Southern Power's wind facilities are a part of the company's 4,928-MW renewable fleet, which consists of 43 solar and wind facilities operating or under construction.

This project aligns with Southern Power's overall business strategy of strengthening its wholesale business by acquiring and developing generating assets that are covered by long-term contracts with counterparties with strong credit support.

MORE INFO www.southerncompany.com

Walmart moves toward total renewable business

Walmart recently announced in a collaboration with ENGIE North America, more than 500 MW of new renewable energy generation capacity now operational across three separate wind projects. Together, these projects are expected to supply renewable energy annually to hundreds of stores, clubs, and distribution centers across Texas, South Dakota, and Oklahoma. This is enough renewable electricity to power more than 240,000 average American homes for an entire year.

According to the American Clean Power Association, as a result of these transactions, Walmart procured the most wind energy of any company in the U.S. in 2019.

This collaboration will allow Walmart to purchase offsite power from three separate wind farms in Texas, Oklahoma, and South Dakota. Together, these facilities are expected to help avoid as much as 1.3 million metric tons CO_2 of greenhouse gas emissions per year.

But beyond being better for the planet, these facilities also provide more direct benefits to communities by creating local opportunity. They support employment ecosystems all their own. According to ENGIE North America, the three projects supplied 1,000 construction jobs at their peak and are expected to deliver more than $400 million in landowner lease payments, taxes, wages, and commitments over the life of the project.

The partnership highlights how Walmart's investments in infrastructure, paired with innovative thinking, are creating change for people and the environment in ways that will benefit the communities Walmart serves, its associates, and customers for years to come.

Bringing this amount of renewable energy online represents an important leap forward in Walmart's renewable energy journey, reinforcing its broader mission to spark collective climate action and drive environmental sustainability.

But it still stands as part of the bigger picture toward reaching the company's goal of becoming a regenerative company.

It's not just wind energy that's helping Walmart fulfill its renewable ambitions. The sun is playing its part, too. According to the Solar Energy Industries Association, in 2019, Walmart added the most solar of any company in the U.S., increasing its solar use by more than 35 percent. This growth in solar was driven by several large offsite solar projects added to Walmart's history of using solar at its facilities. And according to the EPA Green Power Partnership Top 30 Retail Ranking, Walmart was the top retailer in terms of annual green power usage in the U.S. in 2020.

These recent strides have moved Walmart closer to meeting its goals. In 2020, renewable sources supplied an estimated 36 percent of its electricity needs globally. To date, Walmart's actions will have helped to bring more than 3 GW of new renewable energy capacity to power grids since 2008. As of the end of 2020, Walmart had more than 550 onsite and offsite projects in operation or under development in eight countries, 30 states, and Puerto

According to the American Clean Power Association, Walmart procured the most wind energy of any company in the U.S. in 2019. (Courtesy: ENGIE North America)

Rico.

Last year, the renewable energy supplied by Walmart's projects globally grew to more than 4 billion kWh.

Beyond efforts to scale renewable energy for Walmart's own operations, the company is encouraging its suppliers to act in theirs through Project Gigaton, an initiative to avoid a gigaton of greenhouse gas emissions from the global supply chain by 2030. In September 2020, in collaboration with Schneider Electric, Walmart launched Gigaton PPA™ to help engage its suppliers in accessing renewable energy purchases and accelerating greater renewable energy adoption.

Securing innovative, scaled energy transactions is another step toward Walmart's goal of being powered by 100 percent renewable energy by 2035 and achieving zero emissions across its operations by 2040.

MORE INFO corporate.walmart.com

NovaTech CEO seeks to consolidate organization, products

NovaTech, a medium-sized provider of automation and engineering solutions serving electric utilities and process manufacturing industries for 40 years, recently announced the appointment of Conrad Oakey as its chief executive officer.

Oakey, who originally joined NovaTech in 2000, includes among his many accomplishments consolidating the management of the two business units (power and process automation), simplifying online ordering and customer support, as well as continuing to improve the functionality and ease-of-implementation of the company's three product lines.

Conrad Oakey. (Courtesy: NovaTech)

In his previous role as vice president of strategy and communications, Oakey focused on web technologies, search engine optimization, and other digital marketing strategies while tracking or managing multiple high-level change initiatives within the organization.

He continues to drive the digitization of internal information and work processes to increase responsiveness to customer needs.

During the pandemic, he successfully shifted NovaTech's communications by introducing weekly educational product webinars for its power business customers and adopting real-time web-based collaborations to support process division customers during installations. These innovations helped keep NovaTech closely engaged with their customers during a period when they could not visit them in person.

As CEO, Oakey has a priority meeting with NovaTech's customers as markets begin to open up.

"I want to make sure I spend as much time meeting with customers and advocating for them within our organization as possible," he said. "Customer experience, not established practice, will continue to be of primary importance at NovaTech."

Product innovation is another area of focus for the new CEO, including incorporating specialized versions of products requested by customers into standard releases to accelerate new feature development.

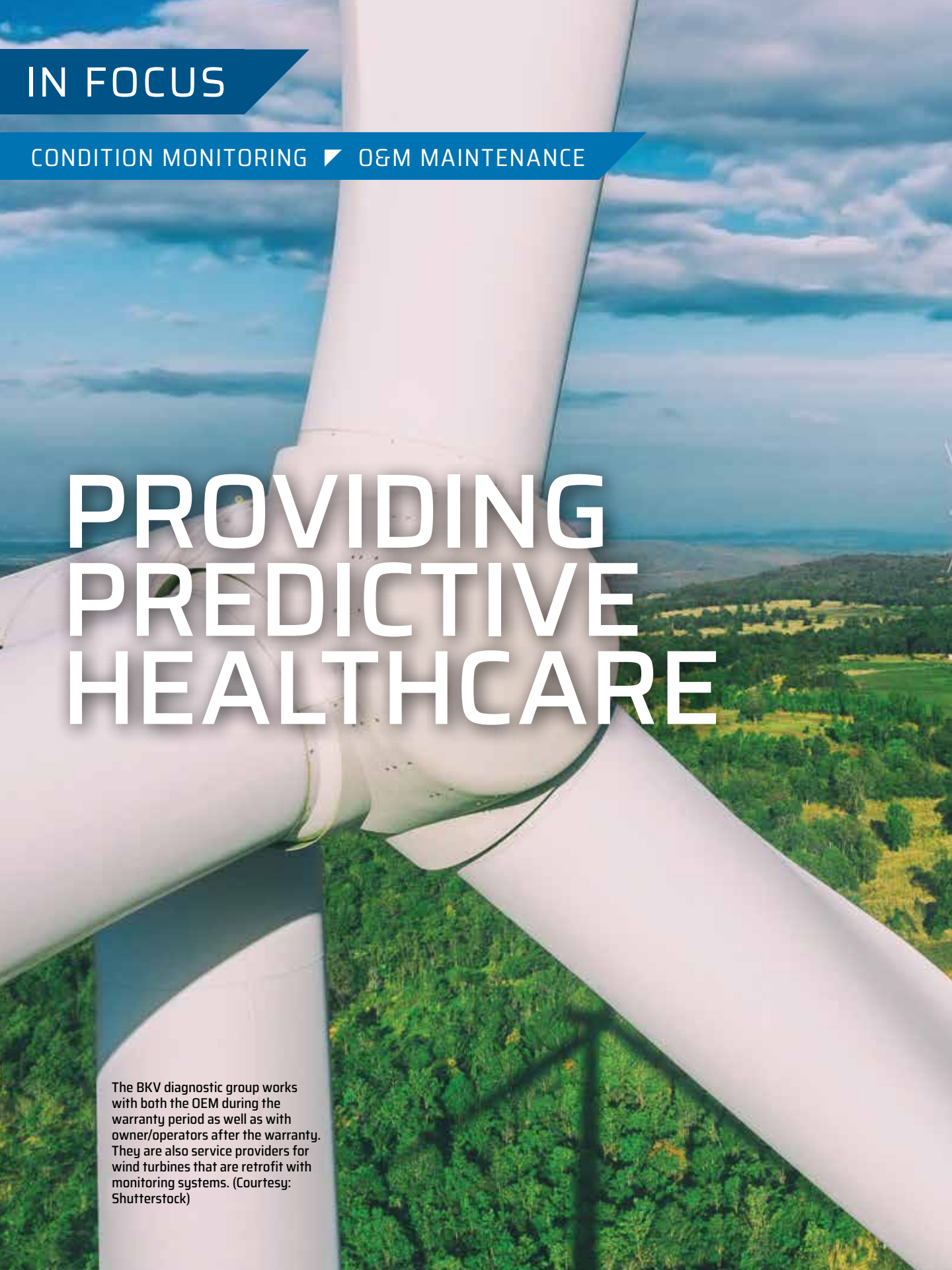
Oakey points to the latest version of their Orion product for substations that have been reduced to the size of a book. The smaller form factor enables the device to sit on a pole-top or inside larger equipment, where it can consolidate information and perform control actions for distribution feeders.

Oakey envisions moving beyond the company's long-held strength in utility substations onto more points along the feeder, including pole-top sensing and control applications, underground vaults, small exchange points and mini substations.

Internally, Oakey will be leading a recently consolidated management team responsible for sales, marketing, operations, product development and employee services including IT, HR, finance and administration.

MORE INFO www.novatechautomation.com.

PROVIDING PREDICTIVE HEALTHCARE



The BKV diagnostic group works with both the OEM during the warranty period as well as with owner/operators after the warranty. They are also service providers for wind turbines that are retrofit with monitoring systems. (Courtesy: Shutterstock)

A day in the life of a diagnostic service provider for wind turbines.

By MIKE HASTINGS

The Brüel & Kjær Vibro (B&K Vibro) monitoring and diagnostic group plays a very special service role in the operation and maintenance of wind turbines. In close cooperation with the wind-farm owner/operators, it manages machine problems from even before any fault is detected, right up until after the faults are diagnosed and fixed. This article explains how the diagnostic group came to be, how it functions, and includes an interview with Christian B. Poulsen and Ivaylo Dragiev, two specialists from BKV, to show the personal side to this comprehensive and demanding task.

Wind energy, unlike thermal power stations, has no fuel expenses or water/air pollution treatment requirements, so maintenance is a primary-area focus that influences owner/operator profitability. This is reflected by the fact that all offshore and an increasing number of land-based wind turbines are equipped with monitoring systems as standard. Moreover, a large number of the new wind turbines begin their life under a two- to five-year warranty, where all monitoring and diagnostics are provided by the OEM as a turnkey service. No monitoring expertise is required from the owner/operator during this time. In fact, after the warranty, the customer has generally not gained sufficient expertise to do the monitoring by themselves, so they will often renew the OEM service contract or find an independent service provider. Interestingly enough, the owner/operators typically never do their own monitoring and diagnostics, in order for them to focus on other pressing issues in running a wind farm.

POOL OF SPECIALISTS OFFERED AS A SERVICE

Traditionally, long before the wind-power industry was born, many industries had a team of diagnostic specialists looking after the machines in their plant all the time. As the condition monitoring systems at the time were more or less "data pumps" that basically just provided pre-configured spectrum plots and alarms based on overall vibration measurements, there was a lot of diagnostic work that was needed to be done to interpret this data, so they were kept busy.

Things have changed, though. The newer systems provide descriptor measurements, based on narrowband fault frequencies and statistical analyses, which give much earlier fault-detection capability than overall vibration measurements, and provided basic diagnostic information once the fault was detected. Instead of just providing plots based on a fixed configuration, the newer systems store raw data with post-processing capability, so the user can do user-defined diagnostics and analyses themselves with much more flexibility, reliability, and accuracy. Even

The drive train in the nacelle of a typical wind turbine (2MW). (Courtesy: B&K Vibro)

automatic diagnostics are offered by the new systems.

At the time when the wind-power industry took off, all of this new monitoring-system functionality significantly reduced the work load of the wind-farm diagnostician, so it was hard to justify having a full-time specialist on board for the smaller wind farms. Although their work load was reduced, it is important to stress that the new monitoring systems could in no way replace the specialist's skills and experience.

There are still a number of decisions that have to be made that can't be done by the monitoring systems, such as evaluating the severity of the fault and how to react to it, evaluating several faults simultaneously, or how to take into account unexpected anomalies.

The OEM service contracts relieved this problem by using a team of specialists to look at thousands of wind turbines as part of the warranty. Independent service providers did the same. They both offered a turn-key monitoring and diagnostic service where nearly everything concerning machine healthcare is done for many owner/operators — from fault detection to actionable diagnostics.

Even the monitoring system IT issues are taken over by the service providers, where data storage, updating and maintenance of the data servers and monitoring systems is taken care of.

BKV MONITORING AND DIAGNOSTIC GROUP

The BKV diagnostic group works with both the OEM during the warranty period as well as with owner/operators after the warranty. They are also service providers for wind turbines that are retrofit with monitoring systems.

Christian B. Poulsen and Ivaylo Dragiev recently were interviewed on a busy day in the remote monitoring office of BKV in Nærum, Denmark, where they discussed their daily duties as specialists.

Christian, tell us a little about the group and explain why this service is so important for the wind industry.

Poulsen: We are a very dedicated team of full-time specialists, all with a passion for providing predictive healthcare for many different types of turbines and customers. Ivaylo and I, together with others, are located in the B&K Vibro monitoring and diagnostic service center in Denmark, but we also have service centers in the U.S. and China. Our overall objective is actually very simple: to constantly monitor the condition of the drive train and nearby components of thousands of wind turbines worldwide in order to optimize turbine uptime and reduce maintenance costs. This is done by giving simple, precise, and conclusive warning and advice to the wind-turbine operators and owners in good time so the appropriate maintenance action can be taken to keep the turbines running. Our comprehensive system of severity warnings — early-, mid-, and late-stage warnings — enable the customer to plan optimal maintenance ahead of time, while ensuring the best possible lifetime utilization of individual components. In addition to this, we provide close communications and support to the customers throughout all monitoring phases, making both our job and the customers' jobs easier, fulfilling all mutual expectations, and we are prepared to provide specialized help when needed.

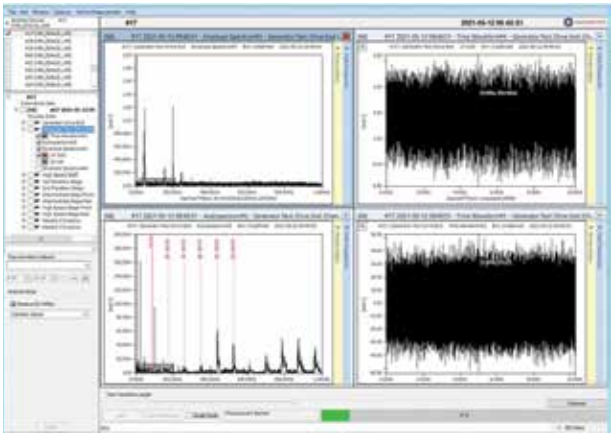
The group has been monitoring wind turbines for 16 years now. How much data do you have now, and can you tell us what is in the data?

Poulsen: We host and keep all data that we monitor, both vibration and the available process data. Currently we have many terabytes of stored data, which includes both scalar values, which are a single measured or calculated value in time, and time waveforms, which would typically be complex raw vibration data. This gives us the opportunity to see long-term development of mechanical faults as well as for testing and optimizing new measurement techniques and monitoring strategies. Because we have so much data, we are in a good position for performing "big data" statistical analysis across various platform types and operating conditions for gaining insight in predicted remaining useful life of components, evaluating component performance under different conditions, and revealing completely new vibration patterns for many kinds of faults.

You obviously get a deep-dive insight in wind-turbine machine faults; do you share this expertise with the rest of the company, with the wind-turbine manufacturers, and with the component manufacturers?

Poulsen: We have a lot of meetings with both customers and OEMs, and part of that is to ensure that the results from our monitoring strategy, monitoring system technology, services and monitoring techniques — also called descriptors — are as expected. Much of our monitoring technology is proprietary, but the results are made to be accurately and reliably measurable, transparent, understood, and verifiable.

The Alarm Tracker gives an overview on the alarm status of all the wind turbines monitored. (Courtesy: B&K Vibro)



The Wind Turbine Generator Analyzer is the basic tool for doing diagnostics on detected faults. (Courtesy: B&K Vibro)

With customer and OEM input, this makes it easier for us to optimize and improve our monitoring solutions. Often, we have daily communications with wind-farm managers, so our monitoring service becomes more "alive," and they see us as a vital part of their daily planning. This ultimately contributes to getting maximum life out of the individual drive train components of each wind turbine, thus improving the levelized cost of electricity produced by the individual wind turbines as well as optimizing performance for the entire wind farm.

And the knowledge we gain from seeing many machine faults under a wide range of operating conditions is channeled into our Innovation & Development team, so new descriptors and monitoring technology can be developed into our new products to better serve the wind-farm owners and operators.

Do you get requests from customers to look into the data?

Poulsen: Special requests for customized tasks are also part of our job. It can be an independent investigation into the mechanical condition of a turbine that is out of warranty, or it could be a request for focused analysis on a specific wind farm or platform type to get a better insight from the field. These special tasks give good value to the customer while, at the same time, enable us to extend the scope and bandwidth of our monitoring services to serve more.

Ivaylo, what does it take to be a diagnostic specialist?

Dragiev: It takes a broad range of skills. Usually a diagnostic specialist will have an academic background as a mechanical, acoustic, or electrical engineer on which basis he/she later would take additionally some specialized vibration certification courses.

Aside from that, it requires a very good machine and failure mode knowledge, which would help correlating the vibration data with the machine's condition. An important part of the diagnostic specialist daily routine is communication with the customers, who usually provide very good feedback, which is later used to fine tune the descriptors, the alarm levels, and even the sensor layouts if needed.

It is important that the diagnostics are very focused on the task he/she is performing, especially when it comes to in-depth analysis, because sometimes the small details matter a lot when it comes to what is delivered to our customers. Thinking out-of-the-box is a "must" for the diagnostic specialist, too.

Can you tell us the life story of a typical machine fault and what role you play in it?

Poulsen: The typical scenario begins with the very early detection of a drive train fault, which is then followed by a series of B&K Vibro alarm reports. These are issued in pace with the increasing severity levels of the fault and a decreasing lead time to failure over a period of say six to 18 months. The alarm report concisely explains the type and location of the fault and gives a clear indication of future recommended actions together with an estimated timeslot. In most cases, as the severity level increases, the customer dialogue also increases in order to accurately update the right planned maintenance at the right time. When the on-site maintenance work is finished, we will re-evaluate the mechanical condition of the component and inform the customer accordingly. If everything is OK, we will then re-start the normal monitoring period again.

Is there a difference in the customers, as far as dialogue, action, expertise, expectations, etc.?

Poulsen: Over the last 10 years, we have experienced that customers are much more knowledgeable with respect to insights toward condition monitoring and optimization of turbine maintenance. This has challenged us positively and supported us in developing new, better, faster methods of condition monitoring of wind turbines.

Dragiev: There is a big variety of customers, and many of them run their own preventive maintenance strategies. Depending on the location of the wind farm and the service organization taking care of the planned maintenance, some customers would require that we provide the earliest possible warning about a potential defect, while others would rather act at a later stage of development. Additionally, most of the so-called utility customers have their own diagnostic groups, which we also support as a second-level support or with different troubleshooting activities. Other customers would purely rely on B&K Vibro's experts to monitor their assets and prepare their maintenance schedules.

What are some of the challenging moments in your job, and what are some of the rewarding times?

Poulsen: Customers are becoming more knowledgeable, therefore, more interested in our diagnostic approach. This is actually helpful because we get a better understanding of the customer's perspective. And it is not just monitoring individual turbines but a fleet of them for fine-tuning the maintenance strategy. Another challenge is the continuous development of wind-turbine technology, turbine types, and drive-train configuration. This requires us to continuously upgrade our monitoring strategy to still deliver optimal wind turbine performance.

Some of the most rewarding situations are when we are closely trending a late stage component fault, and we work closely with the maintenance crew for planning an optimal shutdown. This means we succeed in getting maximum life out of the component based on our diagnostic predictions without unnecessary downtime or maintenance expense based on the capacity and ability of the maintenance crew. This is a cooperative effort, and again, this is doing "the right service at the right time."

Dragiev: Some of the challenges we have faced are related to accurately defining the remaining useful lifetime of the components, which requires taking into account multiple factors, not just the vibration data. I could describe this as a constantly evolving process in which B&K Vibro's diagnostic group is getting better and better day by day.

When it comes to rewarding situations, I could mention the thankful emails we get from customers where they praise the accurate diagnoses we made or their insistence to continue with their B&K Vibro monitoring contract, such as for assets about to come under their operation. I would also mention the satisfaction we get when we deliver training sessions to our customers, where we can see how much knowledge they gained and how much they really appreciate the value of the online condition monitoring system.

What lies ahead in the future?

Poulsen: In addition to the continuous optimization of our monitoring strategy as experience is gained, we will also extend our monitoring strategy to include wind-turbine components other than just the drive train. We will also extend our holistic monitoring approach by incorporat-

ing other monitoring sensor techniques, so we can monitor for more potential failure modes. We also plan to implement more data science in our diagnostic approach. All of this will lead to even more machine uptime, more focused maintenance, and a better prediction of wind-turbine component remaining life.

Dragiev: Over the course of the last couple of years, we all have been reading about data science, AI, and machine learning coming into our daily lives, so in our field of work, this is not an exception. We are expecting certain human tasks to be automated, which would enhance the work of the diagnostic engineer and would allow him/her to focus in areas that haven't been explored yet and to be more efficient in general.

OPTIMAL WIND FARM HEALTH

A day in the life of a B&K Vibro diagnostic specialist is not just looking at the data and informing the customer of anomalies by showing a vibration plot. The wind-farm owners and operators, as well as the OEMs, have many challenges and must make operation and maintenance decisions constantly, sometimes almost on a daily basis. This requires much more than looking at a vibration plot. The expertise from the full-time diagnostic specialists coupled together with the expertise from the maintenance crew results in optimal healthcare for the entire wind farm. In addition to the diagnostic specialist's expertise, the specialist also has access to data tools and a vast amount of data — not only from the machine in question but also historical data from similar machines elsewhere — thus ensuring effective, reliable operation, and maintenance of the turbine in question as well the entire wind farm.

Christian B. Poulsen is the Global Team Lead in B&K Vibro's Wind Service Group, in Denmark. He has been with the company for 12 years, joining as a diagnostic engineer in 2009. Today he is responsible for worldwide diagnostic service and project handling within condition monitoring of wind turbines.

Ivaylo Dragiev is the Technical Lead/Diagnostics for the Wind Service Group at B&K Vibro, based in the Denmark office. He has been with the company for seven years, and is skilled in condition monitoring of wind turbines, gearboxes, generators and other types of rotating and auxiliary equipment. He is responsible for the creation and modeling of new monitoring templates, executing data analysis and optimizing existing tools and applications.

ABOUT THE AUTHOR

Mike Hastings is a senior application engineer at B&K Vibro based in the Denmark office. He has been with the company for 30 years and has worked with developing machine monitoring strategies and optimization techniques for a wide range of machines. He is currently working with strategic market development, analysis, and communications. He is also active in ISO committees that create standards for condition monitoring and diagnostics of machines.

DRONES CAN MAKE INSPECTIONS SAFER

Many wind farms are turning to drone technology for inspections. (Courtesy: Shutterstock)

Traditional offshore wind-turbine inspections come with significant risks for workplace accidents; however, the use of drone technology can change that by offering long-term cost benefits and improved efficiency.

By MARLA KEENE

Offshore wind capacity around the world now tops 31.9 GW, with expectations of an additional 11.8 GW growth by year's end. Market development is expected to continue, especially as newcomers such as the U.S. expand their reach and countries such as Brazil enter the market for the first time.

But offshore wind turbines remain vulnerable to maintenance issues due to environmental conditions at sea. High winds and corrosive salt waters can wreak havoc on turbine blades. Greater exposure to ultraviolet radiation also takes a toll.

Meanwhile, blade condition is a key factor for continuous turbine operation. Yet, as turbines move into deeper water, erosion and wear become bigger issues, reducing overall efficiency by as much as 5 percent.

Damage identification through inspection is the best way to predict blade failure before it occurs. In fact, a 2015 report by the Bureau of Safety and Environmental Enforcement (BSEE) recommends yearly blade inspection. Foundations must also be inspected.

But offshore inspection comes with its own risks to workers, including falls, electric shock, and risks from working in confined spaces. With turbines reaching new heights — quite literally, as GE's new Haliade-X wind turbine will be more than 850 feet tall from base to blade tip — these hazards will only increase.

To mitigate these issues, many wind farms are turning to drone technology for inspections. Drones offer significant safety improvements over traditional inspections using industrial climbers. This new technology may also offer long-term cost benefits due to improved efficiency.

MOBILE THERMOGRAPHY INSPECTION

As offshore turbines age, minor surface roughness begins to generate turbulence that lowers efficiency. Left unchecked, damage can lead to more serious issues such as edge erosion and surface fatigue. But unpredictable weather conditions offer hit-and-miss windows for high-altitude inspections. Scheduling off-site human workers to take advantage of these opportunities can be difficult at best.

A better solution uses automated drones equipped with mobile thermography sensors. This technology measures heat-flow variations within materials. Areas with structural defects create friction and heat, generating lighter temperatures on the thermal image. Damage is pinpointed, offering opportunities for repair before downtime is necessary.

Automated flights remove the need for scheduling visiting workers, as IoT-connected drones can be controlled remotely. Additionally, thermal images can be taken at a distance that mitigates potential drone/blade collision concerns. According to a 2018 report by the U.S. Department of Energy, thermography systems successfully detected flaws as shallow as a quarter-inch during benchtop testing.

Adding Lidar (Light Detection and Ranging) inspections in conjunction with mobile thermography can provide additional data thermal imaging may not provide alone. Lidar inspection offers high resolution images, but this relies on slow-speed close fly-bys. Still, with recent improvements in battery technology, many drones can now inspect all three turbine blades without a battery change.

Additionally, drones can significantly speed up inspections as compared to traditional climber inspections. One U.K. startup project suggests drones will cut manual inspection time down by 80 percent while cutting costs in half.

BETTER FOUNDATION INSPECTION POSSIBLE

Offshore turbine foundations are subject to wind turbulence and harsh marine environments. Prolonged wave loading, axial loading, and low-amplitude lateral loads can all generate significant cyclic stress.

But conventional inspections put engineers into precarious positions as they inspect foundations for evidence of structural strain. Workers must use ladders to access foundation junction points. But not all areas are easily accessible. Workers must deal with heights, wind, and other environmental dangers. Inspections may run upwards of six hours.

Now, the same inspection can be completed using a drone with a mounted high-resolution DSLR camera. Drones offer 360-degree access to all of the wind-turbine foundation above the waterline, removing blind spots typical with manual inspection. High-resolution images provide visual data regarding damage to bolt joinings, tower, and other components, that then can be used for further assessment and scheduling of repairs. Additionally, drone inspection is as much as 15 times faster than traditional inspection methods, making best use of short inspection opportunities.

UNDERWATER INSPECTION

Offshore wind companies also need to regularly check underwater structures and cables connecting their turbines to the seabed. Until recently, divers or expensive, complicated ROVs (remotely operated vehicles) completed the job.

But in recent years, robotics companies have developed underwater industrial inspection drones. These user-friendly machines can run from a smartphone or PC tablet with very little training. The drones are designed for quick deployment, allowing for inspections in minutes rather than hours or days. They can withstand heavy ocean currents,

Traditional offshore wind-turbine inspections come with significant risks for workplace accidents if performed in the wrong conditions. (Courtesy: AX Control, Inc.)

sometimes offering oscillation damping for clearer video production. With an operational range to 150 meters, drones can easily inspect all existing fixed and floating foundation turbines in use today. Additionally, these drones can access locations around turbine bases that would otherwise be inaccessible or dangerous to human divers. And like their flying counterparts, underwater drones offer essential visual data that can streamline and improve repairs and operations.

CHALLENGES FOR DRONES

But offshore turbine inspection still poses challenges for drones. High winds affect drone maneuverability, making them sluggish or difficult to control. Rapid wind speed and directional changes around turbines can be challenging for inexperienced operators. Salt residue from sea air can affect drone motors, fans, and gimbal assemblies. Accidents, while rare, still occur.

Successful drone inspection relies on good planning. Automated flights minimize operator issues and can make the most of limited fair-weather conditions. Autonomous inspections are preferable, too, due to precise onboard sensors with split-second adjustment control. This is typically superior to an operator relying on visual feedback. When using real-time human direction, it's important pilots demonstrate experience dealing with challenges associated with flying around wind turbines.

CONCLUSION

Traditional offshore wind-turbine inspections come with significant risks for workplace accidents if performed in the wrong conditions. But wind farms that limit preventative maintenance increase the likelihood of lost revenue and asset damage, as well as escalating workplace risks. It can become a maddening Catch-22 for operators who want to maintain a safe, well-maintained environment.

Successful drone inspection relies on good planning. (Courtesy: AX Control, Inc.)

Drone thermographic inspections can change that. Predictive maintenance and better data will offer deeper insight for risk-adjusted decision making, allowing performance improvements and decreased failures to follow.

ABOUT THE AUTHOR

Technology writer Marla Keene works for AX Control, Inc, a North Carolina industrial automation parts supplier. She writes about drones, green tech, artificial intelligence, and other technologies changing our world. Her articles have been featured in *Power Magazine, Food Industry Executive*, and other industry sites. Before working for AX Control, Keene spent 12 years running her own small business.

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THE NEED FOR MET-TOWER MAINTENANCE

Adding full service met tower maintenance to a fleet will reduce the long-term costs associated with unknown or neglected problems. (Courtesy: ColdSnap Towers)

Met-tower maintenance is an important part of an owner-operator's fiscal budget and helps ensure every wind farm has an optimally functioning met tower.

By SAM MOHLER and CORA FAITH

In an age where the cost for everything is rising at an alarming rate, the last thing companies want to add is another expense. Asset management, risk mitigation, longevity of wind-farm investments, and the budget are at the top of every wind-farm owner-operator's mind.

What are the financial costs, liability risks, and data-accuracy implications of having a poorly maintained met tower? They are immense. Poorly maintained towers create exorbitant unexpected costs, potential downtime of data communications, inaccurate data, and increased financial risk and liability.

Even though Lidar has taken center stage recently in regards to wind condition monitoring, there is a vast fleet of aging met towers still in operation, providing very important data. Additionally, Lidar does not work in certain environmental conditions, so it's not a good fit for every project. For the foreseeable future, met towers will continue to be the gold standard for hub-height data measurement.

COMPREHENSIVE INSPECTIONS

Met tower fleet maintenance ensures every wind farm within a company's portfolio has an optimally functioning met tower. This service means providing annual (or bi-annual) comprehensive inspections of all components on the tower, including, but not limited to, data acquisition systems, fiber or cellular communications, instrumentation, data-accuracy verification, FAA lighting, tower safety features, and inspection of the tower structure itself.

This means replacing the weather monitoring instrumentation on a proactive, routine timeframe, before errors, glitches, or failed communications can occur. This allows for the most optimal real-time data available, as well as a safe and properly functioning tower.

The cost savings of routine fleet maintenance done by specialists who are familiar with meteorological towers, is significant. Fleet maintenance also provides a well-documented paper trail related to the repairs performed, as well as anticipated and upcoming expenses.

Accurate budgeting of resources toward met towers ensures efficient and consistent function. This is compared to the cost of replacing only failed instruments (when noticed), dealing with the downtime and lack of communications, etc., which ultimately results in inaccurate or missing data. Many times, an owner-operator replaces an instrument on a met tower, only to have another instrument fail days or weeks later.

Emergency, as-needed repair results in substantially higher long-term costs vs. choosing preventative fleet maintenance, which allows for pre-planned budgeting and scheduling for maintenance in a proactive method.

LONG-TERM COSTS

Adding full service met tower maintenance to a fleet will reduce the long-term costs associated with unknown or neglected problems. This type of maintenance service package saves money on mobilization and labor costs, addresses all maintenance needed in one swift motion (reducing the likelihood of a re-mob). It also reduces the risk of critical sensor failures, increases accuracy of instrumentation, and decreases down-time due to instrument failures.

Hiring one company to perform all fleet maintenance creates a situation of accountability, as it is the sole responsibility of the contractor to ensure all components of the met tower are in functional condition and are up to best practice industry standards. Developing a good relationship with the met tower maintenance team will help ensure condition monitoring will function efficiently, reliably, and safely.

THE COLDSNAP TOWERS FLEET MAINTENANCE PROGRAM

Preventative instrumentation replacements:

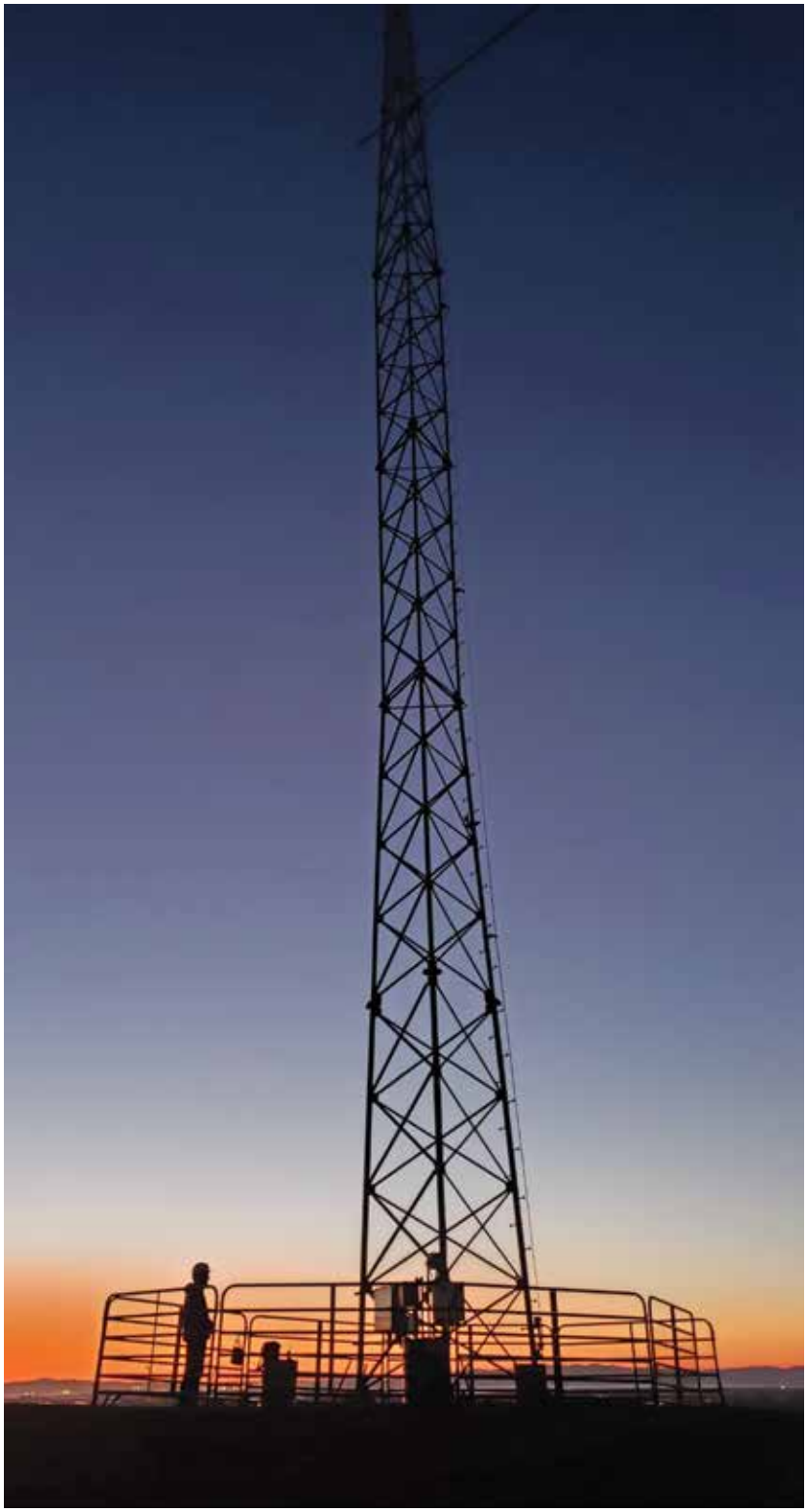
- All calibrated and/or critical instruments are replaced during every site visit (annually or bi-annually). In some cases, used instruments can be sent back to the manufacturer for re-calibration, and then installed again during the next visit (which is a huge cost saver)

Replacement of other failed components:

- Replacing any failed instruments discovered while on site.
- Arriving prepared to replace any faulty electronics associated with the data acquisition system, power supply, FAA lights, and communications devices.
- Swapping failed instrument cables as they are discovered.
- Repairing damaged lightning protection.
- Replacement of damaged safety cables.

Verifying:

- Sensors and data acquisition systems are producing accurate data.
- SCADA or modem communications are functioning properly.
- FAA lights are functioning and compliant with FAA regulations.
- Utility and backup power supplies (PV and battery combos) are working.
- The integrity of lightning protection system and tower grounding.
- Instrument mounts are level and in good working order.



Even though Lidar has taken center stage recently in regards to wind condition monitoring, there is a vast fleet of aging met towers still in operation, providing very important data. (Courtesy: ColdSnap Towers)

- Instrument cables are secured throughout the tower to prevent abrasion damage.
- The safety cable system is in safe working order.
- 10 percent bolt torque check. If 10 percent check fails, a 100 percent bolt torque check is performed.

ColdSnap Towers has been working throughout the United States for more than 17 years with an exemplary safety record. Due to its wide footprint, the company can offer affordable mobilization with significant cost savings for clients with flexible schedules.

Fleet maintenance should be added to a company's maintenance plan to avoid another met tower outage, inaccurate data, unnecessary failed instruments, or a met tower that "nickels and dimes" a wind farm. It can also increase the lifespan and accuracy of a met tower while simultaneously decreasing company expenses.

ABOUT THE AUTHORS

Sam Mohler is co-owner of ColdSnap Towers. He and his brother and business partner, Isaac Mohler, began their careers in the wind industry in 2005, by building remote wind resource assessment towers. They quickly learned their interest was not in building towers, but in the weather instrumentation itself. Providing reliable and accurate data, while staying compliant, became their primary goals. Elevating their safety protocols, maintaining their strong attention to detail, and their vast field experience, has made their passion evident, which shows in the caliber of their work. The Mohlers reside in Northwest Montana, where they have a shop, office, and training center.

Cora Faith has been involved with ColdSnap Towers for more than seven years. In addition to general consulting, she has played an important role in assisting ColdSnap with media creation, advertising, and brand recognition. She has helped ColdSnap position itself as a recognized industry leader by being on the forefront of ColdSnap's marketing footprint, as well as assisting with the design of the business platform. For more information, go to coldsnaptowers.com.

The cost savings of routine fleet maintenance done by specialists who are familiar with meteorological towers, is significant. (Courtesy: ColdSnap Towers)

PROFILE

JAMES FISHER RENEWABLES

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www.jamesfisherrenewables.com

James Fisher Renewables is a part of James Fisher & Sons, which has 174 years of maritime experience. (Courtesy: James Fisher Renewables)

James Fisher's specialist expertise and understanding of the unique demands of the marine environment enable it to offer integrated solutions to offshore renewable energy projects around the world.

By KENNETH CARTER ◤ Wind Systems editor

As offshore wind continues to drive the industry in Europe and position itself to be a major player in the U.S., site preparation becomes an essential part of any major project.

That site preparation could involve a myriad of moving parts and tasks that must be done before, during, and after a wind farm becomes operational, and James Fisher Renewables is uniquely suited to make sure those jobs are done, and done efficiently, no matter how unusual they may be.

James Fisher Renewables is a part of James Fisher & Sons, which has 174 years of maritime experience and, even though it was founded as a shipping company, its resume of responsibilities includes dealing with ocean-based challenges from transportation and construction to crew transfers and ordnance removal.

"Our history has always been in energy — whether it was transportation of coal in the original vessel fleet, through to construction of heavy lift vessels that were helping to build coal-fired power stations in the U.K. in the '60s and '70s," said Jim Hey, managing director of James Fisher Renewables.

Now, with the globalization of offshore wind, James Fisher has positioned itself to continue to supply its decades-spanning expertise to the implementation of renewable energy in support of the broader energy transition.

MAJOR GLOBAL EXPANSION

"If you look at the build-out plans across the globe between now and 2030, and 2030 to 2050, we're going to see an acceleration in Europe; we're going to see an acceleration in the Asia Pacific; we're going to see the acceleration in the U.S, and in Brazil and South America, as well," Hey said. "And as that happens, the market matures very quickly. And we've spent a lot of time thinking about what our right is to play in that market. And effectively, we are focusing on reducing the cycle time of building offshore wind farms. That means we are focusing on preparing the ground for large marine industrial installation contractors to come in and build the foundations, install the transition pieces, install the floating foundations, install the turbine, and more."

That means honing in on areas where James Fisher can support its customers and suppliers by ensuring a site is prepared so the job can be done as efficiently as possible, and the total construction time is reduced, according to Hey.

"What that means in terms of services that we're focusing on is it's things like unexploded ordnance removal; it's things like cable installation; it's things like high-voltage testing and terminations, high-voltage commissioning, and general subsea support," he said. "It's the removal of boulders, protection and excavation of cable crossings, or pipeline crossings. It's doing the fiddly bits."

To further make his point, Hey compared what James Fisher does to a factory that manufactures suits.

"You can have machines that cut the cloth, and you can have machines that sew up the suits, but they all have to be hand-finished; to get that suit perfect, it comes off the end of the production line where it's all done by machine, and it's done very, very exactly, but somebody has to sew up the loose edges, turn up the trousers, press it, and put it on the hanger," he said. "That's really our role."

HELPING TO BUILD THINGS QUICKLY

When it comes to construction, James Fisher's role is to help make it easier for big contractors to build things quickly. When it comes to maintenance, the company focuses on maximizing generation and maximizing the export of products, essentially, according to Hey, providing an emergency response to ensure the product can get to market.

"That means high-voltage maintenance, high-voltage operations, cable repair, blade repair, gearbox oil changes, anything that's critical to making sure that you can harvest the wind, convert it into power, and get that power to shore," he said. "If any one of those links breaks, it's a little bit like a dairy farm. You have to milk the cows every day. And once you've got the milk in storage, the tanker's got to turn up and take that milk to market, otherwise you can't milk the cows tomorrow, and you've got to pour it all down the drain. It's exactly the same thing for an offshore wind farm. It's all about harnessing the wind and converting that to power and getting that power to where it's needed. And if you don't, the money pipeline stops."

MEETING CUSTOMERS' CHALLENGES

Part of James Fisher's investment strategy is making sure it has the best people, the best technology, and the best assets in order to focus on cost, time, and risk mitigation, according to Hey, which helps the company be there for whenever a customer needs a solution to a difficult challenge.

"We love that," he said. "We have a very pioneering and innovative workforce who actually takes the customer's problems and makes them their own. But typically, we get approached with, if it's an unplanned event, we will be asked, 'What's our view, and how would we approach it?' And we look for ways in which we can do it faster or more reliably or with low cost assets. We work on a very simple methodology really: The more value we can create for our customers, the more of that value we can retain for

James Fisher can support its customers and suppliers by ensuring a site is prepared so the job can be done as efficiently as possible, and the total construction time is reduced. (Courtesy: James Fisher Renewables)

ourselves. If we just provide labor, you can't keep as much value just providing labor. Whereas if you actually say, 'You know what? I can save you money. I can save you time. I can reduce your risk.' Then that really is an opportunity for us."

UNEXPLODED ORDNANCE REMOVAL

One of the more fascinating tasks James Fisher has taken on over the years when it comes to site preparation for an offshore wind farm is the removal of unexploded ordnance, much of it left over from World War II and other conflicts, according to Hey.

"If you look where all the wind farms that are being constructed in Europe, they're in the North Sea, and they're in the Baltic," he said. "That was quite a congested site for mines and also aerial bombardment. There is an awful lot of unexploded ordnance. There's also unexploded ordnance off the East Coast of the U.S. It was never fired or dropped or ports weren't mined, but at the end of the second World War, the best place it was thought to put unstable explosives was in a nice stable-temperature place where no oxygen could get to it. Guess where that was? Right off the Eastern seaboard."

Taiwan and Vietnam and the German Baltic also have unexploded ordnance that must be dealt with before serious construction of wind farms can begin, according to Hey.

"You look at all the places that wind is being considered, and, certainly, there is a risk, and, therefore, you have to verify there isn't any ordnance there, and if there is anything there, you need to deal with it," he said. "I understand in the Baltic, the German government has made a commitment that they're going to remove every single piece of (unexploded ordnance) out of the sea whether they're going to build a wind farm or not. Because you have to think about the chemicals and the propellants. You have to think about the explosive charge; you have to think about the fuses. These aren't just explosive risks; these are environmental risks. Those are nasty chemicals that leak out over time. And we're 65, 70 years on, so, are we going to leave them for another 30 years? It's quite an important area for us because we've got a long track record of actually dealing with, finding, identifying, and mitigating the threat from those devices. We've got to blow them up, or we've got to render them safe and move them."

PROTECTING MARINE LIFE

In addition to dealing with unexploded ordnance, James Fisher provides air compressors that provide noise attenuation during piling operations, according to Hey.

"That means that, when you're piling all of these monopiles into the sea, it's our compressors that are creating a bubble curtain, and the bubble curtain prevents noise from either stunning and killing fish or interfering with cetaceans' sonar," he said. "That's something that we're very proud of because it's very consistent with our purpose. We do difficult stuff in very, very challenging environments, but we're also on a mission to change the world. We want to protect the habitats that we're working in. We want to mitigate and reduce waste streams. And we want to be part of the transition to the new energy mix. We're a company that has been around for a very, very long time. And oil and gas has been very much part of our history, and it will still be part of our future as well, because oil and gas aren't going to go away completely overnight."

James Fisher operates in 40 countries worldwide. (Courtesy: James Fisher Renewables)

James Fisher also expects to be looking into hydrogen production and what role offshore wind will play, according to Hey, since the company has an established presence in transporting and transferring kerosene and crude oil.

"We're basically transferring 70 percent of the world's ship crude oil volumes that are ship-to-ship transfers," he said. "You get one super tanker with oil on it; you got another super tanker with oil. We do 70 percent of the world's ship-to-ship transfers. We're very proud of the fact that we conduct all of those activities, and our environmental record is exemplary, because when handling oil in the sea, you need to make sure that you don't spill a drop."

'IT'S A GLOBAL MARKET'

Now that offshore wind is poised for a major boom in the U.S., Hey said James Fisher has already established itself to be a significant player in its development.

"It's a global market," he said. "In the offshore wind supply chain, I would say there are very few medium-size capitalized companies in the offshore wind space. You've got large construction contractors; you've got large equipment manufacturers, OEMs, and you've got large utilities. And then in the supply chain, you've got lots of small companies providing local services. We have the luxury in that we've got a reasonably-sized balance sheet, and we also are used to operating around the world. We're already operating in 40 countries worldwide. We've been operating in the U.S., particularly in the oil and gas sector — the Gulf of Mexico and Houston — for many, many years."

ESTABLISHING A U.S. PRESENCE

With the expected growth rate in the U.S., James Fisher made a calculated bet in November 2020 that offshore wind might accelerate, according to Hey.

"We took the decision to deploy a member of our staff over there (in the U.S.), and we are currently looking to recruit a regional director," he said. "We're looking for partners; we're looking for space, and we will look for acquisitions to build a sustainable business in the U.S. And the skills will be the same. And this isn't just my personal view on things. There is a lot of learning in Europe that has been created by building offshore wind farms. But, I think it's a mistake to assume that means that the European contractors can come in and do it all and then leave again."

In that vein, Hey emphasized that James Fisher's goal is to create sustainable opportunities in the communities in which it operates.

"We've always made a virtue of taking our knowledge that's developed in Europe and in the U.K. and exporting it overseas," he said. "We believe there is a need to partner with and employ local people who have got the right skill set and the right attitudes. And we can then work with them to give them the benefit of our experience and actually help those companies and those partnerships flourish."

With all the expertise James Fisher has under its belt, offshore wind should be in good hands both now and in the future as the company looks to not only ensure renewable energy is generating thousands of megawatts, but making sure the construction of these major projects is done efficiently and safely.

"I think every organization has to be driven toward something, and ours is really focusing on these things like safety and availability, and how do we make a valid contribution?" Hey said. "What is the contribution that we can make? How do we do that well, and as safely and environmentally responsibly as possible?"

Cedric Ouellet

Director, Energy & Industrial ◤ Gastops

"Not only can we tell you that there's a problem, but we can tell you how long that problem has gone on and what your options are."

◤ What does Gastops do for the wind industry?

Gastops provides products to the wind industry that deliver unique condition-monitoring capability. Our sensors are used to understand the overall health of the drive train in the wind turbine, dispensing advanced indication of degradation of critical components. Beyond simple indication, the value proposition of our technology is that it monitors the progression of the damage, utilizing application specific algorithms, to provide invaluable information about remaining useful life, allowing the operator to optimize equipment operation, maximize life and schedule maintenance when it is required, and when it can be done in the most cost-effective manner.

◤ What went into launching your fifth-generation sensor, the MS3500?

The MS3500 is the fifth generation of our product. We had a very strong pedigree of prior-generation products that were widely accepted by OEMs (the turbine manufacturers that make the turbines) and had been in production since about 2005. Over the years, we have gained tremendous insight from customers, both from retrofit applications and from our OEM partners. We essentially brought in the new features they were asking for. The wind industry has a very high focus on lowering the cost of energy, so the MS3500 is our lowest cost sensor to date, but also introduces Ethernet connectivity to enable fully remote monitoring and maintains the high level of product quality our customers have come to expect. This is the same technology that is used to monitor the health of the engine on the F35 fighter jet ... Gastops understands how to produce a reliable sensor.

◤ What about the sensor has made it a must-have with OEMs?

First and foremost, it provides the earliest indication of damage of any sensor technology used in the wind market. Further, and equally important, it is the only technology that gives you a direct measure of the amount of damage that is occurring. Other technologies can tell you there is a problem but cannot determine how critical or how advanced the failure mode is. MetalSCAN gives you a direct indication of how far along the gearbox is in the failure mode, and how much longer the equipment can operate before reaching a point that could lead to a catastrophic failure or to secondary damage, where other components will start to fail.

For perspective, the gearbox is the most critical and most expensive component of an entire wind turbine. The ability to repair the gearbox and related components up-tower is very limited. If you do not catch a failure early enough, you get into some very heavy equipment costs to do repairs. What differentiates our product from other condition-based maintenance products is the timing and level of information provided, including options as to what actions can be taken to mitigate the problem before that maintenance is undertaken. At a high level, that is the secret sauce for Gastops, the most valuable differentiator we offer. Not only can we tell you that there is a problem, but we tell you how long that problem has been progressing, and we provide expertise on how to optimize your maintenance plan.

◤ You mentioned your enhanced monitoring service. Could you go into more detail about the service and what it will bring to the industry?

Our remote monitoring service is targeted toward the retrofit space, meaning it is for owner-operators of equipment who do not have condition-monitoring services from the OEM. Gastops' core expertise is in providing prognostic health monitoring services.

We understand how equipment fails, how equipment operates, and how maintenance should be done. We have a suite of complementary services, such as oil analysis and other techniques that are used to deep-dive equipment performance issues to further optimize maintenance scheduling and reduce the cost of energy. We are leveraging the new Ethernet connectivity of the MS3500 and packaging all these capabilities together into a remote monitoring service

that our customers can take advantage of. This is our Industrial Internet of Things (IIOT) cloud services offering that enables our customers to be able to go to a mobile device and see the health status of their critical equipment in real-time. This is a big step change in how diagnostic and prognostic information is delivered.

What are some of the other advantages MetalSCAN has over technologies already out there?

The traditional technology used for condition-monitoring in the wind market is vibration. The biggest challenge with vibration monitoring is that you need experts with PhDs to analyze the data to determine whether there is a problem with the equipment. In contrast, our technology (oil-debris monitoring) is simple and intuitive in nature. You do not need expert interpretation, because Gastops has provided the expertise in the product itself, and then offers our remote monitoring services to further enhance the value. The solution is also very scalable in the sense that you can monitor thousands of assets very easily.

Is this service a one-size-fits-all product, or does it need to be custom tailored depending on the size and make of a turbine?

We have a few models of sensors that are designed to fit most OEM platforms, but our approach has always been to co-develop application specific solutions with the OEM to optimize the accuracy of the predictive information provided and ensure they are fully engineered into these platforms. Our products are either a standard product offering from the OEM or selectable as build option, depending on the manufacturer and the model. When MetalSCAN is not purchased with the wind turbine from the OEM, Gastops offers and installs the same engineered solution as a retrofit option.

Do you see your product being a good fit with offshore turbines?

A huge benefit of our product in offshore is that it provides condition indication without needing to actually go inspect the turbine. Without remotely accessible condition-monitoring, physical inspection is the only way to check for gearbox or drivetrain damage. Just the mobilization of the crew to the turbine is a higher cost than the actual cost of our technology, and the mobilization cost for offshore is exponentially higher than for land-based assets. If an operator can avoid one trip to do an inspection, they have already paid for our product. In offshore installations, operators are using information from MetalSCAN to pre-determine what components will require replacement and are able to schedule a single visit to address the required maintenance, avoiding significant downtime and significantly reducing mobilization costs.

Do you find your service, in some respects, superior to actual eyes-on inspection?

Definitely. A thorough visual inspection is a full day of effort, and there are a lot of blind spots. There are areas you simply cannot physically inspect. With MetalSCAN, if the drive train is shedding debris (that will liberate itself in the oil) the sensor will detect it. Regardless of where it is coming from, MetalSCAN will see it.

What has been the market reaction so far to MS3500?

Our fifth-generation product is being widely adopted. We have already transitioned most of our OEM customers to this new platform that launched earlier this year. A key differentiator for Gastops is the reliability and quality of our products, and the new sensor meets the market demand for a lower cost offering, with improved connectivity features, all without compromising on quality or reliability. The bottom line is that sales have been through the roof. We are extremely busy right now. The product has been quickly and widely accepted, endorsed, shipped, and is now in the field. It is exceeding our expectations.

Has the pandemic been a problem with getting this out to OEMs or has it been negligible?

I would say that this is the strongest year for this product line ever, irrespective of the pandemic. It is a testament to the value proposition of the product line itself that it has been so successful even with everything happening in the world.

Anything else about Gastops you'd like to add that we didn't discuss?

The whole value proposition of condition monitoring in general, but specifically the transition to an IIoT approach, with the addition of Ethernet capability, and our cloud-based remote monitoring services, just goes way up as you move from land-based to offshore wind. That is a key driver for the industry, really, in terms of the importance of remote monitoring and condition monitoring, as it is costlier and more difficult to get to the turbines that are out in the ocean.

They are bigger; they are larger; and they are more expensive to protect. That is a real key focal point for where the industry is going and where Gastops is going in terms of advancing our roadmaps with respect to our remote monitoring capabilities.

I would add our focus on reliability and availability of equipment, especially given what happened in Texas recently, as it is critically important that we have the ability to see you through maintenance issues. The support that we offer when an event does happen goes beyond our remote monitoring capability. We will also work with you through any potential outage or loss of power to minimize whatever that downtime is and allow you to meet your availability targets. That sets us apart, and it is a unique offering; you are not just buying a product and then trying to figure it out yourselves. We are in it with you, for the duration.

MORE INFO www.gastops.com

RealWear's assisted reality device supports safe, hands-free work for front-line jobs in manufacturing, oil and gas, healthcare, utilities, and other industries. (Courtesy: Imint)

INNOVATION

RealWear device enables techs to collaborate safely

IMINT Image Intelligence AB, a global leader in video enhancement software, recently announced collaboration with RealWear Inc., the world's leading developer of industrial-grade assisted-reality connected devices for industrial applications. Under the agreement, Imint's pioneering Vidhance software is integrated into RealWear's flagship HMT-1 voice-controlled device — delivering the industry's clearest, most stable video performance to frontline workers who need hands-free access for visual communications and information.

Already a pioneer in the mobile industry, partnering with blue-chip brands such as Xiaomi, Vivo, and Motorola, among many others, this collaboration marks Imint's debut into the head-mounted display and enterprise wearable markets — which, like smartphones, stand to benefit significantly from professional-quality video performance.

"RealWear's hands-free platform is the gold standard for industrial wearables and is an ideal application for Imint's industry-leading video optimization software — which has already proven essential in today's leading smartphones and other mobile devices," said Andreas Lifvendahl, CEO, Imint. "Imint's Vidhance video enhancement software, together with RealWear's advanced technology, ensures optimal video performance for both recording procedures and real-time viewing by a remote expert."

RealWear's assisted reality device supports safe, hands-free work for front-line jobs in manufacturing, oil and gas, healthcare, utilities, and other industries. In light of the ongoing COVID-19 pandemic, organizations are seeking solutions to give remote experts access to onsite frontline workers. The HMT-1 voice-enabled solution gives workers real-time access to documents, workflows, visual data, and remote experts while on the job.

Remote mentoring on RealWear's assisted reality, hands-free platform has gone global in large part due to the pandemic, leveraging certified voice-enabled apps such as Microsoft Teams, Cisco WebEx Expert on Demand, Zoom, or other purpose-built software. The HMT-1 allows remote

technicians to "see" what frontline workers see while maintaining a safe distance during the pandemic or by bringing their expertise to bear without incurring travel costs. However, doing so effectively requires stable, high-quality video processing.

To achieve this, RealWear is leveraging Imint's Vidhance video optimization software, which is included in Release 12 of the HMT firmware update, which became available March 2021. Specifically, RealWear Release 12 will incorporate Imint's Vidhance Video Stabilization and Vidhance Dynamic Blur Reduction, two technologies that intelligently compensate for camera movement to deliver the most stable video possible, especially in low-light environments.

"A superior video experience on the HMT-1 has always been critical to performing mission-critical tasks while using both hands on the job," said Dr. Chris Parkinson, chief technology officer. "By integrating Vidhance into our firmware, it's helping take remote mentor to the next level. Through our early access program, we've already received very positive feedback about the stable video experience."

The cumulative effect of Imint's Vidhance software algorithms on the HMT platform is video that is significantly more stable, balanced, and clear — ensuring professionals receiving a feed from an HMT headset have the highest-quality picture possible of the situation and can take decisive action.

MORE INFO weareimint.com

A shift toward smarter asset investment and predictability of O&M has been made possible with the combined expertise of SkySpecs, Fincovi, and Vertikal AI. (Courtesy: SkySpecs)

INNOVATION

SkySpecs acquires two European wind-tech companies

SkySpecs, a global leader in wind-energy technology, has acquired two of Europe's premier wind-energy companies: Fincovi, a leader in financial asset management, and Vertikal AI, a pioneer in predictive maintenance for wind energy. The combined entity brings together world-class data insight and automation to help wind-farm owner-operators to optimally invest in, maintain, and manage their assets for sustainable returns.

Serving customers in 26 countries, SkySpecs, Fincovi, and Vertikal AI have offices in Ann Arbor, Michigan; Amsterdam, The Netherlands; Dublin, Ireland; Vejle, Denmark; and Hyderabad, India.

"Our global customers are facing critical challenges when it comes to budgeting and maximizing the life and returns of their assets as the wind industry matures," said Danny Ellis, CEO of SkySpecs. "We are thrilled to join forces with these two great companies to equip global wind customers with the tools to best utilize capital and keep a pulse on their assets' health and performance. Our vision requires world-class data, predictive insight, and automation. Collectively, we will help wind-farm owners and operators to best invest in, maintain, and manage the world's top-performing wind assets."

"There is an incredible opportunity to integrate operating data with financial data to provide better insight into asset investment," said Ray O'Neill, CEO of Fincovi. "Our team can't wait to combine our capabilities to help wind-farm owners decide how to invest their next dollar."

"We use data analytics and applied AI to optimize the real-time health of wind turbines," said Allan Larsen, CEO of Vertikal AI. "Joining with SkySpecs will enable us to deliver our predictive maintenance software to the market — at scale — for the greatest performance impact with wind producers."

As the wind industry matures and assets age, there is an urgent need for wind-farm owners, operators, and OEMs to seek out data-driven predictive insight and automation to best manage operating expenses, extend asset life, and realize optimal total production. This demand is creating an incredible opportunity for the united entity of SkySpecs, Fincovi and Vertikal AI.

MORE INFO skyspecs.com

CONSTRUCTION

Vestas enters Latvian market with 59-MW wind project

Marking its entrance into the Latvian wind market, Vestas has secured a 59-MW order at the Targale wind project from a special purpose company majority owned by Utilitas, the Estonian utility provider.

The Targale project is in Ventspils municipality in western Latvia, and will be powered by 14 V136-4.2 MW turbines at a hub height of 82 meters.

With only 65 MW of wind capacity installed in Latvia, this project is due to nearly double the total installed capacity in the country, as Latvia makes progress toward its target to procure 50 percent of energy from renewable energy sources by 2030. To support the country's wind-energy ambitions, Vestas opened its first office in Latvia in April 2021.

Vestas will supply and install turbines and will provide service for the project through a long-term 20-year Active Output Management 5000 (AOM 5000) service agreement, providing power performance certainty and Vestas' industry-leading service expertise throughout the lifetime of the project.

"Our first project with Utilitas also marks Vestas' arrival in Latvia," said Nils de Baar, president of Vestas Northern & Central Europe. "We are positive about Latvia as a market and are delighted to be selected to provide turbines and long-term service at the Targale project. This project can be a bellwether for the Latvian wind industry, as the country advances its strong performance on clean energy toward 50 percent renewable energy penetration by 2030."

"We are delighted to partner with Vestas, the largest manufacturer of wind-turbine generators, to build the wind park Targale together," said Rene Tammist, development manager at Utilitas. "The explicit technological innovations in terms of efficient and environmentally friendly energy production that Vestas provide will contribute greatly to the renewable energy sector in Latvia. I am convinced that their presence in the Baltics will even more support the wind-energy development in the region."

Turbine delivery to the Targale project will begin in the second quarter of 2022, and commissioning will begin in the third quarter of the same year.

To seal Vestas' entry into Latvia and to service new wind projects such as Targale, plans are also underway to establish a local Vestas service hub in Latvia in 2022, near Ventspils port.

MORE INFO www.vestas.com

Ameresco's 9.2-MW Wind Project for PPC Renewables completes construction in Kefalonia, Greece. (Courtesy: Ameresco)

CONSTRUCTION

Ameresco's 9.2-MW wind project is up and running

Ameresco, Inc., a leading cleantech integrator specializing in energy efficiency and renewable energy, recently announced that its wind-turbine project at Xerakia Dilinata of the Municipality of Kefalonia, Greece, has completed construction and is in operation. The project is Ameresco's first international wind project completed on continental Europe and expands the company's presence as a leader in renewable energy. It was secured as part of a design, build, operate, and maintain (DBOM) contract awarded to Ameresco in 2019 by PPC Renewables SA (PPCR), a wholly owned subsidiary of Public Power Corporation SA, Greece's largest power generation company.

Located against the picturesque backdrop of Kefalonia Island, the Kefalonia Wind Project tasked Ameresco with the design and construction of four 2.3 MW wind turbines that will be operated and maintained under an additional 14-year fixed price contract. The 9.8 million euro renewable energy project will supply clean energy to the area, ensuring the island's natural beauty and resources are preserved for future generations.

"In benefiting our local communities with enhanced renewable energy

solutions, we contribute to Greece's standing as a notable international player in the renewable energy space," said Konstantinos Mavros, CEO of PPCR. "We have been pleased to work together in partnership with the Ameresco team and are proud to be a part of such a meaningful initiative."

The Kefalonia Wind Project will advance Greece's environmental sustainability goals by improving the country's overall environmental footprint and reducing carbon dioxide emissions by 22,000 tons each year. That figure results in savings equivalent to 4,753 passenger cars not driven, 2,475,526 gallons of gasoline not burned, or 28,731 acres of pine forest conserved. PPCR will also return 3 percent of revenues received from the project to local governments and communities as an added cost savings benefit from the project.

"The beauty of Kefalonia is unmatched, and we're thrilled to be contributing to the preservation and betterment of the municipality and its residents both fiscally and environmentally," said Britta MacIntosh, senior vice president at Ameresco. "This project demonstrates our commitment at Ameresco to providing renewable energy solutions that advance sustainability goals globally."

MORE INFO www.ameresco.com/energy-efficiency

CONSTRUCTION

Exus wins repowering contract for 240-MW Big Sky Wind Farm

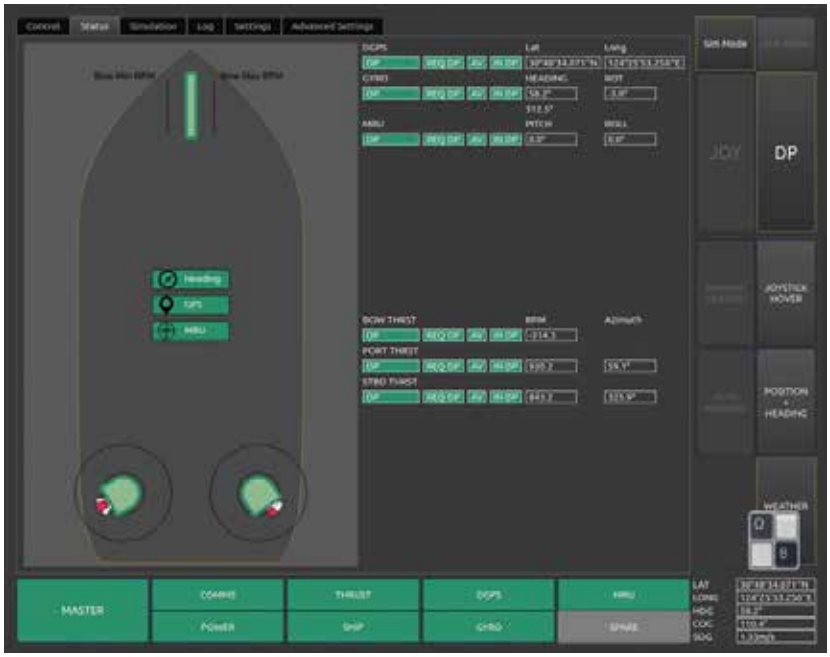
Exus Management Partners, a leading expert in powering sustainable investments through operational excellence, has been selected to lead the repowering of Illinois' Big Sky Wind Farm by Vitol. The deal follows Vitol's acquisition of the project from a BlackRock-managed fund earlier this year.

Exus will play a central role in Vitol's plan to invest more than $250 million to upgrade the project, with the repowering expected to increase Big Sky's annual energy output by 60 percent by the end of 2022. The scheme will entail the installation of highly efficient Vestas wind turbines using the existing foundations and towers.

Exus will provide asset management services for the project and handle the permitting for its repowering, enabling Vitol to optimize returns and continue enhancing its participation in the green energy transition.

As well as offsetting more than 620,000 tons of CO_2 emissions each year, Exus' involvement will incorporate a variety of environmental and community activities, including support for regional wetland and prairie reserves and sponsorship of local cultural events.

Wind farms typically have a lifes-



Reygar's BareFLEET system provides enhanced vessel health, performance, and motion data to drive maximum operational efficiency. (Courtesy: Reygar)

pan of about 20 years, but individual turbines can begin to lose productivity due to wear and tear within a decade of their construction. With approximately 40 GW of U.S. wind capacity now more than 10 years old, including Big Sky Wind Farm, it is becoming increasingly cost-effective for owners of older wind farms to replace turbines with new, more advanced models.

"Repowering is a rapidly growing trend in U.S. wind," said Mike Speerschneider, development partner at Exus. "Increasing numbers of projects are approaching a decade or more in their life cycle, experiencing associated losses in efficiency. Larger and more efficient turbine technologies are helping projects generate electricity at a level that makes the investment worthwhile and supports the energy transition. Exus is proud to be working alongside Vitol at the forefront of US wind repowering."

"Big Sky is well placed to deliver clean energy to our commercial and industrial customers, as well as the highly liquid PJM power market, and is the latest example of our ongoing commitment as one of the market leaders in the shift towards renewable energy," said R. Andrew de Pass, head of Renewables at Vitol Inc. "We are excited to be working with Exus to optimize the project, while aligning with our premium standards of ESG investing."

MORE INFO www.exuspartners.com

MAINTENANCE

U.S. vessel operators push to meet offshore wind ambitions

As offshore wind expands in the U.S., local commercial vessel and workboat operators looking to become leaders in the emerging offshore support market must respond to the demands of project owners whose standards and ways of working have been established in the mature European sector.

That is according to Reygar Ltd, the firm behind the innovative advanced remote monitoring platform, BareFLEET, which is seeing growing demand from U.S. vessel operators.

Across Europe and, increasingly, Asia-Pacific, offshore wind project owners focused on maximizing the availability and, therefore, profitability of their assets are mandating for advanced remote monitoring and reporting technologies across both their direct operations via their operations and maintenance providers, but also their operator's support fleet. As these mature project owners begin to establish interests stateside, it is clear that digitalized O&M will be a requirement of firms looking to determine their place in the burgeoning U.S. offshore support market, too.

Fortunately, many firms working across the U.S. workboat and commercial vessel sector are already beginning to invest in cost-effective monitoring platforms integrated into their existing vessel systems. Harbor tug, ferry, and pilot boat operators in particular are looking to these systems to cut downtime via real time data-informed planned maintenance across their varied fleets, allowing them to guarantee a continued high quality of service to existing clients.

"Forward thinking commercial vessel operators are already working to secure their place in the U.S. offshore market, but to become sector leaders they must be able to capitalize on what we already know from firms operating globally: that a willingness to be transparent with vessel health, performance, and safety data is critical to winning contracts," said Chris Huxley Reynard, managing director of BareFLEET. "In order to prepare for entry to this emerging market, we have begun working with a number of commercial vessel operators to deploy the BareFLEET monitoring and reporting system across their diverse vessels and onboard systems. As BareFLEET is technology agnostic, it can be integrated into each vessel firm's preferred fleet and business management system, preventative maintenance system, and supplementary data analysis platform. This reduces administrative workload ahead of the businesses scaling up."

The BareFLEET system monitors vessel health, navigational, and performance data from across any vessel

or critical equipment type. As well as informing accurate daily reporting and baseline comparisons, it provides the data for a "deep dive" into values such as motion, fuel use, and engine health in order to inform operational improvements where relevant.

"Over the past few years, BareFLEET has been mandated by a number of global offshore wind project owners as the 'must have' system for their contractors," Reynard said. "We have worked hard to ensure that this does not present a challenge for operators, but is instead an opportunity for them to achieve goals such as environmental compliance, optimized crew comfort, and reduced emissions and fuel use — all while freeing up the time and resource for the crew and O&M team to do what they do best — guarantee excellent, consistent service to their customers."

MORE INFO www.reygar.co.uk

MAINTENANCE

Guardian expands into 360-degree height safety offer

Pure Safety Group recently announced its family of height safety brands — Stronghold by PSG, Ty-Flōt, Checkmate, ESG, and HART — have all been brought under the Guardian banner. The expanded Guardian is now the world's largest independent fall protection and prevention brand.

"We are excited by Guardian brand awareness levels amongst the core end user groups we strive to protect," said Jeff Ward, Guardian CEO. "We are proud to further extend the brand offering into an unrivaled range of fall protection and prevention solutions. Our vision is to blend scale with agility to make it easier than ever for our partners to operate safely at height. This is the start of a new journey for Guardian with several exciting initiatives in the pipeline over the coming months."

The announcement comes at a time of meaningful investment by Guardian. Its manufacturing and supply chain team has grown under the leadership of recently appointed SVP of Operations, Derek Grant.

The sales team has been strengthened with multiple hires — led by newly appointed industry veteran, Dale Bartelson, SVP of sales and marketing. New specialist roles have been created to further deepen expertise and partner support in areas such as dropped object prevention and foreign material exclusion. And its fast-growing engineered systems and training arms continue to expand as they take on a greater strategic role within the business.

MORE INFO guardianfall.com

MANUFACTURING

Timken innovation drives market sector outgrowth, leadership

The Timken Company, a global industrial leader in engineered bearings and power transmission products, recently announced it achieved industry-leading growth in service to wind-energy customers over the last five years. During this period, Timken significantly outgrew this market sector by registering a compound annual growth rate (CAGR) of 17 percent, compared to an estimated 7 percent CAGR for the industry as a whole. Timken is poised to capitalize further as global demand for equipment and services for the growing wind-energy sector continues to increase. The company anticipates another record year for wind-related revenue in 2021 and remains well-positioned to succeed in this market sector over the long term.

"With global demand on the rise for renewable energy sources, our customers' success depends on designing larger, more powerful and efficient wind turbines," said Andreas Roellgen, Timken vice president, Europe, Asia, Africa.

"As wind-turbine manufacturers continue to push the limits on performance, designing and manufacturing bearings for them is increasing in complexity. Timken's long history of technical problem solving and engineering innovation for the world's most challenging applications continues to be a significant advantage for our customers in the wind energy industry."

Timken products, such as engineered bearings and lubrication systems, are designed to help wind turbines operate with greater efficiency in producing power. Also, the company's maintenance services help maximize a turbine's performance over its lifetime.

Timken increased its presence in both gear drive and main shaft equipment as the global wind energy market sector experienced rapid growth in 2020. And ongoing trends — such as OEMs building larger turbines that generate more power, and turbine main shaft designs that increasingly rely on tapered roller bearings to take on additional loading — continue to favor the company going forward. In fact, Timken demonstrated its industry leadership by recently partnering with a leading OEM to design and manufacture bearings for the world's largest and most powerful wind turbine.

Timken, which entered the wind-energy market sector about 15 years ago and has since become a technology leader in the industry and a leading technical partner for wind-turbine and gear-drive OEMs, offers customers a complete engineering solution that meets an application's demanding duty cycles.

Employing its collaborative technical sales model, the company works with customers to understand their most important success factors and key challenges. This tried-and-trusted approach is paying off in the rapidly evolving wind-energy sector, where Timken has been able to provide timely support to customers with solutions for new wind installations as well as existing designs that are underperforming. Given that the industry's

Replacing main shaft bearings with upgraded Timken® bearings with wear-resistant coatings can help wind operators reduce maintenance costs over the turbine lifecycle. (Courtesy: The Timken Company)

growing base of installed turbines generally requires a major overhaul after 10 to 15 years, Timken is well-positioned to support not only new equipment, but also the increasing demand for maintenance, repair, and overhaul services. "Downtime and repairs can be very costly for wind-turbine operators, and our wind-energy solutions support our customers' needs to optimize reliability, cost, and performance," Roellgen said.

For example, to help increase the service life of bearings in wind-turbine main shaft applications, Timken developed a thin-film coating that simultaneously increases surface hardness and wear-resistance, while reducing friction.

MORE INFO www.timken.com

MANUFACTURING

Composite-core based conductors can help wind sector

Wind power is particularly advantageous over other renewable energy resources as it doesn't require water and takes up minimal lateral space.

But creating powerful, environmentally friendly energy resources requires an equally beneficial material choice to produce and transmit their power.

Composites are already well known for aiding the wind-power sector. A significant amount of a turbine blade's strength comes from its spar caps, the support beams inside the blades. Making the spar caps from carbon fiber reduces the weight of the turbine blade, so manufacturers can produce longer blades to increase power output and efficiency.

However, in order to increase adoption of wind power into widespread infrastructure, the performance of the wind turbines and their power transmission across the grid need to be optimized.

The major limiting factor for how much wind power can be connected to the grid is often the maximum current capacity of the overhead lines. Maximum current capacity is determined by the line temperature limit, which ensures a safe distance between the line and the ground.

Going beyond the capacity overheats the wire, triggering a "thermal

Composite cored conductors can carry approximately twice the current of steel-cored conductors at much cooler operating temperatures. (Courtesy: Exel Composites)

sag," which can lead to power outages and pose a health and safety risk.

One solution is to install more cable lines, but this involves the acquisition of new land rights, passing environmental regulations, lengthy installation time and additional labor costs. A quicker and more cost-effective solution is to upgrade the existing lines.

Traditional power cable wires, or conductors, are aluminum conductor steel reinforced (ACSR) conductors that consist of an outer aluminum conducting ring with a steel core that provides support and strength.

However, steel has a high coefficient of thermal expansion (CTE), which means steel core cables expand significantly when heated, leading to thermal sag.

Instead, aluminum conductor composite reinforced (ACCR) conductors have a much lower CTE than steel, meaning they can withstand higher temperatures without causing the cable to sag, making the cable a high-temperature, low-sag (HTLS) conductor.

Composite cored conductors can carry approximately twice the current of steel-cored conductors at much cooler operating temperatures. Composite cores also have a higher strength-to-weight ratio than steel, allowing a greater amount of aluminum in the cable for power transmission without weighting the cable down.

Exel Composites manufactures composite cores for overhead cables, as well as composite materials for wind-turbine blades, which can be combined with composite core reinforced cables to bring a large wind power source to urban infrastructure.

Wind power is already a popular clean energy source, but power grid infrastructure often limits its potential. Composites are aiding the adoption of wind power, not only by making turbines more powerful and efficient, but also by increasing the current capacity of power cables.

MORE INFO www.exelcomposites.com

MANUFACTURING

Tech ensures signal continuity in harsh environments

Greene Tweed, a leading global manufacturer of high-performance elastomers, thermoplastics, composites, and engineered components, recently announced its Seal-Connect® product line. These engineered connectors ensure reliability in data and electrical connections in a wide variety of applications across multiple industries, while providing a reliable seal.

Seal-Connect products are designed for use in environments typical of the energy, aerospace, and defense industries. (Courtesy: Greene Tweed)

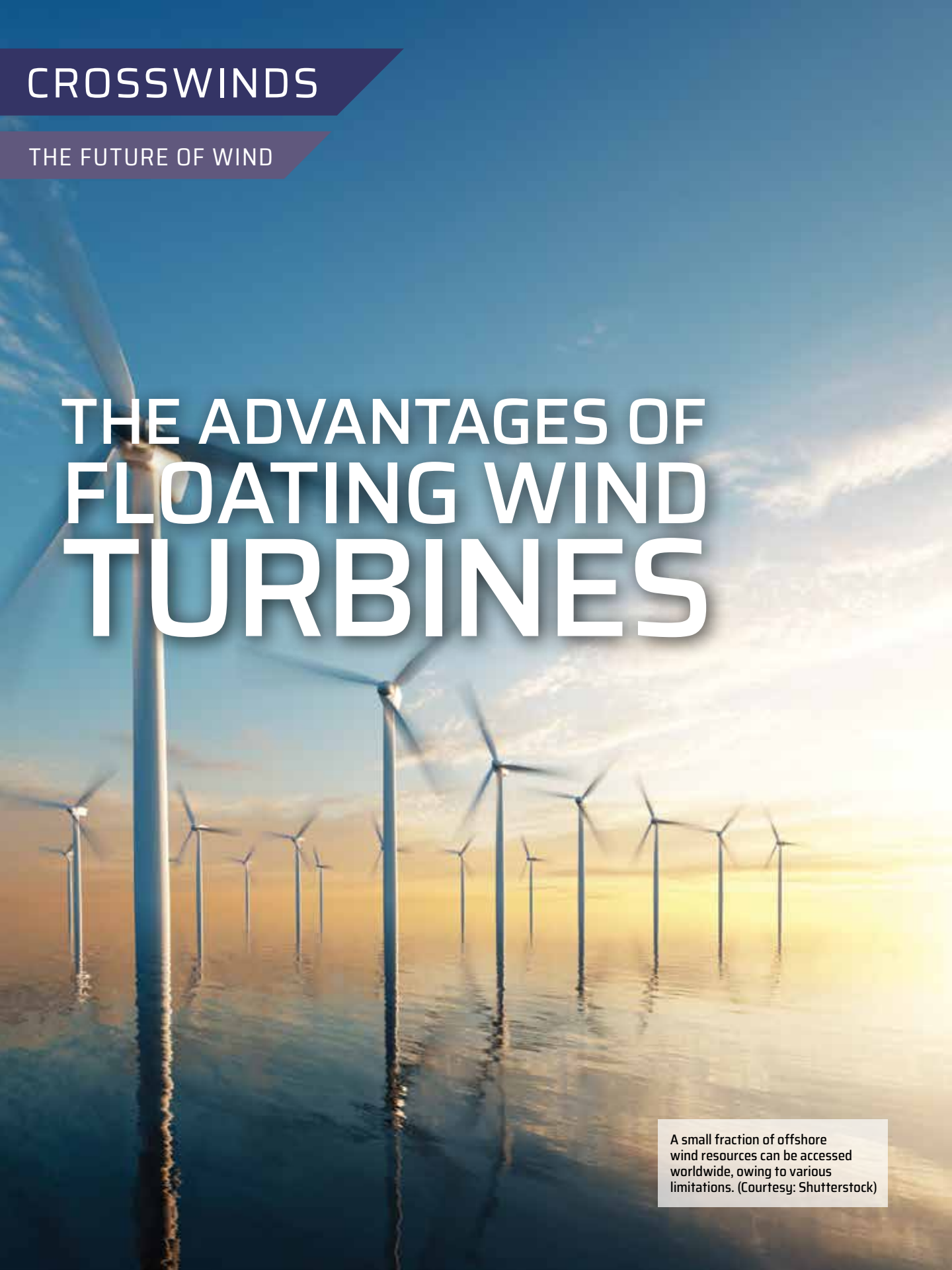
Seal-Connect products are available in three types: electrical, fiber-optic, and hybrid electrical and fiber. The products are designed for use in primarily high temperature and/or high-pressure environments typical of the energy, aerospace, and defense industries. Greene Tweed's connectors protect sensitive electronic and sensor assemblies that are critical to customer success. Proprietary materials and technologies allow Greene Tweed to provide advantageous solutions comparable or better than traditional glass-to-metal seals typically found in connectors. This creates a seal ideal for high-temperature and pressure environments common to the energy, aerospace, and defense industries, where hermeticity and signal insulation are critical.

Greene Tweed's engineers understand application needs across the energy, aerospace, and defense markets and how materials behave in a wide range of operating environments to offer the best Seal-Connect ® product solution. Greene Tweed's design experience is backed by application success and extensive laboratory testing.

In addition to the wide variety of Seal-Connect® solutions already available in its portfolio, Greene Tweed's industry-experienced design and application engineers will collaborate with customers to design connectors to meet specific application requirements and specifications.

MORE INFO www.gtweed.com

THE ADVANTAGES OF FLOATING WIND TURBINES



A small fraction of offshore wind resources can be accessed worldwide, owing to various limitations. (Courtesy: Shutterstock)

New floating wind-turbine projects and government initiatives could set the scene for the development of green energy.

By AKSHITA PACHOLI

Floating wind-turbine platforms are becoming one of the most electrifying technical advances for the wind industry, as the concept gains popularity over conventional offshore wind turbines for its numerous advantages.

For starters, floating wind turbines are able to take advantage of wind resources farther out to sea over deeper waters. Secondly, offshore wind is less likely to face challenges and resistance that land-based turbines might. The advent of floating wind turbines has minimized that challenge without competing for land. On top of that, floating wind turbines are cost-efficient, requiring fewer construction materials, and, at the same time, it does not require marine engineering expertise for assembling.

Presently, a small fraction of offshore wind resources can be accessed worldwide, owing to various limitations. These floating offshore prototypes, therefore, are still in their infancy and will need more time before they are mass produced and commercialized. At the same time, the numerous challenges faced by the wind industry are further leading toward innovative and efficient options. The advantages of floating wind turbines, on the other hand, are gaining popularity, followed by high investment expectations. Market players are implementing various strategies to expand the prospects of the industry, while a number of activities are transpiring across the market.

JOINT VENTURES

Joint ventures are trending high among the market players, and investments for new and innovative projects based on green energy also are gaining traction all across the world. A global energy company, Shell, recently announced its joint venture with Simply Blue Energy, a transformative and sustainable marine-projects developer based in Ireland. The venture is established for the Emerald project that involves a floating wind farm in the Celtic Sea. The project is in its infancy and is intended to achieve the huge potential for vast floating wind in the Irish area of the sea. Moreover, the infrastructure to power the large-scale project is specially designed and is expected to augment the energy independence in the region along with reducing emissions.

A Swedish company and developer of vertical-axis floating wind turbines, Sea Twirl, recently announced it has been granted a patent for its wind turbine from Japan. As stated by the company, the patent uses a vertical-axis wind turbine with a tower connected to the sub-sea structure, consisting of a floating element and a keel. As the energy of the wind causes the turbine to rotate, the structure maintains its stability by using the keel and the counter turning moment, similar to the function of a keel on a sail boat. The company added that it minimizes the cost for installation and maintenance along with simultaneously reducing the downtime. Moreover, the company aims to put the commercial unit for sale and contribute to developing a floating offshore wind farm.

GOVERNMENT INVOLVEMENT

In addition to the companies, government bodies also are investing in new projects. The U.K. recently announced funding of more than £90 million in support of green technologies. The government has set three challenges that include offshore wind, energy storage, and biomass production. Nearly £20 million would be used to augment the potential of floating offshore wind technology. Moreover, the initiative would work toward positive governmental goals that include more jobs, low deployment costs, and confronting climate change.

The U.K. recently announced funding of more than £90 million in support of green technologies. The government has set three challenges that include offshore wind, energy storage, and biomass production. Nearly £20 million would be used to augment the potential of floating offshore wind technology.

The need to constantly improve efficient, eco-friendly, and lower-cost options for energy generation remains a top priority for businesses and governments alike. Floating wind turbines are expected to accomplish this in an effective way; however, the high cost of installation could limit its popularity.

Even with that caveat, it carries huge potential for offshore wind-energy production.

With the world already experiencing the impacts of technology and development, floating wind-turbine platforms are emerging as a way to boost the switch toward green energy. This has further encouraged industries to shift toward environmentally friendly ways of development; therefore, the industry is expected to grow. The demand for renewable power sources increases every year. According to a report published by Allied Market Research, the global floating wind turbine market is anticipated to reach $30.6 billion by 2027.

A growing concern from governments around the globe regarding renewable power sources is anticipated to boost the floating wind turbine market. (Courtesy: Shutterstock)

FLOATING OFFSHORE BOOST

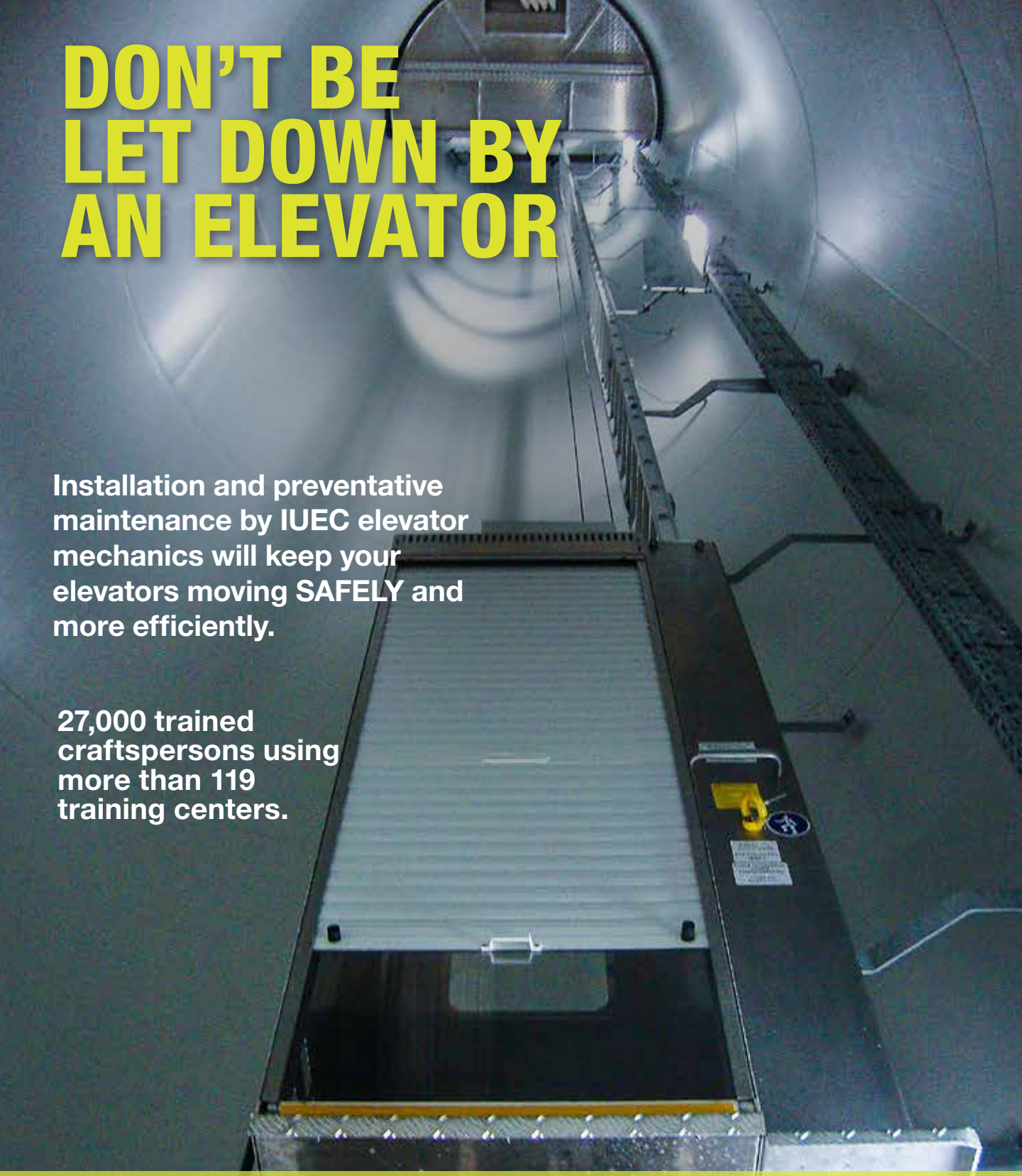
In that vein, a growing concern from governments around the globe regarding renewable power sources is anticipated to boost the floating wind turbine market. Why? Because about 80 percent of offshore wind resources are in waters deeper than 60 meters, where a fixed offshore turbine is not effective. Since the floating structure can harness wind resources at deeper water levels, it is more effective in narrow continental shelf regions with sea water depths of more than 200 meters. In addition, floating wind turbines can decrease the cost of energy production more than that of fixed wind turbines in the long term. For instance, the current levelized cost of energy (LCOE) for a wind turbine in Europe is about $220-$245, but it is expected to reach $50-$73 by 2030.

Floating turbines also have a higher energy capacity factor with lower carbon emissions, which further augments their demand. Moreover, the advancements in wind-turbine structures pave the way for numerous opportunities. The investments and funding for new projects are increasing, and governments are taking initiatives for more developments. Also, industry players are adopting further strategies to contribute to advanced technologies and expand the market field. Nevertheless, with all these aspects, the market is expected to witness exponential growth in the future.

ABOUT THE AUTHOR

Akshita Pacholi has accomplished Masters degree in English Literature and presently is working as a content writer with Allied Market Research.

AD INDEX



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