

Giving Wind Direction

WIND SYSTEMS

IN FOCUS

AWEA WINDPOWER 2019

PROFILE

Harvest Energy Services



info@torkworx.com

888.502.WORX

torkworx.com

OH BABY! We have cut the cord on RAD Extreme Torque Machines.

See it at the WINDPOWER EXPO in Houston, TX May 20 –23, 2019. BOOTH 3528



- Range from 250 to 3000 ft/lbs
- Torque and angle feature
- Automatic 2-speed gearbox
- Programmable preset torque settings
- Latest Li-ion 18V battery
- High accuracy +/- 5%



WIND ENERGY SOLUTIONS

- ACCELERATED TORQUE AND TENSION SERVICES
- TURNKEY BOLTING SERVICES
- COMPLETE OEM TORQUE AND TENSION SYSTEMS
- BOLTING CONSULTATION SERVICES
- ISO 17025 ACCREDITED CALIBRATION SERVICES
- REPAIR SERVICES FOR MOST TOOL MODELS
- DBRAD DIGITAL TORQUE CONTROL SYSTEMS
- ELECTRIC GEAR TURNING SYSTEMS
- WTG SPECIFIC BOLT TENSIONING SYSTEMS
- HYDRAULIC WRENCH SYSTEMS

extreme bolt working solutions

sales
rental
service
consulting
engineering

WIND POWER SCADA

MORE TRANSPARENCY – MORE POWER

CUSTOMER REQUIREMENTS INCLUDED.

Flexible, configurable, adaptable,
Expandable to customer requirements,
Access security through user management

READY-TO-USE.

Wind branch requirements integrated,
Online configurable and adaptable,
Fast efficient overview (dash-board)

INVESTMENT SECURITY.

Based on pure web technology,
Responsive design, Standard
protocols (OPC UA, IEC 61400-25, ...)

IN FOCUS

RECORD YEAR FOR WIND

Companies wanting renewable choices, technological advances, and offshore potential were just a few of the driving forces behind a profitable 2018.

THE FUTURE OF WIND ENERGY

Positive growth throughout the wind industry is achievable with maintenance software. **18**

HYDROGEN-BASED WIND-ENERGY STORAGE

Hydrogen as an energy storage medium provides an alternative pathway **22**

PROFILE

Harvest Energy Services is an independent service provider to the renewable energy sector within the Americas. **28**



CONVERSATION

WINDPOWER 2019 exhibitors share what attendees can expect from their booths **32**



VERTEX[®] VENT HI-VIZ

The standard for work-at-height.

The VERTEX VENT HI-VIZ helmet is designed with six-point textile suspension, CENTERFIT, and FLIP&FIT systems for all day comfort. Integrable with Petzl headlamps, visors, and multiple accessories, it is an entirely modular helmet. Available in ANSI or CSA compliant versions with personalized versions available on demand. www.petzl.com

Photo © www.kalico.fr



Access
the
inaccessible[®]

▸ THE FUTURE OF WIND



DIRECTION

8

Enel Green Power acquires U.S. renewable energy developer Tradewind Energy ▸ Visser & Smit Hanab awarded East Anglia One Cable contract ▸ Bethany Frew elected to ESIG board of directors



CROSSWINDS

44

MAKING U.S. OFFSHORE WIND A REALITY

U.S. offshore wind is just over the horizon, but the success of these projects rests on meeting certain challenges head on now.

TAILWINDS

THE BUSINESS OF WIND



▸ CONSTRUCTION

CdA asserts itself as a key player of the European energy transition **36**

▸ INNOVATION

NRG's Bat Deterrent System reduces bat fatalities by 67 percent **40**



▸ MAINTENANCE

O&M jack-up vessel to join the Fred. Olsen Windcarrier fleet **42**

▸ MANUFACTURING

Vestas receives 143-MW order in the U.S. **42**



IMMEDIATE RESPONSE!
POWERFUL TOOLS!

24/7 AVAILABILITY!



AZTEC

NO LIMIT SERVICE FOR A NO LIMIT INDUSTRY

Get the latest and greatest wind systems equipment at Aztec Bolting. Top quality and delivery speed guaranteed.



The latest development from JUWEL presents itself compact and strong. Models available with torque capacity up to 5000Nm.

Enerpac's New Portable Battery Pump for Hydraulic Torque Wrench Applications



GET SERVICES ON-SITE WITH OUR MOBILE FLEET

In an industry where time is of the upmost importance, our mobile units bring skilled and reliable technicians to your site, increasing efficiency and reducing equipment downtime to get your project back on track.



24/7 Service - Call Us

520 Dallas St. League City, TX 77573

 **832-271-5120**

aztecbolting.com

Powering up for WINDPOWER 2019

The wind is definitely blowing through Houston this month, as the energy capital of the world plays host to this year's AWEA WINDPOWER 2019. An amazing amount of planning and coordination goes into this annual event, and the 2019 show has a lot in store for attendees and exhibitors alike.

AWEA President Tom Kiernan says presenters this year will range from experts in siting, transmission, energy storage, and finance and investment to those who focus on operations and maintenance, offshore, supply chain, and electrification.

"Regardless of your expertise in the renewable energy industry, it's essential to know what's on the horizon for the U.S. wind-energy market and, more broadly, the utility-scale renewable market, how to influence it, and how to ensure success across the industry," Kiernan told *Wind Systems* in April.

And if anyone doubted how the industry is growing, you only need to look at some of the statistics from last year's WINDPOWER show in Chicago.

The 2018 conference boasted an attendance number of 7,600, up 10 percent from 2017. A third of those were new to WINDPOWER.

As a primer for the show, our May inFocus topic shines a spotlight on WINDPOWER 2019. Make sure and check out our cover article by John Hensley, AWEA's vice president of Research & Analytics. In it, he discusses how the demand for wind made 2018 a record year.

And with WINDPOWER in mind, we reworked our monthly Conversation feature and asked several exhibitors at the show what attendees should expect from their booths. It turned out to be popular and a fun way to share some extra show information. Make a note and swing by their booths. They'll be glad you did.

I am excited about renewing industry relationships in Houston, as well as meeting some new industry insiders and experts as I walk a few miles each day on the show floor.

Be sure and stop by our booth (#3154) for a chance to win a Snap-On toolbox. They are super nice, and we're giving away three of them during the show each day at 11 a.m. But you have to be present to win. We do love a captive audience.

I hope to meet all of you at the show and discuss opportunities for editorial content to share with our readers. 2018 was a stellar year for wind, and with your help, we can make 2019 even better.

See you in Houston, and as always, thanks for reading!



Kenneth Carter, editor

Wind Systems magazine
editor@windssystemsmag.com
(800) 366-2185, ext. 204

David C. Cooper
Publisher

EDITORIAL

Kenneth Carter
Editor

Jennifer Jacobson
Associate Editor

SALES

David Gomez
National Sales Manager

Jim Faulkner
Regional Sales Manager

David Marlow
Regional Sales Manager

Tom McNulty
Regional Sales Manager

CIRCULATION

Teresa Cooper
Manager

Jamie Willett
Assistant

DESIGN

Rick Frennea
Creative Director

Michele Hall
Graphic Designer

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage-and-retrieval system without permission in writing from the publisher. The views expressed by those not on the staff of Wind Systems magazine, or who are not specifically employed by Media Solutions, Inc., are purely their own. All "News" material has either been submitted by the subject company or pulled directly from their corporate web site, which is assumed to be cleared for release. Comments and submissions are welcome, and can be submitted to editor@windssystemsmag.com.



Published by Media Solutions, Inc.
P.O. Box 1987 • Pelham, AL 35124
(800) 366-2185 • (205) 380-1580 fax
info@msimktg.com

David C. Cooper
President

Chad Morrison
Vice President

Teresa Cooper
Operations Director

7 projects funded through Wind Wildlife Research Fund

From AWEA

- The Wind Wildlife Research Fund, a new wind industry-led initiative to pool investment for wind-wildlife solutions, raised \$828,000 to support and implement seven priority research projects in 2019. By investing in key research, the Fund aims to develop solutions to wildlife challenges, focus conservation efforts, expedite wind energy siting and permitting, and reduce costs.
- The seven projects will be completed in 2019 by leading scientists managed by the American Wind Wildlife Institute (AWWI), an independent nonprofit collaborative science organization that is the secretariat of the Fund. Project results will undergo peer review in fall of 2019 and will ultimately be submitted for publication.
- The projects address challenges that scientists, industry, and conservationists have identified as highest-priority.
- For bats, projects focus on refining smart curtailment practices for bats and enhance understanding of bat activities and fatalities.
- For eagles, studies aim to refine curtailment and fatality estimates.
- For grouse, new information on movement and response of lesser prairie-chickens at a wind facility will be assessed.
- In March, the Fund released a Request for Proposals soliciting research projects to begin in 2020 on better understanding and addressing wind-wildlife challenges. Proposals will be selected this summer, and Fund leaders are committed to raising funds to support the highest priority projects.



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

THE PORT OF STOCKTON YOUR PERFECT PIVOT POINT

We stay in constant motion so that your wind energy components reach the market on time and ready to spin. We give you 24/7 access to your cargo, on-dock rail facilities, and we are adjacent to less congested highways. This makes our turnaround time second to none. Need space to prepare your cargo for the next leg of the journey? We have ample lay-down area to stage your over-size and heavy lift cargo.

The Port of Stockton: we keep things moving at a key turning point in your supply chain.



Port of Stockton
CALIFORNIA

209 • 946 • 0246
PORTOFSTOCKTON.COM

DIRECTION

THE FUTURE OF WIND



Enel Green Power is the largest wind operator in Kansas and Oklahoma.
(Courtesy: Enel Green Power)

Enel Green Power acquires U.S. renewable energy developer Tradewind Energy

Enel, through its U.S. renewable subsidiary Enel Green Power North America, Inc., recently closed an agreement to purchase Kansas-based renewable developer Tradewind Energy, Inc.

Under the agreement, Enel Green Power North America purchased all of Tradewind's development platform comprising of 13 GW of wind, solar, and storage projects throughout the U.S. Shortly after the closing of Enel's purchase of Tradewind, the company signed a definitive agreement with the Macquarie Group's Green Investment Group to sell Savion, LLC, a 100 percent subsidiary of Tradewind that includes a development platform including 6 GW of solar and storage pipeline projects. The closing of the transaction with Macquarie, expected mid-year, is pending regulatory approval. Through this sale, the company is able to generate immediate returns on portions of the acquired portfolio, while retaining ownership of a strategic pipeline of about 7 GW of wind projects.

This strategic acquisition will enable Enel Green Power North America to manage all aspects of the renewable value chain in North America, from greenfield development through operations. Following the transaction, the company will integrate Tradewind's development expertise across key areas of renewable growth for the company including wind, solar, and storage.

"Through this deal, we are acquiring an experienced renewable-development company to help carry out our North American growth strategy across all technologies with even greater speed and efficiency, thereby strengthening our position in the competitive U.S. market," said Georgios Papadimitriou, head of Enel Green Power North America.

The Enel Group and Tradewind Energy, headquartered in Lenexa, Kansas, have been strategic development partners since 2006, supporting Enel's growth in the U.S. wind market. Over

the course of this partnership, Enel successfully constructed and began operations of about 3.9 GW of capacity developed by Tradewind. With this acquisition, Enel Green Power North America will further expand its presence in Kansas where the company is the largest wind operator with more than 1.4 GW of operational energy.

MORE INFO enelgreenpower.com

Visser & Smit Hanab awarded East Anglia One Cable contract

High Voltage offshore wind specialists Visser & Smit Hanab have been awarded the contract to perform all array cable terminations and testing work at East Anglia One Wind Farm.

The scope of the work entails the 66kV array cable terminations in 102 turbines, as well as the installation of the custom-designed cable management system and testing of the high voltage and fiber optic connections. In order to ensure high-quality test work, Visser & Smit Hanab (V&SH)

will deploy its own 66kV VLF/PD testing equipment.

Visser & Smit Hanab employs one of the largest teams of in-house offshore wind specialists in the industry, with expertise regarding pull-in, cable preparation, termination and testing operations, and equipment for both 33kV and 66kV installations. V&SH has an extensive track record of offshore wind high-voltage solutions at the major wind farms in North-West Europe.

"Being committed to the global energy transition, we have been focusing on offshore wind development for a decade now," said Arjan Paardekoper, general manager of Offshore Wind. "Our dedicated and skilled teams are looking forward to contributing to this major wind farm."

Offshore Termination & Testing activities are scheduled to start in the second quarter of 2019. With an installed power capacity of 714 MW, East Anglia One is expected to provide clean energy to more than 600,000 British homes by 2020.

In addition to terminations and testing, V&SH also provides services including consultancy, site inspections,



Visser & Smit Hanab employs one of the largest teams of in-house offshore wind specialists in the industry. (Courtesy: Visser & Smit Hanab)

pre-assembly of HV cable sets, testing, maintenance, fault finding, and quick response services 24/7 worldwide.

MORE INFO www.vshanab.nl

Bethany Frew elected to ESIG board of directors

The Energy Systems Integration Group (ESIG) recently announced Bethany Frew, an engineer in the Strategic



Bethany Frew

Energy Analysis Center at the National Renewable Energy Laboratory (NREL), was elected to the group's board of directors.

Frew has spent nearly 10 years building and using computational models to analyze the power system,

both as a graduate student and as a researcher at NREL. In her current role, she is engaged in a variety of power system modeling activities. She joined NREL as a postdoctoral researcher in 2014 upon completion of her Ph.D. in Civil and Environmental Engineering from Stanford University.

MORE INFO www.esig.energy

Uptake's AI recognized for revolutionizing energy sector, more

Industrial artificial intelligence leader Uptake was recently named as a 2019 New Energy Pioneer by Bloomberg New Energy Finance (NEF). The award is in recognition of ground-breaking companies that are fueling the transition to a lower-carbon economy and bringing new ideas for business models, technologies, market structures, and commercial opportunities.

With the massive amount of data generated by industrial machines, companies are increasingly searching for simple ways to turn this data into action that improves their bottom line. Using artificial intelligence and data science, an intelligent industrial platform turns machine data into insights, predictions, and recommendations.

With insights, people can improve all aspects of industrial performance, make better-informed decisions that affect both topline and bottom-line financials, and help optimize the overall business. Uptake's APM software improves productivity and efficiency by leveraging artificial intelligence (AI) to create business value from operational data.

Traditional asset management only covers routine maintenance tasks and fails to anticipate and adjust to the ways industry operates its business. ↲

MORE INFO www.uptake.com


OZZIE'S PIPELINE PADDER

1.800.758.6634
sales@ozzies.com
www.ozzies.com



Replace Expensive Select Fill


Benefits of Mini-Padder:

- Reuse Native Soil For Backfill
- Reduce Cable Damage From Hard Materials
- Facilitate Even Heat Dispersal Through Better Soil Compaction

WIND FARMS


WINDRUSH LLC

Wind Turbine Bolt Cleaning Tools & Services

Clean threads on any fastener are critical to help insure proper tension and help prevent galling, and to provide a clean surface for applying non-corrosive coatings.

We offer the industry's best and most efficient tools for bolt cleaning.




405-549-8400
sales@windrushllc.com



ENGINEERED DROP PREVENTION SOLUTIONS



Since inventing the socket and driver back in 1920, Snap-on has been driven by innovation. This GE 1.5 Hub Hatch Tool is an engineered solution that replaces the homemade version in many technician bags. It includes a floating, certified attachment point, ensuring functionality and drop prevention.

GE Hub Hatch Tool



Stainless Steel Safety Coil is designed to slide freely along the handle, so you can hold the wrench where you need to.

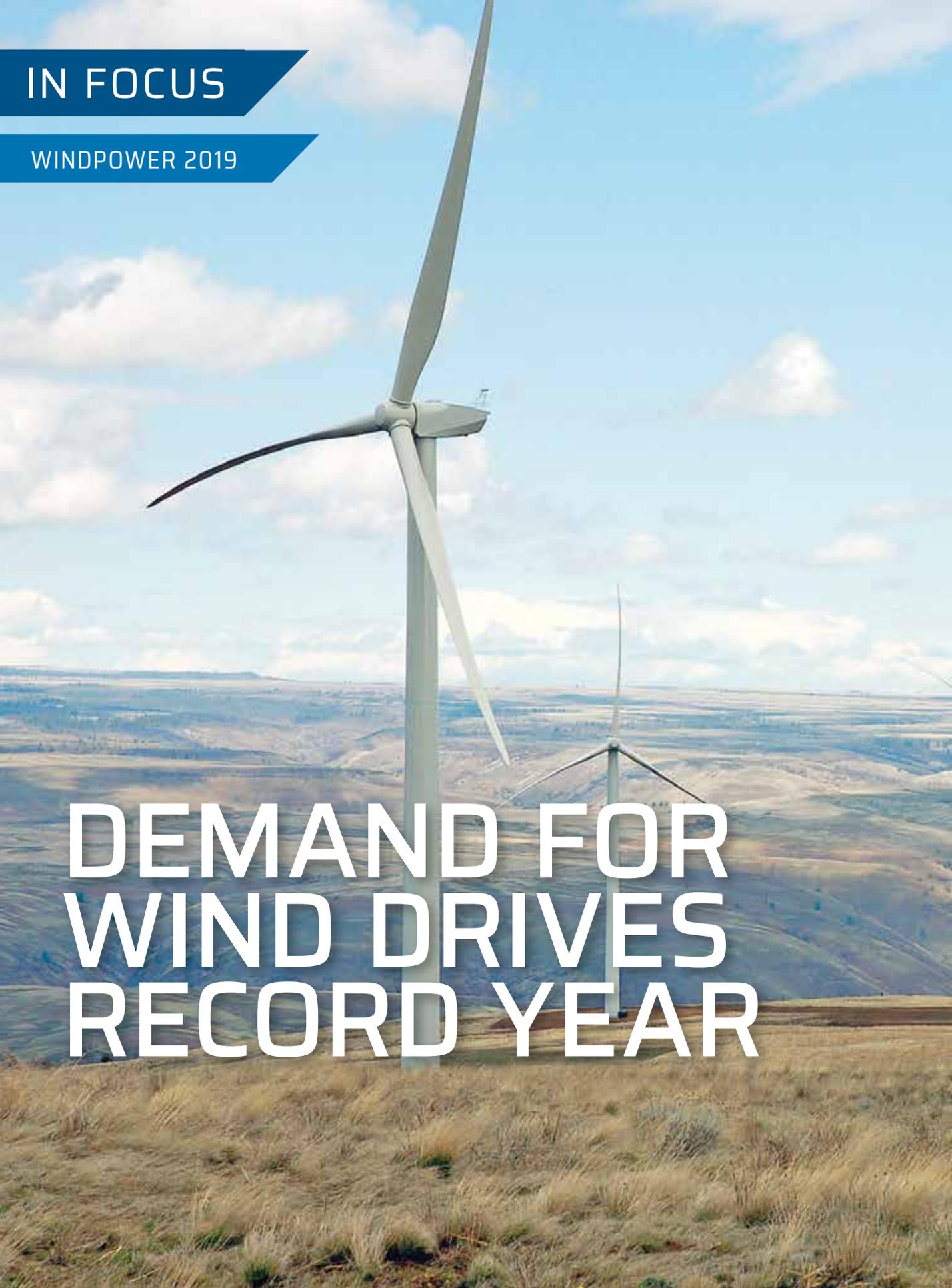
CUSTOM DESIGNED AND TESTED DROP PREVENTION TOOLKITS WITH INVENTORY MANAGEMENT SYSTEMS ARE ORDERED AS A SINGLE LINE ITEM.



Contact Power Generation Manager John Tremblay
413-519-3380 or john.r.tremblay@snapon.com

www.snapon.com/industrial

Snap-on
INDUSTRIAL

A large white wind turbine stands in the foreground on a grassy hill. In the background, another wind turbine is visible on a distant ridge. The landscape is a vast, rolling plain under a blue sky with scattered white clouds.

IN FOCUS

WINDPOWER 2019

DEMAND FOR WIND DRIVES RECORD YEAR



Companies thirsty for renewable alternatives, technological advances, and the potential of offshore are just a few of the driving forces that propelled wind energy into a successful and profitable 2018.

By JOHN HENSLEY

American wind power continued to push forward and reach new heights in 2018 – it was a record-setting year for corporate wind purchasing as customer demand for affordable, reliable, and clean energy continued to rise. Technology progressed further and more of the country’s electricity came from wind energy than ever before. That also means more families and businesses are seeing the benefits wind delivers to their communities. New, well-paying jobs, land-lease payments, and additional tax revenue, billions of dollars in investment, and greater access to renewable energy are just some of the advantages.

Companies large and small are taking advantage of the opportunities wind offers. C&I customers purchased 66 percent more wind power in 2018 than 2015 – the previous record year – with a total of 4,203 MW of deals signed. American businesses and non-utility purchasers such as universities and municipalities are attracted to wind’s low cost and price stability that protects them from fuel price spikes. For many businesses, wind is a way to meet their sustainability goals while locking in a predictable electricity price for years to come. This helps companies plan better for the future. And wind is the top choice for C&I customers. Data from the Business Renewables Center shows that wind provides more energy to corporate brands than any other renewable source.

“It’s the Un-carrier way to do the right thing by our customers, and moving to renewable energy is just a natural part of that,” said John Legere, president and CEO at T-Mobile. “And it’s not just the right thing to do – it’s smart business. We expect to cut T-Mobile’s energy costs by around \$100 million in the next 15 years thanks to this move. Imagine the awesome things we can do for our customers with that.”

A diverse group of companies joined T-Mobile in signing wind deals in 2018. Last year saw a mix of repeat buyers including Walmart, Facebook, and Microsoft and first-time buyers such as AT&T, Shell Energy, Boston University, and Royal Caribbean Cruise Lines. These buyers join a growing list of companies choosing wind through long-term contracts, or power purchase agreements (PPAs).

In 2018, C&I customers purchased more than 4,203 MW of wind power. (Courtesy: AWEA)

On top of the cost savings and stability, the fact of the matter is more and more customers are demanding renewable energy. That has presented businesses an opportunity to directly respond to their customers' desires. Look no further than the media boon Budweiser received for its 2019 Super Bowl commercial, which boasted about the company's decision to brew 100 percent of its beer using wind power.

"As a leading brewer, Anheuser-Busch understands sustainability is not just related to our business, it is our business," said Angie Slaughter, vice president of Sustainability at Anheuser-Busch. "We are proud that Budweiser is the first major beer brand to be brewed with 100 percent renewable electricity from wind power; we hope our efforts inspire others in our pursuit for a more sustainable future."

INSTALLED WIND CAPACITY HITS A NEW HIGH

Strong customer enthusiasm and positive market signals last year spurred significant new wind power installations. The fourth quarter of 2018 was the third highest on record for wind capacity installations across the country with more than 5,944 MW installed. This brings the total installed capacity of the U.S. to more than 96,488 MW, enough to power 30 million homes. Looking forward, seven states are now on track to double their installed wind capacity in the next few years.

TECHNOLOGY TAKES WIND TO THE NEXT FRONTIER

Technological innovations and improved siting practices have also made wind turbines more efficient and increased their value to consumers. These improvements have driven the cost of wind down by 69 percent since 2009, making it the cheapest source of new generating capacity in many parts of the country. Advances in modern turbines help them reach stronger, steadier winds, which improves production and capacity factors. And improved performance helps drive more growth.

Notably, 2018 saw orders for the first 4 MW land-based turbines — nearly twice the capacity of the average U.S. turbine model in 2017. These more powerful turbines let developers better customize individual projects to better suit their local wind resource and the needs of their host community.

Technological advancements and wind-related R&D are also opening the potential of wind power's next great



New Mexico is one of seven states on track to double their wind capacity. (Courtesy: AWEA)

Wind development also helps provide financial stability for many rural landowners — wind projects pay more than \$289 million in land-lease payments each year. This number will only grow as more projects come online. ▶

frontier — offshore. Offshore wind development leapt into serious action in 2018 and that momentum shows no signs of slowing in 2019.

OFFSHORE IS COMING ASHORE

Since the Block Island Wind Project became the country's first operational offshore wind farm at the end of 2016, coastal states have been racing to gain a competitive edge for the burgeoning sector. Last August, Massachusetts passed legislation setting its offshore target to 3.2 GW by 2035. Already in 2019, New York Gov. Andrew Cuomo tripled his state's offshore target to 9 GW by 2035, raising the bar for the sector nationwide and boosting offshore wind's prospects.

States are also investing in critical infrastructure and technology that will make offshore wind a success. Take Massachusetts, which made improvements to the New Bedford Marine Commerce Terminal to accommodate turbine parts and increased shipping traffic. Or look to MHI Vestas' \$35 million offshore gearbox testing facility at Clemson University in South Carolina. Physical infrastructure is only part of the puzzle. Just as onshore wind created thousands of jobs, the offshore wind sector expects to create thousands more as it matures. Many states are already investing in their workforce to train residents to fill the new positions.



Contemporary Lubricants for Machine Reliability

EcoGear 270XP

Eliminate oil
change headaches.

THE LIFETIME FILL

- ◆ Reduction in wear on critical equipment
- ◆ Higher load carrying capacity
- ◆ Non-sludge or varnish forming
- ◆ Hydrolytic stability forgives water ingress

Polyalkalene Glycol based synthetic lubricants by American Chemical Technologies protect your turbines and stay within spec while extending oil changes to 20 years.

American Chemical Technologies, Inc.

800-938-0101 • www.americanchemtech.com



The wind industry supports 114,000 American jobs. (Courtesy: AWEA)

“The industry is moving at a phenomenal pace,” said Walter Cruikshank, acting director at the Bureau of Ocean Energy Management (BOEM). “There is great industry-wide confidence in the market ...There are strong policy commitments from the states, particularly in the Northeast and mid-Atlantic, and a strong commitment from this Administration. We are actively working with leaseholders to move their projects forward.”

Innovations in turbine technology and new supply chains will continue to bring down the cost of offshore wind in the U.S. The deployment of new turbine models and offshore technology will continue to show that the United States’ world-class offshore wind resource is ripe for harvesting.

In December, BOEM held a major auction for three parcels off Massachusetts’ Martha’s Vineyard. The winning bids made by Equinor, Mayflower Wind Energy, a joint venture of Shell and EDP Renewables, and Vineyard Wind totaled more than \$405 million. These results show that offshore wind is finally coming ashore in America. The auction shows the water is fine, and major international players in the industry are ready to jump in.

A SUCCESSFUL YEAR AMPLIFIES BENEFITS

Wind’s growth is helping deliver benefits to communities across the country. More than 114,000 Americans across 50 states now work directly in wind. And the industry contin-

ues to create jobs: For example, wind-turbine technician is the second-fastest-growing profession in the country, according to the U.S. Bureau of Labor Statistics. The profession is second only to solar installer. Nowhere have these jobs made more of a difference than in America’s rural communities, where 99 percent of the country’s wind fleet is located.

Jobs supported by the construction and operation of wind farms have created new opportunities for many to make a living without having to leave their hometown to find a job elsewhere. For many small towns across America, this has helped keep families together.

Nathan Simpson, a wind-energy instructor at Northeast Community College in Nebraska, observed this firsthand in his town.

“We have a lot of rural communities in our area that seem to be phasing out or growing smaller as time goes on,” he said. “Right now, with the new wind farms coming in, they provide that career path for a lot of those people who want to stay around their community and grow and develop or raise their families, to stick around and find a well-paying job, a job that gives back to their own community.”

Wind development also helps provide financial stability for many rural landowners — wind projects pay more than \$289 million in land-lease payments each year. This number will only grow as more projects come online. These payments provide a dependable income, which

hedges against poor crop yields, making wind a drought-proof cash crop for many farmers and ranchers. And because the typical wind farm leaves 99 percent of the land in its footprint untouched, wind is a value-add to the property, keeping most of the land usable for other purposes such as farming or ranching.

Meanwhile, new tax revenue and other payment arrangements from wind companies support local schools, public services, and law enforcement. In 2018, the industry paid more than \$1 billion to state and local governments and private landowners in tax and lease payments. For many rural counties, wind-farm payments represent an enormous opportunity and boon to the county coffers.

“Wind energy ... is transforming low-income rural areas in ways not seen since the federal government gave land to homesteaders 150 years ago,” the Omaha World-Herald reported. “As commodity prices threaten to reach decade lows and farmers struggle to meet debt payments, wind has saved family farms across a wide swath of the heartland.”

Wind has been able to do all this by providing a low-cost, reliable energy product that both makes good economic sense and delivers environmental benefits.

Wind boasts among the lowest environmental impacts of any utility-scale source of electricity generation. In 2018 alone, wind power created \$9.4 billion in public health savings by cutting down air pollution that creates smog and triggers asthma attacks.

KEEPING THE MOMENTUM STRONG

Even as the markets are choosing wind, stable policies and infrastructure investment will play important roles in ensuring the U.S. wind industry keeps growing. At the top of the to-do list is updating and expanding America’s electric grid to meet 21st century needs. Investments in the grid will make electricity more affordable and reliable for American families and

businesses. They’ll pave the way for a new clean energy economy, much like the creation of the interstate highways system in the 1950s unleashed decades of economic growth. Importantly, studies routinely show that transmission upgrades more than pay for themselves.

As more states and businesses recognize the value wind power delivers, the future looks bright. This will come

into clearer focus following the release of the American Wind Energy Association’s 2018 Annual Market Report in April and in the run-up to AWEA’s WINDPOWER 2019 Conference on May 20-23 in Houston. ↘

ABOUT THE AUTHOR

John Hensley is vice president of Research & Analytics at the American Wind Energy Association.

COME AND SEE US AT
AWEA WINDPOWER
AT BOOTH 2545

HOUSTON, TX, USA
May 20-23, 2019

Dialing up the power
of your wind turbines?

Mersen has the customized solutions
you will need



One of the most trusted configurations:
MERSEN'S BRONZE RING + CG677 THE PREFERRED BRUSH GRADE

Mersen has been
recommending Bronze
rings for decades.

Our new generation
of components are
designed to handle the
additional rotor current.

info.ptt@mersen.com



SR13-15
BRONZE SLIP RING



HCH-30X
CG677 BRUSHES



BR09-13
BRUSH-HOLDERS

WWW.MERSEN.COM

mersen
Expertise, our source of energy

THE FUTURE OF WIND ENERGY



Wind-turbine maintenance software should be chosen based upon its capabilities, scalability, and reliability. (Courtesy: CloudVisit)

Positive growth throughout the wind energy industry is achievable with wind turbine maintenance software.

By GENEVIEVE PFEIFFER

The worldwide increase in demand for renewable energy has fueled the investment and technological advancements in wind turbines. But the largest opportunities are not necessarily the newest designs or the largest turbines — they are in the maintenance processes used to maintain existing turbines and install future turbines. The winds of change are blowing, and they're blowing in a renewable future.

NECESSARY MAINTENANCE UPDATES

Despite the growing investment in and demand for wind power, wind-turbine installation and maintenance are using outdated project management processes. Existing methods rely on traditional data collection methods — chiefly pen and paper recordings of maintenance work. According to MAKE Consulting, a research firm focused on renewable energy, global wind production is expected to double by 2027. To maintain this strong growth, the wind-energy industry is required to optimize maintenance procedures, workflow, and efficiency.

Technicians must adhere to routine maintenance practices to compile detailed records. The more thorough a record, the more data can be used to enable inspectors to provide quick prognoses of necessary maintenance or repairs. Attention to detail and organization, and the resulting speedy prognosis, can optimize the life of a turbine and reduce downtime and loss of energy production. Overall, to maximize a wind farm's energy generation, wind-turbine technicians require an updated method of communicating and collaborating with inspectors.

HIGH DEMAND FOR INSPECTORS POSES CHALLENGES

While the role of a wind-turbine technician is important, no wind turbine can be used without an inspector's approval. The multiple, high-level skillsets and extensive experience required to become a wind-turbine inspector creates a high demand for their expertise. Currently, there is a shortage of wind-turbine inspectors.

Additionally, inspectors must travel to the remote locations onshore and offshore to inspect turbines. During this travel, their skills are not used. New technology can encourage inspectors' skillsets to be used more efficiently and enable the wind-energy industry to keep up with the growing demand for wind power.

TECHNOLOGICAL ADVANCEMENTS

Recent technological advancements in wind-turbine inspections can provide more efficient installation, maintenance, and repairs. Wind-turbine inspection paired with maintenance software is a solution for the need to update current maintenance practices. Using this software, in-

spectors can approve inspections from a centralized office. Inspectors do not have to travel to distant sites and can use their time more efficiently to communicate and collaborate with technicians. Technicians can also work more efficiently, since they do not have to wait for inspectors to arrive on site. If a technician needs to speak with an inspector, he or she can schedule a videoconference session. Wind-turbine maintenance software can facilitate a decrease in travel, as well as the increase in communication and collaboration, so the overall number of approved turbine inspections can increase without having to hire new personnel.

Wind-turbine maintenance software should be chosen based upon its capabilities, scalability, and reliability. Enhanced functionalities maximize safety, efficiency, accuracy, and accountability and encourage the wind-energy industry's quick growth.

Here are some key capabilities and functionalities that should be considered in wind-turbine maintenance software, and how they can be implemented and used:

VISUAL INSPECTION-RECORDINGS

Video recording and audio recording functionality should be a top priority when identifying the correct wind-turbine maintenance software. Wind-turbine inspectors must be able to use their desktop or mobile device to record a videoconference session with technicians. Wind-turbine technicians should be able to use their smartphone or tablet to record any onsite maintenance or repair, and upload the file for inspection.

Additional enhanced features should include time stamps in video and audio recordings. Time stamps ensure viewers replaying the recording can quickly be taken to an exact moment in the video. If a recording must be paused or stopped, it should be concatenated into the original master recording to avoid confusion while reviewing multiple files.

Make sure to invest in software that includes cloud storage and be sure to ask questions about low bandwidth or high latency — low bandwidth should never interfere with a technician's ability to capture and share quality recordings or images with an inspector.

WIND-TURBINE MAINTENANCE CHECKLIST

Using a wind-turbine maintenance checklist, inspectors can create a punch list, or job cards. This functionality prioritizes and organizes tasks that must be performed in order to approve a wind-turbine inspection. This checklist ensures each task is completed up to industry standards and government regulations.

Visual data, including time-stamped videos and audio recordings, images, and chats should be uploaded to each



Recent technological advancements in wind-turbine inspections can provide more efficient installation, maintenance, and repairs. (Courtesy: CloudVisit)



A Complete Portfolio of Comprehensive Engineering, Procurement, Construction Management & Testing Services for Project Development

- Complete Electrical Power Systems Design*
- Electrical EPC Design*
- Interconnect Assistance & Electrical Studies*
- Construction Services with Start-Up*
- Ongoing Electrical Maintenance & Testing*



www.electricalconsultantsinc.com

Visit Our Booth #2945 at the 2019 AWEA Windpower Show

corresponding item, or task, on the wind-turbine maintenance checklist. This visual data provides accuracy and a record of visual inspection. The visual and audio data ensures the inspection was completed as if the inspector was at the site.

- ▼ A sign of quality wind-turbine maintenance software is functionalities that encourage organization and collaboration. All data on the wind-turbine maintenance checklist should be organized through customizable labels and the ability to easily update the status of each task.

- ▼ The software company should guarantee that checklists are customizable. Customizable checklists will allow inspectors to create a checklist for a singular instance of repair, or a master checklist, which can be created, replicated, and used to inspect many wind turbines of the same model. A scalable solution will be necessary as wind farms expand and technological advancements are made.

VISUAL INSPECTION-IMAGES

- ▼ Complex inspections of wind turbines necessitate precise visual acuity. Wind-turbine maintenance software should enable technicians to use screen capture and high-definition video-recording functionality.

- ▼ Using these functionalities, the technicians are able to capture screen shots of high-definition video recordings and take photos of maintenance work. Technicians can then upload these images to the inspection checklist and share them with the inspector and maintenance team. The inspector should be able to mark up the images with lines, arrows, circles, text, and more to show exactly what maintenance work must be done.

- ▼ Using the enhanced data, the inspector can make an informed decision on the maintenance and repairs needed, provide quick feedback to the technician, and keep all data as records of quality assurance.

SECURITY

- ▼ Security must be maximized in all stages of the inspection, including data stored at rest post-inspection. Ensure all communication is encrypted, and the software should include robust virus protection on the server level. The software should also feature multifactor authentication for administrator-level users and multiple-user roles.

- ▼ Only users with matching roles and permissions need access to files, so this feature will further protect restricted and confidential information. Always confirm the privacy agreement: The software provider should never share data with third parties without explicit permission.

ENHANCED DATA REPORTING AND ANALYSIS

- ▼ To analyze and adapt wind turbines and wind farms to specific needs, wind-turbine software must enable customizable data analysis. This information can be used to discern patterns and trends in wind-turbine models, maintenance processes, or maintenance teams.

- ▼ Furthermore, customizable reports can be produced

and analyzed to optimize wind-turbine investments, safety, accountability, and MRO practices.

SUPPORT FOR THIRD-PARTY DEVICES

▸ Wind-turbine maintenance software should efficiently integrate with other third-party software and devices, such as smart goggles and/or a borescope.

▸ This integration can be used to capture images both inside and outside of a wind turbine during repair and maintenance and provide enhanced records as well as quality assurance.

CUSTOMER SERVICE AND USER TRAINING

When considering wind-turbine maintenance software, wind-energy companies should have a detailed understanding of the training and technical support that will be provided. The software company should include training sessions, webinars, and online and onsite support services as needed.

Daniel Gilbert, founder and CEO of a maintenance, repairs and operations (MRO) software company, CloudVisit, said, "Inspectors and technicians are only as good as the tools and support they're given. If the tools don't meet their needs, or they haven't been trained properly on how to use the technology, then they won't be able to perform their jobs."

SCALABLE SOFTWARE FOR FUTURE ADVANCEMENTS

Wind energy is quickly expanding around the world and is piquing interest from many, including corporations. Google, Amazon, Budweiser, Gap Inc., and MGM Resort International, along with other companies, have made considerable investments in wind energy. Projected growth rates and widespread technological advancements necessitate a swift solution to provide quick maintenance of wind farms. The solution must also be scalable, as there continues to be investment and research into Airborne Wind Energy Systems (AWES).

In any case, current and future technologies will need to have a quick and efficient method of installing new structures in addition to a comprehensive and consolidated record of maintenance. Wind-turbine maintenance software can provide a scalable solution to an evolving industry, and can be used to facilitate major growth in wind energy through enhanced inspection efficiency now and into the future. ↵

ABOUT THE AUTHOR

Genevieve Pfeiffer is the content marketing manager at CloudVisit, an MRO software company specializing in maintenance software. She can be reached at (834) 809-5770. For more information please visit www.cloudvisit.com.

United Gear Works



WE OFFER FREE PICK UP AND DELIVERY ACROSS THE U.S.

Call us anytime, 24 hours a day, for emergency repairs.

800-495-7773

www.unitedgearworks.com
info@unitedgearworks.com

United Gear Works

has over 55 years of experience repairing gearboxes, pumps and gears.

We know how important this equipment is for you, so our services are available for emergency repairs 24/7. We rebuild and repair all types of gears that are chipped, cracked or simply worn out. Building them back to O.E.M. specifications.

Some of the brands of gearboxes we repair and rebuild:
Falk – Flender – Foote-Jones – Lufkin – Cone Drive – Amarillo
Nord – Gloucester Siemens – SEW EuroDrive



OUR LOCATIONS

- Houston, TX
713-992-8900
- Franklin Park, IL
773-808-3008
- Christmas, FL
407-773-8003
- Anderson, SC
864-990-7002
- Santa Fe Springs, CA
562-850-5800

HYDROGEN-BASED WIND-ENERGY STORAGE



Since wind and solar generation is not baseload or dispatchable, energy-storage solutions are needed to harness the full potential of their output. (Courtesy: Hydrogenics)

Hydrogen as an energy storage medium provides an alternative pathway that not only helps to integrate renewable power generation, but also enables the decarbonization of the transportation and natural-gas sectors.

By **ANGUS BROWN** and **ROB HARVEY**

Renewable wind and solar technologies are bringing power to millions across the world with little-to-no adverse environmental impacts. There are a significant number of large new offshore wind farms due to come online over the next few years, and the overall capacity of all wind turbines installed worldwide by the end of 2018 reached 600 GW, according to preliminary statistics published by WWEA2018.

As the installed capacity of renewables increases and is adapted into more energy infrastructures worldwide, it will impose downward pressure on wholesale energy prices. Since wind and solar generation is not baseload or dispatchable, energy-storage solutions are needed to harness the full potential of their output.

One option is a battery energy storage system that stores energy and returns the stored energy as electrons to the power grid. While this approach can help integrate renewable generation and firm intermittent output, it is limited to the power sector and, of course, once a battery is fully charged, its ability to store more is tapped out. Hydrogen as an energy storage medium provides an alternative pathway that, not only helps to integrate renewable power generation, but also enables the decarbonization of the transportation and natural-gas sectors.

This is accomplished by using an electrolyzer to split water into hydrogen and oxygen, and since an electrolyzer can handle a very dynamic load, it can also be used to provide ancillary power services. There are several ways to commercialize renewable hydrogen generation into the energy system. Hydrogen can be used as fuel for fuel-cell vehicles such as buses, trains, and cars (power to mobility). It can be directly injected into gas grids (power-to-gas), and it can also be used in industrial applications (power-to-industry) in fuel production, or in the production of green chemicals such as methanol and ammonia.

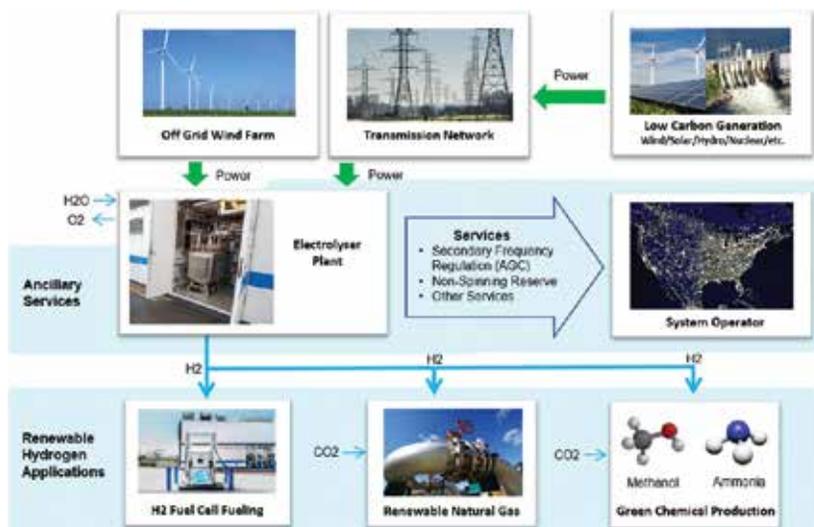
HYDROGEN FUELING (POWER TO MOBILITY)

Momentum is building for hydrogen fuel cell electric vehicles with clear 2020 and 2030 targets in national and regional policies across several regions of the world including Europe, China, California, and Japan. The largest potential is for bus, truck, and commut-

er-train fleets to be powered by hydrogen in the short term. In this scenario, excess or dedicated wind power can be used to generate hydrogen with an electrolyzer to be used as fuel for hydrogen fuel cell electric vehicles (FCEV). A FCEV is an electric vehicle in which a fuel cell is used to keep a small battery at an optimal rate of charge. The drivetrain of a FCEV is the same as a battery electric vehicle. A FCEV provides zero emission transport with the same performance in terms of range, payload and refueling time as a conventional vehicle. Since fuel cells are able to deploy energy in very dense packages, they are also quite suited to moving heavy duty vehicles.

A case in point: Alstom has developed a fuel cell electric version of its Coradia LINT passenger train, and it is now in public service in Germany. The Coradia LINT provides the same performance and operational capabilities as its conventional diesel version. Several bus manufacturers and integrators in China, Europe, and North America have rolled out fuel-cell electric buses. California has supported the build-out of a critical-mass network of hydrogen-fueling stations in southern California for fuel-cell electric automobiles, and there are now more than 6,500 FCEVs on the road. The potential future demand for renewable hydrogen fuel as the FCEV market grows is enormous.

Vehicle refueling is among the fastest-growing uses for hydrogen with a growing preference for green hydrogen due to policy mandates. There are more than 300 refueling sta-



Renewable hydrogen by electrolysis. (Courtesy: Hydrogenics)

tions in operation today, with at least 100 stations expected to be added annually through 2025.

RENEWABLE NATURAL GAS (POWER-TO-GAS)

By adding hydrogen to the natural gas grid, energy storage is expanding to the TWh range. There are two techniques for this: direct injection into the natural gas grid and conversion of hydrogen into synthetic methane (methanation). In direct injection, pure hydrogen enters the gas grid typically at up to 1- to 10-percent concentration (depending on the applicable regulation).

Even with a 2-percent limitation, the potential storage capacity of natural-gas grids is immense. Methanation overcomes direct injection's limitations, producing methane that is fully compatible with natural gas and that can be added directly to the gas grid without limitations.

Power-to-gas energy storage may be one of the more cost-effective ways to reach the targets for climate protection in the long term by using existing infrastructure for large scale conversion of renewable energy. Moving and storing renewable hydrogen and methane in gas pipelines reduces the cost of switching to renewable energy as well as the need for new infrastructure. Many gas networks have storage caverns and/or infrastructure whose capacity could be used to store the hydrogen. This hydrogen can be later used to run gas-fired electric generation power plants during periods of low wind and solar output using the existing gas infrastructure.

POWER TO INDUSTRY

Hydrogen is also used by refineries, power plants, and many industrial processes including steel and metal processing, glass, oil and fat hydrogenation, and electronics manufacturing. In this scenario, excess wind energy can be used to generate hydrogen that can be commoditized for use in the production of products or the refinement of fuel. Today, more than 43 percent of global hydrogen production is used in refineries to produce and remove sulphur from fossil fuels. But the hydrogen is usually produced from the reforming of natural gas which generates around 10 metric tons of CO₂ for each metric ton of H₂.

The concept replaces this hydrogen with hydrogen that is generated from renewables like wind, considerably reducing the carbon footprint of the conventional refineries. In this situation, wind energy can be used to replace traditional fossil fuel as well as reduce the carbon output of existing fossil fuel-based energy.

There is growing interest in the production of green chemicals such as methanol and ammonia using renewable hydrogen instead of natural gas as a feedstock. For methanol production, renewable hydrogen is combined with carbon dioxide captured from industrial processes or the atmosphere. For ammonia production, renewable hydrogen is combined with nitrogen.



Vehicle refueling is among the fastest-growing uses for hydrogen with a growing preference for green hydrogen due to policy mandates. (Courtesy: Hydrogenics)



Hydrogenics' Electrolyzer. (Courtesy: Hydrogenics)

ANCILLARY SERVICES

An electrolyzer can operate as a fast-responding, dynamic load whose power consumption can be changed rapidly over its operating range in response to a signal from an independent system operator (ISO). This enables it to provide a frequency regulation service that helps the ISO correct for short-term variations in the frequency of the power system resulting from changes in the balance of electricity supply and demand. The regulation signal is typically adjusted every two seconds. The load of an electrolyzer also can be used to modulate the output of an off-grid wind farm by absorbing excess power as required.

Other ancillary services including frequency response and operating reserve can be provided by an electrolysis system. Operating (non-spinning) reserve is stand-by power or demand reduction that can be called on with short notice to deal with an unexpected curtailment of a generator. An electrolyzer can provide this service by operating at full capacity producing hydrogen and within 10 minutes' notification, it drops its load to its minimum operating point for one hour as a dispatchable load.

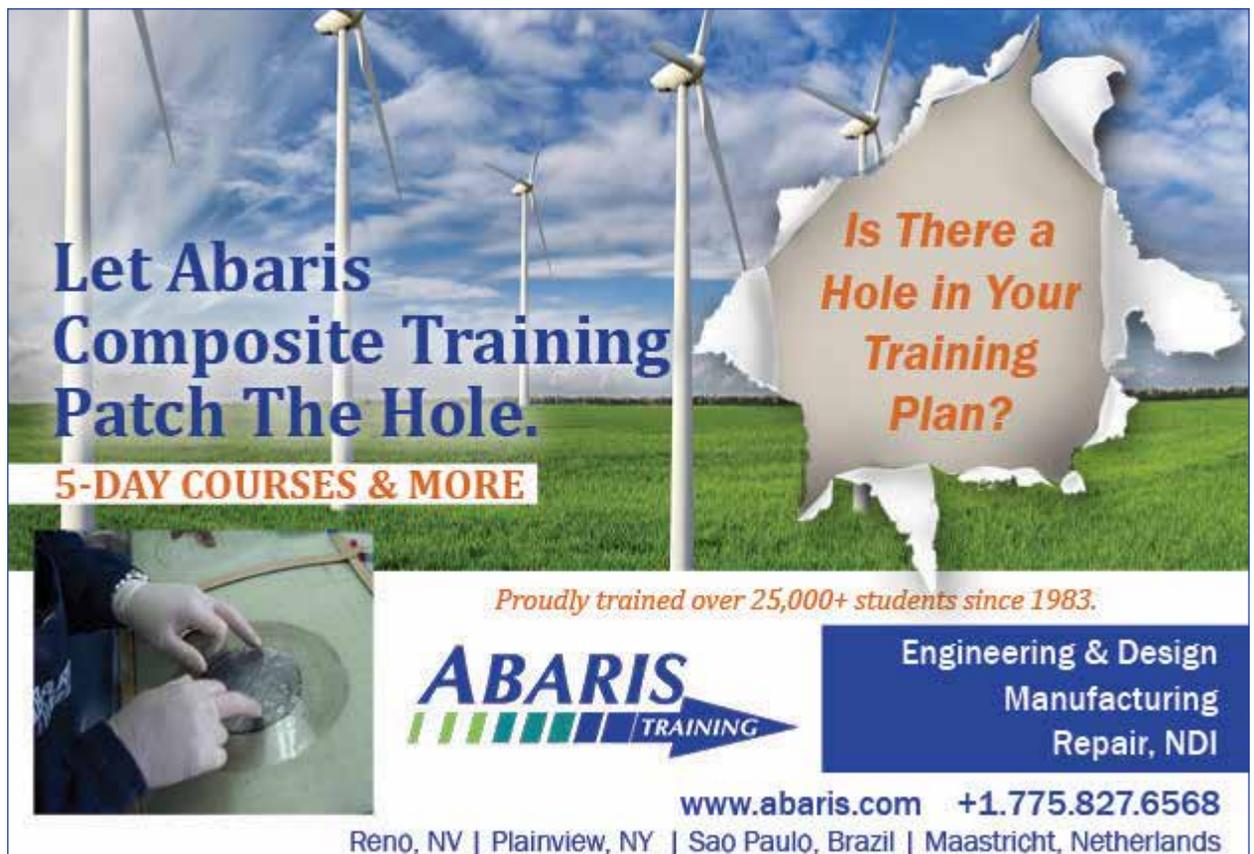
The core function of renewable hydrogen electrolysis is producing hydrogen for a specific application, either hydrogen fueling, renewable natural gas, green chemicals, and industrial applications. Ancillary services are an incremental service and revenue stream and is tailored to the hydrogen

demand for the application. It is possible to allocate a portion of the operating capacity of the electrolyzer plant for ancillary services.

More than 35 renewable hydrogen demonstration projects have been built in Europe across all of the applications – hydrogen fueling, renewable natural gas (direct injection and methanation) and industrial hydrogen supply – and a few projects have demonstrated ancillary services as well. The first multi-MW facility in North America, a joint venture between Hydrogenics and Enbridge Gas Distribution, is under contract with the ISO in Ontario to provide regulation services.

ELECTROLYZERS

The heart of renewable hydrogen electrolysis is the electrolyzer. Electrolyzers are connected to the grid or off-grid source of power and typically the municipal water supply. Other key components are rectified to provide DC power input and a water treatment facility to produce deionized water. Hydrogen and oxygen are liberated by splitting water molecules. Electrolysis for industrial hydrogen applications has been used for decades and deployed onsite to meet the hydrogen demand, typically on a scale of 5 to 30 kilograms of hydrogen per hour. The scale and potential market size for renewable hydrogen is significantly larger. For example, a 10-MW electrolyzer plant would produce enough hydrogen



Let Abaris Composite Training Patch The Hole.

5-DAY COURSES & MORE

Is There a Hole in Your Training Plan?

Proudly trained over 25,000+ students since 1983.

ABARIS TRAINING

Engineering & Design
Manufacturing
Repair, NDI

www.abaris.com +1.775.827.6568

Reno, NV | Plainview, NY | Sao Paulo, Brazil | Maastricht, Netherlands



Hydrogenics' Electrolyzer Plant. (Courtesy: Hydrogenics)

to fuel a single fleet of 130 city buses. Multiple electrolyzers can be combined and scaled in a centralized hydrogen fuel production facility in excess of 100 MW, capable of supplying green methanol or ammonia plants that often require on the order of 100 MW to 300 MW of electrolysis.

Advancements in this technology have been most dramatic for proton-exchange membrane (PEM) electrolyzers. The price of PEM electrolyzers has dropped significantly during the past decade by roughly 40 percent, according to a study published in February in *Nature Energy*. A PEM electrolyzer is up to five times more compact than an alkaline electrolyzer of the same capacity and provides the ability to vary its power consumption within seconds to match the output of a wind farm.

LEVERAGING DEPRECIATED WIND-FARM ASSETS

In jurisdictions such as Germany and California, which were early adopters of renewable generation, a growing number of wind-farm operators have reached the stage where their contracted feed-in-tariff has expired. However, there is often still plenty of life left in these assets. The option of selling power into the spot market is available, but in some jurisdictions, the market power price is often low (and at times negative) at times of peak wind generation.

But the ability to produce electrolytic renewable hydrogen with these wind assets is becoming more and more of a viable option as well. California requires 33 percent of the hydrogen used for fueling FCEVs be from renewable sources. Europe is in the process of adopting renewable targets for transportation fuels and developing standards to measure and track the renewable content of hydrogen under the CertifHY program. There is significant potential in the Middle

East, North Africa, and the North Sea as they generate renewable energy to serve Europe and other regions. The Western U.S. and Canada have the potential to become a hydrogen trade hotspot, with cheap hydropower, an aggressive renewable portfolio, and decarbonization goals, and an increase in recent hydrogen investment activity. There are numerous market growth indicators at play, and the market for renewable hydrogen is expected to continue its growth.

Hydrogen is well positioned to play an important role in the transition to decarbonized energy systems with the integration of FCEVs, improved technology efficiency, and decreased technology costs, and the ability to commoditize, package, transport, and store energy with hydrogen for a variety of purposes and applications. All these factors are leading to growing demand for renewable hydrogen worldwide. Renewable hydrogen produced by electrolysis from wind and solar will be used to fuel buses, trucks, and trains; produce renewable natural gas; and produce green chemicals and feedstocks. It provides a pathway to leverage large scale wind farms to not only decarbonize traditional power markets but also the transport, natural gas, and chemical sectors. And it's already under way. Many major companies around the world are strategically transitioning to hydrogen generated from renewable sources to help reduce their carbon footprint. The value of renewable wind energy can now be captured, stored, and monetized as never before. ↵

ABOUT THE AUTHORS

Angus Brown is marketing manager and Rob Harvey is the director of Energy Infrastructure with Hydrogenics. For more information, go to www.hydrogenics.com.

THIS IS DARYL WILSON, CEO OF HYDROGENICS. AND HE'D LIKE TO INTRODUCE YOU TO OUR ADVANCED HYDROGEN TECHNOLOGY MANUFACTURING FACILITY.



Today Daryl is feeling inspired. After all, he's leading a shift to a cleaner, global energy future through hydrogen technology. With growing production facilities in Canada, the U.S., Belgium and Germany, we're designing and engineering innovative solutions for hydrogen generation, power storage and transportation. OEMs, cities, and other partners are looking to Hydrogenics for carbon-free solutions that

reliably and safely transform how we consume energy. While our leadership comes from our technology, our success is the result of one essential ingredient – the human one. Our experts, our engineers, our researchers and our day-to-day people are focused on advancing hydrogen technology for a better, earth-friendly energy source. Learn how the human factor is changing the world at [Hydrogenics.com](https://www.hydrogenics.com)

HYDROGENICS

The **human** factor. The most advanced part of our technology.

PROFILE

HARVEST ENERGY SERVICES

HARVESTING WIND EXPERTISE

HARVEST ENERGY SERVICES

FOUNDED
2014

HEADQUARTERS
Boulder, Colorado

WEBSITE
www.harvestenergyservices.com

In addition to the growing demand of construction management and plant operations, Harvest Energy Services is also involved in many maintenance activities. (Photos courtesy: Harvest Energy Services)

Harvest Energy Services is an independent service provider to the renewable energy sector and offers O&M, quality control and inspections, construction management, and asset management services within the Americas.

By **KENNETH CARTER** ▶ Wind Systems editor

As anyone involved in the wind industry knows, there are a lot of moving parts involved in getting a wind farm up and running — and that’s not even including the actual moving parts.

That’s where Harvest Energy Services enters the picture as an independent service provider offering products in support of construction, operations, and maintenance.

The 5-year-old company, which began life in the basements of its founders, has grown from offering traveling O&M services to now featuring construction management and plant operations, according to Jed Van Sciver, president of Harvest Energy Services.

“We have managed to secure a lot of business relationships with customers and truly expand on that traveling O&M services piece to where we currently have probably 90 people involved in that operation,” he said. “During that time, we have managed to gain some traction in our other two product lines: one being construction management and the other being plant operations. As we’ve had opportunities and been able to capitalize on that, we’ve been able to build that resume and that team out.”

Harvest Energy has parlayed that expertise in a short time frame to an impressive portfolio.

“We currently oversee plant operations on 547 MW of wind, with an additional 300 MW beginning in September of this year,” Van Sciver said. “That’s not turbine maintenance. That’s true power-generation plant operations.”

In addition to the growing demand of construction management and plant operations, Harvest Energy Services is also involved in many maintenance activities, including up-tower repairs and retrofits, troubleshooting, installation inspections, and end-of-warranty inspections, according to Van Sciver.

“Construction management and plant operations historically have been handled in-house by large IPPs and strategic players in the industry,” he said. “We’ve seen a lot more opportunity for third parties to come in and provide those services.”

CUSTOMER INTERACTION

Part of Harvest Energy Service’s success stems from how it interacts with its customers, according to Van Sciver.

“One of the biggest challenges that our customers face is availability of resources and response time,” he said. “In order to adequately address those challenges, we’ve made investments in terms of employees and processes to help us manage our resources and logistics. We have a dedicated resource coordinator who deals with things like fleet management, mobilization, and items of a more day-to-day logistical nature. We also have hired an equipment manager to ensure that we have the proper tools available, calibrated, and that can be received on site any time.”

When customers have technical issues, Van Sciver said it often requires his team’s full experience.

“When we talk about more of a challenge related to a technical issue associated with our various scope of work, technology, etc., we have an approach whereby first we will review scope of specific items and work instructions,” he said. “We try to identify issues within that scope or work instruction that may be contributing to the challenge or issue that needs to be addressed.”

The team at Harvest Energy Services will capitalize on its individual experience levels and the wisdom gained from the past, according to Van Sciver.

“We have over 100 employees with various levels of experience, ranging from brand new to the industry to 25 years in the industry,” he said. “And oftentimes, the solution has already been there before, so there’s not a need to reinvent the wheel.”

If, after all of that, a solution still doesn’t present itself, Van Sciver said other avenues are available.

“If we can’t find some experience within the team that’s relevant and provides an opportunity to further investigate, we will work with one of our business partners from an engineering perspective to try and identify a solution,” he said. “Subsequent to that, we would come back to the customer with the proposed solution to review it and either agree or say, ‘Let’s take it back to the drawing board and look for something a little different.’”

THREE-PIECE APPROACH

To that end, Van Sciver said his company takes a three-piece approach in how it sees its ability to grow while maintaining its brand awareness: safety, quality, and employee satisfaction.

“Safety and quality are pretty self-explanatory,” he said. “Employee satisfaction we feel is very important to us, given the competitive landscape currently and what we perceive to be resource constraint in terms of wind technicians and just employees in wind. There’s such a boom in the industry and on the O&M side subsequent to the large volume of new installations. We have to really focus on being a preferred employer. We want our people to be very happy and satisfied.”

There are several ways Harvest Energy offers employee satisfaction, but the most important way is creating an opportunity for career development, continuing education, and training, according to Van Sciver.

“We want to give people that forward-looking horizon on how they can improve themselves,” he said. “Avoiding retention issues and supporting growth has become a very, very important focus for us.”

STAYING ON BRAND

Harvest Energy's brand awareness within the wind industry has become a source of pride, according to Van Sciver.

"It certainly, in our opinion, speaks to the quality and performance of our work," he said.

Part of that quality and performance is evident in Harvest Energy's recent achievement of ISO 9001 certification.

"That's a big achievement that we're very proud of," Van Sciver said. "I think, given the size of the company and our stage of growth, implementation of that quality management system has really allowed us to get buy-in from the people who are using it and truly use it for the purpose of business improvement. We've seen some big success there."

GROWTH AND COST

Harvest Energy Services has evolved with the wind industry in its five short years, and Van Sciver said his company is looking at ways to evolve with growth and cost.

"The market itself continually grows," he said. "Understanding how to position ourselves within that growing market, knowing that as a small, privately-owned company, we can't take everything. So, we try to understand market segments, market demands, and needs. Trying to tailor our services to serve those needs has been one way that I think we've been successful."

Cost is important across the board, particularly as the potential offtake becomes more competitive, according to Van Sciver.

"Power purchase prices have dropped significantly," he said. "As a result of that, everybody involved in wind projects has had to figure out how to optimize their costs. We don't have the impact on the capital costs of the wind turbine, but we do have an impact on operational costs. That's probably where our largest contribution to cost optimization has come from. We are constantly looking for ways to improve efficiency and cost of our services to aid in the overall cost optimization of wind energies and ultimately to compete with other more traditional sources of energy."

One of Harvest Energy Service's values, as it relates to cost, is its ability to work with contractors to identify engineering opportunities and cost optimization initiatives, while managing overall costs from any project controls throughout the construction process, according to Van Sciver.

Another evolutionary aspect of Harvest Energy is in the soon-to-be establishment of a 24/7 monitoring center, where Van Sciver intends to use his company's plant management activities as well as offering the monitoring center as a standalone service.

"We're hoping that it is up and operational before the end of the year," he said. "I think that it will further differentiate us from some of our competitors."

LOOKING TO THE FUTURE

From its humble beginnings, Harvest Energy and its team is aware of what the future may bring to the wind industry



Harvest Energy Services oversees plant operations on 547 MW of wind, with an additional 300 MW beginning in September of this year.



Harvest Energy Services takes a three-piece approach in how it sees its ability to grow while maintaining its brand awareness: safety, quality, and employee satisfaction.

and is ready to meet that future head on, according to Van Sciver.

"My personal opinion is you're going to see a lot less installation," he said. "It's not going to go away. But assuming that there is no sort of solution to power prices, financing structure, and things like that, I think that you will see a lower level of installations but more sustained over time. As you see reduced installations, I believe that the higher volume work is going to be, not so much in developing con-

struction, but in operations. That’s why we’re really positioning ourselves to be a major player within the operations and maintenance space because that’s not going to go away.”

Part of the future of wind will be in the repowering market, and Van Sciver said Harvest Energy also is positioning itself to be a player in that as well.

“The advent of the repower-project approach has allowed us to build out a fairly significant division within Harvest, focused strictly on repowering,” he said. “As things move forward, I think inevitably you will continue to see repowering. Turbines are going to be getting older and older. Like cost optimization and increased efficiency of technology, repowering is going to be a logical continued developing construction product.”

Van Sciver expects that to continue into the next decade.

“From an operational perspective, I think you will see inevitable consolidation in that particular market segment,” he said. “We’re working hard to make sure that we have the right strategy so that, in a consolidated market, we’re one of the providers that are still there and operating independently.”

WINDPOWER 2019

Harvest Energy Services has had a presence at AWEA’s WINDPOWER shows in the past, and this year will be no different, according to Van Sciver.



Harvest Energy Services works with contractors to identify engineering opportunities, cost optimization initiatives, while managing overall costs from any project controls throughout the construction process.

“We intend to have a representative at the booth for all three of the products I’ve mentioned: for operations and maintenance services, construction management, and plant operations,” he said. “The depth of experience between the folks that will be there to provide that is significant to say the least. I think there’s a great opportunity for people to come by and better understand our perception of the market, our product offerings as it relates to all three of those, and understand what our team’s experience is and how that adds additional value to our ability to offer solutions to the industry.”



BOLT TENSIONING



- Tensioning equipment is customized for any bolt configuration or clearance
- Our customized equipment can be modified or repaired in the field, reducing downtime
- Certified pump gauges are recalibrated with each foundation
- Professional reports routinely provided for each foundation tensioned
- Free bolt cap installation with tensioning service



NTC WIND ENERGY
Foundation Solutions

RAISING THE BAR IN BOLT TENSIONING

800.359.0372
JWBRUCE@NTCWIND.COM

NTCWIND.COM

TP&L
Management Solutions

See us at
WINDPOWER
Booth 3515

THE POWER OF QUALITY

Streamlining and tediously managing every aspect of the supply chain so your shipments arrive on time and to the highest quality standards set by the manufacturer.

SERVICES + CAPABILITIES

Distribution Services // Inventory Management // Rail & Trucking Logistics // Indoor/Outdoor Storage // Maintenance

NORTH AMERICAN LOCATIONS

Grand Forks, ND // Casper, WY // O’Neill, NE // Pueblo, CO // Garden City, KS // Enid, OK // Levelland, TX

TPANDL.COM

(307) 337-7991

WINDPOWER 2019 exhibitors

► Why are you exhibiting at WINDPOWER and what should attendees look forward to at your booth?

“We’re exhibiting at WINDPOWER because we know that’s the place key decision makers across the industry gather each year.”

AWEA’s annual wind-industry show, WINDPOWER 2019, is scheduled to hit Houston, Texas, May 20–23. The show will bring thousands of industry experts and insiders to the energy capital of the world, where they will be on hand with knowledge to take wind into 2020 and beyond.

Wind Systems reached out to several exhibitors and asked them to share their plans for WINDPOWER 2019. If you’re going to be at the show, be sure and stop by their booths for more information.



At WINDPOWER 2018 in Chicago, attendance was 7,600 — up 10 percent from the previous year, according to AWEA. (Courtesy: Wind Systems)

AIMCO

BOOTH #4147

► **Skylar Hall**, Channel Marketing Project Manager



Whether your priority is to eliminate one of the costliest safety hazards in bolting – finger trauma – or to increase profitability by reducing production time with a reliable product, AIMCO is committed to perfecting its products to hit all customer needs. This year,

AcraDyne will feature DC Transducerized Controlled tools with multiple handle configurations for ideal operator comfort. These innovative high-torque products are some of the most reliable, accurate with traceable data, and flexible in the world, and are 100 times faster than hydraulics. Visit booth 4147 to see a demonstration of the remarkable speed and accuracy (± 3 percent) of AcraDyne solutions.

Bachmann electronic Corp.

BOOTH #1345

► **Nicholas Waters**, Key Account Manager



As the leading independent automation supplier for wind, we have started to see some exciting momentum industry-wide with more and more wind farm owners deciding to self-perform. At AWEA WINDPOWER, we are looking forward to connecting with customers

interested in managing more of their site operations and discussing ways that we can drive up their profitability, while minimizing their risk. This year, we are excited to be showcasing our Wind Power SCADA platform, which provides owners with a flexible and customizable SCADA platform with complete access to their turbine data – an important first step toward OEM independence. To learn more about the path toward independence, stop by the Bachmann booth.

Clobotics

BOOTH #4031 (Co-exhibiting with GEV Wind Group)

► **Kyle Ke**, Senior Solutions Architect



Clobotics and GEV will present a fixed price inspection and maintenance solution that provides a detailed and accurate log of blade condition and is supported by a weather-inclusive maintenance solution. You can see the next generation AI drones and discuss O&M

solutions with Clobotics and GEV at booth 4031. You can see videos of the autonomous drone flying around the turbine

and blades, capturing high-resolution images. You can also see how the blade defects are automatically recognized and reported on the cloud portal and how easy a work order is sent subsequently by the system.

Helwig Carbon Products, Inc.

BOOTH #4330

► **Kevin Koenitzer**, Business Development



We're exhibiting at WINDPOWER because we know that's the place key decision makers across the industry gather each year. We look forward to the opportunity to network with industry leaders and to showcase our product line. In our booth, attendees will be excited to

find superior performing carbon brushes, wind-pitch motor-shaft grounding systems, and our improved designs for OEM wind-turbine brush holders.

ITH Engineering

BOOTH #2045

► **Nick Rasper**, Technical Sales



2019 is our 16th year exhibiting at WINDPOWER, and what always brings us back is our continued dedication toward innovative bolting solutions for the wind industry. On the technical side, attendees should look forward to seeing how advanced bolting technology

can improve turbine design while being cost efficient, and from the hands-on side, attendees should look forward to our newest tension and torque tools specialized for service and maintenance crews.

Kardie Equipment

BOOTH #3803

► **Kevin Darby**, Co-Founder and CEO



As the industry leader, Kardie Equipment (TGM Wind Services) is the largest North American distributor for Bronto Skylift. Since 2010, our fleet of 20 units has pioneered access and cleaning in the renewables sector for the world's largest wind companies. On the

heels of our success over the last decade, we have expanded our capabilities to include various new products and services that will allow us to continue growing and penetrate new industries. We provide the safest, most efficient, and most reliable AWP's across various industries up to 295 feet. We are exhibiting at WINDPOWER to answer any questions

about the Bronto and to give attendees the opportunity to see one up close, as we will have a unit at our booth.

Mankiewicz Coatings

BOOTH #3503

▀ **Jeff Grandgenett**, Technical Sales Manager, North America



Mankiewicz Coatings looks forward to exhibiting at WINDPOWER every year as this exhibition is North America's best gathering of the global wind-energy industry. Attendees looking for coatings concepts for the future need look no further than Mankiewicz's display

where we will have technical sales directors on-hand from three continents personally showcasing our advanced coatings products to maintain turbine blade surfaces for optimal performance and efficiency. Meeting with new and prospective clients in one place, face-to-face at WINDPOWER provides Mankiewicz with unparalleled opportunities for us to bolster our brand recognition and strengthen our ties with those already familiar with our products.

Phoenix Contact USA

BOOTH # 2829

▀ **Heinrich Dyck**, Business Development Manager for Wind



The show is a great opportunity to have excellent discussions about current challenges and, at the same time, a powerful platform to develop innovative solutions together to cover the challenges from tomorrow. Attendees will find a wide range of products and

solutions to establish preventative maintenance strategies, reducing running costs, and increasing profitability by improving the monitoring capabilities of their existing turbine fleet.

SkySpecs

BOOTH #3821

▀ **Theresa Trevor**, Director of Marketing

We are exhibiting at WINDPOWER because it is the most





well-attended, informative and interactive forum at which to network and learn about the industry. There is no shortage of opportunities to engage with others who are all focused on the same goal: making wind energy the most accessible form of energy in the world.

There are also some enjoyable and well-planned social activities that provide off-premise mingling and networking that are very valuable. This year, our booth will showcase one of our fully automated drones as well as demos of our asset platform management software, Horizon.

Sotek

BOOTH #4521

► **Joe Doino**, Director of Business Development

Our capabilities are designed around supplying wind-power stators and rotors. With 35 years of experience, Sotek stamps and laser cuts your stator and rotor laminations from in-house designed and manufactured tooling. Sotek manufactures vent plates, end plates, stator bars, and related components to meet your demanding specifications. We



perform all assembly and quality operations in house, proudly in our Buffalo, New York, facility. Including lamination stacking, pressing, welding, thermal fit shaft insertion, final machining and value-added services with our skilled team of manufacturing and assembly

technicians. Stop in, meet us and find out why we are a seamless part of your wind-power manufacturing team.

Torkworx, LP

BOOTH #3528

► **Pete Fuller**, Managing Partner



Torkworx is at WINDPOWER because we have established ourselves as a leading source for quality torque and tension solutions needed in the industry. This year, attendees can look forward to the release of the new BRAD Select brushless motor battery tool. This

new launch is the fastest, lightest, most powerful battery tool available anywhere.

World Wind & Solar

BOOTH #3129

► **Daryl Ragsdale**, Director of Business Development



AWEA WINDPOWER is the industry's premier North American event where wind and renewable energy professionals gather and share their products, services, and innovative ideas. World Wind & Solar will be sharing our latest innovation at this year's conference

— the WWS Mobile University. Safety has always been our top priority, and we've long recognized the importance of a quality and expansive training and development program. Our new training trailer allows us to be more efficient and cost-effective in training and re-certifying our technicians — by taking the classroom to them, regardless of their location across the nation. Our mission is to train, equip, and deploy an elite workforce who are here to serve. ✌

Visit us at WINDPOWER 2019

Wind Systems will be at AWEA's annual wind-industry show and hope you'll stop by our booth (3154) to chat with our staff and register for our daily giveaway of a Snap-On toolbox. We look forward to seeing you there.





The electrical substation at the Arkona offshore wind farm is fully automated and is designed to be able to manage the wind farm autonomously. (Courtesy: Chantiers de l'Atlantique)

► CONSTRUCTION

CdA becomes key player of the European energy transition

Chantiers de l'Atlantique (CdA), one of the leaders in European maritime industry, is associated with the official inauguration of the Arkona offshore wind farm, April 16 on Rügen Island (north-east of Rostock), in the presence of Angela Merkel, federal chancellor of Germany and many other personalities.

The offshore wind farm consists of 60 wind turbines rated at 6-plus MW each, developed by the German energy company E.ON and the Norwegian company Equinor (formerly Statoil).

They are connected to the electricity network by the German transmission system operator 50Hertz. Chantiers de l'Atlantique, through its Atlantic offshore energy business unit, designed, built, installed, and commissioned the largest electrical substation ever built in a single module. With a weight of more than 4,000 metric tons and a capacity of 385 MW, the substation transfers the carbon-free electricity produced by wind turbines to the equivalent of 400,000 households in Germany.

Electrical substations are key elements for the operation of offshore wind farms. These structures, often weighing more than 2,000 metric tons, transform the electricity produced by the wind turbines and can transfer it up to 100 kilometers to land. They

also serve as relays for remote control of the wind farms. Fully automated, they are designed to withstand extreme marine environments, with the easiest possible maintenance.

Ordered in June 2015, the substation consists of a topside 50 meters long, 35 meters wide, and 15 meters high. It was designed and built by Chantiers de l'Atlantique in Saint-Nazaire (Loire-Atlantique), then transported in February 2018 by barge to its installation location in the Baltic Sea, about 35 kilometers off the coast of Rügen Island.

This “smart,” fully automated substation is designed to be able to manage the wind farm autonomously, without human intervention, thanks to a large electronic PLC system.

Chantiers de l'Atlantique also pro-

vided the foundation for the substation, a 53-meter high jacket structure with a total weight of 1,800 metric tons. The unit was delivered ahead of schedule and commissioned and to the customer in the summer of 2018.

This “turnkey” project, completed in record time, testifies to the excellent cooperation between the German, Norwegian, and French experts in marine renewable energy. It also reflects the expertise of the teams at Chantiers de l’Atlantique, who applied the processes and technologies learned through building large complex ships to design this substation, achieving weight savings of about 20 percent on the metal structure, which significantly reduced construction costs and facilitated the installation.

MORE INFO www.chantiers-atlantique.com

CONSTRUCTION

Eurowind Energy picks Siemens Gamesa for Denmark wind project

Siemens Gamesa has signed an order with Eurowind Energy for Thorup-Sletten, the largest onshore wind farm in Denmark to date. The 18 onshore turbines will have a total capacity of 77 MW and an electricity production equivalent to the average annual consumption of approximately 65,000 households.

“We are proud of being the developer behind the largest onshore project in Denmark,” said Jens Rasmussen, CEO for Eurowind Energy. “This is yet another proof that onshore wind should continue to be an important part of the energy mix to keep Denmark at the forefront when it comes to wind energy. We have chosen Siemens Gamesa because we looked around in the market to find a turbine that is both a great match for these very windy conditions and can deliver high product quality and a highly competi-



The Thorup-Sletten wind farm will feature 18 turbines from Siemens Gamesa. (Courtesy: Siemens Gamesa)

tive price. The upgrade of the turbine from 3.6 to 4.3 MW together with the 130-meter rotor was important to get the lowest cost per KWh produced.”

The installation of the Thorup-Sletten wind farm, west of the Aggersund bridge in northwestern Jutland, will start in October of this year. Siemens Gamesa will also be responsible for

service and maintenance of the wind farm for 20 years through a long-term service program tailored for Eurowind.

“Of course it means a lot to us to win this bid from Eurowind and to be able to continue driving the transformation to renewables in Denmark,” said Steven Pryor, Siemens Gamesa’s Onshore Business Unit CEO for North

DON'T BE LET DOWN BY AN ELEVATOR

Installation and preventative maintenance by IUEC elevator mechanics will keep your elevators moving SAFELY and more efficiently.

27,000 trained craftspersons using more than 119 training centers.

Contact Carisa Barrett at cbarrett@eiwfpf.org or 253-561-4902

We represent more than 450 elevator companies ready to serve your Elevator Lift needs

Europe and Middle East. “We are constantly working to offer innovation, technology, and solutions tailored to the needs of the individual customer.”

MORE INFO www.siemensgamesa.com

CONSTRUCTION

Pfisterer will supply a 52-KM underground cable system

Westnetz, one of Germany’s largest distribution network operators, is building a 17-kilometer underground cable system in Hunsrück as part of its efforts to support the transition to renewable energy. This new high-voltage cable will transport renewable wind power from turbines at Hunsrück to the region’s urban centers. Pfisterer is supplying the entire 110 kV cable system with a total cable length of about

52 kilometers together with the cable accessories, as a turnkey system.

Westnetz, the distribution network operator for the Trier region and a subsidiary of Innogy, views the 19 million euro project as an investment in transition to renewable energy in Rhineland-Palatinate. Its existing distribution network in Hunsrück is now operating close to capacity due to the rapid growth of renewable energy generation. Consequently, surplus wind energy will soon be transported from a substation in Thalfang (110 kV) through a 17 kilometer renewable energy connection to a substation in Osburg.

“We are delighted to be continuing our partnership with Westnetz, a long-term customer, on this key project for the 110-kV distribution network, and thereby contributing to the transition to renewable energy in Rhineland-Palatinate,” said Vukasin Basara, senior manager of Underground Cable Projects with the PTS Cable business unit

at Pfisterer. “This is Pfisterer’s largest order for HV AC underground cables and demonstrates our customer’s trust in our experience and expertise in handling complex high-voltage underground cable projects.”

To support the installation, trenches 1.5 meters deep and 1.7 meters wide will be dug along the 17.3-kilometer route, which will run predominantly along rural roads and over public land. According to Westnetz, this is the longest underground cable they have ever installed. Pfisterer is supplying the complete cable system as a turnkey solution. Initially, three cables will be installed in parallel conduits, but three additional empty conduits also will be installed to allow for future expansion. Installation of the underground cable, with a combined total length of 52 kilometers, will begin in early 2020. Fiber-optic conductors will be integrated into the cable screen, and two conductor cross-sections, one 1,200 square millimeters and the other



WIND TURBINE MAIN SHAFTS

Fusion Inc. can assist you with repairing of bearing journals, seal areas and coupling fits on wind turbine main shafts with our large capacity lathe, grinders and HVOF coating systems. We can perform incoming inspection, level II NDT-Inspection, lathe machining, HVOF coating and finish grinding in-house. To be repaired ODs can be HVOF coated with up to .020" per side of coating thickness and ground back to standard OEM size/finish.

FUSION INC THE COATING & GRINDING EXPERTS

6911 FULTON ST HOUSTON, TX 77022 PHONE 713-691-6547 FUSIONHOUSTON.COM

AWEA WINDPOWER SEE US AT BOOTH 3630

WIND +

POWERING THE FUTURE. TOGETHER.



2018 has been a historic year as wind power surpassed **90,000 MW** installed and the AWEA WINDPOWER Conference grew **10%** making it the **largest show in 5 years**. The wind industry's powerful growth is poised to continue in 2019, with more than **37,700 MW** of wind capacity under construction or in advanced development.

In May 2019, that future begins in Houston, the energy capital of world, where leaders from the wind industry and across energy sectors will gather at AWEA WINDPOWER 2019. In Houston, we will take the next steps forward to powering that future, together!

REGISTER NOW!

www.windpowerexpo.org



1,800 square millimeters, will be used to achieve the required transmission capacity.

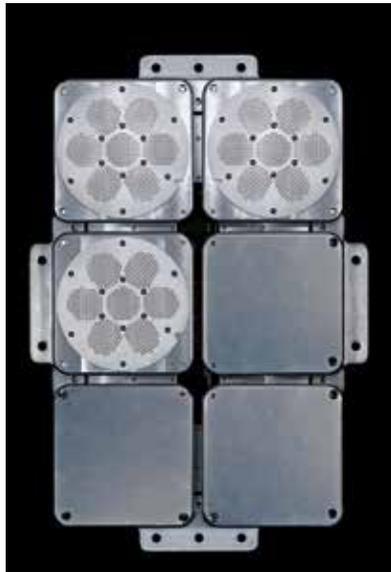
MORE INFO www.pfisterer.com

INNOVATION

NRG's Bat Deterrent System reduces bat fatalities by 67 percent

A trial of NRG Systems' Bat Deterrent System at the Pilot Hill Wind Project in Illinois yielded an overall reduction in bat fatalities of 67 percent and greater reductions with species commonly affected by wind projects.

The results of the trial were announced on March 27, 2019, by EDF Renewables, the developer/owner of the Pilot Hill Wind Project, at the AWEA Wind Project Siting and Environmental Compliance Seminar in



Bat Deterrent System from NRG Systems. (Courtesy: NRG Systems)

Albuquerque, New Mexico. Located in Kankakee and Iroquois counties, the 175-MW Pilot Hill Wind Project was made possible by a 20-year power pur-

chase agreement with Microsoft Corporation and has been in commercial operation since 2015.

Testing of NRG's ultrasonic acoustic Bat Deterrent System was conducted at Pilot Hill between August and October of 2018; 15 out of the facility's 103 turbines were outfitted with Bat Deterrent Systems. A 5.0 m/second cut-in speed curtailment was simultaneously applied at the deterrent-equipped turbines.

"Our goal with this trial was to gauge the efficacy of combining curtailment with NRG's Bat Deterrent System to reduce bat mortality at wind turbines," said Michael Azeka, director of Environmental Strategy at EDF Renewables. "The results of this trial are very encouraging and suggest that this approach to minimizing bat impacts is a compelling one."

MORE INFO nrgsystems.com

INNOVATION

ONYX: Operators must embrace disruptive technologies

Embracing disruptive digital technologies for the collection and analysis of wind-turbine data offers the best route to reducing the costs of operations and maintenance programs. This is according to more than half (55 percent) of the asset and operations managers attending ONYX InSight's European Technical Symposium in March. Disruptive technology is entering the wind-energy sector quickly and helping to improve the cost-basis for running wind-turbine maintenance programs. From micro-electro mechanical sensors (MEMS) for gathering turbine data to machine learning algorithms that improve data analysis, owners and operators of wind farms in Europe need to embrace these technologies to maintain their position in the industry.

MORE INFO www.onyxinsight.com



Building stators and rotors for wind power



Sotek/Belrix is a global supplier of motor and generator components, and integrated value added services. We manufacture up to 5 ton rotor or stator assemblies.

SOTEK

716-821-5961

www.sotek.com/power-generation



Made in the USA



The Digital Twin increases operation and gives the ability to simulate, plan, and solve complex solutions within a digital environment that replicates the real one. (Courtesy: Ericsson)

INNOVATION

Ericsson and Comau show 5G Digital Twin at Hannover Messe

Ericsson and Comau recently showed the Digital Twin enabled by the 5G connectivity to the Hannover Messe. This innovation project, which is being tested, represents a further step in the long-lasting partnership between Ericsson and Comau aimed at developing new use cases and solutions for Industry 4.0 and Smart Manufacturing, thanks to the potential offered by the fifth-generation mobile technology.

Comau and Ericsson showed the digitized version of an assembly line in an automotive plant. Using special glasses for virtual reality applications, visitors were immersed in the line and could “move” within it, monitoring the key parameters of the processes and of the machines, such as vibrations, temperature, pressures, and absorptions. A virtual reality digital dashboard, which can be used with a standard tablet, will identify situations that could create slowdowns or interruptions in the process by providing instructions to tackle the problem effectively.

The features of 5G connectivity allow a collection of a stable, continuous, and massive flow of data in

real-time that is vital for automation processes.

MORE INFO www.ericsson.com

INNOVATION

Geo-location mapping project crosses 100K turbine milestone

An ambitious project led by IntelStor to map the geo-locations of every wind turbine in the world has hit a major milestone.

IntelStor has now completed the geo-location mapping of 107,902 out of 355,793 onshore and offshore wind turbines in the world, spanning 38 countries so far. This project enables IntelStor to remove ambiguity over the global installed base of wind turbines and provide the most accurate market intelligence to the industry. To date, this includes more than 24,500 offshore wind turbines and 83,400 onshore wind turbines including decommissioned, operational, under construction, consented, and proposed assets.

This IntelStor-led project to clean and scrub the data provided by governments and industry trade associations increases the precision in the data sets. Some publicly available data for wind-turbine geo-locations includes non-wind turbine structures, such as

MANKIEWICZ
Coating Concepts of the Future

Whether you need a system for wind blade production or repairs, come by and learn how Mankiewicz can provide your complete coatings solutions.

AWEA WINDPOWER
Houston, TX • May 20 - 23, 2019

Booth # 3503

North America: +1 (843) 654 7755
Europe: +49 (0) 40 / 75 10 30

www.mankiewicz.com

met towers, cellphone towers, or other tall structures. Additionally, this research has identified missing turbines from published datasets as well as inaccurate labeling of wind turbines that have been subsequently decommissioned.

Removing these inaccuracies from data sets, which includes the U.S. Geological Survey and Federal Aviation Administration database in the United States, the Danish Energy Agency master data register, WindStats data sets in the Netherlands, and INEGI in Portugal, is of the utmost importance to ensure accuracy in global market statistics. Industry reliance on accurate data for historical market statistics as well as future market projections is imperative.

MORE INFO www.intelstor.com

MAINTENANCE

O&M jack-up vessel to join the Fred. Olsen Windcarrier fleet

Fred. Olsen Windcarrier has signed a long-term time charter with Falcon Global for their jack-up vessel Jill. The jack-up vessel will be an integrated part of the Fred. Olsen Windcarrier jack-up fleet for offshore wind, where she will be under commercial management of Fred. Olsen Windcarrier. She will be working out of Europe and carry out O&M work in offshore wind.

The vessel was scheduled to commence work in Europe in mid-April 2019. Jill's first job in Europe will be suction-bucket installation tests out of Frederikshavn in Denmark together with Universal Foundation. The first contracts for main component exchanges will be shortly after arrival.

"With Jill joining our fleet, Fred. Olsen Windcarrier can provide a competitive vessel to the O&M market for the 3-5 MW offshore wind turbines," said Casper Toft, chief commercial officer with Fred. Olsen Windcarrier. "Jill is capable of servicing up to 80 percent of the installed offshore wind base,

and we look forward to showing the offshore wind market what this vessel is capable of. Apart from using her for major component exchanges within O&M, she can, among other things, also be used for offshore accommodation and for blade transportation."

MORE INFO www.windcarrier.com

MAINTENANCE

Renewable energy industry gets training boost

Altitec, a leading provider of wind-turbine rotor-blade repair and maintenance services and technician training, recently opened an Altitec Academy in Australia. The first training course was scheduled for May 7-17, 2019, offering essential skills to develop a career in the wind-energy sector.

Investment in the Australian renewable energy market doubled from \$10 billion AUD in 2017 to \$20 billion AUD in 2018, and wind energy is the second largest source of renewable power in the region, closely following hydropower. This means that in 2018, wind provided enough energy to power 3,518,452 homes in Australia.

While renewable energy capacity in Australia continues to grow, further investment is needed to support the development of skills appropriate to the market as more and more local workers seek sustainable careers in a thriving and future focused industry.

MORE INFO www.altitec.co.uk

MANUFACTURING

Vestas receives 143-MW order in the U.S.

Copenhagen Infrastructure Partners (CIP) recently placed an order for 143 MW of V126-3.45 MW turbines for the

Bearkat II Wind project in Texas.

Bearkat II is the second phase of the Bearkat project, following the successful 2017 commissioning of the Bearkat I project, which also featured V126-3.45 MW turbines. Including previously purchased components, the project will have a total capacity of 162 MW.

Deliveries are expected to begin in the third quarter of 2019.

MORE INFO www.vestas.com

MANUFACTURING

Han-Eco® B offers compatibility with metal connectors

HARTING multiplies the possible uses of plastic connectors with the new Han-Eco® B series. The Han-Eco® range now includes plastic housings that are fully compatible with the standard Han® B. This means that Han-Eco B plastic connectors can be mated with Han B metal connectors. This opens up the entire portfolio of Han B inserts for Han-Eco. Another key improvement is the rear-mounting option for prefabricated cabinet harnesses.

The rear-mounting feature has been a demand from the industry for many years and is now realized in the Han-Eco B series. This feature simplifies the assembly process as the insert side of the wiring harnesses can be easily snapped into the bulkhead mounted housing from the inside of the switch cabinet — rearward.

This simplifies the assembly as well as allows assembly floor optimization by providing the ability to stock the internal wire harness pre-cabinet assembly, thus saving time and costs. Now that a switch cabinet unit and its cable harness can be pre-assembled separately, a better division of labor is possible and, if necessary, processes can even be outsourced. ↘

MORE INFO www.harting.com



MOTION+POWER
TECHNOLOGY EXPO

**GEAR
ELECTRIC
FLUID POWER**

 **MOVING THE FUTURE.**

OCTOBER 15–17, 2019

DETROIT, MICHIGAN | COBO CENTER

Go to MotionPowerExpo.com to learn more

A photograph of two large, teal-colored offshore wind turbines standing in the ocean. The sky is overcast with grey clouds. The water is dark and choppy. The turbines are the central focus, with one in the foreground and another further back to the right.

CROSSWINDS

THE FUTURE OF WIND

MAKING U.S. OFFSHORE WIND A REALITY



Major European wind players will have to approach U.S. offshore differently than the way it has been done overseas. (Courtesy: Shutterstock)

U.S. offshore wind is just over the horizon, but the success of these projects rests on meeting certain challenges head on now.

By **KENNETH CARTER** ▸ Wind Systems editor

Expect the path to offshore wind in the U.S. to be filled with its fair share of challenges, but facing and solving those challenges will make the end result of renewable energy all the better in the long run.

In that same vein, it is the job of many wind-industry companies to look at ways to solve those challenges before they become obstacles.

That's where Richard Baldwin and his team with Ramboll come in.

Ramboll — a global engineering, design, and consultancy provider based in Denmark — has been a big player in offshore developments in Europe, which has helped parlay the company's entry into the development of U.S. projects, according to Baldwin, who is a hydrogeologist with Ramboll.

"We've designed 65 percent of the Europe foundation system," he said. "And that's certainly a big market entry point for us in the U.S. But, the market is very integrated. Everybody thinks about these turbines spinning offshore, and that's certainly something that Ramboll is completely interested in and capable of supporting. We can support the developers in doing the data collection, data evaluation, engineering. But then there's the whole supply chain and the ports and harbors and the marine infrastructure issue that in the near term we definitely have to evaluate. And that's something we're quite good at."

Obviously, there are many facets of a project to be considered before there's steel in the water, but Baldwin said many recent projects in development are on the fast track.

PPAS AND ORECS

The projects are based on power purchase agreements (PPAs) and offshore renewable energy credits (ORECs), all of which are state solicitations.

"Massachusetts already has an 800-MW solicitation: Vineyard Wind, and that's in the queue," Baldwin said. "They're going through their permitting process right now. Typically, once a power purchase agreement or OREC agreement is signed, there's about a five-year period that you have to go out and collect ocean data. Then, developers have to do a lot of work. So, we're anticipating the next couple of years, two to three years, that things are going to start being built."

And similar steps are being taken in New Jersey, where the winners of that state's first 1,100-MW solicitation are expected to be announced in June, according to Baldwin.

"That's another one that will be in the pipeline very shortly," he said.

Typically, it's a five-year process that is part of the Bureau of Offshore Energy Management's (BOEM) procedures.

In that time frame, a construction and operation plan is

set where developers do a lot of work to completely delineate the sea-bottom conditions, according to Baldwin.

“There’s quite a bit of work once they win one of the solicitations to get there,” he said. “So, five years is actually a fairly short time period for what needs to be done.”

That relatively short five-year period is helped by BOEM’s ability to limit the longevity of some environmental impact statements, according to Baldwin.

“There’s never a question of if they’re not going to be of high quality, so that everything is protective of the environment and all other things that they tend to look at,” he said. “The Feds are trying to help that process. All of the states are very aggressive in trying to make sure that their level of permitting goes through as easily as possible, too. It’s really, I think the excitement and all the regulatory agencies, be it state, local, federal, they want this to go through, so it’s not like there’s a bunch of people dragging their feet.” The U.S. faces several challenges once a site has been given the green light to build a wind farm on, namely the current lack of necessary infrastructure, according to Baldwin.

“There’s a short-term challenge; we also like to think of it as an opportunity: We don’t have the specialized ports and harbors infrastructure that’s going to be required to build these things,” he said. “The scale of the infrastructure — one blade’s going to be 100 meters long, so the length of a football field. Once they are either delivered, and hopefull-

ly in the future manufactured here, they never get very far from the water, because they’re not rail transportable; they’re not road transportable. In the first project or two, a lot of the materials are going to be coming from Europe, because we just don’t have the manufacturing facilities set up in the United States yet. But again, you have to have good equipment-staging and erection facilities. You have to have good ports to harbor structure. You need deep channels and the like. So, that’s probably, in the short term, really the greatest challenge.”

HOOKING THE FISHERMEN

Another challenge, at least on the East Coast, is the concerns of the commercial fishing industry, who are the biggest opponent to offshore wind as of now.

“They’re very concerned,” Baldwin said. “They think that they’re pretty regulated to over-regulated now, and so when you go to any of these meetings, it’s usually the fishing industry that raises most of the concerns.”

Ironically, it’s been shown that offshore wind farms can actually increase marine habitats, and in the U.S., offshore oil rigs have also contributed to an increase in marine life around the artificial structures.

“They definitely are showing, both in Europe and even off Block Island (off Rhode Island), that they’re increasing the habitat,” Baldwin said. “Typically, it seems like the sport



THERMAL CAM USA

LEADERS IN THE DRONE SERVICES INDUSTRY

Thermal Cam USA is a certified Thermal Aerial Drone Survey company, providing thermal, digital and OGI, PPM photo inspections of wind farms, solar fields, oil and gas, pipelines and much more.

Using drone technology and powerful software, turbine blades can be mapped in high resolution, identifying and quantifying damage then reported to you electronically.

Get a quote: 432-967-4212
info@Thermalcamusa.com




RELIABLE IN ALL CONDITIONS.

MANOSKOP®
730 Quick

Experience integrated tool solutions for maintaining wind turbines. Experience the »Made in Germany« difference.

 Made in Germany

Tel: (+1) 262-583-4060 | info@stahlwille-america.com

AD INDEX

Abaris Training Resources	25
American Chemical Technologies	15
American Gear Manufacturers Assn (AGMA)	43
AWEA (American Wind Energy Assn)	39
Aztec Bolting	5
Bachmann Electronic Corporation	1
Castrol Industries	IBC
Electical Consultants	20
Elevator Industry Work Preservation Fund	37
Fusion Inc	38
Hydrogenics	27
Mankiewicz Coatings c/o Stealth Mktg.....	41
Mersen France Amiens S.A.S.	17
NTC Wind Energy.....	31
Ozzie's Pipeline Padder.....	10
Petzl America	3
Port of Stockton.....	7
Snap-On Tools	11
Sotek/Belrix Industries.....	40
Stahlwille Tools LLC	46
Thermal Cam USA	46
The Timken Company	BC
TORKWORX LP.....	IFC
Transportation Partners & Logistics	31
United Gear Works	21
Windrush LLC	10
Wind Systems	47

EXTEND YOUR COMPANY'S REACH

Present your company's message to the wind-energy industry in print and online through Wind Systems magazine. For 10 years, Wind Systems has served as a leading authority on the wind-energy industry. We offer a variety of media to connect you with potential customers. For details, contact:

David Gomez, Regional Sales Manager

✉ dave@windssystemsmag.com

☎ 800-366-2185 ext. 207



WIN A SNAP-ON TOOLBOX AT WINDPOWER!



**Come by the Wind Systems
Booth (#3154) for details!!**

* MUST BE PRESENT TO WIN

and recreational fishing industry really like it. The commercial guys are worried about how they navigate around the turbines. They just want to make sure they're not displaced basically."

Working with the fishing industry is an interesting development in the U.S. that has some positive potential that it doesn't have in Europe, according to Baldwin.

"As I understand, in Europe, the fishermen can't actually fish in the wind farms, and I believe that the plans are, and again, we haven't really constructed any of these things yet, but the plans are to allow the fishing industry and the commercial and recreational fishermen to actually fish within the wind farms," he said. "Which kind of helps with creating the habitat."

Basically, when dealing with the public about the construction of wind farms, transparency is the key to successful projects, according to Baldwin.

"It's really focused on public participation," he said. "Don't surprise stakeholders, whether they're the fishing industry or whether it's the maritime industry. And don't surprise the public. Be open; be honest. I think, too, with the fishing industry, be responsive, listen. You want to show that you're actually thinking, and you're actually listening to them and making sure that you're responsive."

Another takeaway from the European offshore market is that it's going to be a huge job market booster, according to Baldwin.

"There's a lot of white- and blue-collar jobs that will hopefully last for a long time — decades and decades," he said. "Science, engineering, vessel operators, repairs, ship hands, ports, etc. I think that's one of the things that, as time goes on, it's going to develop into quite a strong and robust job market, as they have seen in Europe."

U.S. VS. EUROPE

With many of the major players in wind hailing from Europe, Baldwin said their approach to the U.S. will have to be a little different than the way it's done overseas.

"With companies such as Ørsted and EnBW and Equinor, they're all European firms that are now coming in," he said. "In Europe, I understand, they're kind of used to being the big boys, the big people on campus, and maybe with more centralized federal governments, they may have a little more sway. I think that the big surprise they're going to have is to do this in the American way. You have to deal with multiple jurisdictions; you have to deal with American business practices, and the like. I think that's definitely a big thing that's going on right now."

Currently, there are about 10 GW in play in the U.S. offshore market with signed PPAs and ORECs, so wind companies will need to know how to approach this potential windfall with an awareness of American business practices, according to Baldwin.

And the need for offshore wind — especially on the East Coast — becomes clear when the location of the most energy-hungry areas is near those shores.

"You've kind of got the load center right next to the main users, so you can be 20 miles offshore, so the wind farm is beyond the visual horizon for most of the time," Baldwin said. "And the wind also blows the most during hot times, so during the summer, it's actually blowing during the hottest time of the day, when we have the biggest usage. With offshore, the scale of turbines is so large. Whereas onshore wind turbines, they're obviously going to be visible, use up a lot of land, and also they typically tend to be smaller, so you need more of them."

WEST COAST CHALLENGES

The West Coast is also an area that could benefit from offshore wind, but the geographical makeup is vastly different than the East Coast's, making those projects much more of a challenge, according to Baldwin.

"Definitely the Atlantic is going to be moving first because I think the technology is so much better developed; this is where being a geologist is a good thing," he said. "The difference between the West Coast and the East Coast is that the East Coast has a passive tectonic margin. There's nothing much going on, that's why we have the wide continental shelf, and also, it's not hard rock until you get up to Maine. But off New Jersey and New York and that whole area, the geologic conditions are good for installing different kinds of foundations."

The West Coast, on the other hand, has a very active tectonic margin, according to Baldwin.

"You have the San Andreas Fault, and there's just a lot going on geologically," he said. "And that's why we don't really have a nice wide continental shelf off the West Coast with a lot of bedrock. What they're looking at on the West Coast are actually floatable platforms, and that is certainly very exciting, and we're even looking at those on the East Coast for deeper water conditions. But, there's something called the levelized cost of energy, LCOE; that's an acronym you hear a lot. Right now, the way to bring the power to the East Coast in the most economically viable way is with fixed foundations. But it's definitely going to be a big market off the West Coast. The floatable technology is definitely developing, but it's probably a little farther behind."

SUPPLY CHAIN

Another aspect that makes East Coast wind more economical is the development of a supply chain, since most of the components will ship from Europe, according to Baldwin.

But part of Ramboll's job is to look for possible areas that could be part of a functional supply chain, with a lot of these areas classified as Brownfield sites. A Brownfield site is basically a blighted underutilized site.

"We're looking at facilities to become either port facilities or staging facilities; those are some of the obvious ones that could work, like an old power plant site or something like that, that has some contamination, but we can deal with it, especially if we're able to redevelop it for commercial or industrial purposes," he said. ↵



CASTROL OPTIGEAR
SYNTHETIC CT 320

THE LONGEST TRACK RECORD, LONGEST OIL LIFE AND LONGEST GUARANTEE.

- Castrol has over 30 years of experience and knowledge in the wind industry.
- Our Optigear CT 320 gear oil is running on its 10th year without intervention.
- An industry leading guarantee gives you the confidence you've chosen the very best.

Discover why leading turbine manufacturers and energy companies opt for Castrol Optigear.

For more information go to
castrol.com/windenergy
or call 1-877-461-1600

Visit Castrol Booth #2333
at AWEA May 21st – 23th



IT'S MORE THAN JUST OIL. IT'S LIQUID ENGINEERING.®

 **OPTIGEAR®**



TIMKEN

The Power Behind the Power

You bring us your toughest challenges. We bring you unrivaled technical support, superior engineering and manufacturing expertise.

Power on with innovations developed from the inside out.

Visit us at Booth 1221 at WINDPOWER 2019.

timken.com/wind-energy