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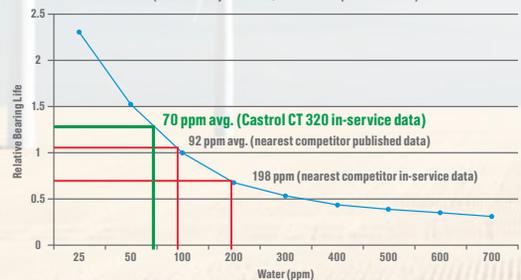
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*WEU Operations and Maintenance Report 2016.

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EDITOR'S DESK

MAY 2018

Looking toward wind's future

As I continue to talk with experts in the wind-energy industry, I am getting so excited about the seemingly constant chatter surrounding offshore wind development in the U.S.

It seems like, since the Block Island Wind Farm in Rhode Island went online almost a year and a half ago, more and more companies are pushing to get more steel in the water.

And now that the Trump Administration has given a major boost to offshore wind development with a recently announced sale of two new offshore wind leases off Massachusetts, the reality of U.S. wind in the Atlantic just got another step closer.

As wind grows, the need for technicians will only become more crucial to the success of new wind projects across the country, as well as the continental shelf.

This issue of *Wind Systems* takes a look at the growing field of wind technicians and the schools that offer this lucrative training. Experts from Iowa Lake Community College and Kalamazoo Valley Grove Center talk about what their institutions can teach the aspiring wind tech.

In addition to sharing the state of the workforce and training, this issue also takes a look at turbine inspection.

Babak Sardary, CEO of Scoop MAE, talks about how advanced mobile and cloud-information technology can be a potent tool in helping wind technicians and their managers achieve better results.

And getting back to offshore wind, in this month's Crosswinds, I had the opportunity to talk with experts from Ramboll's global wind division on the challenges that offshore wind faces and how to approach them in order to get those offshore turbines spinning.

Our company profile features a big fish in the energy industry. Experts with Shell Energy talk with *Wind Systems* about how Shell has invested significantly in wind over the past 15 years, both in assets, as well as products and services for major wind OEMs around the world.

I hope you enjoy these features and much more in our May issue.

There is a lot going on in the industry, and I am always excited to bring the latest news and information to you.

As always, thanks for reading!



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Wind proves it's good for the economy

Courtesy of AWEA

- The U.S. now has enough installed wind to power the equivalent of 27 million homes.
- Iowa, Kansas, South Dakota, and Oklahoma all generate 30 percent or more of their electricity using wind.
- Farmers and ranchers were paid \$267 million in lease payments in 2017 alone.
- New Mexico had the highest rate of new wind-power growth in 2017, followed by Missouri and Vermont.
- Wind farms that came online between 2014 and 2016 have averaged capacity factors of more than 40 percent.

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

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



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DIRECTION

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New partnering arrangement enhances WSP's offshore wind capabilities

WSP USA has entered into a partnership with Wood Thilsted, a specialist structural and geotechnical engineering consultancy, to provide detailed design services for offshore wind foundations in the U.S. market.

WSP provides technical and consulting services to support developers in planning, implementing, and operating offshore wind systems. The firm's expertise includes geotechnical, civil, and structural engineering; renewable generation, transmission, and distribution system design; wind resource assessment; and equipment and process quality assurance.

WSP's extensive knowledge of the U.S. regulatory and management environment, combined with Wood Thilsted's extensive experience in the design of offshore wind foundations, provides clients with a unique service offering.

Since its founding in 2015, Wood Thilsted has served clients on more than 30 projects worldwide. While most of these projects are in support of foundation design for offshore wind-farm developments, the firm has also worked on onshore infrastructure and building projects.

"The combination of Wood Thilsted's expertise in wind-turbine monopile design and WSP's multidisciplinary skills and global resources provides an exceptional level of technical and consulting support to the offshore wind industry," said Matthew Palmer, vice president and manager of offshore wind services at WSP USA.

"Improved design of offshore wind foundations has contributed significantly to reducing the overall cost of energy for offshore wind in Eu-



WSP provides technical and consulting services to support developers in planning, implementing, and operating offshore wind systems. (Courtesy: WSP USA)

rope," said Wood Thilsted partner Alastair Muir Wood. "Our firm has been working on feasibility-level design for U.S. projects for more than 18 months, and this new partnership with WSP provides an opportunity

to apply that experience at a detailed design level." ↵

Source: WSP USA

For more information, go to www.wsp.com

Floating offshore wind farm planned for California coast

The Redwood Coast Energy Authority has selected a consortium of companies comprised of Principle Power Inc., EDPR Offshore North America LLC, Aker Solutions Inc., H. T. Harvey & Associates, and Herrera Environmental Consultants Inc. to enter into a public-private partnership to pursue the development of an offshore wind-energy project off the Northern California coast.

The consortium was one of the six respondents to the Request for Qualifications (RFQ) issued by the RCEA February 1.

“We have been very impressed and humbled by the respondents and the quality of the responses we received for this RFQ,” said Matthew Marshall, executive director of the RCEA. “Large development companies and energy players based in Europe and the U.S. responded to the RFQ, which helps confirm the attractiveness of Humboldt County as the potential starting point for an entire new industry.”

The consortium is excited with the opportunity presented by RCEA and pleased to bring proven technology, development expertise, and financial capabilities to the partnership, which will work toward a flagship project for the floating offshore wind industry in California and the U.S. in general.

“We believe this project can represent a game changer for the industry in the U.S.,” said Joao Metelo, Principle Power’s president and CEO. “The establishment of a public-private partnership with a community-based energy provider like RCEA represents a unique opportunity to develop a project with strong foundations from the get-go, and to build a comprehensive launching pad for a successful industry in the West Coast.”

“This project is strategic in the long-run and attractive to us due to its potential to spur large market development in California,” said João Manso Neto, EDP Renewables CEO. “EDP Renewables is confident in the viability of the offshore wind market and looks forward to continuing development on this project with the ultimate goal of further increasing our operational presence in the United States.”

“We are excited to be part of this first commercial scale project for floating offshore wind in the United States,” said Jonah Margulis, vice president and U.S. country manager at Aker Solutions. “Combining our capabilities with Principle Power’s technology can help mature the local supply chain, potentially generating industry growth in Humboldt County and the state of California.”

wind-energy industry on the West Coast of the U.S. The wind resource off the Humboldt County coast is the best with average wind speeds of more than 10 meters per second, inducing expected high capacity performance from wind farms.

The proposed project is a 100- to 150-MW floating offshore wind farm planned more than 20 miles off the coast of Eureka. The project will pave the way for offshore wind energy off the West Coast and may be the first project to unlock the extraordinary value of offshore wind energy for California.

The selected consortium features significant offshore wind lease application and permitting experience, a mature, cost-competitive and suitable floating wind technology for Humboldt County’s unique geography (Principle Power Inc’s WindFloat technology), and a highly-capable team with the needed capacity to develop, finance, operate and build a supply chain to support this and future projects. RCEA and the selected consortium will be negotiating and finalizing a partnership agreement in the coming weeks, working toward the goal of submitting a lease application later this spring.

LED BY THE LOCAL COMMUNITY

Humboldt County is marked by a strong ecosystem of local energy, environmental, and economic professionals who played a crucial role in the 15-member RFQ review committee along with local officials and public agencies. Input and guidance from local stakeholders will be critically important to the project and the overall development of the industry in California. With RCEA leading, the project partners will continue proactive community and stakeholder outreach to understand and address all the facets of developing a project of this kind to minimize any potential impacts and maximize local community benefits.

The project is expected to drive investment in local infrastructure at the Port of Humboldt Bay and other nearby onshore facilities. A strong collaboration with local stakeholders to identify and address needed infrastructure improvements will be led by the project partners. The upcoming offshore wind industry will also require skilled labor and create local jobs and workforce training, thus advantageously positioning Humboldt County as a leading hub for future offshore wind development throughout the West Coast. ↘

QUICKLY ESTABLISHING AN OFFSHORE WIND

Humboldt County has natural enabling advantages that make it a prospective stepping stone for the offshore

For more information, go to www.edpr.com

Source: EDP Renewables

New York set to become leading hub for offshore wind

After years of false starts and delays, U.S. offshore wind is finally gaining momentum, fueled by innovation in turbine technologies, greater economies of scale, and increased political support — at least at the state level. New York, in particular, is ideally placed to benefit and serve as an economic and financial hub for U.S. wind over the next decade.

This is according to the latest findings outlined by industry intelligence service A Word About Wind in its Finance Quarterly Q2 report. The report forms the latest analysis published exclusively for its rapidly expanding international membership of energy developers, financiers, and investors.

This financially focused, quarterly investor report series provides an exclusive insight into key M&A transactions, data on the most notable deals of the past three months, economic country forecasts, and unrivaled investment analysis, four times a year.

This edition focuses on the U.S. wind market, and that of New York in particular, and reveals that 2.4 GW of wind PPAs were agreed in the first quarter of 2018 — making it the busiest quarter for PPAs in the U.S. since 2013.

While the Trump administration and its tax reforms have given rise to considerable uncertainty, for instance, this has been more than compensated for by the initiatives of state governments in New York, New Jersey, and Massachusetts, among others.

However, market challenges such as the Jones Act, which requires that goods shipped between U.S. ports be carried on ships that are U.S.-built, U.S.-flagged, and U.S.-crewed, have the potential to disrupt the pace of growth. In addition, the proposed 25 percent tariff on steel — the major



New York is well placed to attract investors' interest and capital and position itself as a regional leader in offshore wind. (Courtesy: Pixabay)

raw material in wind turbines — could well result in increased turbine prices.

Nevertheless, the outlook for U.S. offshore wind remains positive. As one of the world's largest financial centers, New York is well placed to attract investors' interest and capital and position itself as a regional leader in offshore wind. And it has already set itself the ambitious target of generating 50 percent of its electricity from renewable sources and having a total offshore capacity of up to 2.4 GW by 2030.

Significantly, the New York State Energy Research & Development Authority is aiming to encourage investors to back offshore wind projects that cost more upfront than other clean energy schemes. It formed the New York Green Bank in 2014, which is interviewed in this report, to fund renewables projects in the state, and the bank is now capitalized with \$1 billion, of which it has invested \$457.5 million to date.

While wind has so far been a minority interest, as more and larger projects are mooted, the bank has

the potential to play a key role in future commercialization of the U.S. offshore wind sector.

“For years the U.S. offshore wind industry lay dormant, but it is now beginning to wake up and stands to benefit from greater cost efficiencies and technological advances,” said Richard Heap, editor, A Word About Wind. “But it's also becoming increasingly clear that strong political buy-in at the state level will have a make or break effect on overcoming potential regulatory and economic stumbling blocks. New York in particular has pushed itself to the fore in terms of its commitment to creating a profitable environment for U.S. offshore wind, and this will be crucial to the success of the wider industry.”

“U.S. offshore wind currently has much to shout about, and competition between the states is driving the growth of the sector and its supply chain,” said Adam Barber, managing director of The Tamarindo Group, of which A Word About Wind forms a key part. “New York is in a strong position to capitalize on its status as

a global financial center and continue attracting greater investment in offshore wind, but can expect to be pushed hard in its bid to become the leading hub for wind by New Jersey and Massachusetts.” ↴

Source: *A Word About Wind*

For further information,
go to: www.awordaboutwind.com

U.S. Department of the Interior charts big future for offshore wind

U.S. offshore wind development received a major boost from the Trump administration. The U.S. Department of the Interior’s Bureau of Ocean Energy Management (BOEM) recently announced the sale of two new offshore wind lease areas off Massachusetts, a call for input on additional proposed lease areas in the New York Bight, and a high-level assessment of all Atlantic Coast waters for potential future offshore wind lease locations.

“Secretary Zinke’s leadership is transforming the enormous potential for offshore wind into a concrete pillar of American energy dominance,” said Tom Kiernan, CEO of the American Wind Energy Association (AWEA). “Expanding the market for offshore wind is good news for American workers and the coastal communities needed to manufacture, deploy, and operate these projects. Working closely with the states, this administration can lead the U.S. to become a world leader for offshore wind as it is for other sources of energy.”

Because most offshore wind development will happen in federal waters, BOEM’s process to assess, identify, and auction lease areas to offshore energy developers is essential to unlock U.S. offshore wind’s technical potential, which is estimated to be nearly double current U.S. electricity use. BOEM has previously awarded 13 commercial wind-energy leases off the Atlantic coast and this announcement puts two more areas up for sale off the coast of Massachusetts. BOEM’s call for input in New York and the high-level assess-



Gulf Island Fabricators constructed offshore wind turbine jackets for Deepwater Wind’s Block Island Wind Project off Rhode Island. (Courtesy: BOEM/Sid Falk)

ment of the Atlantic Coast has the potential to open even more lease areas to offshore wind.

BOEM’s announcements add to the market optimism for U.S. offshore wind development. Major offshore infrastructure developers have placed aggressive bids to develop existing wind lease areas, and America’s first offshore wind farm came online in late 2016. States such as Maryland, Massachusetts, New Jersey, and New York are advancing ambitious policies that will help the offshore wind industry achieve scale and build out a domestic manufacturing supply chain.

A recent study coauthored by New York, Massachusetts, Rhode Island, and the Clean Energy States Alli-

ance, found that 8 GW of offshore wind from Maryland to Maine will create almost 40,000 full-time U.S. jobs by 2028; 86 GW by 2050 would support 160,000 jobs. Another study by the Workforce Development Institute found that 74 different occupations, including electricians, ironworkers, and welders, are needed during the various stages of planning, development, and operations of offshore wind farms. The land-based wind industry supports more than 100,000 U.S. workers today, demonstrating growth at this scale is achievable. ↴

Source: AWEA

For more information,
go to www.awea.org

inFOCUS

Skill is just the beginning

Iowa Lakes Community College teaches its future wind technicians more than just how to repair turbines.

By Dan Lutat

Building a professional workforce is an essential, but often overlooked, component of wind-energy development.

Thanks to private landowners in the heartland, wind-energy development is now a mainstay in rural communities that needed a modern hedge against agricultural and fossil fuel volatility.

“Our diplomas represent more than degrees,” said recent graduate John Kleppinger. “They represent drive, determination, and resiliency — key ingredients to reaching any goal. Even though I’m not certain where I’ll wind up, I now have the ability to pursue what I’m passionate about. I can now achieve my dreams and the life I’ve imagined.”

What does being a professional really mean? Professionals are defined by service to the common good, specialized skills and training required for entry into the field and deliberate development from the rookie to novice to expert to master.

It isn’t enough to advocate for an industry if that field wishes to be called a profession. Since turbines are a visible part of the landscape, technicians are required to be ambassadors of the industry in communities where they are now raising families.

A deliberate process of developing talent — not just hiring it — both on the job and formally, is necessary to ensure that the wind-energy field grows the right leaders.

It is a common mistake to assume that people just come by leadership naturally, or that there is always someone with the right skill waiting for a job offer. Leaders are indeed made by those who understand that one’s position doesn’t denote leadership.

None can look back on their experiences and say they succeeded on their own. Understanding the pathway of professional development is critical, and the pathway begins with the understanding that all doing is learning and all learning is knowing.

This concept is evident in the nation’s first Associate in Applied Science in Wind Energy and Turbine Technology at Iowa Lakes Community College, where developing the person is as important as developing skills.

It can’t be overstated that a cornerstone of professional development is skill. Expert power is an essential building block of leadership and must be demonstrated in order to earn trust and respect from others.

As a person earns skills, an essential part of developing individuals along a “whole person concept” is mentorship in the art of building a network, articulating what they bring to the workforce, lifelong learning, and what a professional development pathway looks like.

At Iowa Lakes, that conversa-

tion begins with every prospective student and continues after graduation.

Foundational instruction means that consequences of decisions are an integral part of the student’s lived experience, from safety to team dynamics. Planned values opportunities are built into lectures and demonstrated in labs so that students live the consequences of their approach to problems.





Since rolling out the nation's first Associate in Applied Science Degree in Wind Energy and Turbine Technology in 2004, Iowa Lakes has been a leader in delivering training and education to meet a steadily growing demand for operations and maintenance technicians across the country and abroad. (Courtesy: Iowa Lakes Community College)

In the course of experimenting, planning, and problem solving, individual values are modified, reinforced, and refocused with a responsibility message driven by something bigger than a paycheck or a stable job future.

This is where the seeds of leadership are sown, and where the greatest teacher — failure — is applied in developmental lessons that build versatile, resilient leadership traits.

Alongside technical and safety training, Iowa Lakes

identifies a pathway to the next level in professional development. From the lucrative opportunity presented to graduates entering the field, springs a look over the horizon at what lies ahead.

By engaging students with a certified career coach early and often, conversations that focus students on how to take the next steps expand the graduate's understanding of what motivates them and how to achieve it.

If a person chooses to gain experience in the field and then lead people, students are linked to options tailored to give working adults a degree that develops those skills. If a person wants to pursue engineering after valuable field experience, we identify a pathway to becoming an engineer who is more than just a designer.

No matter the graduate's dreams, a plan, a pathway, and experience in how to make it happen are essential. These so-called soft skills are the hardest to earn and take the longest time to develop. Our deliberate approach to engaging students in the process continuously produces graduates with transferrable skills, prepared to go farther.

To reinforce the value of core transferrable skills, take it from Ross Raymond, a 2018 graduate of Iowa Lakes' Engineering Technology program.

"As a 27-year-old mechanic, unhappy with my job, I made the decision to go back to school in the hope of finding a career that I enjoy," Raymond said. "I chose the Engineering Technology program at Iowa Lakes Community College. At Iowa Lakes, numerous opportunities became available to me. I completed an internship with a major soybean processing facility and am currently working at a company called Windtest here at the college that does a variety of testing on wind turbines.

"These opportunities would not have been available to me had I not made the decision to further my career in renewables," he said. "I look forward to what the future has in store for me, and I'm thank-

ful for the help and guidance that the staff at Iowa Lakes provided."

By establishing a connection to adulthood, from high school, through an effective community college experience, Iowa Lakes



In January 2011, the Wind Energy & Turbine Technology program at Iowa Lakes Community College was one of the first three programs nationwide to earn the American Wind Energy Association's Seal of Approval for Wind Turbine Service Technician Programs. (Courtesy: Iowa Lakes Community College)



Classes in the Wind Energy & Turbine Technology program at Iowa Lakes Community College cover many aspects of the wind-energy industry, including safety training as well as extensive training in electrical theory and practical application, mechanical systems, hydraulic theory, and practical application and field training. (Courtesy: Iowa Lakes Community College)



Iowa Lakes Community College students use a 1.65 MW working turbine about a mile and a half south of the Iowa Lakes Community College's Estherville campus as an educational laboratory. (Courtesy: Iowa Lakes Community College)

builds understanding of professional development and lifelong learning. It breaks through myths to produce versatile, self-reliant technicians, with recession-proof, core-transferrable skills every industry needs.

To produce critical thinkers and competent problem solvers, Iowa Lakes integrates teaching young people how the world works and what core values are in practice. It produces competence through experiential learning that puts integrity first and focuses on excellence in personal and professional mastery.

An understanding of what it means to have an impact on America's energy future is vital to building a sense of service to people who may never know a graduate's name yet will benefit from their drive to make a difference. ✨



Students in the Wind Energy & Turbine Technology program use ground trainers and laboratories as well as the college's working utility scale turbines. (Courtesy: Paul Gates Photography)



Dan Lutat is director for Sustainable Energy Resources and Technologies (SERT) studies at Iowa Lakes Community College in Estherville, Iowa. A 28-year Air Force veteran, he and his team connect intuitive dots that link technology, the environment, and sustainability.

Competency-based training

The Wind Turbine Technician Academy at Kalamazoo Valley Community College teaches master skills that are highly sought after in the wind-energy industry.



By Thomas Sutton and Delia Baker

Creating an educated workforce skilled to meet the demands of a changing economy is the focus at Kalamazoo Valley Community College's Groves Campus. Originally opened in 2001 as one of 18 M-TEC facilities across the state, the Groves Center was financed by a \$5 million grant from the Michigan Economic Development Corporation, plus \$6 million in matching funds provided by area companies and foundations. It offers a variety of training programs for those looking to embark on a new career path, including fast-track training academies that are designed with input from local employers.

One of its most notable programs is the Wind Turbine Technician Academy (WTTA), which was launched in 2009 and has quickly earned a reputation as one of the premier training sources for wind-industry professionals.

The Wind Turbine Technician Academy provides an opportunity for individuals to learn, develop, and master skills that are highly sought after in the wind-energy industry.

The WTTA is a competency-based, 24-week training program designed to teach individuals the skills necessary to work as wind-turbine technicians. Upon successful completion of the program, students typically enjoy a high placement rate within the wind-energy industry.

The program meets Monday through Friday from 8 a.m. to 4:30 p.m. During scheduled service trips, students can expect to work 10 to 12 hours a day to complete the scheduled tasks.

The college has educational affiliations with two Michigan-based utility companies that give the WTTA sole responsibility for five utility-grade turbines in the state. Students can expect to spend at least two weeks working in the field on these turbines.

COMBINING KNOWLEDGE AND APPLICATION

The field service trips are a unique way for WTTA's trainees to combine the theoretical knowledge and laboratory application on turbines that are producing electricity to the grid. Graduates receive real-world experience well before they are hired by an employer in the wind industry.

Kalamazoo Valley WTTA graduate Tory Jones on site at Stoney Corners Wind farm in McBain, Michigan — owned by Heritage Sustainable Energy. The turbine is a Fuhrländer FL2500 2.5MW machine. (Courtesy: WTTA)



Kalamazoo Valley WTTA graduate Justin Barget on site in Mackinaw City, Michigan – now owned by Mackinaw Power. The turbine is a NEG Micon NM52 900 kW machine. (Courtesy: WTTA)

Kalamazoo Valley’s WTTA differs from similar programs in the U.S. in that it is competency-based rather than credit-based. Each competency has been validated by the industry as a necessary skill for wind-turbine technicians. Students must demonstrate with 100 percent proficiency that they can complete the tasks. These competencies are proven by hands-on demonstrations completed in the presence of one of the instructors or representatives from industry who may be visiting.

As students are completing the competency demonstration, they will need to describe what they are doing as well as answer questions from the person evaluating them. This provides opportunity for stu-

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Current Kalamazoo Valley WTTA trainee Jeff Condry demonstrates a controlled descent from the 100-foot tower at the Groves Center on the first day of class. (Courtesy: WTTA)

dents to learn the theory and reasoning for the tasks they are performing. Instructors work closely with each student to develop and strengthen troubleshooting skills. There is not always one solution to each problem encountered in the industry, so instructors try to guide students to discover the most preferred solutions.

Learning the skills necessary to be successful as a wind-turbine technician requires hours of hands-on practice. So, as a general rule, the college aims to keep the class time to a minimum, spending about 85 percent of their time in the laboratory or in the field.

TRAINING SERIES

Additionally, students enrolled in the academy must complete ENSA GWO BST training series, which includes working at heights, first aid, fire prevention, and manual handling. All work at heights training is completed on the college's 100-foot climbing tower or on the indoor climbing structure.

In order for this type of training to be successful, class sizes must remain small. The college only accepts a maximum of 12 students each session, allowing it to maintain an ideal student-to-instructor ratio. Acceptance into the academy is based on a detailed application process.

"Individuals are required to apply for the academy with an application similar to a job application. They need to provide contact references, pass a mathematics test, as well as conduct an interview. This application process allows the WTTA team to identify individuals with the most potential for success.

Graduates of the WTTA typically take positions as wind-turbine technicians either on a wind farm or as a traveling technician for virtually every major OEM and service and maintenance provider in the U.S. wind industry. New wind-energy projects are being constructed throughout the U.S., and they will require technicians to maintain and service wind turbines. The demand for highly trained wind-turbine technicians will continue to rise as more projects are constructed.

CAREER OPPORTUNITIES

The WTTA team is constantly being notified of career opportunities in the wind industry. The school maintains a private network in order to inform previous graduates of available opportunities.

In order to meet goals put in place by the U.S. Department of Energy, the wind-energy industry will need to continue growing.

Currently trending in the U.S. wind industry is more corporate ownership of wind assets every year



Kalamazoo Valley WTTA graduates Eric Wanczak and Claire Bagniewski practice some electrical work in the motor controls laboratory at the Groves Center. (Courtesy: WTTA)

as it allows a corporation to identify its actual energy costs for many years — sometimes up to 20 years. With the increased demand from private industry, wind energy will continue to grow. The growth in wind energy is coupled with a steady increase in employment for people to support the increased wind capacity.

At the same time, technology is ever changing, and turbines are becoming more efficient and sophisticated every year. This requires a workforce with diverse skill sets in order to maintain and repair legacy machines as well as the newer and more advanced machines. WTTA's close working relationships

and validation from the industry, coupled with its competency-based program, allows the college to continuously improve to make certain its graduates receive the knowledge and skills needed to satisfy all of the requirements of the industry.

CERTIFICATIONS

Kalamazoo Valley's WTTA has earned both the American Wind Energy Association (AWEA) seal of approval and certification by the Bildungszentrum für Erneuerbare Energien (BZEE) Renewable Energy Education Center. Upon successful completion of a series of written and practical tests, as well as a completion of the field service,

students receive certification as a service technician for wind-turbine engineering through the BZEE.

Companies in the wind industry have become familiar with WTTA's program. Employers benefit from hiring its graduates because they are not only hiring an employee who is fully certified and competent, but they also have gained experience on real components and actual field experience all within the 24-week training period.

Kalamazoo Valley runs two academies per year; one typically starts during the first week of January, and the other normally starts the first week in July.

Established in 1966, Kalamazoo Valley Community College is a comprehensive, fully accredited, public, two-year college with about 10,000 students. Kalamazoo Valley offers certificate programs in more than 20 areas of study and associate degrees in 25 others. In addition to associate degree and certificate programs in business, health care, human and public service, technical occupations, and industry, the college also provides a quality experience for students preparing to transfer to four-year institutions following graduation.

To learn more about the WTTA, contact Delia Baker at dbaker2@kvcc.edu or (269) 353-1554. ↵



Thomas Sutton is the director of Wind Energy and Technical Training Services. In 2008, he became a key developer of the Wind Turbine Technician Academy at Kalamazoo Valley Community College including the Quality Management system. Sutton is an active member of the International Technical Committee and travels to Europe where he helps develop global work-safety-at-heights standards. He is also active in the American Wind Energy Association and is serving on the Safety Steering Committee. Sutton also delivers safety-at-heights training to the wind academy and general industry as a College Instructional Partner with ENSA North America.



Delia Baker is program coordinator for Technical Training Services. Baker obtained a Bachelor of Business Management from Western Michigan University in 2012. She joined the team at Kalamazoo Valley in September 2017 after several years working in sales for a relocation company.

Rising Costs of Wind O&M and the Importance of the Human Factor

Advanced mobile and cloud-information technology can be a potent tool in helping wind technicians and their managers get better results.



O&M costs associated with wind turbines are significant, making up, on average, 20 percent to 25 percent of the total levelized cost per kWh produced over the lifetime of a turbine. (Photos courtesy: Scoop MAE)

By Babak Sardary

As fleets age and the cost of wind-energy O&M rises, wind-farm owners and operators look far and wide for ways to achieve efficiency. In this article we look at the importance of the human factor and examine key challenges faced by companies and their employees. We look at how readily available advanced mobile and cloud-information technology can be a potent tool in helping wind technicians and their managers battle complexity and get better results while significantly lowering the cost of wind turbine O&M.

Wind is an abundant, affordable and scalable source of renewable energy. According to a report released by the U.S. Department of Energy, “Wind Vision: A New Era for Wind Power in the United States,” by 2050, wind energy in the U.S. alone has the potential to create 600,000 jobs and provide consumers with \$149 billion in savings. Today’s wind turbines are not the prairie windmills of yesteryear. They are massive, highly sophisticated machines. A modern wind turbine has a whopping 8,000 components.

Wind-turbine fleets are aging and O&M costs are going up. According to IHS Markit, “the majority of installed wind-turbine equipment averages more than five years in age, and operations and maintenance (O&M) expenses cost the industry \$3 billion to \$4 billion annu-

ally (in the U.S.)” In fact, this increase in O&M costs is what’s driving significant growth potential for employment in the sector, making wind-energy technicians the fastest growing occupation.

According to the U.S. Bureau of Labor Statistics, the demand for these workers will double in the next seven years.

O&M costs associated with wind turbines are significant, making up on average, 20 percent to 25 percent of the total levelized cost per kWh produced over the lifetime of a turbine. In recent years, as fleets age, a good deal of attention has been given to methodologies and technologies that can help reduce wind-turbine O&M costs. Specifically, advances have been made in areas of predictive maintenance, condition monitoring systems, and even use of aerial drone technology for automated blade inspections. However, as is often the case, some of the more basic but perhaps less glamorous factors related to how wind companies enable O&M teams to organize, gather data, and communicate have been ignored. In this article we analyze the key challenges in these areas and how relatively inexpensive and easy-to-deploy information technology solutions can produce an outsized effect. We describe how these innovative solutions can boost the effectiveness and efficiency of wind-turbine inspections and O&M programs.

THE HUMAN FACTOR IN WIND O&M

Maintaining wind turbines is hard work. Wind turbine O&M field work is physically demanding labor, requiring early hours, long drives over backroads, and 300-foot ladder climbs just to get to the office. Wind technicians and field personnel are under tremendous time pressure to complete jobs quickly and efficiently. With wind installations in remote areas and the move toward more offshore installations, the completeness and accuracy of site visits is becoming ever more important. The human factors involved in the operations therefore deserve special attention.



Figure 1: Wind-turbine maintenance crews carry out physically demanding, complex work. Reduce their workload and help them overcome complexity by putting clear instructions and the means to collect good data right at their fingertips.

BATTLING COMPLEXITY

Wind-turbine inspectors and O&M personnel work remotely on complex equipment. The number of components and steps involved in maintenance routines can be mind-boggling. In this environment, lack of clear instructions and on-the-spot contextual information can lead to mistakes and less-than-optimal results or, worse yet, serious incidents or accidents.

Classroom training, on-the-job shadowing of more experienced personnel, and daily crew meetings are important tools for imparting knowledge and know-how to employees. However, work in wind energy is a classic example of how in today's ever-growing complex world, the human performance factors can come into play in a major way. To take an example from the aviation world, where the cost of mistakes is rather high, even the most experienced pilots are required to follow detailed step-by-step checklists. Studies from the medical world similarly point out the power of checklists in preventing mistakes. In his highly acclaimed book "The Checklist Manifesto: How to Get Things Right" author Atul Gaw-

de says: "The modern world has given us stupendous know-how. Yet avoidable failures continue to plague us in health care, government, the law, the financial industry — in almost every realm of organized activity. And the reason is simple: The volume and complexity of knowledge today has exceeded our ability as individuals to properly deliver it to people — consistently, correctly, safely."

With the rapid growth in demand for wind-turbine maintenance services and the corresponding demand for technicians, companies will be faced with hiring less-experienced resources.

Companies need to not only arm all employees with easily accessible instructions and information to do their job but do so within an accountable and trackable framework that ensures the steps are in fact followed.

Advances in mobile computing in the last decade and creation of flexible software platforms have made it possible to quickly create and provide clear, checklist-driven instructions to field personnel — even in remote areas where they may not have access to cellular or WiFi connectivity. Checklists can be set up to require mandatory completion of each item, addition of pictures, and annotations. Additionally, some of the more advanced software options allow embedding drawings, reference manuals, and how-to video clips right into the checklist, making these much more likely to be referenced and used.

GETTING TO GOOD AND GREAT WITH DATA

Wind-energy maintenance visits are costly. A one-day visit with three to five people can easily run in the multi-thousand dollar range when you factor in labor, tools, transportation, and, of course, wind-turbine downtime. With the shortage of resources, there is also the

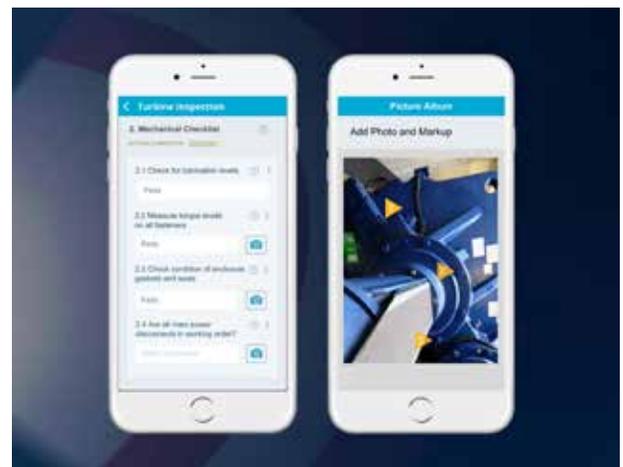


Figure 2: An example of the mobile Work App configured on the Scoop® Wind platform (www.scoopwind.com) for wind-turbine inspection preventative maintenance and troubleshooting. Wind clients can use the drag-and-drop App Builder™ to customize their own checklists and multimedia collection fields.

opportunity cost to consider. Crews that are visiting one wind farm are not available for other sites with perhaps more pressing maintenance tasks. It's important to maximize the results from each trip. A key consideration is to ensure all necessary data is collected in the most complete and accurate manner while crews are onsite. Often this data can be critical to analysis back at the office and/or creation of client-facing reports that are required before invoicing for services. Repeat site trips as a result of crews leaving a wind farm without a complete set of data are significant contributors to the overall cost of O&M.

As mentioned above, checklists can be used to guide wind technicians to follow the correct procedural steps to perform a PM routine or to diagnose, fix, and verify a reactive maintenance task. Similar digital checklists can also be used to ensure a complete set of data is gathered while onsite.

Given how busy and time-pressured technicians are during a typical visit, wind-farm operators and service providers need to do all they can to reduce the fatigue and workload. Juggling notebooks, paper forms, spreadsheets, laptops, and cameras while wearing PPE and harnesses is exhausting and significantly slows down work. Reducing the number of devices and media can thus be hugely beneficial. With modern mobile devices and field apps, technicians can focus on their work steps on a single device. The mobile app guides them as to the steps to follow, list of data to collect including measurements, drop-down choices for standardized conditions of equipment, and prompts to capture multimedia and comments when warranted.

CAPTURING AND TRACKING CORRECTIVE ACTIONS

During a typical visit, wind-turbine inspectors may notice numerous issues: a lubrication pot that's nearly empty, corrosion that's creeping up on a cooling fan housing, vibration emanating from a damaged blade, or a missing safety guard rail. All of these are examples of issues that need to be recorded and reported.

The complexity of the work combined with time constraints and work fatigue can conspire to have these observations fall through cracks, denying the team the opportunity to investigate and resolve them while the opportunity still exists. Study after study shows that major failures and tragic safety incidents are rarely due to a single factor but rather arise when multiple seemingly simple issues come together. Apart from the simple fact of recording an issue or corrective action, wind-farm operators need to pay attention to how well corrective actions are described, assigned, and tracked to resolution. With rudimentary tools such as paper notes and spreadsheets, descriptions of issues are often illegible or lack sufficient detail. Additionally, given the need for data re-entry, issues are not centralized in a unified database and can



Figure 3: By establishing real-time, two-way data flow across field and office, wind-farm owners and service providers gain true visibility into the status of operations. Key issues, tasks, and corrective actions are reliably gathered, tracked, and resolved while back-office managers are able to generate client-facing reports and analytics efficiently.

easily be overlooked.

Today's mobile IT field technology makes it exceedingly easy for technicians to log corrective actions and observations the moment they are encountered. The technology can be used by technicians in an ad-hoc fashion and/or be set up to automatically prompt the technician to record a corrective action task when a failed condition is observed within a checklist. Pictures and even video clips can be recorded seamlessly and attached directly to tasks providing an accurate description of the issue to folks back at the office or subsequent crews. Given the cloud connectivity of many such tools, corrective actions are automatically transmitted to a centralized dashboard for management tracking and resolution by personnel.

RAPID TURNAROUND AND REPORTING

It is important to remember that wind-farm visits and turbine inspections are not done in a vacuum. Often one or more downstream business processes depend on the results of a site visit. For example, the inspections could be part of a due diligence study performed on behalf of a potential investor. Or, they may be part of a contractual preventive maintenance program offered to a wind-farm owner or may be part of a reactive maintenance trip to fix an issue and bring a turbine back online.

Regardless of the purpose, rapid turnaround of the inspection process and the ability to get eyes on reliable data evidencing and documenting the visit is crucial. Traditionally, given the remote location of wind farms, it can take days to receive this data when you combine the need for technicians to collect, tabulate, and package the data, complete with comments, notes, and pictures, into a comprehensive archive and

ultimately transmit this to the office. In this space of time, management, engineering, and other reviewers back at the office are stalled when it comes to the status of work and ability to generate reports or certify the work as complete.

Bridging the time and space gap across field and office is a crucial area that can benefit wind-farm operators, owners, and service providers. Establishing a near-real time data pipeline and visibility into the status of work being performed cannot only ensure data is available for analysis, validation, and reporting right away, it can also stimulate collaborative problem-solving between field personnel and remote managers or subject matter experts. With advances in cloud and mobile communication, it is now possible to cost-effectively achieve this level of data synchronization and communication with personnel at wind farms.



Figure 4: An example of client-facing PDF report and analytic charts showing aggregate stats on wind-turbine data configured in the Scoop® Wind platform [www.scoopwind.com]. With real-time data and automated report templates, wind companies can cut report generation lead time from two to three days after visit completion to a just a few hours.

SOURCING RAW INGREDIENTS FOR ANALYSIS

In recent years, a great deal of emphasis has been placed on the importance of predictive maintenance and use of advanced AI and machine learning algorithms for predicting when failures are likely to occur. The lifeblood of all such methodologies is copious amounts of data. Today's modern wind turbines are increasingly equipped with a variety of sensors measuring temperature, wind speed, vibration, fluid quality,

and other parameters that are recorded and made available via SCADA systems. While this data forms a valuable baseline, its utility in prediction can be greatly enhanced when combined with onsite human observations and measurements. In order for the human-generated data to successfully mesh with machine SCADA data, the former needs to be organized, standardized, and structured. Digitizing the technician data collection process using mobile technology makes it possible to achieve this goal. In this fashion, not only a single centralized body of data is available, but every data item is properly referenced to the correct wind turbine, component, and serial number. This data can then be correlated reliably with SCADA data for a powerful comprehensive picture of each asset and its subcomponents.

ATTRACTING AND KEEPING TOP TALENT

Last but definitely not least, as we enter an era of mass-retirement (12,000 baby boomers retire every day in the U.S. alone — being replaced by the mobile, social-media native generation) and the demand doubles for wind-turbine technicians in the next seven years, wind-farm operators and service providers are increasingly searching for ways to recruit, train, and retain top talent.

Being active in the wind-energy community and establishing a track record and reputation for innovation is a huge asset when it comes to attracting the best resources. However, once an employee is onboard, actual experience with the work environment and interactions with colleagues and managers must continue to validate and reinforce this image. When a company projects a great forward-looking exterior but continues to operate based on outdated methods and tools, employees quickly become disillusioned and begin to look elsewhere. Digital technology can play an important role in not only projecting a progressive image but empowering and engaging employees in real and practical ways.

Given the remote and often isolating nature of work in wind energy, mobile technologies that enable connectivity provide an important lifeline to employees. The ability for field employees to report what they see in a visible manner contributes to their engagement. Being able to essentially tell a story of what they encounter and having the opportunity to interact in real time with the rest of the team and management, provides them with the sense that they have a voice, and their contribution is noticed and appreciated. ↵



Babak Sardary is CEO and co-founder at Scoop®, a mobile cloud-based Field Project Management and Workflow Automation platform for renewable energy operations. Sardary has a Master's degree in mechanical engineering from the University of Waterloo, Canada, and is a veteran of the intelligent systems software industry. During his career, Sardary has initiated and led strategic relationships with major corporations including ABB, Ford Motor, Toyota Motor, General Motors, Microsoft and LG. For more information, go to www.scoopwind.com

PROFILE

Royal Dutch Shell

Shell has been in the energy business for more than a century, but as the need for renewables has grown, it has expanded its footprint into many areas of the wind industry.

By Kenneth Carter
Editor | Wind Systems

When Shell's logo pops up on a gas station about every few miles while driving down a street or interstate, it's sometimes easy to forget that the global energy company is involved in so much more than oil and gas.

As a matter of fact, Shell has had a hand in the wind-energy industry for more than 15 years starting with the Rock River project in 2001.

Just in the U.S. alone, Shell maintains an energy capacity of 425 MW from wind energy, according to Tim Russell, power and general manufacturing — sector marketing manager with Shell Lubricants.

"Shell became investors and developers of a number of wind farms in the U.S. and in Europe a number of years ago," he said.

Shell has an onshore wind portfolio



Shell has an onshore wind portfolio that includes four joint venture interests that span six operating wind projects. (Photos courtesy: Shell)

Royal Dutch Shell

Founded:
1907

Headquarters:
The Hague, Netherlands

Website:
www.shell.com

that includes four joint venture interests that span six operating wind projects. Those projects are 50-50 non-operated ventures.

In addition to U.S. wind, Shell also maintains a 50 percent interest in NordZee Wind, an offshore wind park in the Netherlands.

BUILDING NEW BUSINESS MODELS

By investing in areas such as the Netherlands and the supply of power to retail customers in the U.K., Shell has been able to take advantage of its existing gas and power trading capabilities while building new business

models for the future.

With the cost of wind generation decreasing, the desire to create renewable energy resources continues to interest Shell.

But Shell's foray into the wind industry doesn't stop with its wind-farm portfolio.

Shell also works with wind turbine and wind-turbine component manufacturers through its Lubricants division.

"We supply all of the major manufacturers in the sector, whether it's with greases, hydraulic oils, or gear oils."

SYMBIOTIC RELATIONSHIPS

When it comes to lubricants and the

OEMs, it's important to have a symbiotic working relationship, according to Russell.

"We have a partnership mentality with our customers," he said. "Supplying today's requirements on time and with the right products is critically important, as is ensuring that our lubricants and grease portfolio are aligned with the new developments in technology in the industry."

Shell is an active player in the energy system and has embraced its transformation into different areas in order to create commercial opportunities while providing cleaner energy worldwide.

And as the offshore business continues to boom abroad and as it gains a foothold in the U.S., Shell is ensuring its lubricants are a part of traditional turbine gearboxes as well as turbines with direct drive.

"One of the bigger changes is going to be what type of lubrication is needed," Russell said. "As far as requirements go, the direct drive is going to take a different type of lubricant."

THE GEARBOX CHALLENGE

However, the gearbox has always been one of the biggest challenges in a turbine, according to Russell, and he said Shell is coming out with a new gearbox oil that it introduced at AWEA WINDPOWER in May. Shell has developed a premium gearbox oil, Shell Omala S5 Wind, which in testing has proven to be the best performing in the industry.

"Using synthetic oils means gearboxes last longer," Russell said. "Wind-farm operators and owners want to extend their oil change intervals and with Shell Omala S5 Wind, we have tested that the oil will perform for 10 years without need for a changeover."

Other good news is that wherever a turbine is located, Shell Omala S5 Wind performs even in the coldest temperatures.

"With such a good quality synthetic, you're going to cover most of the operating temperature ranges that you're going to need," he said.

LOOKING TO THE FUTURE

Shell's broader energy plans involve matching the net carbon footprint of the global energy system by 2050, but, in the interim, the company hopes to reduce that footprint by 20 percent as soon as 2035.

Electricity, including from renewable sources, will be a large part of Shell's future as the world moves to lower-carbon energy. By doing so, Shell expects it to become the fourth pillar of its business, alongside oil, gas, and chemicals.

"Our business priority is to dramatically reduce the net carbon footprint," Russell said. "Renewables, in particular, wind power, is definitely a significant factor in our strategy." ↵



Shell is an active player in the energy system and has embraced its transformation into different areas in order to create commercial opportunities while providing cleaner energy worldwide.



Shell is ensuring its lubricants are a part of traditional turbine gearboxes as well as turbines with direct drive.

CONVERSATION

Tracy Deadman

Site Operations Supervisor
e.on's Bruenning's Breeze Windfarm

“We are a coastal wind farm. There's a lot of activity on the coast of Texas.”

Tell us a little about Bruenning's Breeze Wind Farm?

First thing, I want to touch base on how the farm was named. It was actually named after Michelle Bruenning, and she worked in our legal department in Austin. She passed away a couple years ago from cancer, and this farm was named in dedication to her and the work she did for the company. We recently had a dedication ceremony in April that included her family coming down.

Legally, the farm was called Magic Valley 2, but then we changed the name. But we are comprised of 76 Acciona 3 MW turbines. So, we're 228 MW total. We have just one substation, operations building. And we tie into the local AP-345 line. And we actually went COD (commercial operation date) in December of last year.

What are your duties at Bruenning's Breeze?

I am the site operations supervisor. I oversee all operations onsite. This is, of course, a first for e.on. This is a first site for e.on that was self-performed from day one. So, e.on has taken control of the site. We have just a parts warranty with the manufacturer. We actually have a group of e.on technicians on site taking care of daily operations, taking care of the maintenance repair, and everything. Not only that,



but we also take care of the BOP side. We take care of the substation; we take care of the road, yard, building, 100 percent all the way across.

Is that a unique situation for e.on?

On the ownership side, I know that FP&L (Florida Power & Light) has been doing this for years, and a couple of others have taken over first day, but not many. So, I think this is what we're going to be looking at pretty much moving forward with all our projects. It's just, from a cost standpoint, a lot better.

But my duties onsite are that I run the show. I take care of everything from contract management to negotiations on vendor contracts and turbine performance, safety. Everything is under my scope.

What's a typical day like at Bruenning's Breeze?

We have our scheduled work that we always have to do. Every day starts with a nice morning meeting with everyone on site. We have a daily safety brief every single day. And we're a little unique — we started this at my last wind farm — at every wind farm, they'll do a stretch-and-bend in the morning. But we actually go for a walk first every morning. We walk around the yard and get a little warmed up, and then we actually do our bend-and-stretch after our morning meeting.

We essentially have a lead technician who looks at SCADA and sees what's down for the day. Normally, we know the day before as to what we're going to be doing as far as scheduled work is concerned. And then, of course, we have teams that are designated for unscheduled work during the day as well. And it's a wind farm, so you deal with anything else that arises. And that could be anything from a different turbine faulting that wasn't down or addressing some major fault issue. There are a lot of different things that could make it on that list. And there are several things that as a manager that I have to monitor. We have safety steering committees. We have building walkthroughs. We go out and do observations onsite. We do QA/QC

work on our own people internally, so it depends on what the day holds.

Is there anything about Bruenning that makes it unique among wind farms of its size?

If anything, it's the fact that we were self-performed from day one as the owners. That is definitely unique to us, in that this is the first site within e.on. And I believe this is the first site where Acciona has ever sold turbines where the farm has been self-performed. So, there have been some growing pains and learning curves, but we're managing.

How does Bruenning's inspect its turbines?

We have scheduled maintenance for one. Right now, of course, we're a brand-new wind farm. We actually are just finishing up our three-month maintenance cycle, which is known as your break-in maintenance cycle. And we're going to be rolling right into our six-month inspect. And that's normally a bi-annual event. For most turbine manufacturers, it's every six months. And depending what year you're in will determine what type of task. You may do more on one maintenance than the other. But you can almost guarantee that every turbine will be inspected bi-annually or every six months.

Some of the other things that we do, though, is we try to capture fault data. We Pareto check our faults as far as production losses — which turbine faults are giving us the most issues, how many are we seeing the most of, and which ones are causing the most down time. And we run those checks at least on a weekly basis. So, we know the status and if we have any sick turbines out there. We also have a condition monitoring system on our bearings. We also monitor vibrations



The Bruenning Breeze Wind Farm is comprised of 76 Acciona 3 MW turbines. (Courtesy: Tracy Deadman)

throughout the towers. And that data will throw out, maybe every three weeks, some turbines that need to be looked at based on those conditions that we're seeing as well.

Other than that, every day we look at SCADA, and if you see a turbine down, then you go address it. And we have a 24-hour monitoring center in Austin in our operations headquarters for e.on.

What strategic placement advantages contributed to the Bruenning Breeze project?

We are a coastal wind farm. There's a lot of activity on the coast of Texas. And one of the reasons for that is that they've noticed that our wind regime on the coast actually follows the power demand. In the afternoon is when we have our highest winds, and that's also when we have the highest load on the grid. It's a win-win for us, because we're supplying more power when there is peak pricing and when there is more load on the grid. And it's kind of specific to this area. The coastal winds come up every after-

noon just like clockwork.

That's why you're seeing a lot of growth down here. But not only that, but in the valley, the Rio Grande Valley, there are only two conventional power plants. And the Rio Grande Valley is one of the fastest growing metropolitan areas in the U.S. So, every day, there are new businesses. Every day, there are new homes. That means the power consumption becomes higher and higher and higher, but they're not building any more conventional plants. As power consumption grows in the valley, wind power is helping with those consumption needs.

What's next for the Magic Valley Wind Farm?

We have had a great working relationship with counties here in the valley, and we've really enjoyed being part of the community here, and we are exploring more mutually beneficial projects in the area for the future. ↵

For more information, go to www.eon.com

MAINTENANCE

Operations • Service & Repair • Inspection • Safety • Equipment • Condition Monitoring • Lubrication

Altitec rotor blade technician training receives DNV GL certification



Since 2010, Altitec technicians have provided regular inspections on more than 5,000 blades and 1,500 turbines throughout the U.K., Europe, and key emerging wind markets around the world. (Courtesy: Altitec)

Altitec, a leading blade repair and inspection specialist, has been issued with a Training System Certificate, after a successful assessment by DNV GL, the world's largest resource of independent energy experts and certification body.

Certification of the Altitec Academy's "Rotor Blade Repair and Inspection Training" course according to DNV GL guidelines for the certification of training in the wind-energy industry and DNV GL Rotor Blade Standards provides a stamp of approval to the Altitec course and reassures new technicians and employers alike that the training offered by the Altitec Academy provides technical and safety competency.

With more than 150 GW of total installed wind capacity in Europe alone, and as more wind farms come

online around the world, blade damage will continue to be the most common cause of wind-turbine downtime. The significant economic opportunity this growth offers in the U.K. and Europe means that there is not only great scope for further job creation, but also a large number of positions already available that need to be filled. Only by equipping more technicians with the necessary skills will the demand for well-trained technicians on sites around the world be met.

Each year Altitec trains about 150 new blade inspection and repair technicians for a career in the wind industry at its dedicated training center in London. Each trainee needs to be confident that their newly acquired skills will be recognized across the industry, not only by Altitec.

Previously, the lack of a widely recognized qualification of blade repair standards was a key factor in dissuading job-seekers from entering the wind sector, resulting in a skills gap in the labour market.

Certification from DNV GL demonstrates the quality of the training technicians have received to employers across the world. The certification of the Altitec Academy means employers can be confident they are hiring well-trained technicians with the appropriate skillset.

“We are delighted to have received this certification from DNV GL, which reflects the high standard of training provided by the Altitec Academy,” said Tom Dyffort, managing director, Altitec Group. “Employers around the world can be confident of the competency of new technicians leaving the academy, whilst job-seekers looking to transition into the wind industry can be assured that they are receiving high quality training. Well-trained technicians are in demand right now, and the Altitec Academy offers a chance for many more to develop these skills and pursue a new career path.” ↵

Source: Altitec

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

HTL Group appoints new technical director



Bob Fogerty

U.K. headquartered OEM HTL Group has appointed Bob Fogerty as group technical director.

Formerly group training director at HTL, Fogerty’s new role was a natural progression; Fogerty has decades of experience in the industry and is a well-respected technical authority in bolting on a global scale.

Since starting working life as an apprentice mechanical fitter, Fogerty joined the bolting industry as a field service engineer with Hedley Purvis in 1990. From then, career developments in various senior management positions led Fogerty to use his 28 years of industry expertise at HTL Group.

The new role will allow Fogerty to extend a technical support platform two fold: internally to help further develop HTL’s OEM product range with the in-house design team and, importantly externally to support clients with technical queries.

Providing technical insight into the continuous development of HTL’s flange management systems also will play a vital part in Fogerty’s new role due to his in-depth technical knowledge and constant personal development route, which has seen Fogerty achieve a BSc in Engineering and become a chartered member of the Institution of Occupational Safety and Health.

“Developing solutions to solve the ever changing technical demands of the bolting industry is the primary focus of my new role as group technical director, which is something I have taken pride in throughout my whole career in bolting,” Fogerty said. “I am looking forward to working with clients directly and continuing to work with the many industry professionals I have met over the years who now hold senior management positions in many organizations within the industry.” ↵

Source: HTL Group

For more information, go to www.htlgroup.com

GTI Predictive Technology announces GTILube for iPad

GTI Predictive Technology recently announced the immediate availability of GTILube for testing bearing lubrication and condition. GTILube is the system that takes ultrasonic technology to the next level.

GTI Predictive Technology's GTILube is a simple app that uses UE System's sensor technology to baseline and measure changes in the ultrasound signal to determine when a bearing needs lubrication. GTILube uses NASA standards for ultrasound measurement. An 8-dB increase signals a need for lubrication. A 12-dB increase indicates early bearing failure.

GTILube includes a calculator for determining an acceptable amount of lubrication for the bearing

based on its geometry. This value is displayed on-screen when the measurement exceeds the alert level. Users can also enter and display the type of grease for each bearing.

"We are excited to offer GTILube to help prevent bearing failure issues," said Tom Hoenig, president of GTI Predictive Technology. "GTI Predictive is taking the necessary steps to stay at the forefront of this technologically driven industry." ↵

Source: GTI Predictive Technology

For more information, go to gtipredictive.com



Semco Maritime wins engineering study for Taiwan wind farm

The joint venture between Canadian power producer Northland Power Inc. (NPI) and Taiwan-based Yushan Energy Co. Ltd. has selected Semco Maritime for an engineering study for the Hai Long offshore wind farm in the Changhua area in Taiwan.

The scope of the study comprises optimization of the electrical infrastructure hereunder electrical grid studies, assessment of number of offshore substations, sub-sea cable characteristics, design of preliminary offshore substation substructure, and topside layout as well as onshore substation layout. The study will be delivered in cooperation with Taiwanese engineering partners to ensure local requirements are met.

The Hai Long projects will have a generating capacity of 1,044 MW at two sites off the shore of Changhua County.

"We are very pleased that NPI/Yushan Energy Co. Ltd. has chosen Semco Maritime for this study, and we are proud that our services can play a part in helping the Hai Long project with its maturation,"

Semco Maritime's electrical engineering study of the Hai Long offshore wind farm will be finalized in June. (Courtesy: Semco Maritime)

said Hasan Jørgensen, senior business development manager for Taiwan, Semco Maritime. “We view the Taiwanese market as very promising and we will do our utmost to assist Taiwan with reaching its ambitious 5,500 MW offshore wind target by 2025.”

Semco Maritime has been active since 2016 in the Taiwanese offshore wind market and is building and maintaining alliances with Taiwanese companies to ensure local requirements are met and local jobs are created.

“We work from more than 15 years of experience within offshore wind and our combination of providing services from engineering studies through detailed engineering to procurement and construction as well as service and maintenance makes for a unique full life-cycle offering to the market,” said Tommy Flindt, director of technology, Sem-

co Maritime. “We think the initial key to success for offshore wind in Taiwan is to blend our offshore wind experience with the local Taiwanese engineering capabilities and by this establish a self-propelled future for offshore wind in Taiwan.”

“We have selected Semco Maritime as we recognize their capabilities within offshore wind and the success Semco Maritime has shown so far in building alliances with local companies,” said Tsung-Hua Chen, CEO, Yushan Energy Co. Ltd. “We believe there could be an opportunity to work closer together beyond the scope of this study.”

The electrical engineering study kicked off in March and will be finalized by June by the study team in Denmark as well as in Taiwan. ↴

Source: Semco Maritime A/S

For more information, go to www.semcomaritime.com

“We think the initial key to success for offshore wind in Taiwan is to blend our offshore wind experience with the local Taiwanese engineering capabilities and by this establish a self-propelled future for offshore wind in Taiwan.”

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Hansford Sensors debuts compact triaxial vibration monitor



The HS-173 accelerometer. (Courtesy: Hansford Sensors)

Hansford Sensors, a leading designer, developer, and manufacturer of high performance industrial accelerometers, has launched a compact and lightweight 100mV/g triaxial vibration sensor.

Called the HS-173, the new accelerometer is a side-entry device can be used in both online and offline applications and has been introduced to enable OEMs, vibration analysts, and end users to measure vibration in three axes simultaneously. This makes it ideal for use across a range of industries.

With an operating sensitivity of 100mV/g and a transverse sensitivity of less than 5 percent, the HS-173 is one of the most compact triaxial accelerometers on the market and ensures measurement time can be reduced due to the simultaneous reading of three axes. This, combined with its excellent frequency response of 6 Hz to 6 kHz, makes it ideal for monitoring vibration in a variety of machines, from fans, motors, pumps, compressors and gear-

boxes, to conveyors, process equipment, and spindles on machine tools.

The HS-173 is a robust and reliable industrial accelerometer, weighing just 250 grams, protected by a stainless steel casing that is sealed to IP67, and capable of operating at temperatures ranging from -55 to 140 degrees C. Installation is quick and simple, via a standard M12 connector, either temporarily for offline data monitoring with a handheld data collector or online as part of an integrated condition monitoring system.

The HS-173 forms part of Hansford Sensors' extensive range of industrial accelerometers, which includes 4-20mA, AC and AC/Velocity sensors, vibration modules, enclosures, switch boxes, and cables and connectors. ↴

Source: Hansford Sensors

For more information, go to www.hansfordsensors.com/us/



The Rotorlock locking system has been developed for application in wind power stations with a nominal capacity of up to 7 MW. It absorbs transverse forces of up to 7,500 kN (Courtesy: Roemheld).

‘Rotorlock’ locking system rated for turbines up to 7 MW

Roemheld has improved the performance of its modular locking system “Rotorlock” for the inspection and maintenance of wind-power stations. With a transverse force absorption of up to 7,500 kN, the systems reliably and safely lock rotors with a maximum capacity of 7 MW. Customer-specific variants with higher values are also possible. Due to their design and special coating, they are maintenance-free and corrosion-free through the entire service life of onshore and offshore stations.

The core of Rotorlock is a double-action, hydraulically or electromechanically driven pin that quickly and reliably locks the rotor disc. Non-contact position monitoring transmits the end positions “rotor disc locked” and “rotor released” to the system control and hence provides for extra safety for the operator.

At present, great interest for the locking system developed by Roemheld is shown by the offshore industry. Adverse weather conditions, temperatures between -30°C and 70°C and air with a high salt content are easily managed by Rotorlock. All components meet the corro-

sion protection requirements for offshore stations with a surface coating pursuant to DIN ISO 12944.

SPECIAL COATING

A special coating provides long-term protection for the sleeve where the locking pin rests during wind-power station operation. Roemheld warrants continuous corrosion protection for a period of 25 years and hence the typical service life of a wind-power station. Regreasing, as for other models, is not necessary, either. The element is therefore practically maintenance-free and ready to use at any time.

Since only restricted space is available in most gondolas, the locking system has a specially compact design. As stated by Roemheld, the standard modular systems allows for offering special designs on the short term and at reasonable cost. \sphericalangle

Source: Roemheld

For more information, go to www.roemheld-gruppe.de

G&W Electric collaborates with GE on new integrated recloser relay

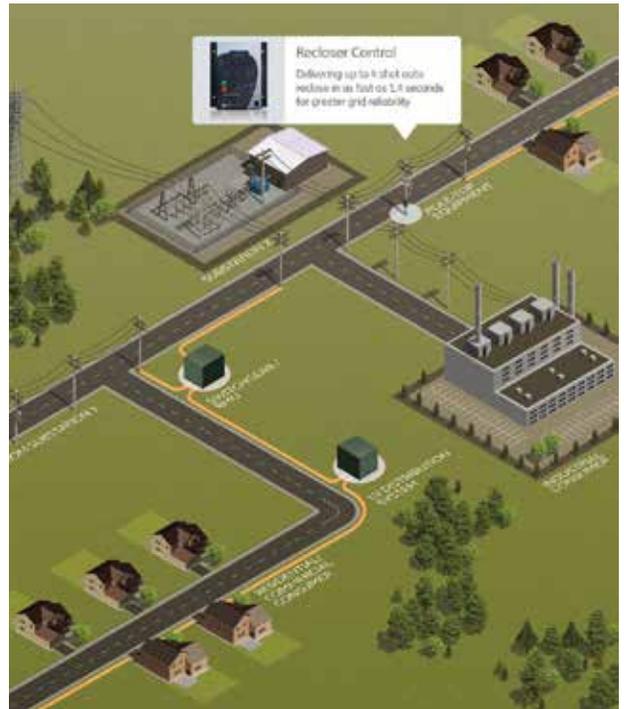
G&W Electric and GE's Grid Solutions have collaborated on the development of a new integrated recloser solution. G&W's Viper®-ST Recloser has been designed and tested to work seamlessly with GE's new Multilin® R650 recloser control. It delivers comprehensive performance in protection, monitoring, control, automatic network configuration, and communications. This is a leading recloser package to be deployed in distribution automation projects using G&W's LaZer® solution.

"Providing highly reliable and smart switchgear solutions to customers while meeting the evolving challenges of distribution automation is G&W's specialty," said John Mueller, G&W Electric owner and chairman. "By collaborating with GE, G&W's solid-dielectric recloser products perform reliably, and provide customers with an easy solution to install, maintain, and monitor."

GE's Multilin R650 platform provides secure and reliable protection by offering a comprehensive range of standard and advanced elements with multiple stages and wide setting ranges for each. Because a recloser needs a highly accurate and efficient tripping mechanism to clear as many faults as possible, the R650 contains a unique driving electronics module specifically matched to the Viper-ST recloser design. This combined solution delivers reliable four-shot auto-reclosing in as fast as 1.4 seconds, ensuring distribution utilities can maintain grid reliability.

"G&W's customized solutions, well-regarded reputation, and expertise made them an obvious partner for GE," said Jeff Mazereeuw, chief technology officer. "G&W's Viper-ST model is a great fit for this integrated solution. Together with the R650, it will deliver the speed, flexibility, and situational awareness needed for intelligent, distributed control. By collaborating with leaders like G&W, we can ensure our utility customers are provided with intelligent, simple to deploy, and effective distribution automation solutions to address the demands of the new network."

With a new 16kA rating, G&W's Viper-ST is a three-phase independent pole-operated recloser. It offers single or three-phase trip and single or three-phase lockout, fast-



GE's Multilin R650 platform provides secure and reliable protection by offering a comprehensive range of standard and advanced elements with multiple stages and wide setting ranges for each. (Courtesy: GE)

er installation with site-ready designs, maintenance-free solid-dielectric technology, field-changeable silicone insulators, a single 32-pin control cable interface and advanced safety features. This integrated solution allows for single phase tripping capabilities and integral current and six voltage sensing that allows for automation, providing significant reliability improvements.

A variety of options are available for the integrated Viper-ST and R650 recloser solution including recloser control accessories, customized pole-mount and substation frames, wildlife protectors, lightning arrestors, and more. ↴

Source: G&W Electric

For more information, go to www.gegridsolutions.com/multilin/catalog/r650.htm

Spectro upgrades SpectroTest mobile metal analyzer

Spectro Analytical Instruments recently announced a major upgrade to its SpectroTest arc/spark mobile metal analyzer for applications in the metal producing, processing, and recycling industries.

The SpectroTest mobile spectrometer delivers precise

results without compromise when an exact metal analysis is required, materials are difficult to identify, or there is a large number of samples to be tested. Applications include the on-site grade confirmation of incoming materials at the shipping dock or on the production floor,

or when metal sorting for value-optimized recycling.

The upgrade, which introduces a new, more-advanced readout system, represents a dramatic improvement to an already industry-leading solution. The new readout is a prerequisite for the introduction of iCAL 2.0 — a consistent enhancement of the instrument's proprietary iCAL calibration logic system; iCAL 2.0 enables the mobile analyzer to deliver unsurpassed stability, even in the face of ambient temperature changes.

With pre-defined calibration packages and the iCAL 2.0 diagnostics software, the upgraded SpectroTest allows users perform a single-sample standardization (in less than 5 minutes) at the start of the day's testing. The iCAL diagnostics ensure stable performance through a typical day, and, now the software helps maintain the same standardization, regardless of most temperature shifts.

The SpectroTest analyzer is designed for productivity and reliability as well as portability. The analyzer's high-resolution optical system provides for the probably widest element range, including N, Li, Na — all elements necessary for a complete on-the-spot metal analysis.

Its measurements are fast with flexible, point-and-shoot analysis. Sample probe adapters are quick and easy to change for arc excitation and spark excitation (arc spark OES). Its battery-powered operation can deliver up to 800 measurements on a single charge. An app enables the display of the measuring screen on a PC monitor, tablet, or smartphone. Results can be simultaneously observed in the laboratory and on site.

Global service and support for the upgraded SpectroTest are provided through the AMECARE Performance Services program, backed by more than 200 AMECARE service



The SpectroTest mobile spectrometer. (Courtesy: Spectro)

engineers in 50 countries, who help ensure peak performance and extended life for every SpectroTest instrument. AMECARE's high-value, customized services include proactive maintenance programs, application solutions, access to specialists, and instrument-specific training.

The upgraded SpectroTest mobile arc/spark spectrometer is available from Spectro Analytical Instruments. ↵

Source: Spectro
For more information,
go to www.spectro.com

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Siemens Gamesa sets sails with cutting edge offshore logistics concept



With the first load of nacelles shipped from Cuxhaven to the Belgian offshore wind-power plant Rentel on the purpose-built transport ship *Rotra Vente*, SGRE's Ro/Ro logistics concept is now fully functional. (Courtesy: Siemens Gamesa)

Siemens Gamesa Renewable Energy has now fully implemented its cutting-edge offshore logistics concept announced in late 2015: After the establishment of a blade plant in the harbor of Hull, England, in 2016 and the opening of a nacelle factory in Cuxhaven, Germany, in 2017, the company eliminated road transportation of large and heavy wind-turbine components from factories to installation harbors.

With the first load of nacelles shipped from Cuxhaven to the Belgian offshore wind-power plant Rentel on the purpose-built transport ship *Rotra Vente*, SGRE's Ro/Ro logistics concept is now fully functional. Compared to the former setup including road transportation and crane loading, SGRE significantly increases safety while saving approximately 20 percent in logistics costs. The concept is aligned to the offshore cost-out measures as part of the

business strategy presented by Siemens Gamesa at the Capital Market Day in February.

One key element of this advanced transport solution is the efficient link between Siemens Gamesa's offshore production locations in Cuxhaven, Germany, and Hull, England, provided by two purpose-built transport vessels. Another is the new process of loading and unloading these ships: Instead of lifting tower sections of up to 200 metric tons and nacelles weighing about 400 tons by crane, the large and heavy components are rolled on and off of these vessels. This "Roll-on/Roll-off" process is known as Ro/Ro. Siemens Gamesa has used this method inside its plants for many years. Based on this experience, the company's experts further refined the concept together with deugro, an international forwarder in the capital project and heavy lift field. Tailor-made transport

frames are used to store and move the nacelles. These transport structures are mounted under the bedframe of the nacelles and can be carried by self-propelled modular transporters (SPMTs). These self-lifting, motorized units feature a large array of wheels and are remotely controlled by experienced operators.

The two special transport vessels, each with a length of approximately 140 meters, are also operated by deugro Danmark A/S exclusively for Siemens Gamesa. The *Rotra Vente*, which has now been loaded in Cuxhaven, can transport eight nacelles of the current Siemens Gamesa direct drive wind turbine at a time. The second vessel, the *Rotra Mare*, accommodates three complete wind-turbine towers of three sections each or up to 12 rotor blades and transports them from the production facility in Hull, England, or from Aalborg, Denmark, to the respective installation port. Both vessels can also be unloaded by crane if required. This enhances the flexibility of the installation ports, which are selected according to project-specific requirements. Currently both ships use the Ro/Ro capabilities of the harbors on their routes between the U.K., Denmark, and Germany to the Rentel installation port in Ostend, Belgium.

Since inauguration in November 2016, the two transport vessels are well integrated into SGRE's value chain: More than 130 voyages have been made. Both ships have delivered components for more than 250 wind turbines to eight different offshore wind power plants. Thanks to

Ro/Ro loading, more than 2,000 lifts has been mitigated.

"As our manufacturing footprint and logistics concepts continue to mature, we make additional progress on lowering the levelized cost of energy for offshore wind," said Andreas Nauen, CEO Offshore at Siemens Gamesa Renewable Energy. "We're able to deliver these components more safely and more efficiently by eliminating crane lifts. The experiences we have made over the last month confirm that the expected savings of up to 20 percent in logistics costs compared to traditional transport procedures will be fully met."

Over the next weeks, Siemens Gamesa will provide all 42 SWT-7.0-154 turbines for the Rentel offshore wind power plant. They will be preassembled and installed together with the towers and nacelles from the recently opened installation facility in the Belgian harbor of Ostend. SGRE will also service the Rentel offshore power plant from Ostend, where a service office with an additional 300 square meters of storage is under construction. Full commissioning of the Rentel project is expected later this year. The Cuxhaven nacelle plant will deliver the nacelles to the 588 MW Beatrice wind power plant and the 1,218 MW Hornsea One project, both of them are in the British North Sea. ↵

Source: Siemens Gamesa

For more information, go to www.siemensgamesa.com

Ty-Rap® cable ties mark 60th year with 28 billion ties

Thomas & Betts, a member of the ABB Group, will produce its 28 billionth Ty-Rap® cable tie in 2018 — the 60th anniversary of a simple product that has quietly become an essential part of the modern world.

Tied together, 28 billion Ty-Rap cable ties could reach from the Earth to the Moon 22 times and cinch around both equators, each time. Or it could girdle the sun seven times.

That's a lot of cable ties. But here on Earth, sales numbers are not the key to Ty-Rap cable ties' longevity. In fact, others have probably sold more ties since Thomas & Betts engineer Maurus C. Logan

patented the Ty-Rap cable tie, the original cable tie, in 1958.

For us, quality, not quantity, is the key, as it was in the beginning. And so is innovation.

Logan observed in 1956 that workers in a Boeing aircraft plant had to laboriously knot thousands of feet of electric cables together with waxed nylon cord, tearing their fingers in the process. He knew there had to be a better way, so he entered the lab and emerged two years later with his invention: the Ty-Rap cable tie, the world's first self-cinching cable tie.

By 1965, Thomas & Betts extended its patent on the Ty-Rap ca-

ble tie to include the characteristic Grip of Steel® locking barb in the Original Oval™ head. Combined with the equally characteristic ribbed and stippled body, rounded strap profile and upturned no-slip tail, the basic features of Ty-Rap cable ties gave them the ability to hold cable bundles with unparalleled strength and reliability. And the innovations have continued unabated since then.

Today, Ty-Rap cable ties come in heat-resistant varieties, along with product lines that are resistant to UV rays, harsh chemicals and extreme heat and cold. A version has been designed to withstand the



Ty-Rap cable ties come in heat-resistant varieties, along with product lines that are resistant to UV rays, harsh chemicals and extreme heat and cold. (Courtesy: Thomas & Betts Corporation)

sizzling radiation and vacuum of space. Another has been infused with special materials to make it easily detectable if it falls into food processing lines. And a variety of related Ty-Fast cable ties have been designed to kill microbes on their surface.

Ty-Rap cable ties come in lengths that range from 4 inches to 42 inches. They come in 12 varieties and have spawned several sister product lines, including all-nylon Ty-Fast cable ties, all-metal Ty-Met™ cable ties, and super-convenient Twist Tail® cable ties.

Ty-Rap cable ties are produced in plants in the U.S., Japan, and Hungary. From there, they have gone just about everywhere.

Heat-resistant Ty-Rap cable ties traveled with the Colonel Brothers as they pounded their race buggies through the brutal 5,600-mile Dakar Rally in South America in 2017. They hold engine cables on high-performance Formula 1 race cars in Europe. Ty-Rap cable ties bind cables in searing solar power farms and on weather-lashed wind generators all over the world. They help keep deep-ocean drilling rigs operating smoothly. And the toughest variety, the ETFE, sits on the surface of Mars holding cables on NASA’s Martian land rovers.

This year, the 60th anniversary, will see the introduction of an improved detectable Ty-Rap cable tie

that is up to 300 percent more detectable than similar cable ties on the market, and the introduction of a line that changes color in the presence of scalding heat.

“If the record of the past 60 years is any indication, the innovations are likely to continue from here,” said Andrew Battermann, ABB global product manager for fastening systems. “Because one simple fact has held true since the beginning — when performance really matters, Ty-Rap cable ties are there to do the job.”

Source: Thomas & Betts Corporation

For more information, go to www.tnb.com

Siemens Gamesa to supply 166 MW at four new wind farms

Siemens Gamesa Renewable Energy has entered into new agreements with Gas Natural Fenosa Renovables for the supply of 166 MW at four wind farm developments in Spain. These projects fall under the scope of the renewable capacity allocated to the Spanish utility as part of the auction held last May.

Specifically, Siemens Gamesa will commission a total of 48 of one of its most popular turbines, the SG 3.4-132, thus installing 166 MW of capacity. The company will also operate and maintain these four wind farms, which are due to be commissioned in mid-2019, for three years.

The blades for these turbines will be made at the Aoiz factory (Navarre, Spain) and the Tangier factory (Morocco), while the nacelles will be produced at the Ágreda facility (Soria, Spain).

Siemens Gamesa’s relationship with Gas Natural Fenosa dates back to 1997, since which time the company has supplied the Spanish utility with more than 670 MW, most of which is in Spain and Mexico.

Source: Siemens Gamesa

For more information, go to www.siemensgamesa.com



Siemens Gamesa will install 48 of one of its best-selling models, the SG 3.4-132. (Courtesy: Siemens Gamesa)

Vestas sells first V120-2.0 MW turbines in North America

Xcel Energy Inc., a leading utility wind provider in the U.S., has placed the first V120-2.0 MW order in North America for the 138 MW Foxtail wind project in North Dakota. The V120-2.0 MW offers the 2 MW platform's longest blades, and the order marks another step forward in rotor length for the platform that has been key in Vestas becoming the leading wind-energy OEM in the U.S. for the last two years.

Including previously purchased 2 MW PTC components, the Foxtail wind project will be 150 MW upon completion and is part of Xcel Energy's proposed multi-state wind expansion to add 3,680 MW of new wind generation to its system across 12 projects in seven states across its territory. This expansion will increase Xcel Energy's wind capacity to more than 10,000 MW by the end of 2021.

"We're pleased to work with Vestas on the Foxtail Wind project," said Chris Clark, president, Xcel Ener-

gy Minnesota, North Dakota, South Dakota. "Investing in low-cost wind energy provides the benefits of clean, affordable energy directly to our customers. These projects deliver on our vision to keep energy costs low while also achieving 85 percent carbon free energy by 2030 for the Upper Midwest."

"We are pleased to expand our portfolio with Xcel Energy and supply the V120-2.0 MW, our most advanced turbine in the 2 MW platform, for the Foxtail project, which will help Xcel Energy realize their vision to deliver low-cost wind energy to their customers," said Chris Brown, president of Vestas' sales and service division in the United States and Canada. "Wind energy is an incredible contributor to the U.S. economy, and the production, construction, and operation of these turbines will generate hundreds of millions in economic benefit including considerable amounts of long-term, secure jobs."

Xcel Energy and Vestas previously partnered on the 600 MW Rush Creek wind project in Colorado, the largest wind project of its kind in the state. Rush Creek, currently under construction, is "Colorado made," with turbines produced at Vestas' Colorado factories, and is expected to save Colorado customers \$1.1 billion over the life of the project.

The order includes supply and commissioning of the turbines as well as a 10-year Active Output Management 5000 (AOM 5000) service agreement, designed to maximize uptime and energy production and ensure optimized performance for the lifetime of the project. Turbine delivery will begin in the second quarter of 2019. ↘

Source: Vestas

For more information, go to www.vestas.com

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Pattern Development completes 147 MW project in Québec



Turbine top view at Mont Sainte-Marguerite Wind. (Courtesy: Pattern Development)

Pattern Energy Group LP (Pattern Development) recently announced the completion of its 147 MW Mont Sainte-Marguerite Wind power facility. Mont Sainte-Marguerite Wind is about 50 kilometers south of Québec City in the Chaudière-Appalaches region. As announced in June 2017, the facility will be acquired by Pattern Energy Group Inc. and PSP Investments.

“The successful completion of our first project in Québec brings our total operational capacity in Canada to 1,533 MW, making Pattern the largest wind-power producer in the country with nine facilities across four provinces,” said Mike Garland, CEO of Pattern Development. “Mont Sainte-Marguerite Wind brought strong economic benefits to the Beauce region through its use of local construction workers from Québec and Siemens Gamesa wind turbines with locally sourced components, supporting manufacturers in the province. Going forward, the facility will generate millions of dollars for our community partners, the municipalities of Sacré-Coeur-de-Jésus, Saint-Sylvestre and Saint-Séverin.”

“Congratulations to our partners on the commissioning of the Mont Sainte-Marguerite Wind farm,” said David Hickey, head of the Siemens Gamesa business in Canada. “With towers and hubs produced by local workers in the Gaspésie region, this wind farm is another great example of the positive economic impact the wind-power industry has for the region and is a progressive step towards environmental sustainability.”

The Mont Sainte-Marguerite Wind facility is using 46 Siemens Gamesa innovative 3.2 MW direct drive wind turbines with components made in Canada, including the turbine hubs and towers, which were built in Québec, leveraging the highly-skilled labor force and manufacturing facilities in the province. The turbine hubs were provided by Québec-based Group FabDelta. The turbine blades were manufactured in Ontario, and the towers were manufactured by Marmen at the company’s facility in Matane, Québec.

More than 350 skilled workers were employed on site at the peak of construction activity and Mont Sainte-Mar-

guerite Wind has approximately 10 permanent employees for ongoing operations and maintenance, in addition to using a number of local contractors.

Mont Sainte-Marguerite Wind is bringing strong economic benefits to the local community, including more than \$775,000 annually to Pattern Development's community partners, the municipalities of Sacré-Coeur-de-Jésus, Saint-Sylvestre, and Saint-Séverin, which are stakeholders in the facility and active participants in its development.

The facility operates under a 25-year power purchase agreement (PPA) with Hydro-Québec Distribution. Mont Sainte-Marguerite Wind facility is expected to generate enough power for approximately 28,000 Québec homes annually, according to power use statistics from Hydro-Québec. The facility site, on one of the higher elevations in Southern Québec, has one of the strongest wind resources in the region.

The Mont Sainte-Marguerite Wind facility was constructed by Borea Construction, under the supervision of Pattern Development's construction management team. ↴

Source: *Pattern Development*

For more information, go to www.patterndev.com.

Final section of Nexans power export cable sails to Scotland

Nexans has reached two key milestones in its major contract to create the high voltage power export connection for Scotland's Beatrice 588 MW offshore wind farm. The first of the two 400 kV onshore cable links and the high voltage accessories have been installed successfully and tested on site. At the same time, the Nexans factory in Norway has completed the manufacturing of the 220 kV offshore cable and loaded the final section onto the Group's Skagerrak cable laying vessel for the journey across the North Sea to the Moray Firth where it will be installed and later trenched into the seabed by Nexans' Capjet system.

The Beatrice Offshore Windfarm project, scheduled to be fully operational by 2019, is a joint venture between SSE, Copenhagen Infrastructure Partners, and Red Rock Power Limited — the U.K. subsidiary of China's SDIC Power Holding Co. Located in the Moray Firth, it will be Scotland's largest wind farm, with the combined output of 84 turbines capable of generating enough electricity to power approximately 450,000 homes.

To export the energy from the wind farm to the grid, the two offshore cables take a route of 70 kilometers along the seabed to a landfall point to the west of Portgordon on the Moray coast. A transition joint bay then connects them to the onshore cable system, which takes a 20-kilometer route to Blackhillock substation. From there, the 400 kV onshore cables will transmit the electricity to the grid.



The Nexans-operated Skagerrak is responsible for laying the subsea export cables. (Courtesy: Beatrice Offshore Windfarm)

Nexans was awarded the turnkey contract to design, manufacture, test, deliver, and install both circuits of the complete power transmission cable system. This included the delivery of a total of 265 kilometers of cables, including 145 kilometers of 220 kV offshore cables, 115 kilometers of 220 kV and five kilometers of 400 kV onshore cables, and the associated high voltage accessories.

Nexans completed the laying and burial of the first offshore cable route in 2017 and connected it to the offshore platform in February 2018. In March 2018, Nexans installed the 400 kV onshore circuits and their outdoor sealing ends using its expertise of carrying out the termination works horizontally prior to connecting them vertically at Blackhillock substation.

"The Beatrice project perfectly illustrates our capacity to deliver turnkey grid connection solutions for offshore wind farms," said Vincent Dessale, senior executive vice president for the Subsea and Land Systems business group at Nexans. "For many years, Nexans has been committed to facilitating the energy transition in Europe and worldwide, and we are

proud to contribute to building Scotland's largest wind farm."

The offshore cables for the Beatrice Offshore Wind Farm were produced in Halden, Norway, and installed by Nexans Norway. The onshore cables were manufactured at Nexans Benelux facility in Charleroi, Belgium and installed by Nexans France. The associated high voltage accessories were delivered by Nexans Switzerland.

For more than 15 years, Nexans has been a key driver in the development of wind-farm technology. It was

the first company to manufacture three-core 245 kV submarine cables as well as the first to manufacture 420 kV submarine cables. To date, Nexans cables have enabled in excess of 3,500 MW of offshore wind-farm energy to be integrated into power grids across the world. ↵

Source: Nexans

For more information, go to www.nexans.com

Samsung and Pattern Development start operations at Ontario facility

Samsung Renewable Energy Inc. and Pattern Energy Group LP recently announced that North Kent Wind, a 100 MW wind-power facility in the municipality of Chatham-Kent, has completed construction and is fully operational.

"Samsung is proud to complete its sixth wind project under our Green Energy Investment Agreement with the government of Ontario," said Eskay Lee, vice president, Samsung C&T. "Samsung and its partners have created jobs and invested in the community, benefiting real people in Chatham-Kent and across the province."

"North Kent Wind marks our sixth operational wind power facility in Ontario, totaling more than 1 GW of capacity, enough to power more than 400,000 homes each year," said Mike Garland, president and CEO of Pattern Development. "North Kent Wind was built entirely by Ontario workers and is generating substantial economic benefits in the municipality of Chatham-Kent by injecting more than \$40 million in direct spending into the local economy over the next 20 years."

North Kent Wind is using 34 Siemens Gamesa 3.2 MW wind turbines with towers and blades made in Ontario. During the peak of construction activity, North Kent Wind employed about 175 skilled workers, 100 percent of which were from Ontario, with the majority from the local area. The facility has approximately 10 permanent employees for

The North Kent Wind facility. (Courtesy: Pattern Development)



ongoing operations and maintenance, in addition to using a number of local contractors.

Samsung and Pattern Development, as part of their commitment to make a positive impact in project area communities, are providing \$4 million to the municipality of Chatham-Kent as a community benefit contribution to be used at the sole discretion of municipal council. In addition, the facility is estimated to generate approximately \$5 million in tax revenue over 20 years. In total, North Kent Wind will inject more than \$40 million of direct spending into the local economy over 20 years, including taxes, community benefits, landowner payments, and facility spending.

The municipality of Chatham-Kent also holds a 15 percent equity interest in North Kent Wind through its affiliate Entegrus Renewable Energy Inc. Bkejwanong First Nation, also known as Walpole Island First Nation, also holds a 15 percent equity interest in North Kent Wind.

The 100 MW North Kent Wind facility is expected to generate enough clean energy to meet the electricity needs of approximately 35,000 Ontario homes annually, based on average annual residential energy use in Ontario. The facility operates under a 20-year power purchase agreement (PPA) with the Independent Electricity System Operator (IESO). ↴

Source: Pattern Development

For more information,
go to www.patterndev.com

M-KRAN orders Demag® CC 8800-1 Crawler Crane

Russia's leading crane service provider, M-KRAN, is expanding operations with the addition of the large and powerful Demag® CC 8800-1 lattice boom crawler crane with the optional Boom Booster Kit. The new crane will allow M-KRAN to perform the most challenging lifts.

In its standard configuration, the Demag CC 8800-1 crawler crane has a maximum capacity of 1,760 tons and maximum tip/sheave height of 709 feet. The Boom Booster Kit can extend lift capacities by up to 90 percent.

The new Demag crawler crane provides M-KRAN a productive and versatile machine for petrochemical projects, wind-turbine installations, and other challenging jobs. Because of its flexibility, ease-of-transport, and quick-rig design, the Demag CC-8800-1 crawler crane delivers an excellent return-on-investment. ↴

Source: Terex

For more information,
go to www.terex.com



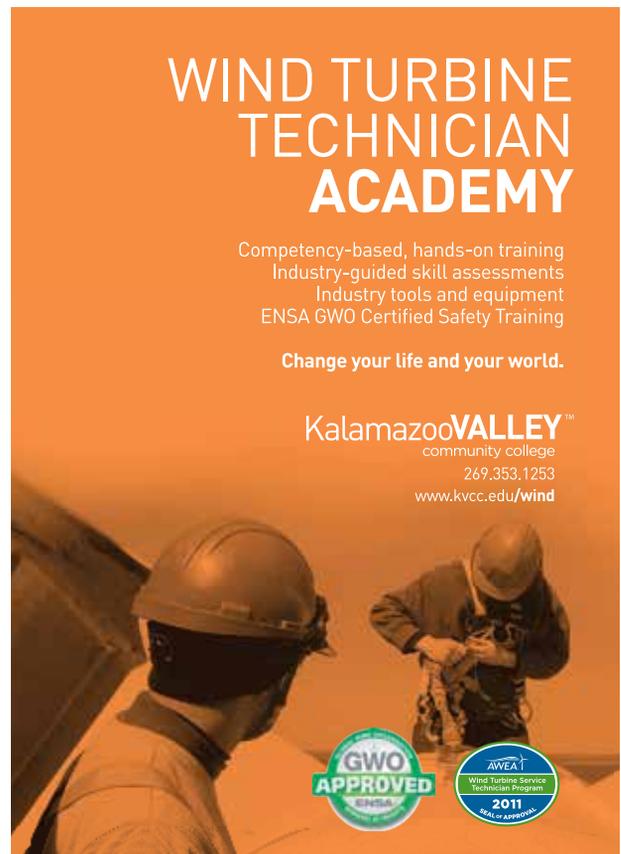
The Demag CC8800-1 can be used for wind-turbine installations. (Courtesy: Terex)

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Offshore wind makes waves



The Port of Esbjerg in Denmark is one of several offshore wind port “hubs.” (Courtesy: Port of Esbjerg)

New York, New Jersey, and Massachusetts are leading the development of the U.S. offshore wind supply chain and infrastructure with the help of Ramboll, one of the world’s leading offshore wind consultants.

*By Kenneth Carter
Editor | Wind Systems*

Since Block Island Wind Farm off the coast of Rhode Island started generating power at the end of 2016, several states are building up their offshore wind capabilities in a move that could make the United States the next major player in the global offshore wind market.

But U.S. offshore wind faces some challenges in order to make that happen.

“A major issue for every industry entering a new market is the supply chain,” said Tim Fischer, vice director of the global wind division for Ramboll, one of the world’s leading wind consultants. “And the biggest question is: What is the U.S. market going to make of it?”

As of now, the infrastructure that would support a supply chain for offshore wind remains a hurdle in many places where the industry has the potential to grow.

The U.S. has a significant number of waterfront facilities, but many of them are already heavily in use from other industries or they suffer from aging infrastructure.

“The U.S. has a very robust supply chain in other industries such as oil and gas and the use of steel in manufactured products,” said Jay Borkland, senior managing consultant with Ramboll’s Environment & Health division. “That is obviously a strong basis on which to launch an offshore wind supply chain in the U.S. But one has to remember that it’s not the exact same product and production process. There’s a timeline — and investments that need to be made — in order to get the supply chain up and running for offshore wind.”

UPGRADED FACILITIES

For other links in a potential supply chain, facilities would need to be upgraded and modified in order to serve offshore wind, according to Borkland.

“A wind farm is not the same as building washing machines,” he said. “We need to adjust and adapt manufacturing capabilities to be able to produce the components that are needed for offshore wind. But that’s going to take some concerted effort, and there’s a timeline. Hopefully the strategy for the U.S. market will be a blended approach, initially with the U.S. supply chain developing as the industry develops and as more wind farms come online. And, importantly, what the supply chain needs is a pipeline of projects — that will signal the industry that it (offshore wind) is consistent.”

According to Fischer, local markets in Europe focused on their own supply chain, and they were open to supply. In order to get a supply chain started in the U.S., the approach can’t be tackled hastily.

“I’m very curious on what strategy will be taken, and I hope that it will be to build up the U.S. supply chain slowly,” Fischer said. “We do not expect it to be there from the start. The projects in the U.S. are quite big, and everyone wonders where the components will come from. So hopefully there will be a nice smooth transition from allowing supplies from other countries and ramping up to manufacturing components in the U.S. But it could take time. And that is also some of the parallels we can see in some European markets.”

EAST COAST STATES

But there has been much progress among several East Coast states such as Massachusetts, New York, and New Jersey.

Massachusetts was an early adopter of offshore wind with its Cape Wind project in Cape Cod. That project

served as an icebreaker of sorts where all the activities associated with permitting and locating a wind farm were tackled, including integrating with agencies such as the Bureau of Ocean Energy Management, the Department of Energy, NOAA, and the National Marine Fisheries.

“So, Massachusetts has had a very robust history with offshore wind,” Borkland said.

And now Massachusetts has developed a program for larger wind projects that will be farther off the coast. That includes leases acquired by three large offshore wind developers that now have power purchase agreements being bid on by those major players, according to Borkland. And Massachusetts is prepared in terms of understanding the framework needed to both characterize the sites in offshore wind and the permitting process, as well as involving large stakeholders that include the fishing industry and the shipping industry.

“Massachusetts has undertaken a large number of studies in these outreach areas in an attempt to provide a platform for offshore wind developers as they are looking at developing their leases,” he said. “In addition to that, Massachusetts has invested in infrastructure.”

That first bit of infrastructure that related to wind was the creation of the Wind Technology Test Center (WTTC).

“The WTTC was constructed by the Massachusetts Clean Energy Center,” Borkland said. “The fact that Massachusetts has a Massachusetts Clean Energy Center is a plus. It is a state economic development agency entity that is directly involved in promoting renewable energy, including offshore wind. And it has a platform in which to develop assets for offshore wind. The WTTC is a wind-blade test center, and it was one of the largest in the world.”

With blades getting larger all the time, Borkland admits that there may more than likely be similar large test centers in development somewhere in Europe or Asia, but the WTTC still stands as a major achievement and continues to test blades for offshore wind.

INFRASTRUCTURE

The bottom line of all Massachusetts’ myriad of studies came down to a not-so-surprising conclusion: the importance of infrastructure.

“There weren’t any ready-made port facilities that could assist in pure wind projects in the U.S., and so MassCEC studied this challenge to identify locations; and they identified a location in New Bedford, Massachusetts, as the best location in Massachusetts for an offshore wind port facility,” Borkland said. “And the

state invested pretty significantly in the development of the first offshore wind port facility in the United States built specifically for offshore wind. I was fortunate to have been a part of the design team for that project, and a lot of mine and Ramboll's interface with the supply chain had been developed through our relationship with the Clean Energy Center in Massachusetts, and the work that MassCEC did to pave the way for offshore wind there."

New Jersey's offshore wind journey has run along similar timelines where New Jersey recently made commitments to purchase more than 3,000 MW of offshore wind.

And New York has been thinking of offshore wind for some time with several initial projects.

"They have a major lease that BOEM has let," Borkland said. "They have a competition for power. They have made a commitment for 2,400 MW of power purchase. And they are in the process of developing their own studies."

New York also has completed a port study through the New York State Energy Research & Development (NY-SERDA).

"They are moving along quite quickly and attempting to accelerate because they have a goal of a high percentage of power generation from renewables, including offshore wind, and they have targets for 2030 and 2050 that are aggressive — and therefore they are looking to have a quick process to bring those technologies online," Borkland said.

ONSHORE VS. OFFSHORE

Even though there is plenty of land that can still be used for onshore wind facilities, the reality of the situation is that the coastal areas of the U.S. are where the majority of power users operate.

"Consumer centers are on the coastline; therefore, it also makes sense to have energy where the consumer sits," Fischer said.

Plus, the size and scale of offshore wind isn't con-

strained by land issues; however, onshore wind can operate in tandem with offshore — as well as other renewable energy sources — in what is known as sector coupling, according to Fischer.

"That is how you can ensure a transition to green energy like Denmark," he said. "(Denmark) is almost 100-percent green energy, and it's because they combined all these different energy sources. Offshore wind is just one important part."

A symbiotic relationship among supply chains is also key, along with project development, according to Borkland.

"I think one of the things that is propelling offshore wind as a concept, particularly in the northeast of the

United States, is that the wind resource is tremendous off the coast," he said. "It's not just tremendous in terms of the strength and the size of the wind resource, but also the fact that it is reliable — essentially the wind blows all the time."

So, there are less concerns about peak periods in terms of power production, and the potential of generating massive amounts of power from offshore wind would also serve to offset aging traditional energy sources such as oil, coal, and nuclear that will eventually have to fall off the grid, according to Borkland.

“Some of the states that have been looking and watching the development of the resource move over the last several years are now beginning to come into the game. The geographic reach of offshore wind on the East Coast may literally extend from Maine to Florida eventually.”

OFFSHORE TECHNOLOGY

The technology to efficiently implement offshore wind exists, but it's going to take serious investment to capitalize on it, according to Fischer. And part of that includes building a workforce capable of constructing the large turbines needed.

"One of the things I see as both a very large challenge and a great opportunity in the U.S. marketplace is the idea of logistics, and (loosely) how logistics is related to development of the supply chain - and the development of the infrastructure and the actual development of the wind farms," Borkland said. "And if you look at Europe

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as a model, the supply chain and the infrastructure developed hand-in-hand, and the industry formed in very large hub-type systems where a series of port facilities and infrastructure systems grew up where a lot of the manufacturing, fabrication, marshalling, and component-transfer out to the wind farm sites occurred at some very large, well developed facilities.”

However, in the United States, it’s different.

Borkland said there are few coastline locations where there is unused land or sufficient facilities that could be used or converted for offshore wind that don’t already compete with other kinds of shipping.

“And so, what’s likely to happen in the U.S. is the development of a network of facilities for manufacture and marshalling, fabrication, and assembling components for offshore wind,” he said. “And that large number of smaller facilities is going to require a network of logistics to sew it all together and make it work appropriately.”

LOGISTICS ISSUES

That includes everything from training facilities for specialized welders, to the development of specialty marine vessels and transfer barges to move components from site to site, according to Borkland.

“That’s something that did develop in Europe, but it needs to develop in the U.S. in its own way,” he said. “And I think there’s a large opportunity for existing U.S. service firms, as well as manufacturing firms, to get involved in solving the logistics issues that are going to occur in the U.S. because, quite frankly, the U.S. implementation of offshore wind is going to be a little bit different than the way Europe evolved.”

And that is because some of these turbine components are so massive, they can’t be handled the same way other manufacturing components are traditionally handled, according to Borkland.

“In particular, the Gulf of Mexico may be used to sending pieces of giant oil derricks offshore, but there’s nowhere on the U.S. East Coast where those kinds of components have been manufactured and routinely shipped,” he said. “And so, the onset of offshore wind is going to necessitate the development on the East Coast of that sort of infrastructure that can allow for those types of components. And it’s similar to what the Gulf of Mexico has developed in terms of how they service, say, the oil industry, but it’s also different in that the components are shaped differently, they require different handling, and in some cases, they’re larger.”

There’s also adaptive reuse of existing vessels as well as the potential for the development of new vessels and new equipment, according to Borkland.

THE WEST COAST

The potential for new technology will also come into play when it comes to establishing offshore wind on the West Coast, where the continental shelf is not as broad.

“The Pacific has a similar population density along the coastline, and it has a good resource in terms of its wind resource,” Borkland said. “Its main challenge is that the water depth plummets very quickly offshore. The technologies to allow offshore wind foundations to be in place need to be developed and made more robust. A large percentage of the industry is promoting the concept of floating offshore wind turbines as the technology of choice for offshore wind for the West Coast. And there is a lot of development going on there. We’re not the first ones to think of floating offshore wind.”

Fischer said a lot of headway has been made in Europe in the development of floating turbines over the last five to eight years.

“In the U.S., there’s a really big market for this technology,” he said. “On the West Coast, you need floating technology because the water is too deep. And the U.S. could simply become the frontrunner for that technology globally.”

NEXT STEPS

But for the immediate future, the East Coast is ripe for offshore wind development, and Borkland said he feels BOEM is also thinking along those lines quite aggressively as well.

“We know that, in addition to the Massachusetts leases already let and upcoming, BOEM is looking at New York, and New York is requesting that BOEM look at additional lease areas off of New York,” he said. “I think we’ll see another round of leasing and potentially new developers and new names that have not yet been involved in offshore wind in the U.S. getting involved in some of those new potential lease areas, and the projects will start to expand geographically down the coast.”

And that increased interest will align the Northeast states along a more reliable trajectory toward successful projects, which could affect the entire East Coast, according to Borkland.

“Some of the states that have been looking and watching the development of the resource move over the last several years are now beginning to come into the game,” he said. “And I think the geographic reach of offshore wind on the East Coast may literally extend from Maine to Florida eventually.”

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