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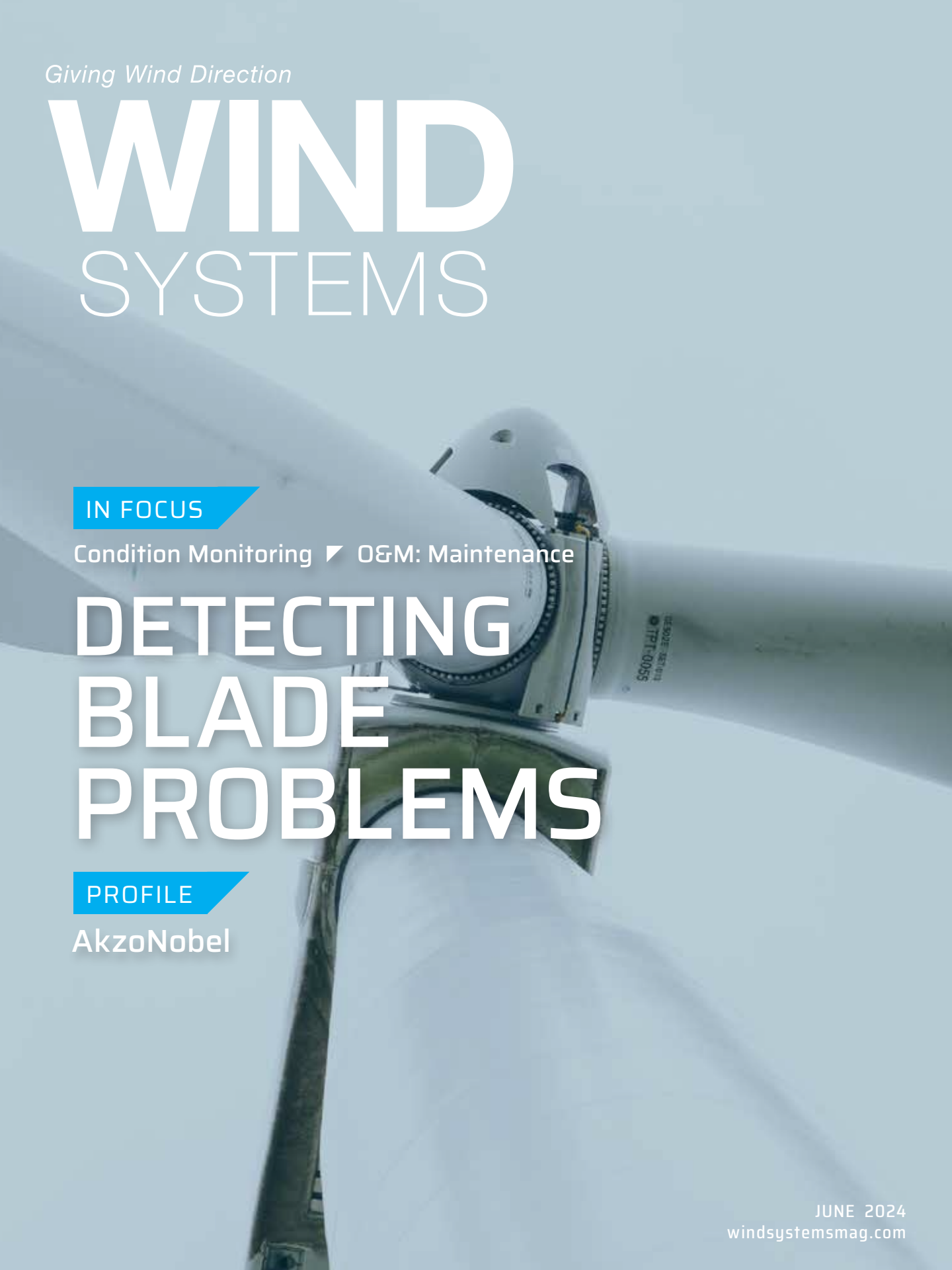

IN FOCUS

Condition Monitoring ◤ O&M: Maintenance

DETECTING BLADE PROBLEMS

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◤ THE FUTURE OF WIND

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LEADING THE CLEAN-POWER CONVERSATION

At a successful CLEANPOWER 2024, the American Clean Power Association brought together a diverse panel of experts to discuss the future of renewables in the U.S. and beyond.

TAILWINDS

THE BUSINESS OF WIND

◤ CONSTRUCTION

◤ INNOVATION

◤ MAINTENANCE

◤ MANUFACTURING

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CLEANPOWER is a Twin Cities success

One of the best reasons for having a digital-only issue is that I am often able to get wind-energy news to you a lot quicker.

Case in point: Our *Wind Systems* team recently returned from a successful trip to CLEANPOWER 2024 in Minneapolis, Minnesota.

In between hunting down a statue of Mary Tyler Moore, we were able to spend time with colleagues and industry friends who have a finger on the pulse of the wind-energy industry.

According to the American Clean Power Association, more than 10,000 people explored the 480-plus exhibits that crisscrossed the Minneapolis Convention Center floor. There were also dozens of panel discussions throughout the three-day event discussing practically every aspect of what renewables can do to advance zero-carbon goals that may seem like a long way off, but, in actuality, are closer than you might think.

This issue has several articles of interest that are a direct result of being at CLEANPOWER, but our June issue also has a lot of information designed to address the issue's main focus on maintenance and condition monitoring.

Crosswinds features a breakdown of what was discussed at CLEANPOWER's opening remarks panel. In the article, ACP CEO Jason Grumet talks about where clean-energy stands today, as well as what will be needed moving forward.

During CLEANPOWER's opening session, Minnesota Gov. Tim Walz was also on hand to let attendees know what his state is doing to advance clean energy initiatives.

With all that forward momentum, it makes it even more important to look at ways to ensure the turbines in operation today keep spinning.

Our cover article, which was written from information at a CLEANPOWER session, takes a look at how ONYX Insight is extending its condition monitoring software to monitor potential challenges in a turbine's blades.

Also, as part of this month's inFocus features, is an article that looks at lessons learned by mitigating offshore wind farm risk from extreme weather events and an article examining efficient thermal management systems within wind-turbine components.

CLEANPOWER was definitely a success, and it demonstrated that, even with a few setbacks, there is ultimately no stopping the industry's drive to make a better future for everyone.

Enjoy your summer, and, as always, thanks for reading!

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ACP teams with Crux for tax credit transfers

From American Clean Power

American Clean Power Association recently announced a partnership with sustainable finance technology company Crux to make clean energy tax credit transfers more accessible to the clean energy industry. American Clean Power's 800-plus member companies will be able to access discounted transaction fees on Crux's platform.

"Our partnership with Crux will help catalyze accessible funding alternatives for clean energy," said Jason Grumet, ACP CEO. "By simplifying the ability to monetize tax credits, the industry can invest more effectively and flexibly, bringing more projects, jobs, and investment to communities across the U.S. This collaboration underscores ACP's commitment to leading innovative solutions that drive the industry forward."

Crux is changing the way clean energy projects are financed in the United States, starting with transactions for the new transferable clean energy tax credits created by the Inflation Reduction Act. The new transferable tax equity market allows, for the first time, clean energy developers and manufacturers to sell their tax credits to third parties for cash, creating a market mechanism to expand access to capital for clean energy infrastructure, innovative technologies, and advanced manufacturing.

This partnership provides ACP members with discounts on transferable tax credits transaction fees as well as access to programming and insights developed by Crux.

"Capitalizing on the tremendous growth opportunity for our clean energy sector and maximizing the tax incentives provided by the IRA requires expanding the tax equity investor base," said Susan Nickey, ACP board chair and chief client officer at HASI. "Partnering with Crux provides the industry with critical tools, data, and pricing transparency to build a robust and efficient market for tax credit transfer transactions. I am thrilled to see ACP members gain access to key resources to help accelerate the deployment of clean energy solutions."

ACP launched the partnership in Minneapolis at CLEANPOWER 2024.

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

Offshore wind approved for construction in the U.S. surpassed 10 GW during the first quarter of 2024. (Courtesy: Vineyard Wind)

U.S. offshore wind's first quarter marked by transitions

The U.S. offshore wind market transitioned from planning to commercialization in the first quarter of 2024. In total, the amount approved for construction in the U.S. surpassed 10 GW during the first quarter of 2024. These and other key industry findings are detailed in Oceantic Network's U.S. Offshore Wind Quarterly Market Report, which highlights announced investments, advancements of the review process for several projects, and notable policy developments that drove the U.S. market forward between January and March of 2024.

Notable milestones include Ørsted and Eversource's completion of the South Fork Wind project in March. Next up is Vineyard Wind, to be completed later this year, which also began delivering power to the grid. Meanwhile, two new projects, collectively triple the size of South Fork and Vineyard, were announced to begin installation this summer.

"In the first quarter, our industry moved from concept to reality with projects now delivering power to the grid," said Sam Salustro, vice president of strategic communications at Oceantic Network. "No longer will the question be whether the U.S. builds offshore wind projects, but how many and how fast. This summer we'll see the market move into a new region with the start of Dominion Energy's Coastal Virginia Offshore Wind in the mid-Atlantic, and a third project in the Northeast with Revolution Wind."

Further market strength was showcased in the first quarter with the ninth CTV launch, and fourth this year, for the U.S. market and a new $700 million investment in a steel tower facility. These announcements along with new tax guidance will enable the Inflation Reduction Act to benefit even more projects.

"We will continue to hit speed bumps, like New York's announcement (recently) regarding recently awarded projects, but we are still seeing the market build momentum," Salustro said. "The wind is at our backs; now we must continue our work to build a supply chain for offshore wind."

The first quarter of 2024 signaled a new era for the industry with American homes being powered by offshore wind energy. The report identified several further advancements, including:

- The Bureau of Ocean Energy Management (BOEM) increased the total capacity approved for construction by more than 30 percent as the U.S. more than quintupled its installed offshore wind capacity — from 42 MW to 242 MW.
- U.S. Forged Rings announced a new $700 million tower and forge facility on the East Coast, an investment based purely on the strength of the U.S. market.
- Another 4,000 MW of projects are expected to begin installation activities this summer.
- New IRS tax guidance will drive down costs for a range of offshore wind activities across the East Coast.
- Four new crew transfer vessels, the workhorse of the offshore wind industry, have launched in just the past three months.
- New offtake awards contain provisions supporting supply chain investments throughout the East Coast.

MORE INFO www.oceantic.org/us-offshore-wind-quarterly-market-report

Report: Offshore wind can benefit Louisiana

Louisiana businesses and workers stand to benefit from expansion of offshore wind nationally and in the Gulf of Mexico, according to the Louisiana Offshore Wind Supply Chain Assessment, released by the Southeastern Wind Coalition, GNO Inc., Center for Planning Excellence, and The Pew Charitable Trusts, with research partner and global energy consultancy Xodus Group. The report identifies recommendations to tap into more Louisiana know-how to help build offshore wind in U.S. waters.

"This state is already a national leader for offshore construction. Harnessing that expertise and infrastructure for offshore wind is a logical next step," said Hillary Bright, VP of Renewables for Xodus Group. "The opportunity for Louisiana is real, and it's here right now for Louisiana's suppliers."

"The report is clear: Louisiana can be a leader in supplying the goods and services for the build out of offshore wind along both coasts," said Courtney Durham Shane, a senior officer on Pew's energy modernization project. "This industry is expected to bring over $100 billion in private investment and nearly 50,000 jobs across the U.S, much of which can be realized by Louisiana businesses and workers."

The findings come on the heels of the recent federal government announcement of new offshore lease opportunities in the Gulf of Mexico, which have the potential to power up to 1.2 million homes and create jobs and economic development across Louisiana. The report also offers five steps the state should take to build its offshore wind opportunities and broaden its reputation as an energy leader. The recommendations include:

- Maximize export opportunities to strengthen business networks to position Louisiana for large contracts.
- Invest in offshore workforce and job sites.
- Upgrade ports and support shipbuilding to support the maritime industry and leverage Louisiana's shipbuilding reputation.
- Capitalize on economic benefits of offshore wind by codifying a state procurement target, establishing a government agency to provide market certainty, ensure enforceable state goals, and drive additional private investments.

Louisiana businesses and workers stand to benefit from expansion of offshore wind nationally and in the Gulf of Mexico, according to a report. (Courtesy: Xodus Group)

Lean into Louisiana leadership by coordinating state government, higher education, economic development organizations, and grant-funded innovation clusters to maximize Louisiana's offshore wind industrial and employment power.

"Louisiana is an energy leader and this report shows how the state can add wind to an already thriving offshore economy," said Southeastern Wind Coalition's Senior Program Manager Jenny Netherton. "With over 450 businesses that are offshore-ready, Louisiana's workforce is poised to serve as the foundation of the offshore wind industry in the United States."

Also, there are more than 100 fabrication and manufacturing assets with strong potential to support offshore wind development when coupled with investments to reskill, retool, or expand their current operations.

"Louisiana can lead in wind power the same way it has led in oil and gas production," said Lacy McManus, executive director of Future Energy at Greater New Orleans, Inc. "Today, our state plays a vital role in bolstering the country's offshore wind supply chain through manufacturing, engineering, design, and other services that leverage decades of expertise – setting the stage for Louisiana to be a global leader in wind energy production."

MORE INFO www.xodusgroup.com/this-is-what-we-do/louisiana-offshore-wind-supply-chain-assessment

BOEM completes review of Beacon Wind proposal

The Bureau of Ocean Energy Management (BOEM) has completed its environmental review of Beacon Wind's proposal to test suction bucket foundations on its lease area offshore Massachusetts. Based on the analysis in the environmental assessment, BOEM determined that the proposed testing will not cause significant impacts to environmental resources. Suction bucket foundations are an alternative foundation type that allow for installation of turbines without the need for pile driving.

BOEM analyzed Beacon Wind's proposal to conduct 35 deployments and removals of a single suction bucket foundation at 26 locations within its lease area. Beacon Wind's objective is to gather information to support the engineering design of wind turbine and offshore substation foundations that would potentially be installed for a future offshore wind project. Use of this new technology could minimize underwater noise from installation and allow for more flexibility around supply chain constraints.

The proposed Beacon Wind project is about 17 nautical miles south of Nantucket, Massachusetts, and about 52 nautical miles east of Montauk, New York. Beacon Wind's future project proposal includes construction and operation of two wind-energy facilities (Beacon Wind 1 and Beacon Wind 2)

The Beacon Wind project is about 17 nautical miles south of Nantucket, Massachusetts. (Courtesy: BP)

with a total capacity of at least 2,430 MW of clean, renewable wind energy, enough to power more than 850,000 homes each year.

MORE INFO www.boem.gov

Exus Renewables acquires Spain wind farm

The wind farm in Spain is expected to begin operation in 2025's third quarter. (Courtesy: Grupo Enhol)

Exus Renewables, a premier independent power producer and asset management firm specializing in the renewable energy sector, recently announced the acquisition of a 51-MW wind farm in the north of Spain from independent Spanish company Enhol Group, whose main work centers on the renewable energy sector.

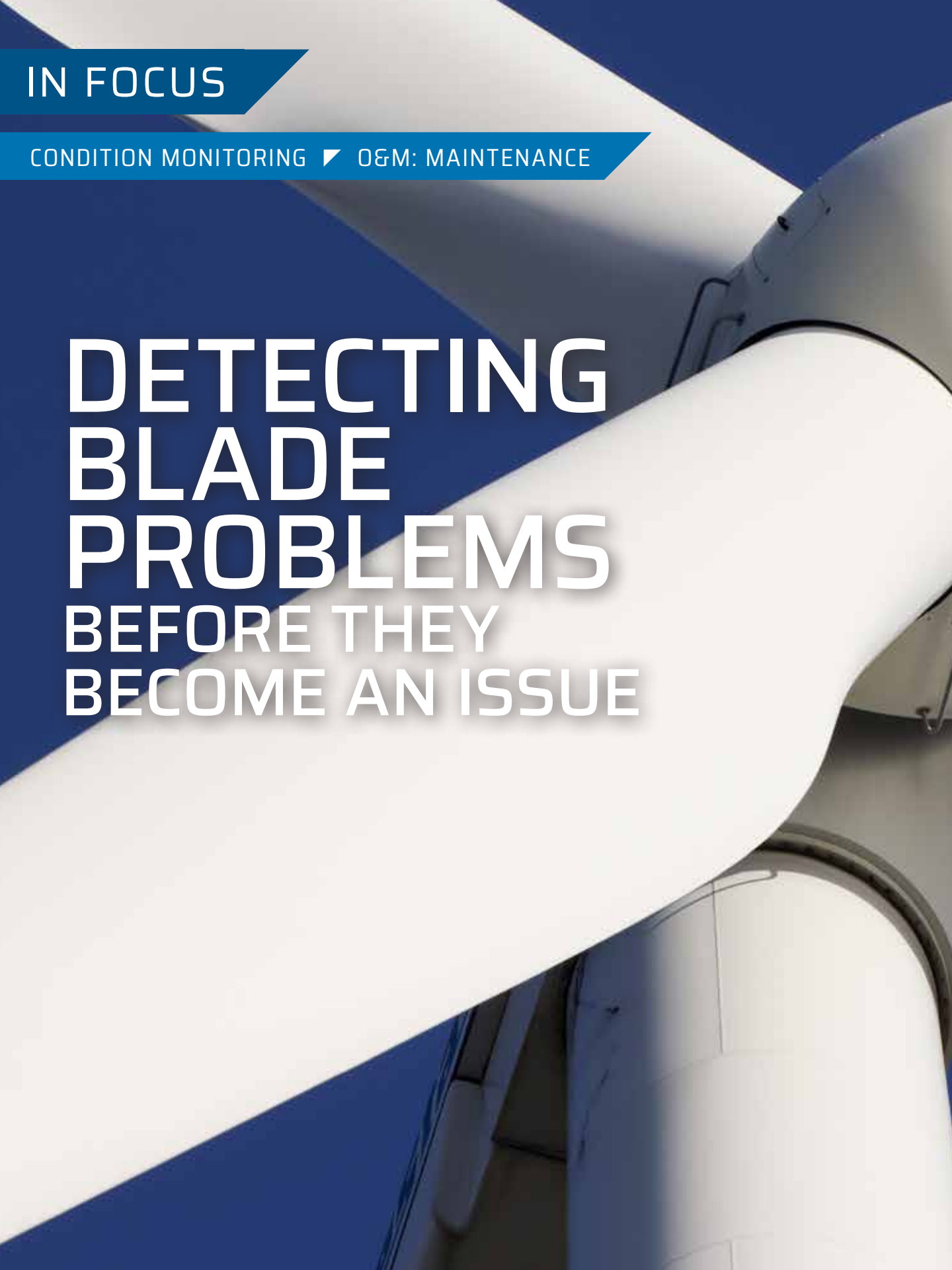
This acquisition represents another addition to Exus' growing portfolio of renewable energy assets in Europe. The wind farm, now in ready-to-build status, is expected to achieve Commercial Operation Date (COD) in the third quarter of 2025. With its strategic location and favorable wind conditions, this project is poised to deliver a substantial contribution to renewable energy capacity in the region.

"This acquisition marks another milestone in Exus' transition to an independent power producer, further solidifying our position as a leading player in the renewable energy sector," said Víctor López, head of M&A at Exus Renewables. "As we continue to expand our portfolio and embrace new opportunities, Exus remains dedicated to delivering clean, reliable energy solutions that contribute to a more sustainable future."

The agreement marks the initial step in a broader Exus strategy to establish its footprint in the region's renewable energy sector. This approach acknowledges the significance of cultivating relationships with partners such as Enhol and local communities.

"We are delighted to work together with Exus on this transaction," said Roberto Sabalza, Energy & Service Division CEO at Grupo Enhol. "Together, we see the great potential of this project, and our agreement with Exus represents a significant step forward in their advancement of renewable energy initiatives in the region."

MORE INFO www.exuspartners.com



DETECTING BLADE PROBLEMS BEFORE THEY BECOME AN ISSUE

With a new focus on predicting blade failures, accurately reducing costs and repairs will only add to a company's bottom line, making wind farms that much more efficient by minimizing downtime. (Courtesy: Shutterstock)

Condition monitoring sensors, used for years to detect imminent failures in a turbine's gearbox and drivetrain, are being adapted to find often hard-to-see defects in an asset's massive blades.

By KENNETH CARTER ◤ Wind Systems editor

Condition monitoring can cover a wide array of preventive measures to ensure wind turbines function optimally. In many cases, this monitoring is focused on the gearbox and its surrounding mechanisms.

However, massive spinning blades, with their almost constant exposure to harsh elements, can be a major source of headaches for owner-operators.

"When you want to do condition monitoring for the blade, you need to focus on the failure mode and focus on the area of the blade that you're interested in," said Ashley Crowther, chief commercial officer for ONYX Insight.

According to Crowther, with blade lengths 50 meters and larger, there are many different failure points that can occur on such a large structure.

"You can have a hole at the end of the blade that's clogged — that's a simple failure mode," he said. "More trouble are bond line failures and interior structural cracks, often in the mid-section of the blade (see zone 3 in Figure 1), and leading-edge erosion (zone 1), which is well monitored by drone inspection. And at the base of the blade (zone 2), you've got the bolted joint where pull-out of the insert or failure of the stud are not uncommon issues."

CATEGORIZING AREAS OF THE BLADE

The trick is to understand issues that are categorized into the three zones and how those areas on certain blades from certain manufacturers are going to be different. Often, a problem with one blade will be mirrored on more of the same model turbine. According to Crowther, blade condition monitoring is best focused on these present serial issues, as opposed to trying to solve every possible issue.

Blade condition monitoring consists of three principles:

◤ **1. Target the failure:** This is found by identifying the present defect or design flaw.

◤ **2. Direct measurement:** Even with the use of SCADA data and analytics with machine learning, the information is most often not in the SCADA signal to reveal; it isn't the right sensor data. To correct this, additional sensing is required, whether that be acceleration, strain, or sound pressure, for example.

◤ **3. Work at scale:** The solution needs to be practical and reliable and be backed by an infrastructure for thousands of turbines worldwide.

To accomplish this, off-the-shelf, mass-produced equipment that can withstand turbine lightning strikes and other

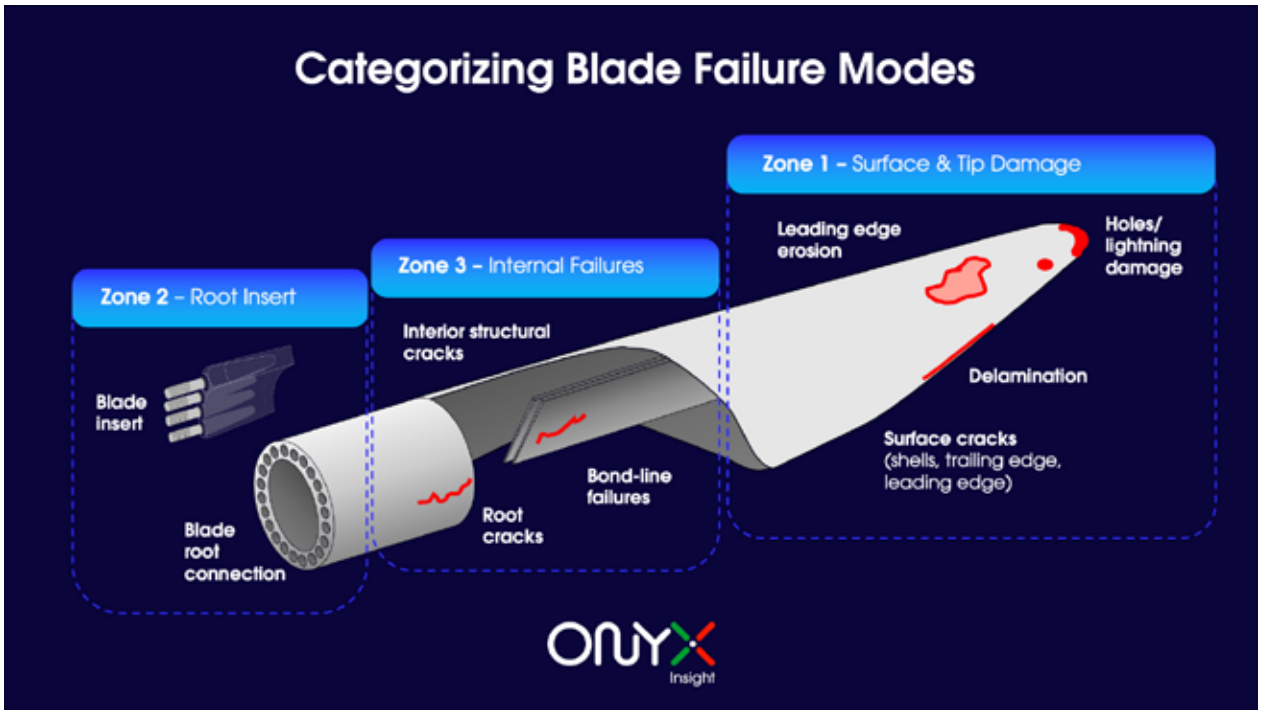


Figure 1: Categorizing Blade Failure Modes. (Courtesy: ONYX Insight, 2024)

harsh handling needs to be efficiently installed with easily repeatable work instructions. Businesses can then be trained to repeat this in all types of potentially inclement weather.

"Looking at these blade failure modes, we've been working on solving problems with these three principles in mind," Crowther said. "One of the problems that's been manifesting itself a lot in recent years is the blade root insert and its failure by pull-out. When you manufacture a blade, you need to be able to attach it to the hub and the blade bearing, obviously with a lot of bolts.

There are two main design philosophies that the industry has been using: one is a glued insert and the other a T-bolt, also affectionately known as an IKEA nut."

COMMON BLADE FAILURES

When a blade is manufactured, the bushing is glued into a hole and bonded so the bolt can be fixed into the bushing that connects the blade to the pitch bearing, which is then connected to the hub.

The failure mode that can occur happens when the bushing is pulled out and loosens, according to Crowther.

"Once you get one loose, you're getting a reduced-joint integrity," he said. "And then the next bolts in the side are under higher fatigue loads. So, the next bushing is becoming loose and so on."

Several root causes are touted, including improperly cured epoxy caused by temperature, oil contamination during manufacturing, or moisture getting into the blade through overuse, according to Crowther.

"There are different problems, too, that have caused it, but, at the end of the day, when this is failing, it is very difficult to repair; you're going to have to replace your blade," he said. "And there have been many cases where the blades have come off. The industry likes to call it 'blade liberation.'"

DISCOVERING DEFECTS

This euphemistic term for a catastrophic problem can sometimes result in entire wind farms shutting down for a period of time. In some countries, governments have gotten involved and ordered wind facilities offline until the problem is resolved, according to Crowther.

Visual inspections are a common method of searching for potential defects, but expense, worker safety, and human error can make this type of preventative method challenging at best.

ONYX Insight has adapted its ecoPITCH monitoring system for blade bearings to predict and protect against blade joint failure. The system monitors day-to-day operation and the integrity of the blade joint for the life of the turbine. It is currently monitoring about 3,000 blades across 1,000 turbines worldwide.

"That's one failure mode," he said. "But blades are fun. They have lots and lots of different failures. We can all work on them. We need to improve our designs and manufacturing process, but even if we solve all those problems today and every blade that was made from now on is perfect — it never broke — there are still tens of thousands of blades to maintain for their lifetime; some of which you can't get anymore, so you need to repair them; you need to maintain them."

Figure 2: Blade failure at a U.S. wind farm. (Courtesy: The Oregonian, 2022)

HARD-TO-FIND PROBLEMS

These types of blade sensors become even more important to detect structure problems such as cracks that might not be immediately visible to visual inspection or drones, according to Crowther.

"If these cracks are in areas that are structurally really important, then there could be a big problem," he said. "If they're detected early, then there are more options for making repairs. But if they're detected really late and they've gotten quite big, then it might be impossible to repair them. And they can develop quite quickly. Obviously, drone inspections, both internal and external, are good for managing these problems, but not all cracks you can see."

Again, maintaining visual and drone inspections becomes costly, so Crowther said his team is developing a permanent online monitoring system that, once installed, can be monitored from anywhere while awaiting an alert to a problem.

"If you don't get the alarm, don't worry about it," he said. "We also have to scale up and automate the analytics process. You can't have people punching numbers all day and night, so we can scale that up and automate this as well. We're working toward this, and we've expanded our same ecoPITCH system, which ironically enough, we developed and launched to the market to monitor pitch (blade) bearings, and now we're using it for blade joints and structural cracks."

THE EVOLUTION OF THE SENSORS

The original ecoPITCH sensors were installed in the hub to detect wear-out of the pitch bearings. Now, the sensors have been moved farther into the blade. The existing solution has all the infrastructure in place for monitoring of nearly 20,000 turbines, every day, according to Crowther.

"And now we're trying to just change 10 percent of the solution — the sensor at the end — and make that work for this different problem, which actually is a challenge: Which sensor? What's going to do the best job, and how are you going to do analytics?" he said.

Crowther said ONYX Insight sees strain sensors as a good approach for certain failure modes. These strain sensors can be placed, for example, on the pressure side shell of the blade near the shear web for crack monitoring that is known to occur in that region.

"To do the installation, you need an operator, have the blade horizontal, and a technician needs to climb up inside the blade and put the sensors in place on the cables, connected back to our ecoPITCH cabinet inside the hub," he said.

PREDICTING FAILURES

The need to monitor turbines all comes down to O&M costs and unscheduled repairs. Drivetrains make up 55 percent of unplanned repair costs, but other factors, including blades, can also add to those unplanned repairs, according to Crowther.

"You never plan for something to break, so predictive technology helps you plan the maintenance, optimize around low-wind periods, group multiple activities, and plan for part and labor availability," he said. "As we solved the drivetrain monitoring problem quite a while ago, blades are a natural expansion area."

With a new focus on predicting blade failures, Crowther said accurately reducing costs and repairs will only add to the bottom line, making wind farms that much more efficient by minimizing downtime.

"About 25 percent of the industry's cost for unplanned repairs are blade issues," he said. "So, there are a lot of issues to get to."

MORE INFO onyxinsight.com/blade-failures-detection-methods

RESILIENCE IN THE STORM: LESSONS LEARNED IN NAVIGATING HURRICANES AND TURBINES

In the realm of offshore wind energy in the U.S., there are well-tested logistics models that are instrumental in designing the setup of an offshore wind farm. (Courtesy: StormGeo)

Mitigating risks for offshore wind farms, especially in the face of extreme weather events like hurricanes, is a complex task that requires a deep understanding of various factors.

By ANNA HILDEN

Harnessing the power of the wind has been a pursuit of humanity for centuries, and the Gulf of Mexico is the latest frontier in this endeavor. As we embark on the journey of constructing wind turbines in this region, we find ourselves looking to the East for guidance. Asia's wind farms, seasoned by the diverse and often harsh weather conditions including typhoons, have become a beacon of knowledge and experience. The lessons learned from Asia's triumphs and tribulations in wind-energy generation can illuminate our path toward sustainable energy production in the Gulf of Mexico.

The Gulf of Mexico, with its vast expanse and consistent wind patterns, presents an enticing prospect for wind-energy generation. However, the path to harnessing this potential has been fraught with challenges and hesitation. Historically, concerns about the impact on marine life, shipping routes, and the tourism industry have been significant hurdles. The Gulf's susceptibility to hurricanes has also raised questions about the durability of wind turbines and the potential financial risks involved.

Furthermore, the region's established oil and gas industry has often overshadowed renewable energy initiatives. Despite these challenges, the lessons learned from Asia's wind farms and advancements in turbine technology are gradually turning the tide toward wind energy in the Gulf of Mexico.

Asia's wind turbines have been a testament to resilience and innovation in the face of nature's fury. Typhoons, with their high-speed winds and torrential rains, pose a significant challenge to the integrity and efficiency of wind farms. However, through strategic design and robust engineering, these turbines have not only withstood the onslaught of typhoons but have also harnessed their power to generate substantial amounts of electricity.

The lessons learned from these experiences have led to advancements in turbine technology, such as typhoon-resistant designs and automated control systems that adjust blade angles for optimal wind capture and minimal damage. These insights from Asia's wind farms are invaluable as we venture into similar endeavors in regions like the Gulf of Mexico.

Indeed, the belief is strong it is possible to construct wind farms in the Gulf of Mexico and other hurricane-prone regions, mirroring our success in building turbines in typhoon-prone areas and other offshore installations. This confidence stems from our technological advancements and the resilience demonstrated by wind turbines in the face of extreme weather conditions. However, it's crucial to acknowledge and address the unique challenges posed by hurricanes.

UTILIZING WEATHER DATA

Asia has effectively used weather forecasts to mitigate risks for wind farms. Effective weather management is crucial for the safety and success of offshore wind projects. Developers and operators gather and analyze data on various weather parameters, including winds, waves, currents, tidal waters, lightning, and tropical cyclones. This accurate, site-specific data helps ensure safe operations and prevent costly delays. Insurance companies also require dedicated local weather forecasting for all wind-farm projects. Private weather companies such as StormGeo are able to provide site-specific forecasting for each project area. Wind farms achieve maximum efficiency by using hub-height wind forecasts at the turbine level to measure wind speed, direction, and gusts. These measures guide project managers in decision-making, schedule optimization, and safety assurance.

The U.S. Gulf of Mexico can learn valuable lessons from Asia's effective use of weather forecasts to mitigate risks for wind farms. Just as in Asia, effective weather management is crucial for the safety and success of offshore wind projects in the Gulf of Mexico. Developers and operators of wind farms collect and analyze data on various weather parameters to ensure safe operations and avoid delays. Insurance companies may require dedicated local weather forecasting for all projects. Companies like StormGeo can provide site-specific forecasts. Wind farms use these forecasts to optimize efficiency and guide decision-making, scheduling, and safety measures. By adopting these strategies, the U.S. Gulf of Mexico can enhance the resilience and efficiency of its wind farms.

SEVERE HURRICANE CONDITIONS

The Gulf of Mexico is known for its severe hurricane conditions, which are often more intense than typhoons experienced in regions like Taiwan. These hurricanes, characterized by their high wind speeds and heavy rainfall, pose a significant challenge to the operation and maintenance of wind farms. Moreover, climate change projections suggest that these conditions are likely to become even more frequent and severe over the coming decades. This anticipated increase in hurricane activity underscores the need for robust, hurricane-resistant designs and proactive disaster management strategies in our pursuit of harnessing wind energy in the Gulf of Mexico.

One such innovation is the development of "hurricane-resistant" turbines, which are designed to minimize damage and maintain functionality during severe storms. These turbines feature enhanced control systems that can adjust the pitch of the blades, reducing wind load during high winds. Additionally, some designs incorporate a "teetering" hub

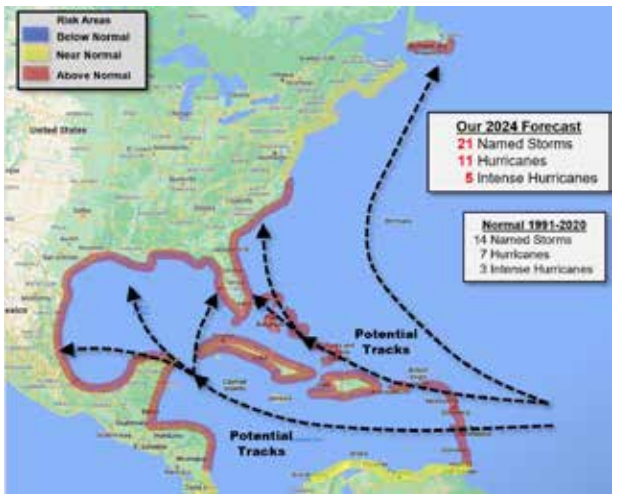
The Gulf of Mexico is known for its severe hurricane conditions, which are often more intense than typhoons experienced in regions like Taiwan. (Courtesy: StormGeo)

that allows the rotor to move backward slightly, relieving stress on the turbine. Furthermore, advancements in forecasting and remote monitoring technology allow for better prediction and management of hurricane events. However, the Gulf of Mexico presents a unique dilemma.

The average wind speeds in the region are relatively low, which would typically call for larger rotors to capture more wind energy. On the other hand, the region also experiences extreme high winds during hurricanes, which would ideally require smaller rotors to minimize stress on the turbine. This dichotomy is one of the many challenges we face in harnessing wind energy in the Gulf of Mexico, and it underscores the need for innovative solutions and adaptable designs.

LOGISTICS

Asia has developed innovative strategies to navigate the logistics of wind farms during typhoons. Research in Southeast China is addressing wind-turbine damage caused by frequent typhoons. This includes the development of anti-typhoon designs for offshore wind turbines and operation strategies for wind farms. In Taiwan, the typhoon season restricts installation projects to a six-month window. Meanwhile, a Japanese start-up, Challenergy, has innovated a wind turbine that can operate in cyclonic conditions, transforming a challenge into an energy opportunity. These strategies



Developers and operators of wind farms collect and analyze data on various weather parameters to ensure safe operations and avoid delays. (Courtesy: StormGeo)

Asia has developed innovative strategies to navigate the logistics of wind farms during typhoons. (Courtesy: StormGeo)

have enabled Asia to effectively manage the logistics of wind farms during typhoons.

In the realm of offshore wind energy in the U.S., there are well-tested logistics models that are instrumental in designing the setup of an offshore wind farm. These models take into account various factors such as turbine placement, maintenance schedules, and supply chain management, ensuring efficient operation and optimal energy production. Furthermore, these models are designed to be adaptable, allowing for effective planning and operation even when weather restrictions apply. This includes contingency plans for severe weather events such as hurricanes, ensuring the safety of personnel and minimizing potential damage to equipment. These logistics models, refined through years of experience and technological advancements, are crucial in navigating the challenges of offshore wind energy generation.

FINANCIAL RISK

Managing risk and insuring offshore wind farms, especially in the face of extreme weather events like hurricanes, is a complex task that requires a deep understanding of various factors. The offshore wind insurance market has been instrumental in the sector's growth by providing coverage to various stakeholders, thereby mitigating their risks. The primary areas of coverage include property damage to the wind farm, revenue loss due to such damage, and liabilities arising from third-party property damage, death, or injury during the wind farm's construction or operation.

Asia has effectively addressed the financial challenge of covering natural catastrophe risks for wind farms. Insurers in the region typically categorize certain locations as "high-risk zones" due to threats such as windstorms, earthquakes, and floods. Insurance providers typically establish a sublimit of liability on their coverage. This sublimit is not arbitrary but is calculated based on the likelihood of certain events, such as natural catastrophes, occurring over a specific period. To make these calculations, insurers use predictive modeling tools. These tools use historical data and sophisticated algorithms to predict the probability of an event occurring within a given timeframe. This approach allows insurers to manage their risk exposure more effectively.

In addition to this, there has been consideration of a potential solution that involves the creation of government-backed reinsurance pools specifically for natural catastrophe risk. This would be separate from other property risks associated with offshore wind-farm development. The idea behind this is to spread the risk among a larger pool, thereby reducing the potential impact on any single insurer. This approach could provide a more sustainable and resilient insurance framework for dealing with the financial implications of large-scale natural catastrophes.

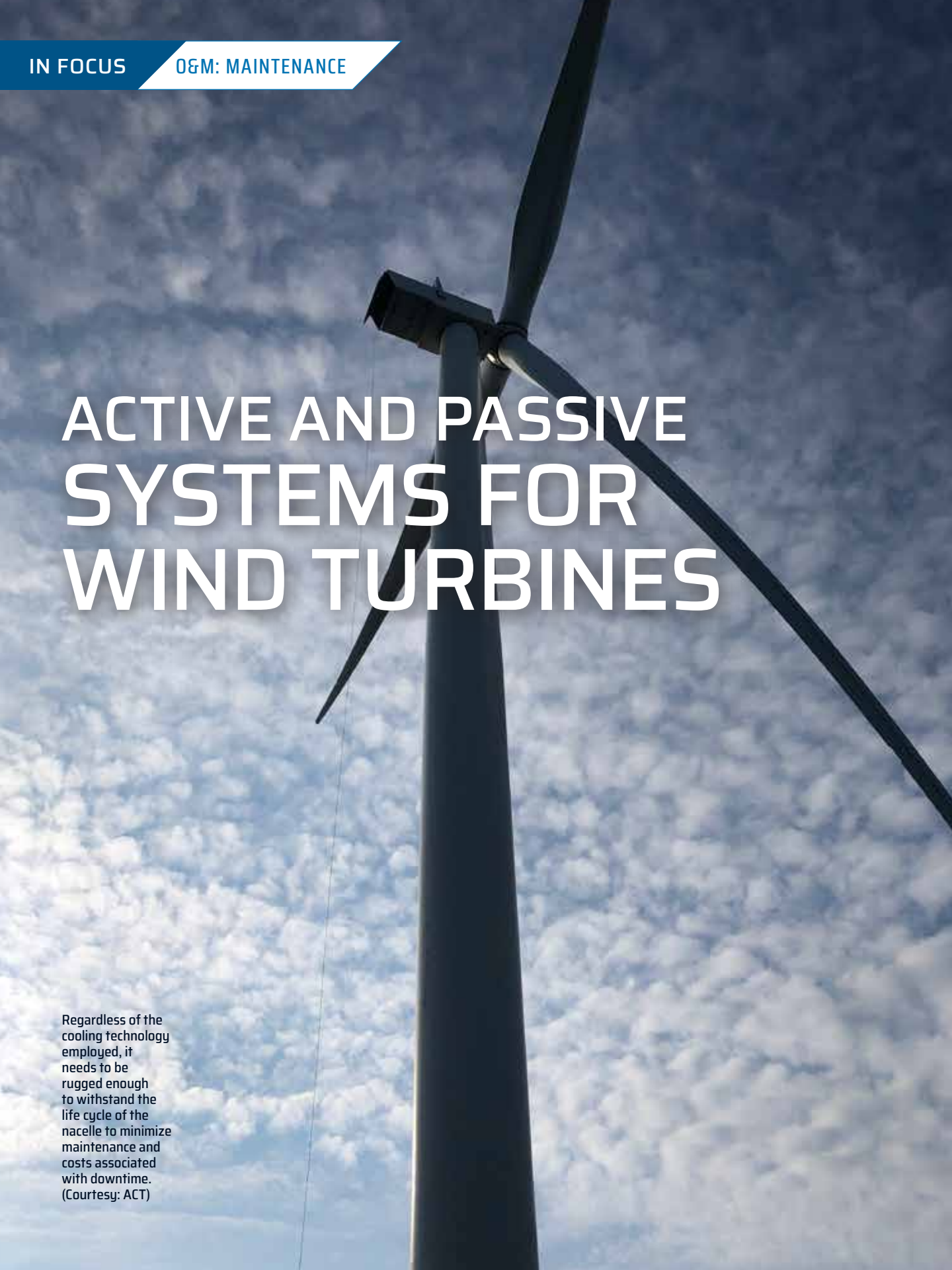
The U.S. can adopt similar strategies to manage the financial risks associated with wind farms. The offshore wind insurance market in the U.S. has a robust insurance market for offshore wind farms, with more than 50 insurers providing coverage. This market has been crucial in the sector's growth, offering protection to various stakeholders and mitigating their financial risks.

In conclusion, we are confident in our ability to construct wind farms in the Gulf of Mexico and other hurricane-prone regions, drawing parallels with our experience in building turbines in typhoon-prone areas. However, we acknowledge that managing the unique challenges posed by hurricanes requires careful planning and strategic solutions.

ABOUT THE AUTHOR

As Global Industry Manager for Offshore Wind, Anna Hilden coordinates StormGeo's sales and business development activities in offshore wind globally. In 2020 she secured StormGeo's first forecasting assignment for an offshore wind construction project in the US. She now supports StormGeo's local teams in Texas and California in the company's move to expand in offshore wind in North America Hilden has been with StormGeo for more than a decade. She plays a key role in developing StormGeo's renewables business, especially in offshore wind. Previous employers include a wind-turbine OEM, as well as a national meteorological service. Hilden holds a master's degree in meteorology and mathematics from Copenhagen University.

ACTIVE AND PASSIVE SYSTEMS FOR WIND TURBINES



Regardless of the cooling technology employed, it needs to be rugged enough to withstand the life cycle of the nacelle to minimize maintenance and costs associated with downtime. (Courtesy: ACT)

In the realm of wind energy, efficient thermal management within wind-turbine components, particularly the nacelle, is essential for optimizing performance and reliability.

By HALEY MYER

Wind energy has emerged as a pivotal player in the global transition toward sustainable energy sources. However, the efficient operation of wind turbines is contingent upon managing heat dissipation within their components, particularly in the nacelle, where critical machinery operates.

Loop thermosyphons offer a reliant passive solution, leveraging the latent heat of a working fluid to enhance the cooling efficiency of wind-turbine components or systems. Loop thermosyphons require no power to operate and have a relatively simple design. However, they are not well suited for applications against gravity or long distances, but this could be mitigated to an extent with a pump-assisted loop thermosyphon. On the other hand, pumped two phase systems offer a unique active solution, increasing the heat removal of a system for the same temperature difference and offering great flexibility in terms of orientation and piping design. However, they do require power to operate and are relatively more complex to design. Active and passive systems provide their own unique sets of advantages to manage heat in the nacelle of the wind turbine and choosing between a system will depend on the heat load, power consumption, sizing, and cost requirements of the system.

Regardless of the cooling technology employed, it needs to be rugged enough to withstand the life cycle of the nacelle to minimize maintenance and costs associated with downtime. A variety of techniques can be used to ensure products are suited for their own unique environment.

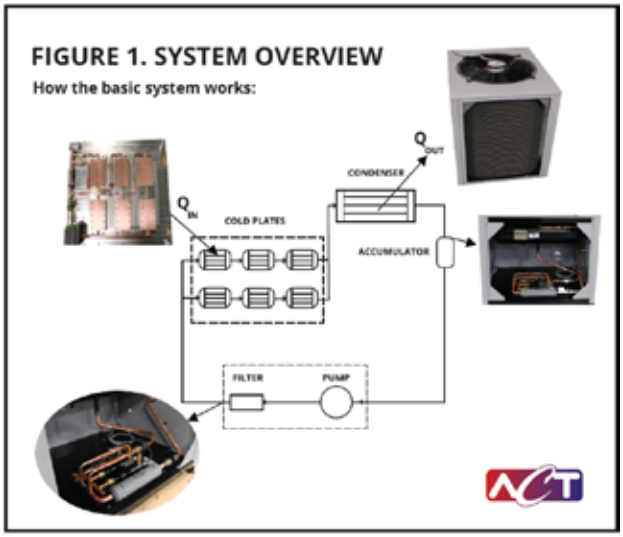
ACTIVE SYSTEMS FOR WIND TURBINES

In order to cool high-power electronics in wind-turbine applications, an active pumped two-phase system should be considered. In a pumped two-phase system, a non-corrosive, non-conductive coolant evaporates upon contact with hot electronics. This closed-loop system is compact, lightweight, and highly efficient, consisting of a pump, reservoir, cold plate or cooling coils, and a condenser. Unlike traditional water-cooling systems, where the liquid merely heats up, this system turns refrigerant liquid to vapor, significantly enhancing heat removal by using the latent heat in the fluid. Leveraging this two-phase evaporation process, this system can remove two to four times more heat for the same temperature difference compared to single-phase water cooling. This translates to increased power throughput for the same system size, as heat removal capacity dictates the maximum reliable operating temperature.

BENEFITS OF A PUMPED TWO-PHASE SYSTEM

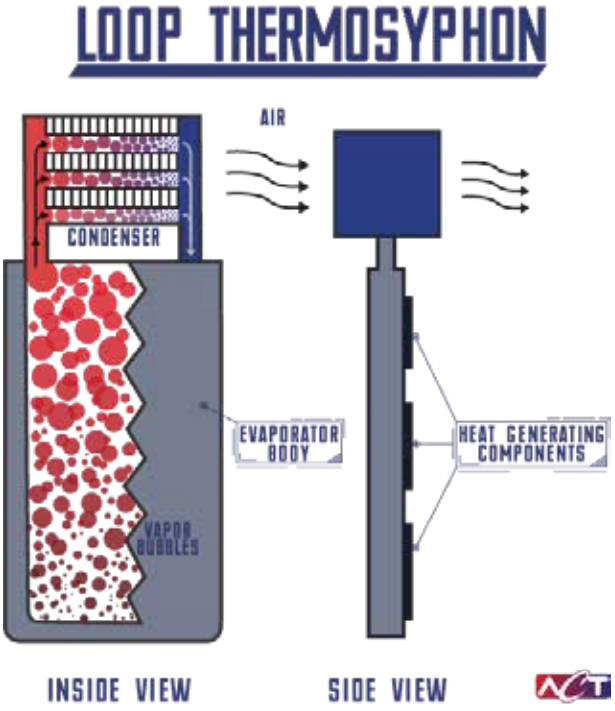
1. Increased power density and reliability: Switching to the two-phase evaporative approach removes safety and maintenance issues linked with water cooling while boosting system-level power densities. This method's isothermal nature also prolongs the lifespan of turbine electrical components by minimizing thermal cycling. Sub-systems such as generators, transformers, and power-conversion electronics can reliably support up to 40 percent more power for the same size/weight, as additional thermal loads are eliminated without raising subsystem temperatures. With more efficient cooling, fewer power modules and supporting infrastructure are needed, reducing both size and weight while cutting overall system costs by using fewer components.

Condenser coil on the nacelle of a wind turbine for a loop thermosyphon. (Courtesy: ACT)



Schematic showing ACT hardware for the basic components on a Pumped Two-Phase system. (Courtesy: ACT)

Schematic illustrating how a loop thermosyphon functions. (Courtesy: ACT)



Custom loop thermosyphon hardware. (Courtesy: ACT)

2. Smaller thermal system in the nacelle: The pumped two-phase system's compact size and reduced weight compared to other thermal management options creates extra space in the nacelle. Despite using only one-fifth of the flow rate of water, evaporative cooling achieves the same thermal performance, thanks to its higher thermal capacity. This allows for smaller, lighter pumps with lower power consumption, as well as simpler, smaller diameter hoses and manifolds. By integrating pumped evaporative refrigerant units with existing copper coils, power throughput capacity can increase by 30 to 40 percent, instantly reducing size and weight without requiring a system redesign.

3. Less maintenance in wind applications: The evaporative precision cooling system requires no regular servicing, a crucial advantage for offshore wind farms facing accessibility challenges. Harsh winter conditions often render wind farms completely inaccessible for days, but a two-phase system minimizes downtime with its virtually maintenance-free features. These features include:

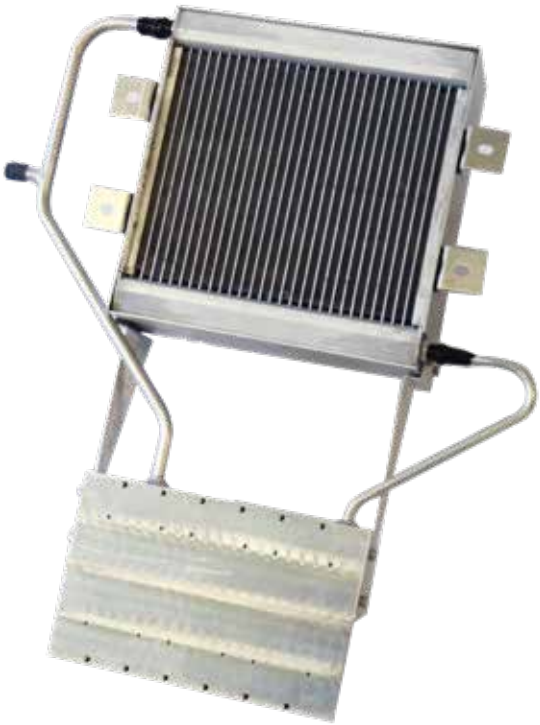
- Hermetically sealed design with pumps offering over twice the reliability of water pumps.
- Leak-proof system: if damage occurs, the non-conductive coolant vaporizes harmlessly.
- Coolant doesn't freeze or require additives; it is non-conductive, non-reactive, and non-corrosive.
- Only includes a dryer filter to remove residual water, eliminating corrosion potential.
- No deionizer needed.
- Equipped with dry break connectors for quick module replacement, reducing downtime during component failure.

PASSIVE SYSTEMS FOR WIND TURBINES

How does a Loop thermosyphon work in a wind turbine?

A loop thermosyphon is a gravity driven, passive, two-phase heat-transfer device that transfers heat from a heat

Custom loop thermosyphon hardware. (Courtesy: ACT)



E-Coated Condenser Coil. (Courtesy: ACT)

source to a heat sink. Its operation is based on the principle of gravity-driven fluid flow within a closed loop containing a working fluid, typically a refrigerant.

The heat-transfer process, as applicable to wind turbines, can be explained in four steps:

1. Evaporation: The loop thermosyphon's evaporator section would be within the nacelle, where heat-generating components such as the gearbox, generator, and electronics can be found. Here, heat is absorbed by the working fluid, and the working fluid undergoes a phase change from liquid to vapor, absorbing latent heat in the process. This vaporization causes a decrease in fluid density, promoting upward movement within the evaporator section.

2. Vapor Flow: The vaporized working fluid flows upwards through the loop, driven by the density difference between the liquid and vapor phases. This gravity-driven circulation ensures continuous flow from the evaporator to the condenser section.

3. Condensation: The vapor flows to the condenser section, typically in a cooler region of the turbine or on top of the nacelle, where it condenses back into liquid form, releasing heat in the process. This condensation releases latent heat, completing the heat-transfer process. The condensed liquid flows back to the evaporator section due to gravity, restarting the cycle.

4. Continuous Circulation: This cycle of evaporation, vapor flow, condensation, and liquid return continues as long as there is a temperature difference between the heat source

Heresite™ coated copper tubing and stainless over-braid flex lines. (Courtesy: ACT)

and the heat sink. This continuous circulation of the working fluid facilitates efficient heat transfer without the need for external pumps or mechanical components, making loop thermosyphons a reliable and energy-efficient cooling solution.

ADVANTAGES OF LOOP THERMOSYPHONS FOR WIND-TURBINE COOLING

1. Passive operation: Loop thermosyphons operate passively, requiring no external power source or mechanical components for fluid circulation. This inherent simplicity enhances reliability and reduces maintenance requirements, making them ideal for remote wind-turbine installations. There is no concern of a pump failing, as opposed to other active systems.

2. Enhanced heat transfer: The phase change of the working fluid enables more efficient heat transfer compared to traditional liquid cooled loops, allowing loop thermosyphons to effectively dissipate heat from critical components within the wind turbine, thereby preventing overheating and prolonging equipment lifespan.

3. Maximized turbine performance: By maintaining optimal operating temperatures within the nacelle, loop thermosyphons contribute to improved thermal management, which is essential for maximizing turbine efficiency and overall energy output.

4. Environmental sustainability: The use of loop thermosyphons, a completely passive device, aligns with efforts to promote environmental sustainability in wind-energy production. By minimizing the energy consumption associated with active cooling systems, loop thermosyphons help reduce the carbon footprint of wind-turbine operations.

5. Cost-effectiveness: The simplicity of design and passive operation make loop thermosyphons a cost-effective cooling solution for wind turbines, offering long-term economic benefits through reduced energy consumption and maintenance costs.

RUGGEDIZING PRODUCTS FOR HARSH ENVIRONMENTS

Coastal regions are a strong candidate for wind-turbine farms due to strong offshore winds and favorable topography; however, they come with challenges such as adverse weather and accelerated corrosion rates due to humid, salty air. To ensure products have reliable power — especially those that will be used in remote applications with harsh terrains — it will be necessary to make them as rugged as possible. Outfitting needed products to withstand extreme environments is critical. Heat-exchanger coils may need to be e-coated with a protective film, so they can withstand environments ranging from remote desert terrain to coastal environments to freezing temperatures in areas such as remote Alaska.

In addition, many products made by ACT receive a Heresite™ coating on the copper tubing to withstand highly corrosive environments such as PCM salts and salty environmental air. Fans and blowers may need to be equipped to withstand the harshest rain-, salt-, fog-, moisture-, and dirt-exposure environments. Any sheet metal aluminum may need to be conversion coated and/or powder coated for corrosion protection, as well as being validated for rigorous shock and vibration requirements. Various FEA- and CFD-platform analysis for thermal systems in high-wind and high-G-loading conditions also should be implemented. Quality products should be validated to MIL-STD-810, the military environmental conditions testing standard, with requirements that include blowing sand and dust at high-wind speeds.

The ability to strengthen products for any environment is an ideal skillset to ruggedize future wind-turbine-pumped, two-phase systems for harsh weather environments and corrosion potentials intrinsic in offshore and coastal wind-turbine farms.

In conclusion, active and passive systems each have their own unique benefits to solve the toughest thermal management challenges. In the realm of wind energy, efficient thermal management within wind-turbine components, particularly the nacelle, is essential for optimizing performance and reliability, and a ruggedizing system fit for the needs of the application is paramount to the success of the thermal management design.

ABOUT THE AUTHOR

Haley Myer is a product development engineer II in ACT's Vapor Refrigeration Group. ACT specializes in engineering and manufacturing system solutions aimed at enhancing the levelized cost of energy (LCOE) through innovative thermal management strategies. With a wealth of expertise in designing, manufacturing, and rigorously testing both active and passive systems — ACT ensures its products are ruggedized to thrive in diverse and extreme environments. From conceptualization to execution, ACT offers a diverse portfolio tailored to address even the most intricate thermal management challenges. For more information, go to www.1-act.com/industries/energy.

PROFILE

AKZONOBEL

SUSTAINABLE AND INNOVATIVE SOLUTIONS

Coatings manufacturer AkzoNobel's mission is to supply sustainable and innovative coating solutions that protect critical pieces of equipment for longer from harsh environments as well as from everyday use. (Courtesy: AkzoNobel)

AkzoNobel has been making and supplying their renowned International Paint brand of protective coatings to a variety of industries, including wind, for decades — coatings that not only protect equipment, but are durable options that are better economically and reduce the impact on the environment.

By KENNETH CARTER ◤ Wind Systems editor

Parts and structures across the globe often have one thing in common: They have a protective coating.

Equipment constructed for the wind-energy industry is no exception.

Coatings manufacturer AkzoNobel's mission is to supply sustainable and innovative coating solutions that protect critical pieces of equipment for longer from harsh environments as well as from everyday use, something the international brand has been doing for more than 140 years.

"As AkzoNobel, we serve quite a number of different industries including aerospace, vehicle refinishes and decorative paints," said Matthew O'Keeffe, global segment marketing manager, protective coatings, with AkzoNobel. "Our international paint business specifically provides solutions for just about any asset which requires corrosion protection, aesthetic enhancement or additional functionality such as protection from high temperatures or chemical exposure. As well as the protective coatings industry, we are also one of the world's leading coatings providers for the yacht and marine industry — for example our solutions deliver fuel and emissions savings for owners and operators of some of the world's largest maritime fleets, we also provide the highest quality systems and aesthetics for superyacht construction and retrofit. In the protective segment specifically, we deliver solutions for a wide range of energy and infrastructure end user markets."

SERVING THE WIND SECTOR

Wind-energy is a key sector, which, according to O'Keeffe, has been a part of the company's expertise for a while.

"Wind has always been there since onshore wind towers and wind farms really were taking off in the 1990s," he said. "We've been a part of it quite early on from the start."

In the beginning, that involved supplying the corrosion-resistant coatings for the wind tower and OEM equipment, according to O'Keeffe. As the industry has developed, the company's long-standing reputation for performance and longevity of its Interzone® range has enabled it to be a key partner in the development of the offshore wind sector.

"In the last couple of years as wind has moved offshore, we've been able to provide further support for the industry because offshore corrosion protection is a key strength of this organization," he said. "We've served the oil and gas market very well for a long period of time, and the requirements for offshore wind are not totally different in terms of corrosion performance or in terms of longevity. A lot of the companies that have participated in the upstream market for many years are involved in offshore wind so it's an opportunity to jointly leverage."

Before the turn of the decade, AkzoNobel acquired the wind-blade division from BASF in Germany. Coatings for blades need to be able to hold up to the blades' great speeds as well as the flexible materials they're made from, according to O'Keeffe.

"The coatings need to be able to withstand that," he said. "There are also additional factors such as rain-erosion impact, which means coatings need to be quite resilient to the environment and high performance in terms of coatings. Coatings are not the same as general industrial coatings that you might put on a piece of structural steel. They're quite functional in that regard, so the quality needs to be very high so we can get the performance we need in operation."

LONGEVITY ALSO A FACTOR

Along with performance, longevity of the coating is also paramount when considering that most wind turbines — especially offshore assets — are going to be operating in harsh, remote environments, making it difficult and expensive to reapply a critical coating, according to O'Keeffe.

"Getting it right at new construction is critical as it is very difficult from an access point of view to get back onto offshore turbines and actually be able to do any work on them, so longevity is key, and, of course, what comes with that is being sustainable," he said. "We need to make sure that turbines are protected for long periods of time and durable with our coatings systems."

AkzoNobel's coatings are designed to last the life of the asset, having to reapply a coating once the asset is in operation hopefully would be rare, according to O'Keeffe.

"What you see more and more is that a turbine might be designed for 10 years, but they want to operate it for longer," he said. "It's a case of being able to meet that initial expectation and hopefully exceed it as well. You can end up with coatings that might be on a turbine blade that's going to last for 10 years, but it might actually go a bit longer. Being a pioneering supplier in the early offshore oil and gas industry means we have a tremendous track record in longevity and performance. Our Hutton TLP case study is a good example of this, where our Interzone system supplied provided performance for over 40 years on this asset — this is currently the longest documented track record in the whole industry."

REDUCING THE IMPACT ON THE ENVIRONMENT

Supplying coatings to an industry that creates renewable energy is not lost on AkzoNobel and its overall mission, according to O'Keeffe. The company strives to develop and sup-

AkzoNobel's coatings are designed to last the life of the asset. (Courtesy: AkzoNobel)

ply sustainable solutions. It considers sustainable solutions to be those that bring tangible sustainability benefits to its customers, and market demand for them is growing, with the aim of achieving 50 percent of total revenue coming from the company's sustainable solutions by 2030.

"For AkzoNobel particularly, sustainability is really a critical part of everything that we do," he said. "Not only from a coatings point of view where we're trying to use more higher solids coatings and products that emit less VOCs to reduce our carbon footprint, but we're very much a company that has sustainability at its core. We have some of the best sustainability credentials of all the coating manufacturers based on external ESG rating agencies, such as Sustainalytics, MSCI, Ecovadis. AkzoNobel was also the first coatings company to have its carbon reduction targets officially validated by the Science Based Targets initiative (SBTi). In line with being a major player in protecting the renewable energy sector, we have an ambition to ensure that all of our electricity will come from renewable sources either through our own on-site generation or through externally validated renewable sources. Currently 100 percent of our energy use in Europe and USA is sourced renewably with an ambition for full global coverage by 2030."

AkzoNobel is also trying to find renewable sources of raw materials as well, and not just relying on 100 percent oil-based derivatives, according to O'Keeffe. "We are constantly looking at other ways to be sustainable," he said. "Sustainability is really at the heart of what AkzoNobel does, and that flows all the way through to our products."

ALWAYS SEARCHING FOR IMPROVEMENT

To that end, AkzoNobel is always looking for ways to improve its product line in innovative ways, according to O'Keeffe.

"Aside from making sure our products are more sustainable, we are always looking to move the industry forward in terms of coatings that require less energy to apply it," he said. "In cold climates, for example, we have coatings that are going to cure and be very productive even without heating or extra energy costs. We're developing water-based coatings and are moving to very, very low VOC-type products."

Increasing the longevity of these innovative coatings will also be a major challenge for O'Keeffe and the team at AkzoNobel.

"Longevity and really high durability are key parts of reducing the carbon footprint and making our solutions and the equipment of our customers more sustainable," he said. "For example, we have a product that has a 40-year track record in the water. It's a coating that we would recommend to put on assets like foundations and transition pieces. From a durability perspective, once the coating's been installed, there's little maintenance. and so there is little extra energy that needs to go into actually making sure that the product's going to be able to go the distance. There are a couple of different ways I think you can really approach it, and we try

Coatings for blades need to be able to hold up to the blades' great speeds as well as the flexible materials they're made from. (Courtesy: AkzoNobel)

to make sure we're covering the bases there."

The international product and service solutions offered by AkzoNobel are accompanied with the expertise and know-how that created them, according to O'Keeffe.

"We don't just sell the paint and forget about it," he said. "We provide a very high level of technical support. Before application, we make sure we understand our customer's process, and then, right after when the coating's being applied, we make sure that we've got some input and some presence there to make sure that the process is working well. We need to make sure that we work with our customers and make sure their equipment setup is right and that they have a smooth process that everything goes through. We try to reduce the amount of rework as much as possible. The quality assurance is quite critical."

HEALTH AND SAFETY GOALS

In addition to the quality of its products, O'Keeffe pointed out that AkzoNobel is very involved in improving the health and safety aspects of its products.

"We were one of the first companies to remove coal tar epoxy from our products in the protective market," he said. "Health and safety remain a key priority for AkzoNobel globally and the whole company continues to both innovate and improve the paints and coatings sector going forward."

In addition to that, O'Keeffe said a major number of energy facilities, including wind-energy substations around the world are protected with AkzoNobel's coatings and their fire protection products.

"We've got exceptionally good products when it comes to wind energy," he said. "Aside from the sustainability and other positives, our products have exceptionally good performance. You can go anywhere around the world, and you'll be able to see our products in action — stadiums, commercial infrastructure, oil and gas facilities, and particularly offshore wind farms. We've supplied our coatings on the London Array in the U.K. which is one of the biggest offshore wind farms in the world."

LOOKING TO THE FUTURE

O'Keeffe expects AkzoNobel's support in the wind sector to continue to grow.

"The global drive for more sustainable energy generation and use is a key trend for the wind energy business," he said. "We'll continue to support customers and the industry in being successful; not only by making sure we've got products that perform well, but that they can offer our customers what they need. Whether that's productivity, whether that's cost saving, whether it's being able to meet their sustainability targets, we'll continue to drive down the track of having sustainable products to support a key energy transition industry."

MORE INFO www.akzonobel.com
www.international-pc.com

James Fisher and Sons recently announced a high voltage commissioning contract at Taiwan's Zhong Neng offshore wind farm. (Courtesy: James Fisher Renewables)

CONSTRUCTION

James Fisher receives voltage contract at Taiwan wind farm

James Fisher has been awarded a contract for the provision of high voltage (HV) specialist personnel and HV safety management services. Developed in collaboration with the China Steel Corporation and Copenhagen Infrastructure Partners, the Zhong Neng offshore wind farm will be comprised of 31 turbines that are set to generate 300 MW of renewable electricity, enough to power about 300,000 households.

James Fisher's renewables team will securely manage the high voltage network and electrical safety throughout the construction and commissioning phases of the onshore substation and wind-turbine generators, spanning about 10 months.

"Taiwan has ambitious plans to achieve 20 percent renewable energy generation by 2025, and the growth in its offshore wind industry will play a significant role in this," said Maida Zahirovic, head of renewables at James Fisher. "As with any ambitious growth plan, the journey won't be without its challenges -- but with collaboration across the entire supply chain and experienced industry players, Taiwan will soon enjoy a thriving renewables sector. We're delighted to be working with Zhong Neng as we continue to champion the expansion of renewables across Taiwan and Asia Pacific more broadly."

"This project is another string to our bow within Asia Pacific, and a further signal of our commitment to the growth of renewables in the region," said Emma Su, APAC operations specialist at James Fisher. "We are dedicated to helping build the foundations to advance Taiwan's renewable energy landscape, both by bringing our own expertise, and crucially, developing the local workforce and supply chain."

James Fisher Renewables has supported 28 projects in the Asia Pacific region to date, including works at The Changfang and Xidao Offshore Wind Project (CFXD), phase II of the Taiwan Power Company (TPCII), Greater Changhua, Formosa 1 and 2 and the Yunlin project.

MORE INFO www.james-fisher.com

Morrison Fabrication in Louisiana will fabricate the unit. (Courtesy: Chet Morrison Contractors LLC)

CONSTRUCTION

Morrison announces contract for floating platform fabrication

Energy service company Chet Morrison Contractors, LLC recently announced a contract award by Aikido Technologies, Inc. (Aikido), a floating wind technology provider, for its Aikido One project, which will demonstrate how the Aikido Platform can enable offshore wind project developers to increase the speed of deployment and reduce costs. Morrison will be responsible for the fabrication of a 1:4 scale 100kW floating wind platform.

"The Aikido One Demonstrator will be a transformational project for the U.S. offshore wind industry for two reasons: First, it represents the largest floating wind platform constructed in the U.S. to date; second, it is the world's first upending semi-submersible platform," said Sam Kanner, Aikido CEO. "Proving this concept in realistic conditions will show how the Aikido Platform can solve challenges facing the floating wind industry in the U.S. and around the world, relating to serial production and limited port space. We are thrilled to be working with such an experienced and well-respected firm as Morrison."

"Aikido is an innovative company that is bringing something unique to the market. We are excited to work with Sam and the entire Aikido team on their concept," said Chet Morrison, Morrison CEO.

Morrison Fabrication in Harvey, Louisiana, will be used for fabrication

Windward Offshore CSOVs being built at Norwegian shipbuilder VARD. (Courtesy: Windward Offshore)

of the unit, which is planned to occur over Q2 and Q3 of this year, culminating with a test program upon completion.

MORE INFO www.morrisonenergy.com
www.aikidotechnologies.com

CONSTRUCTION

Windward Offshore orders Seaonics cranes

Seaonics will supply 3D Electric Controlled Motion Compensated (ECMC) cranes to two commissioning service operation vessels (CSOVs) under construction for the German shipowner at Norwegian shipbuilder VARD.

"We are pleased to announce our partnership with Seaonics delivering cutting-edge ECMC C25 3D cranes for our CSOVs," said Windward offshore managing director Benjamin Vordemfelde. "Equipping two of our vessels with these advanced seven-ton units will bring a big operational advantage for our charterers in their offshore projects."

The order marks Seaonics' first equipment delivery to Windward Offshore, a company founded by Blue Star Group, Diana Shipping Inc and SeraVerse, in collaboration with and under the leadership of SeaRenergy Group. The first CSOV is scheduled for delivery in the second half of 2025, with the remaining vessel following in 2026.

"It's a privilege to welcome Windward Offshore as our newest customer," said Ståle Fure, vice president of sales at Seaonics. "We're excited to support their journey. Our goal is to ensure not only their success and satisfaction but also of VARD. We can't wait to see the cranes in operation."

The ECMC C25 3D Crane features a fully electrically controlled motion compensation system, ensuring smooth and precise movements even in challenging conditions.

The boom control, slew control, and telescope control are all electric driven and used dynamically to enable 3D compensation of the crane tip. The simplified design promotes operational safety and efficiency, reducing the time and effort required for cargo handling.

"This latest order underscores the trust placed in Seaonics' innovative technology and highlights our commitment to delivering specialized solutions for our clients," Fure said.

MORE INFO www.seaonics.com

CONSTRUCTION

DNV calls for HVDC transmission network

DNV, the independent energy expert and assurance provider, has issued rec-

DNV recommends an offshore high-voltage direct current transmission network. (Courtesy: DNV)

ommendations and a timeline to build an offshore high-voltage direct current (HVDC) transmission network to support U.S. offshore wind power goals. As the first phase of a Joint Industry Project (JIP) exploring the feasibility of incorporating HVDC transmission into the U.S. grid concludes, the guidelines emerge from collaboration across the sector.

An offshore HVDC transmission system will enable the delivery of clean electricity to millions of homes and ensure developers and investors achieve a secure return on their investments.

DNV recommends for agencies, governor's offices, developers, HVDC equipment manufacturers, and ser-

Since 2023, Acciona Energía has been using Youwind's web-based tools for the evaluation of offshore wind development opportunities. (Courtesy: Acciona Energía)

vice providers to work together toward building an offshore transmission system that will unlock the potential of offshore wind projects, meeting deadlines, and budgetary constraints effectively.

Specific recommendations from the joint industry project include establishing a task force with industry and state participants to review the feasibility of AC mesh solutions given the significant supply chain constraints that have emerged.

Other recommendations include enabling the connection of 525 kV HVDC bipole circuits from the Northeast through the Mid-Atlantic, investigating options to reduce the size and weight requirements of offshore platforms for 525 kV HVDC bipoles, and setting performance expectations them.

MORE INFO www.dnv.com

INNOVATION

Acciona Energía uses Youwind development tech

Youwind Renewables, a provider of web-based solutions for early-stage offshore wind development, recently announced Acciona Energía, a global leader in renewable energy, is using its technology to accelerate offshore wind-site selection and evaluate its current pipeline of projects. "We are thrilled to work with Acciona Energía; we know Youwind can enhance and help them accelerate their offshore wind-development initiatives," said Anna Rivera, CEO and co-founder of Youwind Renewables. "Together we have fostered a collaborative way of working, providing a great demonstration of how industry leaders like Acciona can boost their processing power to optimize project development and drive sustainable energy innovation forward."

With nearly 30 years of experience in the development, construction, operation, and maintenance of wind farms, Acciona Energía has established itself as a frontrunner in the renewable energy sector. The company's portfolio comprises more than 6,500 wind turbines and a total installed capacity of 13,500 MW, of which 9,387 MW correspond to onshore wind. The business seeks to expand its presence in offshore wind, exploring development opportunities across several territories.

Since 2023, Acciona Energía has been using Youwind's web-based tools for the evaluation of offshore wind-development opportunities, including its Pixel area screening tool and Pixel Park layout optimization tool.

Pixel helps to identify the optimum locations for wind farm development based on technical and financial factors, producing a Levelized Cost of Energy (LCoE) heat map to support the rapid selection of promising sites.

Pixel Park is a web-based application designed to generate detailed wind-farm layouts rapidly for any site worldwide, taking into account site-specific bathymetry and geography. This tool allows users to model the technical and financial performance of layouts, including all major wind-farm components such as turbines, foundations, substations, and cable routes, for floating and fixed-bottom installations. Pixel Park can simulate and evaluate layouts that incorporate crucial redundancy and resiliency measures, such as multiple offshore substations connected by an interlink.

MORE INFO www.youwindrenewables.com

INNOVATION

Gleason gets smaller with gear metrology system

Based on the success of the 300GMS

The system is designed for the complete inspection of types of gears as large as 175 mm in diameter. (Courtesy: Gleason)

nano platform, Gleason recently expanded its nano series with the introduction of the 175GMS nano gear metrology system.

The system is designed for the complete inspection of types of gears as large as 175 mm in diameter and shaft-type gears up to 480 mm in length, maximum measurable tooth width of 340 mm, with a module range of 0.4 (optionally 0.15) to 6.35 mm.

With this update, the measuring range of the 175GMS nano in the lower module range as well as in the capacity for shaft length and tooth width has been extended. Furthermore, the 175GMS nano delivers the nano capabilities first offered with the 300GMS nano. The integrated probe changer automatically deploys a skidless probe to check the surface quality of gear teeth in the profile and lead at sub-micrometer precision.

The skidless probe is available with automatic angle setting to adapt to different helix angles of gears. The 175GMS nano Gear Metrology System is equipped with a high-precision SP25 3D scanning probe head, a wide range of styli, and a mathematical analysis that supports roughness evaluations to DIN, ISO, ANSI and other standards.

The 175GMS nano communicates inspection results directly to Gleason production machines, enabling automatic correction of machine settings. From power skiving to threaded wheel gear grinding, this synergy opens horizons for quality production. Inspection results such as topography measurements and order spectrum from Advanced Waviness Analysis software can be forwarded to KISSsoft® design software.

SINEC Security Guard gives industrial operators and automation experts the key to performing measures for vulnerability mapping and security management. (Courtesy: Siemens)

In KISSsoft, the designer can see differences between the original design and the actual produced gear and evaluate variables such as the contact pattern in the final application under various load conditions. Noise behavior can then be predicted even before testing on a single flank tester or end of a line tester at final installation. This "Smart Loop" technology advantage holds the key to elevating gear designs faster and more seamlessly to a higher level.

The 175GMS nano can be equipped with the Advanced Operator Pendant (AOP) enabling operators to record video and voice messages and to monitor environmental conditions. It may also be used to support remote maintenance via video, and can read bar and QR code information directly into the machine, for further use in inspection protocols or to select the appropriate inspection cycle.

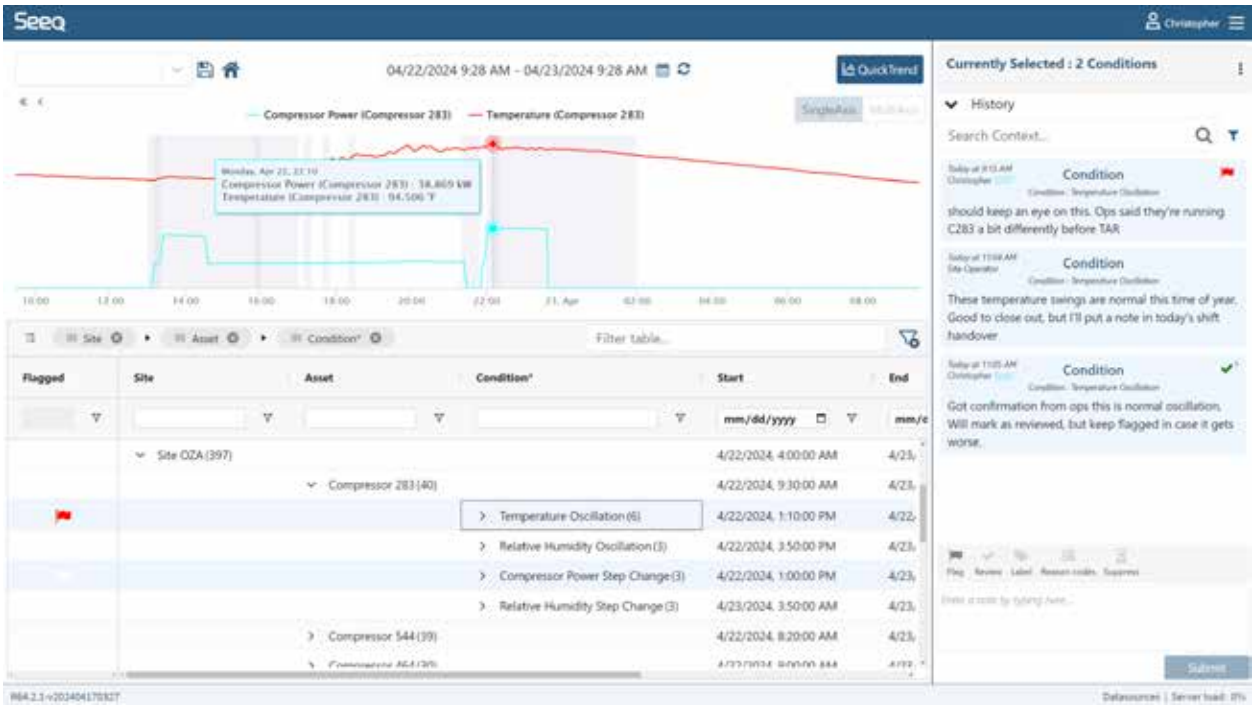
The 175GMS nano can be experienced live at IMTS and AMB shows in September 2024.

MORE INFO www.gleason.com

INNOVATION

Siemens releases new cybersecurity software

Siemens has launched a new cybersecurity software to address the need to



The new Seeq Vantage app scales subject matter expert-driven insights for accelerated value across the enterprise. (Courtesy: Seeq)

identify cybersecurity vulnerabilities on the shop floor as quickly as possible.

The cloud-based SINEC Security Guard offers automated vulnerability mapping and security management for industrial operators in OT environments. The software can automatically assign known cybersecurity vulnerabilities to the production assets of industrial companies. This allows industrial operators and automation experts who don't have dedicated cybersecurity expertise to identify cybersecurity risks among their OT assets on the shop floor and receive a risk-based threat analysis.

The software then recommends and prioritizes mitigation measures. Defined mitigation measures can also be planned and tracked by the tool's integrated task management. SINEC Security Guard will be available for purchase in July 2024 on the Siemens Xcelerator Marketplace and on the Siemens Digital Exchange.

"With SINEC Security Guard, customers can focus their resources on the most urgent and relevant vulnerabilities, while having full risk transparency in their factory; it is unique because it takes the specific situation of the customer's operational environment into consideration while providing a single pane of glass for security-relevant information in the OT area," said Dirk Didascalou, CTO of Siemens Digital Industries. "When developing the SINEC Security Guard, we drew on our extensive experience with cybersecurity in our own factories."

Industrial operators are tasked with continuously safeguarding their production assets on the shop floor. They need to analyze vendor security advisories, manually match them to the asset inventory of their factory, and prioritize mitigation measures. Because this process is time-consuming and error-prone using the existing tools, factories are running the risk of missing critical vulnerabilities in their assets or producing false-positives. This can lead to incorrectly configured plant components and inadequately allocated resources. With the SINEC Security Guard, industrial operators can tackle these challenges without needing in-depth cybersecurity knowledge.

For a comprehensive view of IT and OT cybersecurity, SINEC Security Guard will also offer a connection to Microsoft Sentinel, Microsoft's Security Information and Event Management (SIEM) solution for proactive threat detection, investigation and response. Once connected, SINEC Security Guard can send alerts for security events including attacks to Sentinel, enabling a security analyst to incorporate SINEC Security Guard insights and conclusions in investigations and responses with Microsoft Sentinel powered Security Operations Centers.

"As information technology and operational technology systems continue to converge, a holistic cybersecurity architecture is key to protecting IT and OT capabilities alike," said Ulrich Homann, Corporate Vice President, Cloud + AI at Microsoft. "By combining our domain knowledge, Siemens and Microsoft make it easier for industrial operators to efficiently detect and address cybersecurity threats at scale,"

SINEC Security Guard also supports the manual upload of existing asset information for asset inventory.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The initial release of SINEC Security Guard only supports Siemens OT assets but third-party device support is planned. SINEC Security Guard will expand the existing Siemens software portfolio for OT network security consisting of SINEC Security Inspector and SINEC Security Monitor.

MORE INFO www.siemens.com

MAINTENANCE

Seeq launches industrial enterprise monitoring app

Seeq, a leader in industrial analytics and AI, recently announced the launch of the Seeq Industrial Enterprise Monitoring Suite with the release of Seeq Vantage, the company's first industrial enterprise monitoring app, at Conneqt, the company's global industry conference in Miami.

Today's industrial operations face numerous enterprise-level reliability, performance, and sustainability challenges, which are difficult to systematically identify, prioritize, and correct to maximize operational potential. With siloed teams and information, and limited visibility to historical knowledge and insights from previous operations and events, it can be challenging for organizations to achieve measurable impact.

"Industrial Enterprise Monitoring builds upon and elevates the Seeq mission to enable the creation of the insights that empower decisions and actions that increase operational excellence, drive sustainable manufacturing and, ultimately, the customer's bottom line," said Mark Derbecker, chief product officer of Seeq.

"We've always known that the people across the organization are the secret ingredient, and Industrial Enterprise Monitoring enables a company to turn local insights and expertise into a powerful system-wide advantage."

The Seeq Industrial Enterprise Monitoring Suite provides a comprehensive, automated view into past and present operational performance. This broader view enables better decision making and continuous improvement across today's complex industrial ecosystems. The Seeq Industrial Enterprise Monitoring Suite leverages the combined power of the Seeq Industrial Analytics and AI Suite and the context that only teams of experts can provide — all at the scale needed to drive results across the operational footprint.

The Seeq monitoring suite provides the flexibility, speed, and robust capabilities to help ensure decision-makers have key insights at their fingertips, allowing for faster, better decisions and actions.

Through the Seeq Vantage app, industrial organizations can tailor, deploy and automate cases such as asset and process monitoring, condi-

NGC Gears has integrated two more EndoFlex endothermic gas generators into its China facility. (Courtesy: NGC Gears)

tion-based maintenance, reliability and downtime tracking and more. Coupled with the Seeq Industrial Analytics and AI Suite, customers now have an integrated ecosystem to capture, analyze, aggregate, monitor, triage, investigate, and document insights and actions at the local level and the enterprise level. The app provides proactive and automated enterprise surveillance for daily operational decisions, and comprehensive assembly of operational effectiveness and utilization understanding to prioritize longer-term investment decisions.

"Seeq empowers industrial organizations by turning their expert knowledge into a strategic asset," said Niels Andersen, principal research analyst at LNS Research. "The Seeq Vantage app significantly enhances their enterprise monitoring and AI capabilities."

Seeq Vantage is scheduled for general release in June 2024.

MORE INFO www.seeq.com

MANUFACTURING

NGC Gears installs EndoFlex generators at China facility

NGC Gears, one of the world's largest wind-power gearbox manufacturers, has completed the installation of two additional EndoFlex generators from UPC-Marathon, a Nitrex company, at its new facility in Jinhu, China, location.

This acquisition brings the total of generator sets to five since 2022, collectively generating an impressive 800 cubic meters/hour (22,252 cubic feet/hour) capacity of endothermic gas supplied to carburizing and hardening furnaces used for processing various gear components.

The latest installations in February and March of 2024 support the heat-treating operations of the company's wind-energy gearbox production.

"The latest EndoFlex investments align with NGC's development of low-consumption, high-efficiency gearbox products for large-scale onshore and offshore wind turbines," said Johnny Xu, UPC-Marathon China general manager. "Our collaboration with NGC is focused on advancing excellence in the wind-power sector, and we are thrilled to see the tangible benefits our EndoFlex units bring to NGC."

"This partnership highlights the

Turbine delivery for the wind parks in Italy is expected for 2025's second quarter. (Courtesy: Vestas)

strength of our products and reinforces our commitment to providing quality, local solutions to meet the demands of modern manufacturing for a greener future," Xu said. "We look forward to continuing our work with NGC and delivering the superior endogas quality needed for their high-standard production processes."

NGC's decision to expand capacity is in response to the growing demand for wind-power solutions in China and globally. Recent statistics indicate a robust growth trajectory for wind energy, with the country leading the world in installed capacity and the manufacture of wind-power equipment. The new endothermic gas generating systems will enhance the company's production capabilities, enabling NGC to meet increasing market needs with greater efficiency and reliability.

EndoFlex offers several benefits, including precise control of production media to the carburizing and hardening environments, leading to higher quality gear production with improved longevity and performance. The result is improved carburizing and hardening processes, higher-quality hardened gears, reduced operating costs, and increased efficiency.

MORE INFO www.ngcgears.com

MANUFACTURING

Vestas wins 81-MW order in Italy

Italian renewables producer Edison Rinnovabili recently placed an 81-MW order for the repowering of the Roio del Sangro, Monteferrante Guado, Monteferrante Casone, and Montazzoli wind parks in Abruzzo, Italy. The contract includes the supply and installation of 18 V136-4.5 MW wind turbines, as well as a 10-year operation and maintenance service agreement.

"I'd like to thank Edison for the trust placed in Vestas for the repowering of their projects," said Francesco Amati, Vestas general manager Italy. "We are really proud to see how the diversity of our portfolio continues to optimize our customer's business cases in Italy."

Turbine delivery is expected for the second quarter of 2025 while commissioning is planned for the last quarter of 2025. The order also reinforces Vestas' leadership in the country's wind energy sector, where it has installed over 5.2 GW since 1991.

MORE INFO www.vestas.com

LEADING THE CLEAN-POWER CONVERSATION

According to American Clean Power officials, more than 10,000 attended this year's CLEANPOWER show in Minneapolis, Minnesota. (Courtesy: Wind Systems)

At a successful CLEANPOWER 2024, the American Clean Power Association brought together a diverse panel of experts to discuss the future of renewables in the U.S. and beyond.

By KENNETH CARTER ◤ Wind Systems editor

Despite some bumps along the way, the future of renewables in general — and wind in particular — is still going strong and showing no signs of stopping. That's exactly the message that echoed across the halls of the Minneapolis Convention Center at CLEANPOWER 2024.

Movers and shakers across the renewables spectrum shared the spotlight throughout the conference May 6-9 to preach and teach the more than 10,000 in attendance about what's happening now and what needs to happen in the future in order to attain a better tomorrow powered by clean energy.

Many of those renewables experts were on hand at CLEANPOWER's Opening Session to celebrate just how far the sector has come as well as to reveal caveats on how far renewable energy needs to go.

"You basically have to face the progress that we've made, incredible progress, but we also have to engage the hard truth that 25 years from now, our entire economy needs to be powered by clean energy," said Jason Grumet, CEO of the American Clean Power Association. "The good news: Clean power is now a core facet of the American economy. We are producing utility-scale power in every state in the country ... Now, one out of every two homes in the country can be powered with clean energy. Technology progress has been extraordinary, and we are innovating with pace; we're innovating with purpose. Costs are coming down at an incredible rate. At the same time, technology is leaping forward. The performance of our facilities is leaping forward."

THINKING OUTSIDE THE BOX

Some of those technological strides include the development of green hydrogen, which is a testament to the success of national policy, according to Grumet.

"After decades of really unproductive battles, we now have a forward-looking strategy that is anchored in a shared idea of innovation, and investment and the private sector is responding," he said. "In the next five years, we will double the cumulative investment in clean power in our nation's history. We're bringing back American manufacturing with 150 new announced facilities."

To put a "face" on these accomplishments, one needs look no further than the success of RWE Clean Energy.

"As a renewable energy company with a growing U.S. presence, we are grateful for your support of our industry's top priorities, like ensuring the swift implementation of the Inflation Reduction Act and the bipartisan infrastructure law," said Andrew Flanagan, CEO of RWE Clean Energy. "RWE is committed to investing $60 billion in renewables globally by 2030, a third of that here in the U.S. Our global renewables operating capacity will grow to 65 GW by 2030."

But RWE's success story doesn't end there. After a year of substantial growth, the company is the No. 3 renewable energy company in the U.S., according to Flanagan.

"Our growth is further backed by a robust development pipeline of onshore wind, solar, energy storage, and hydrogen projects, as well as our seabed leases in New York, California, and Gulf of Mexico, a total 6 GW of offshore potential," he said. "We're making critical investments to develop, construct, and operate renewable projects across the country to feed the growing demand for energy in the United States. In partnership with local communities, we'll make significant investments that will improve the quality of life of our host community base, while also securing our energy independence. RWE believes the U.S. will continue to lead in the global-energy transition."

ENERGY EXPANSION

Looking at some of what makes up RWE's success, it becomes apparent that what might be considered non-traditional clean-energy projects are suddenly becoming mainstream and the buzz of the industry, according to Sandhya Ganapathy, CEO of EDP Renewables North America and a member of the management team of EDP Renewables, the fourth largest renewable energy producer in the world.

"There is an energy expansion, and I think there's a significant amount of work that all of us have put on the ground to see where we are today," she said. "When I think about some of the key things that have led us to where we are today, of course, there is the demand side of the equation. On the ground, in terms of just putting projects out there, it's not just traditional wind, which the industry starts off with. I think just the breadth of technologies, right from onshore wind to solar to batteries to hydrogen to offshore wind to floating solar, all of those things that we are doing on the ground, I think it's phenomenal, it's disruptive, and I can't wait for the next 25 years."

Results such as these are a definite indicator that the U.S. continues to move in the right direction. For example, 80 percent of new power brought to the grid was from clean-power technology. Unfortunately, according to Grumet, democracy has not been keeping pace.

"Inefficient decision-making and inadequate infrastructure are barriers to our long-term progress," he said. "Last year, we made more progress than ever before — 34 GW of clean power. We're moving faster than ever before, but not nearly fast enough to actually achieve our mid-century goals. This is why the American Clean Power Association every day with (Minnesota) Governor (Tim) Walz and others are advocating for aggressive permit rule. It's why we're working in regions to try to have the markets actually reward the quality of the power we're producing. It's also why we're

"Clean power is now a core facet of the American economy," says American Clean Power President Jason Grumet. (Courtesy: Wind Systems)

fighting against restrictive local ordinances and misinformation that's designed to slow our progress."

CLEAN ENERGY IN MINNESOTA

Walz was also on stage at CLEANPOWER to echo some of Grumet's sentiments.

"Everybody in this room knows that the future is going to belong to those who embrace and figure out and work together to get us to that clean-energy standard, to get us to that renewable standard; it makes sense across the board here in Minnesota — this is nothing new," he said. "Clear back in 1994, we became the second state of the union to set a clean standard mandate for our state. And then we followed up with that in 2007 with one of my predecessors, Governor Tim Pawlenty, who got us a renewable portfolio standard, and set an ambitious goal in 2007 to get to 25 percent renewable energy by 2025. Well, last week it was announced Minnesota has reached 54 percent renewable energy."

Part of Minnesota's renewable energy goals are to be at 100 percent by 2040 — ambitious, to be sure, but Walz emphasized that plan is not just aspirational.

"I'm so proud in Minnesota, whether it's our utilities, whether it's our contractors, or whether it's the folks that actually put the steel in the ground, our building trades and our union members, who have been leading on this front forever, training their members to embrace this, making sure Minnesota led in wind energy," he said. "IDW was building, on their own money, towers to train their folks, to not only build the towers, but to make sure that they were safe and reduce the cost for folks who are putting these things in."

And with strategies in place, Walz said Minnesota is working hard to ensure those 2040 standards will be in place when the time comes.

"We're not naive; you know this — the easy part is that first 50 percent," he said. "It's going to get harder and harder to get there, and we're going to have to be more focused. And we in Minnesota acknowledge our permitting laws are outdated for where we need to go. And when we talk about permitting reform, just to be clear, no one in this room is talking about cutting standards, whether it's safety standards or environmental standards. But we do need to acknowledge there are things that we're doing that are too cumbersome. They don't fit where we're at; they add costs, and they make it more prohibitive to get where we need to go. So, I'm really glad the legislature's working to try and get us a bill out this year. … It is organized chaos, as many of you know on this. But the focus is there to try and get there."

The jobs the energy sector creates are far beyond simple and present opportunities for a hungry workforce. (Courtesy: Wind Systems)

NATIONAL STRIDES

Luckily for the industry, strides aren't just being made in Minnesota. Signs are being seen across the nation, according to Susan Nickey, ACP Board Chair and executive vice president and chief client officer of HASI, a leading investor in climate solutions.

"We stand at the cusp of an energy decade unlike any other; the pace of change right now is historic, and the energy transition is closely interconnected with megatrends, shaping the future of our economy and our country," she said. "The pace of change right now creates this opportunity we have, and right here, right now, it's bigger than we've ever seen in this industry. Most of you are aware of the explosive new growth projections in our U.S. market. I feel like I see a revised upward projection every week and across all markets. This growth is being driven by several factors, including AI, which is fantastic, but requires so much power. The manufacturers who are re-establishing the U.S. as their base. The ongoing electrification of homes and our transportation. We need new powers in ways we did not even predict just one year ago."

A lot of that stems from the need for the electrification of the industrial sector, according to Nickey.

"Globally, the premium value for derived-from-clean-carbon molecules is further driving electrification of our industrial sector; right now, here we're even seeing gas drilling in the U.S. being electrified. All industries are seeking more of our clean electrons," she said. "Let's consider the numbers for a minute. … We added a record 34 GW of renewable projects last year, and that's equivalent to — think about this — a new 200-MW project every other day in one year. And how about energy storage? Last year, we doubled our new battery additions to 8 GW."

CONTINUED INVESTING

Investments in renewable energy have also taken off over the last year, according to Nickey.

"All that capacity was funded by a staggering $88 billion of investment; that's an 80 percent increase over 2022," she said. "Also, we are witnessing the birth of a brand-new financial market, the tax credit transfer market. Many of you are already active in this market, which only shows how much we needed it to seize the growth opportunity right here in front of us. The new transfer market brought in $7 billion in its first year, and I believe we're only scratching the surface."

With all the growth in the pipeline, this dedication to a carbon-free energy future is going to be a daunting task filled with challenges to the supply chain as well as the

"Clear back in 1994, we became the second state of the union to set a clean standard mandate for our state," said Minnesota Gov. Tim Walz. (Courtesy: Wind Systems)

workers who will be an invaluable asset in order to achieve success. Fortunately, those potential hurdles are being carefully considered and studied.

"So many industries get created and you wonder: Is there sustainable job growth? Industries come, and the worry becomes: Are they going to eliminate jobs? Are they going to create jobs? And this is an industry today that has tremendous potential for everybody in the room and, quite frankly, everybody in our nation that's looking how to retool their lives and work," said Jose Mas, CEO of MasTec Inc., one of the largest and most diversified infrastructure service providers in North America. "Whether it's executive leadership jobs, whether it's jobs in management, or whether it's construction jobs, this is an industry that's radically changing the way America looks, and we're at the forefront of it. At MasTec, we're blessed to be able to build the things that we're talking about all the way from the renewable assets to the transmission lines and distribution lines and feed that into homes and businesses and the job opportunities that exist for our people are unbelievable, and they're great jobs."

NEEDED JOBS

Mas also pointed out that the jobs the energy sector creates are far beyond simple and present opportunities for a hungry workforce.

"For so many years, people have wondered: Do we keep pushing people into these skilled labor positions? And the reality is that it's an incredible opportunity to build a really good middle-class life," he said. "Wages are really high, and it's a great place for people to come and experience a new growing part of our economy. For us, it's a long-term investment. The number of jobs that are going to be required, people aren't waiting on the street to come in and install a wind turbine or install a solar panel. They're jobs that we have to train; they're big investments that we have to make in training programs in schools. The unions are doing it as well. So, it's just an incredible opportunity for us as businesses and even us as individuals to really engage in this industry and build our careers."

Ganapathy expects that workforce growth to increase exponentially as well.

"I think, 10 years down the road, the industry would be much bigger," she said. "Today, we talk about a half a million people employed. (In a decade), we'd be talking about a million-plus people ... Of course, from a technology perspective, there is a lot of innovation happening that we have to be able to deploy the scale that is required or the demand that we are seeing now."

KEEPING POLICY MAKERS ENGAGED

To keep the ball moving, making politicians understand the necessity for clean energy will be paramount. Strides have already been made, of course, with the Inflation Reduction Act and the bipartisan infrastructure law, but it can't stop there, and Grumet promised it was a main goal of ACP to ensure that it doesn't.

"While the legislative process was a little bit of an ugly duckling, clean-energy incentives are maturing into a beautiful swan," he said. "We're bringing economic incentives and jobs and financial benefits to counties all around the country. The significant majority of these investments are actually going into conservative parts of the country, and it's giving us the ability to create a very broad industry coalition. We're actually expanding our capacity to support the ACP members and particularly the workforce. We have a charitable foundation called The Clean Power Foundation. The Clean Power Foundation has made a commitment to dramatically increase the efforts to train and support and engage and nurture the best workforce in the world. One of the things that I'm pleased to announce … is a new Clean Power Institute effort that's going to standardize training and guidelines, and we're going to talk about all the companies that have been a key part of that. We have 30 companies that have signed up for that already, and we expect much, much more to come." Those initiatives are all just part of a greater framework to escort the U.S. into a greener, more sustainable energy future.

"We are not just creating jobs in wind, solar, and storage; we are also powering the most important industries and economic sectors, helping them create thousands of jobs across all 50 states," Nickey said. "The urgency of unlocking our renewable project pipeline underscores ACP's top priorities: transmission build out, grid modernization, and market reform. And yes, I believe that realization has finally settled in with our policymakers, too. Grid enhancing technologies that can expand our existing grid capacity are already here. ACP is working hard right now to affect these grid solutions, along with the permitting and the policy reforms necessary to build out our transmission systems, all of which we sorely need. I have no doubt that we are up to the challenge of delivering all those clean electrons and to energize our country's economic prosperity and our national security for years to come. Together, we can make it happen."

AD INDEX

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The new name for Business Network for Offshore Wind.

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