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Direction ▾ Development

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PROFILE

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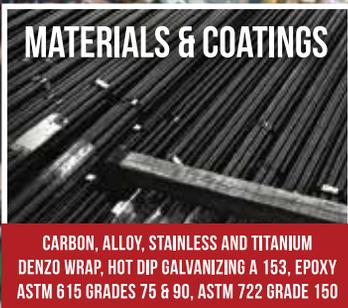
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WIND: LARGEST RENEWABLE ENERGY SOURCE IN THE U.S.

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ARE YOU MAXIMIZING YOUR EXPOSURE?

The screenshot shows a web browser displaying the storefront for Tork Worx on the Wind Systems magazine website. The page features the Wind Systems logo, a navigation menu, and a prominent article for Tork Worx titled "EXTREME BOLTING SOLUTIONS". The article text describes Tork Worx as a leader in providing equipment and manpower for controlled tightening and loosening of complex bolted joints. It also includes a "OUR MISSION" section and a "Company Video" player. The page layout includes sections for "Contact Information", "Related Articles", "Previous article", and "Next article".

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▾ THE FUTURE OF WIND



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Pandemic forces industry to temporarily shift gears

Long-time subscribers might notice something different about this month's *Wind Systems*.

Usually, our May issue has been devoted to the AWEA WINDPOWER show, and with this year's name change and expansion to CLEANPOWER, 2020's May issue was not going to be an exception to this annual practice.

However, the current Coronavirus pandemic has thrown us — and the world — a major curve ball.

With quarantine practices in place for most of the country, AWEA was forced to cancel CLEANPOWER 2020. It was an unfortunate turn of events that has forced a lot of course corrections for the time being.

Instead of an issue devoted to CLEANPOWER, we have used the current circumstances to offer some in depth looks at the current state of wind, as well as the future of other aspects of wind, including offshore.

But for those of you who still may have questions about the cancellation of the CLEANPOWER show, I was able to speak with AWEA's Jana Adams. She shared with me what went into the decision to cancel the show, and what that means to the programs planned. She even revealed what's already being planned for next year's CLEANPOWER scheduled for Indianapolis, Indiana.

With all the maneuvering necessary for CLEANPOWER 2020, I am extremely grateful for AWEA President Tom Kiernan, who graciously took time out of his busy schedule to write our cover story about the amazing milestones wind power has made as it continues to grow.

Along with that article, ABB Power Grid's Fabio Fracaroli looks at what will be needed to push the development of offshore wind in the U.S.

With those articles — and much more — we've tried to offer up quite a bit of information that, hopefully, will keep you encouraged about the industry as we all try to make it through these challenging times.

Please stay safe out there, and, as always, thanks for reading!



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Report looks at wind power trends of 2019

From AWEA

Although the COVID-19 pandemic is causing great uncertainty throughout our economy, American wind power rests on a strong foundation as we seek to overcome these challenging times. AWEA's just-released Wind Powers America Annual Report 2019 shows just how strong that foundation is. The report's top trends include:

- Wind power became the country's largest source of renewable energy in 2019, reliably and affordably supplying 7.2 percent of the country's electricity.
- Wind power was the No. 1 choice of new utility-scale power generation in 2019, capturing 39 percent of new additions.
- Utilities and corporate buyers set yet another record in 2019, signing more than 8,700 MW of new power purchase agreements.
- More than 99 percent of wind projects are built in rural America, bringing nearly unmatched investment and economic opportunity. In 2019 alone wind projects paid \$1.6 billion in state and local taxes and land lease payments.
- More than 120,000 Americans now have well-paying jobs in wind, ranging from manufacturing to construction, operations and maintenance, engineering and more.
- Offshore wind experienced enormous progress in 2019. States up and down the East Coast are now targeting more than 25 GW of offshore, and more than 26 GW of offshore wind projects are in various stages of development.
- Wind provides all these benefits while being a zero-pollution electricity source.



The American Wind Energy Association (AWEA) is the premier national trade association that represents the interests of America's wind energy industry. For more information, go to www.awea.org

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DIRECTION

THE FUTURE OF WIND



The PexaConnect platform is free to use and allows users to view and add to a directory of businesses involved in PPAs and renewable assets, including renewable energy buyers and sellers, legal and commercial advisers, and lenders. (Courtesy: Pexapark)

Pexapark launches new networking platform to drive future PPA deals

Pexapark, a provider of software and advisory services for clean energy Power Purchase Agreements (PPAs), recently launched PexaConnect, a new community platform for businesses involved in renewable energy to virtually meet and communicate their activity. PexaConnect is free to use and allows users to view and add to a directory of businesses involved in PPAs and renewable assets, including renewable energy buyers and sellers, legal and commercial advisers, and lenders.

While a number of high-volume deals have been signed over the past few years, the renewable energy PPA market is still in its early stages. There can be a lack of transparency around which companies are involved in closing deals, beyond the vendor and buyer, which places limitations on companies looking to enter the market without initial connections. As such, Pexapark has developed this platform to give users the opportunity to not only connect with other professionals in the PPA market, but also advertise their own experience buying, selling, or advising on deals.

“Knowing who to contact, and who has worked on specific deals, can be crucial for businesses who have just entered the market to begin setting up these agreements,” said Michael Waldner, CEO of Pexapark. “We’re confident that this platform will help keep up the momentum of the PPA market beyond face-to-face meetings and conferences. This will be particularly critical in the coming weeks given current global disruption.”

“Over the years, we have developed a number of digital tools to give companies the insight necessary across the whole PPA lifecycle to sign better deals, faster, and thereby create investor certainty when transitioning to a more open market,” he said. “PexaConnect takes a step back, and gives users broad, initial visibility into the market, allowing them to set deals into motion. This new platform will become

the leading destination for renewable company insights from developers to investors to offtakers — a LinkedIn for renewables.”

More than 60 executives from renewable energy buyers, sellers, and consultancies, including Innogy, VSB Group, and Vestas, trialed the platform’s beta version, anticipating that PexaConnect will soon become a comprehensive tool for companies involved at all stages of renewable energy PPAs.

Beta users commented that the platform would enable them to get in touch and keep in touch, even with travel restrictions in place, with potential partners for future deals. Beyond the networking element, many beta users new to the PPA market noted the platform’s potential as an educational resource, as other users can collaborate and contribute the information and expertise to bring the total knowledge of the industry forward.

MORE INFO www.pexapark.com

Analysis: Wind-energy expansion would have \$27B economic impact

Wind, which generates less greenhouse gas emission than burning fossil fuels, is making up an increasing share of the energy production portfolio in the United States. But wind is not as efficient as coal or natural gas, causing some concern about its economic impact.

A Purdue University study that models increased wind production in 10 states shows significant economic impact in those states, as well as billions of dollars spread over the rest of the country. Led by Shweta Singh, an assistant professor in the Department of Agricultural and Biological Engineering and in Environmental and Ecological Engineering, a stand-alone academic unit in the College of

Engineering, with colleagues at the University of Sydney, the results were published in the March issue of the journal *Applied Energy*.

“While the impacts are directly felt in the state experiencing the increase in economic activities due to installation of new wind-energy generation capacity, the positive economic effects also spill over as shown by the MRIO calculations,” the authors wrote.

The analysis considers the effects of adding 500 MW each in 10 different states that produce the most wind energy in the U.S. — Texas, Iowa, Oklahoma, California, Kansas, Illinois, Minnesota, Oregon, Washington, and Colorado. The result would be almost \$24 billion in economic impact in those states, as well as an additional \$3 billion throughout the rest of the United States.

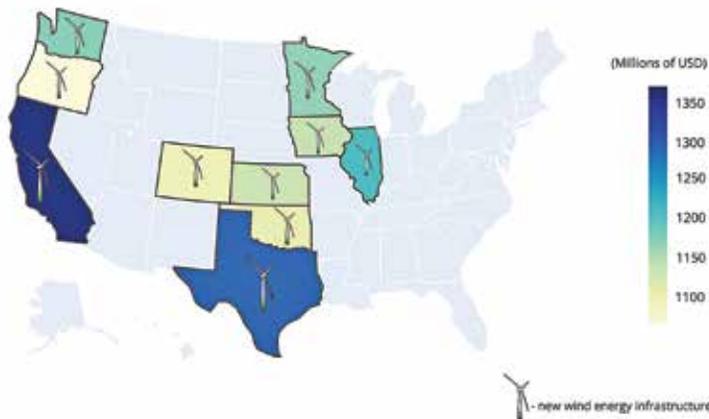
“In states that get new wind-energy capacity, we see significant economic impact, but there is also \$3 billion that spills over into the other states because there is so much interdependency on products being manufactured there,” Singh said.

The U.S. has more than 100,000 MW of operating wind capacity, according to the American Wind Energy Association. Adding 500 MW in 10 states would be only a 5 percent increase but would have significant economic benefits.

Graduate student Gargyea Vunna-va’s analysis was developed using a new USA multi-region input output (MRIO) model that considers how a shock affects not just one segment of the economy, but many interconnected parts and regions. A U.S. MRIO lab has been developed in Singh’s lab using the Industrial Ecology Virtual Lab infrastructure created at the University of Sydney. This is the first MRIO lab created for the United States.

The sectors that would see the most economic benefit would be manufacturing, construction, finance and insurance, transportation and warehous-

State-wise direct economic impact



Expansion of wind power in the top 10 wind-producing states would create billions of dollars of economic impact. States that add wind power would see about \$24 billion in activity, while other states would see \$3 billion in spillover economic activity. (Courtesy: Shweta Singh)



Virginia Gov. Ralph Northam. (Courtesy: virginia.gov)

ing, and public administration.

“We are so dependent on coal energy because the infrastructure has been built, and it’s so cheap,” Singh said. “But this study shows that there is significant economic opportunity from increasing wind-energy production, as well as spillover that touches every state and many employment sectors along with long-term impact on reducing greenhouse gas emissions.”

The Purdue Research Foundation funded this research.

MORE INFO purdue.edu

Passage of VCEA clears path for offshore wind

Virginia Gov. Ralph Northam recently signed the Virginia Clean Economy Act (VCEA), which passed in the state Senate and the House of Delegates in March. This historic legislation paves the way for an enormous expansion of offshore wind, solar, onshore wind, and energy storage.

The VCEA calls for 73 percent or more of the state’s electricity coming from clean energy by 2035, achieving the 100 percent goal by 2050. According to the U.S. Energy Information

Administration, Virginia generated only 7 percent of its electricity from renewable sources as of 2018. To drastically boost Virginia’s renewable energy production, initial milestones in the governor’s plan include generating 2,500 MW of offshore wind energy by 2026, part of the overall 5.2 GW by 2034, as well as 3,000 MW of solar and land-based wind by 2022.

In fulfillment of the offshore wind portion, Dominion Energy is developing what could be the largest offshore wind project in the country. The \$7.8 billion project would place 220 turbines 27 miles off Virginia Beach, producing enough electricity to power 650,000 homes. Dominion aims to bring the project online by 2026.

The following statement can be attributed to Liz Burdock, president & CEO, Business Network for Offshore Wind:

“Gov. Northam is boldly boosting offshore wind as a new source of clean energy and well-paying jobs for Virginia. Offshore wind is a key part of meeting the state’s goal of 100 percent carbon-free electricity by 2050 – that is something to be applauded, and I hope replicated in other states.

“Dominion Energy’s 2,640-MW utility-scale offshore wind project presents a uniquely vertically integrated framework not replicated anywhere else within the U.S. offshore wind

market. Virginia and Dominion’s bold, utility-owned strategy to support and develop offshore wind positions the Commonwealth as a Mid-Atlantic hub for offshore wind.

“This is coupled with Virginia’s December 2019 announcement to include the state’s first Office of Offshore Wind, and up to \$40 million to upgrade the Portsmouth Marine Terminal, in its 2020 budget to secure new investments in the offshore wind supply chain.

“While the world economy is frustratingly slowed down, U.S. offshore wind keeps moving. To date, states have now codified 29 GW of offshore wind in legislation, firmly establishing a U.S. market. The country will need these clean energy infrastructure projects to get our economy moving after the COVID-19 epidemic dissipates.”

MORE INFO offshorewindus.org

ABB partners with China’s State Grid to integrate renewables

ABB’s Power Grids business has won several major orders to supply advanced HVDC converter transformers and high-voltage equipment for three

800 kilovolt (kV), ultrahigh-voltage direct current (UHVDC) transmission links, owned by the State Grid Corporation of China (SGCC), in China. The links will help in integrating hydro, wind, and solar power generation, while reducing CO2 emissions. Financial details were not disclosed.

“We are glad to see a recovery in demand for reliable and clean energy, as the Chinese economy gradually returns to normality following the COVID-19 outbreak,” said Claudio Facchin, president of ABB’s Power Grids business. “Ultrahigh-voltage electricity transmission, enabled by pioneering technologies from ABB, is a critical element of China’s vision of stronger and greener grids. We have full confidence in the resilience of China’s economy.”

The transmission links will be among the world’s most powerful. Each link will transport up to 8,000 MW of electricity – individually enough power to meet the needs of about 8 million people in China.

The 1,700-kilometer Yazhong-Nanchang link is part of China’s West-East Electricity Transmission initiative. It helps the hydro-resource-rich Sichuan Province, Southwest China, to transmit green energy to the load center of Jiangxi Province in East China. Once complete, the project is expected to reduce approximately 16 million metric tons of coal consumption and 40 million metric tons of CO2 every year.

The 1,100-kilometer Shaanbei-Wuhan link marks an important step for SGCC in developing global UHVDC systems standards. And the 1,500-kilometer Qinghai-Henan project is a UHV channel specially designed for the transmission of clean energy, including solar and wind power.

As part of the solution, ABB Power Grids will provide key technologies to ensure and safeguard the reliable, efficient, and smooth transmission and distribution of electricity over these long-distance links – resulting in minimal losses and optimal power quality. Key technologies include HVDC converter transformers, components such as wall bushings, capacitor banks, dead tank breakers and HVDC



The 1,700-kilometer Yazhong-Nanchang link is part of China’s West-East Electricity Transmission initiative. (Courtesy: ABB)

switches.

ABB’s Power Grids business was a key technology provider to SGCC’s first UHVDC transmission link. The 6,400 MW, 2,000 kilometer-long Xiangjiaba-Shanghai link, provides hydroelectric power from South West China to the bustling city of Shanghai. Since then, ABB Power Grids has been constantly pushing the boundaries of long-distance transmission technology, partnering with SGCC in several key projects, thus contributing to energy security, as well as economic support and social development in China.

UHVDC technology is key to interconnect the electrical grids of regions, countries and continents to efficiently transport clean power in large volumes over long distances. UHVDC uses direct current (DC) electricity at extremely high voltages that can have as much as 40 percent lower losses than an equivalent conventional AC (alternating current) system. This means far less energy is wasted, more power reaches end users, and carbon dioxide (CO2) emissions are reduced overall.

Once operational, the Qinghai-Henan project is estimated to reduce CO2 emissions by approximately 30 million metric tons per year – equivalent to more than 6 million passenger cars being taken off the road. ↴

MORE INFO new.abb.com



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WIND: LARGEST RENEWABLE ENERGY SOURCE IN THE U.S.

Wind power was the No. 1 choice of new utility-scale power generation in 2019, capturing 39 percent of new additions. (Courtesy: AWEA)



Wind-energy capacity in the United States is now in the triple gigawatt digits, and it will continue to grow as the reliable power source begins to take hold offshore.

By TOM KIERNAN

The U.S. wind industry achieved two remarkable milestones in 2019 thanks to the ingenuity and hard work of the country's wind-energy workforce. First, we now have more than 100 GW of installed capacity. That's enough wind power to meet the electricity needs of 32 million homes. This success story is decades in the making, and it has created well-paying jobs, new opportunities across rural America, and affordable, reliable, clean electricity.

American wind power was born in the California desert in the 1980s. Over the ensuing years, innovators and pioneers reduced costs, improved reliability and turned wind power into a mainstream energy source. That work paid off — while it took 28 years to build the first 25 GW of wind power, we've only needed 11 years to build the next 75. As a result, wind now generates enough electricity to meet the demands of California (the world's fourth largest economy) and New Jersey combined.

Second, wind is now the largest source of renewable energy in the U.S. In 2019, wind reliably and affordably supplied more than 7 percent of the country's electricity. Locally, the numbers are even more impressive. Six states — Iowa, Kansas, Oklahoma, North Dakota, South Dakota, and Maine — rely on wind to supply more than 20 percent of their electricity. In fact, wind generation exceeds 40 percent in Iowa and Kansas, and in both states, wind is now the largest source of electricity.

The next decade will be seminal for American wind power. We're on track to meet 20 percent of the country's electricity demand by 2030, and U.S. offshore wind is burgeoning into a clean-energy powerhouse. Our project development pipeline is at near-record levels, and with your help we can build the clean energy grid of the future. There's much work that still needs to be done to make this happen, but first let's look at the ways wind is powering opportunity across America:

WIND ENERGY IS THE PREFERRED CHOICE FOR NEW POWER

Wind power was the No. 1 choice of new utility-scale power generation in 2019, capturing 39 percent of new additions. Over the past decade, wind power represents 30 percent of utility-scale power plant installations, and 2019 was the industry's third strongest year for installations on record. And



Wind-energy growth brings nearly unmatched investment to rural America, home to the country's strongest wind resources and 99 percent of wind projects. (Courtesy: AWEA)

there's more on the way — demand for wind energy set a new record as utilities and corporate buyers announced nearly 9 GW of new wind power contracts in 2019.

Overall, the pipeline of wind projects either under construction or in advanced development exceeds 44 GW. Across 33 states, 191 different wind projects are now in the works, representing \$62 billion worth of investments. When these wind farms are completed, they'll generate enough electricity to power another 15 million American homes.

Why has wind become the power source of choice? Economics. Wind's costs have fallen by 70 percent over the past decade — it's now the most affordable source of new electricity throughout much of the country. These cost declines are spurred by technological advances that let newer turbines reach stronger, steadier winds, which also makes wind economically feasible in more parts of the country, including those with less robust wind resources. Improved domestic manufacturing also has played an important role in driving costs down, while tapping into cutting edge tools such as predictive analytics and big data that have lowered operations and maintenance costs as well.

Wind's affordability and long-term price stability is a big reason why Fortune 500 companies across the country are choosing it to power their factories, stores, and data centers. In fact, corporate buyers accounted for 40 percent of the power purchase agreements signed in 2019, and AT&T and Walmart were the year's top two largest wind buyers. There were many newcomers to enter the wind market as well, representing diverse industries with first-time buyers in 2019 including one of the world's largest oil field services provider, Baker Hughes; multinational cosmetics manufacturer, Estee Lauder; and McDonald's, the first fast food restaurant brand

to buy wind power.

"For us, that's kind of a gate," said Apple CEO Tim Cook, explaining why his company built new data centers in Iowa. "If we couldn't (power them with wind), we would not be here."

WIND POWERS A RURAL RENAISSANCE

All this growth brings nearly unmatched investment to rural America, home to the country's strongest wind resources and 99 percent of wind projects. Wind brings new revenue that communities can use to fix roads, invest in schools, and upgrade emergency services equipment. In 2019 alone, wind projects paid \$1.6 billion in state and local taxes and land-owner lease payments.

"We'll be building three state-of-the-art science classrooms; a new life skills special education wing; a new middle school/junior high wing for our students in sixth, seventh, and eighth grade; as well as a new gymnasium and a new band room. Our current band room shares a wall with our library, which is not the best situation. So that will be out on the edge of the school now and they can blow their horns as loud as they want to," said Amy Shane, superintendent of Nebraska's O'Neill School District. "I don't think we would have been able to do this project, at least not at this time (without wind revenue)."

Land-lease payments also provide landowners with a drought-proof cash crop that helps them weather lean years and invest in and expand their operations during good times.

"It's a challenge every day if you're a farmer or a rancher. You depend on the weather in the farming business. Right now, we're in the midst of a really long, hard drought," said Storm Gerhart of Curry County, New Mexico. "I get a good feeling when I look at that turbine. I take pride in it. You can get tired of the wind blowing in your face every day for day after day. But now, when you want to grumble a little bit about it, you can look over there at that turbine and you say, 'Well, that's good; that's good.'"

WIND POWERS JOB CREATION IN ALL 50 STATES

The U.S. wind industry now directly employs more than 115,000 Americans, spread across 50 states. Jobs range from wind technicians to factory workers, engineers, finance experts, and construction workers. Wind-turbine technician remains the second fastest growing job in the country according to the U.S. Bureau of Labor Statistics, and veterans find wind jobs at a rate 61 percent higher than the average U.S. industry.

Many of these jobs are in rural America, offering young people the opportunity to find rewarding careers that allow them to put down roots and support their families without having to leave home.

"If the wind farm didn't get built, I'm not sure what I would be doing. To have a job similar to this, I'd be commuting, which isn't ideal for myself or my family," said Chelsea Borrette, operations maintenance planner at the Prairie Breeze Wind Farm in Nebraska. "Having this position means that

I don't have to travel out of the community I was born and raised in and want to support. For my family, I'm always around for my son, my husband. I'm able to be present."

Wind power is one of the few industries creating new American manufacturing jobs as well. Today, more than 530 U.S. factories across 43 states build wind-turbine components, employing more than 26,000 Americans.

OFFSHORE WIND BEGINS TO TAKE SHAPE

States up and down the East Coast have made substantial offshore wind commitments as they look to supply many of the country's largest population centers with competitively priced, reliable, clean energy. From Massachusetts to Virginia, these pledges now total more than 25,000 MW, enough to power millions of American homes and help keep utility costs stable for residents.

Meeting these targets will require constructing thousands of offshore wind turbines, and that means well-paying jobs for dozens of occupations, including welders, wind technicians, electricians, longshoremen, vessel operators, and many more positions. AWEA estimates that building 30,000 MW of offshore wind could support more than 83,000 jobs by 2030. It would also represent \$57 billion of investment in the U.S. economy and deliver \$25 billion of annual economic activity by 2030.

Many of these jobs will be in the supply chain. As steel goes in the water and American offshore wind farms begin to come online, we'll need facilities and workers here domestically to build the supplies the industry needs.

While many of these jobs will be on the East Coast near operating wind projects, it's important to remember offshore wind will create nationwide benefits and job opportunities. We'll need to tap into the expertise of communities and workers throughout the country to get the job done. For example, several Gulf Coast companies whose primary business involves offshore oil and gas helped construct the first U.S. offshore project, Rhode Island's Block Island Wind Farm. The Gulf knows how to build ocean energy infrastructure, and workers in the region will play a key role in building East Coast offshore wind projects. Offshore wind offers legacy energy companies a way to diversify their businesses so they can thrive even during oil and gas downturns, which many are currently experiencing.

Jobs and a supply chain are just the beginning — the community investments are real, too. So far, companies have announced investments of \$307 million in port-related infrastructure, \$650 million in transmission infrastructure, and \$342 million in U.S. manufacturing facilities and supply chain development. These are just the publicly known figures. We've seen other announcements to establish offshore wind hubs and factories along the coast that have not yet listed a specific dollar amount but represent millions of additional dollars invested. Companies have also signed contracts to build four new U.S.-flagged crew transfer vessels to support offshore wind project development, which is a preview of the ship building activity to

come as we grow our offshore wind pipeline.

WIND POWERS A CLEAN ENVIRONMENT

As the world looks for solutions to combat carbon pollution, wind can play a leading role. In the U.S., wind already voids 42 million cars' worth of CO2 emissions. It also reduces a substantial amount of sulfur dioxide and nitrogen oxides that create smog and trigger air pollution. Lastly, wind is an enormous water saver. Because wind turbines don't require water for cooling like conventional power plants, wind avoids 102 billion gallons of water every year.

THE PATH FORWARD

We still have work to do to fully harness our wind-power potential. The COVID-19 pandemic is causing unprecedented challenges to the U.S. healthcare system, disruptions to daily life across the country, and deep uncertainty across the economy. Global supply chain disturbances and massive public health interventions are extending these obstacles to the U.S. wind-energy industry as well. We're working hard to understand the many hurdles our members are facing and the impacts to their businesses this represents. Ensuring the safety of the wind workforce and protecting American jobs and economic investment remain our primary objectives.

Beyond COVID-19's uncertainty, modernizing the electric grid and building new transmission to meet 21st century needs will play a crucial role in continuing wind's success story. Transmission investment allows us to tap into the country's most wind- and solar-rich areas and deliver that electricity to the towns, cities and manufacturing hubs where energy demand is highest. All of this makes the power system more reliable while lowering costs for American families and businesses, and studies show transmission upgrades more than pay for themselves in the long run. Elsewhere, the rules governing our electricity markets were created for a system much different than today's energy mix. Wind farms can provide important reliability services such as frequency response, voltage and reactive power support, disturbance ride-through, frequency regulation, and operating reserves, and these services should be valued in the marketplace. We can't fully harness the reliability services wind offers until market rules are updated to recognize them. Accurately valuing wind energy's zero-carbon electricity will also help keep our industry growing. Finally, we're prioritizing important work to ensure thoughtful, workable permitting policies. Maintaining positive relationships with the communities hosting wind farms is critical for our industry to continue expanding.

Building 75 GW in 11 years is impressive, and we have the potential to do much more in the coming decade. American wind power stands ready to help lead the country's recovery as we look to get our economy back on track once we defeat the COVID-19 pandemic. ✌

ABOUT THE AUTHOR

Tom Kiernan is president of the American Wind Energy Association.

A row of offshore wind turbines in the ocean under a cloudy sky. The turbines are white with three blades each, and they are spaced out across the water. The sky is blue with white clouds. The water is a deep blue color.

U.S. FORECASTS CALL FOR OFFSHORE WIND

Offshore wind-power projects are vast endeavors that involve a wide range of stakeholders. (Courtesy: ABB)

Offshore wind projects are major undertakings that involve a vast array of stakeholders, so the key to the success of an offshore project is to ensure modern technology is in place and conventional wisdom is implemented.

By FABIO FRACAROLI

Some of the most favorable wind-energy resources in the U.S. happen to be in places where there simply aren't many people—notably in the rural South and Midwest, as well as off our coastlines. This creates a dilemma, since the country's main electricity demand is in large population centers near the East and West coasts. Transmitting electricity over long distances between the coasts and the Midwest is expensive, which limits the financial viability of lighting the coastal regions with onshore wind power.

Offshore wind power, in contrast, is uniquely positioned to address electricity demand in the coastal regions. Notably, the proximity to the load centers increases their viability dramatically by offering a number of key advantages.

For instance, offshore generation sources benefit from lower transmission and logistics costs due to proximity to high electrical load centers in coastal regions. They also enjoy high electricity generation potential due to high offshore wind speeds and power density. Because they are less intermittent, they also tend to have higher power generation per installed capacity. Finally, because they have minimal land requirements per amount of installed power, they benefit from a smaller geographical footprint, lower community acceptance challenges, and relatively low environmental impact.

Of course, there are challenges with offshore wind as well. Of note, turbines are expensive to build, particularly for rugged offshore environments. Interconnecting with the existing grid can also present a significant obstacle. Yet, advanced technology and deployment strategies continue to make offshore wind projects more appealing.

As important, the successful integration of offshore wind power into our energy supply is an essential component of greening the grid. This can also ease the country's demand for large centralized diesel and nuclear power plants.

However, these projects are typically quite dramatic in scale and involve a wide and complex web of players. Developers need to apply a wide range of technologies, planning tools, and deployment strategies to overcome community objections and achieve their aims.

THE OFFSHORE WIND INTERCONNECTION CHALLENGE

The coastal regions in the U.S. represent the peripheral nodes of the grid. They consist of sub-transmission and distribution-level infrastructure. These systems, while favorably located, are not ideal for the transfer of electricity back inland.

Also, they cannot absorb large power inputs from offshore wind generators. The few substations that exist barely have the capacity necessary for interconnection with offshore wind energy. One way to solve this challenge is to upgrade the existing grid.

Advanced solutions are now available that can reduce the risks and costs of offshore wind power integration without requiring huge changes to the grid. The following are key areas in which developers can manage risks without compromising on quality or performance:

- ▀ Power transmission type.
- ▀ Substation systems.
- ▀ Power quality systems.
- ▀ Protection and control systems.

Later, we will explore in detail how each of these features can ease the integration of offshore wind power.

POWER TRANSMISSION TYPE

Offshore wind turbines send all of the power they generate to a central offshore substation. From there, the power goes through a submarine transmission line to the shore and then is transmitted via overhead or underground cables to the final interconnection point.

There are two main power transmission options available for offshore wind farms: high voltage direct current (HVDC) and alternating current (AC) transmission systems. Each system is optimized for a specific set of conditions.

The AC transmission systems are economical over short distances ranging between 30 and 50 miles. Yet, they generate reactive charges that limit the transmission capacity within their cables. The limitations are negligible in short cables but can cause major losses over long distances.

HVDC transmission lines don't generate reactive charging currents. This makes them ideal for long-distance power transmission, as well as suitable for connecting wind farms that are far from the shore.

Once onshore, the power is transmitted via overhead or underground cables to a viable grid interconnection point. Transmission lines must satisfy community requirements to earn right-of-way and relevant permits.

Increasingly, overhead transmission lines face tough opposition due to its high visual impact. Underground AC cables are often opposed due to the charging currents they generate; however, they benefit from the ability to integrate directly with onshore transmission lines.

HVDC cables, in contrast, have lesser, right-of-way requirements than AC systems. This is because they can achieve higher capacity ratings with fewer cables. However, the need for HVDC-to-AC converter stations can face heavy

community opposition, as well as representing additional investments.

Accounting for these factors in the planning phase of an offshore wind farm can save time and valuable resources during implementation.

SUBSTATION SYSTEMS

Offshore and onshore substations are vital components in the integration of wind farms within the grid. The offshore substation balances the power from the various wind turbines before transmission, reducing fluctuations and improving the reliability of the wind farm.

Onshore substations are particularly useful where the coastal grid infrastructure is limited. Robust onshore substations can help facilitate the integration of the offshore wind farm and the grid.

Developers can deploy a wide variety of technology solutions to reduce the footprint of the substations. These technologies make the substations smaller, yet more efficient, helping reduce real estate requirements, in addition to the cost of construction, maintenance, and operation. These techniques can reduce the environmental impact of a given project, and in turn help limit community opposition. Some of these technology solutions include:

- ▶ Low-losses power transformers.
- ▶ Breakers.
- ▶ AC gas-insulated switchgear (GIS).
- ▶ HVDC voltage source converters (VSC).

Gas-insulated switchgear (GIS) is the ideal option when using an AC-based power transmission system. The GIS is a compact metal encapsulated switchgear, consisting of high-voltage components, such as disconnectors and circuit breakers.

The GIS uses sulfur hexafluoride gas (SF₆) because of its high dielectric strength and arc-quenching properties. This allows for the reduction of the spacing between the switchgear and conductors. GIS also makes the AC systems safer to operate in confined spaces.

The GIS takes up much less space than the traditional air-insulated switchgear (AIS), ultimately reducing the substation's footprint by up to 85 percent. This offers substantial benefits in terms of siting, since it is easier to construct, manage, and gain approval for smaller substations. GIS systems are ideal for offshore substations because they have low maintenance requirements.

Voltage source converters (VSC) are a good option for HVDC transmission systems. Modern HVDC systems are more compact than traditional legacy units and need less land for construction. They are also better at managing offshore wind strength limitations.

It is important to consider the best transformer unit size for the offshore substation. This is vital for both AC and HVDC transmission systems. The transformer unit size should create a balance between the space, construction cost, efficiency, and power delivery requirements of the system. This applies to both normal and contingency operating conditions.

POWER QUALITY SYSTEMS

Offshore wind power systems need to maintain high power quality and system reliability to be successful. Weak grids can cause the generation of unacceptable voltage conditions.

Several technologies can facilitate the maintenance of optimal wind power quality in varying conditions. They can regulate the voltage and provide reactive power support at the interconnection point of the grid. These technologies include:

- ▶ Flexible AC transmission systems (FACTS).
- ▶ Energy storage systems.
- ▶ Shunt reactors.
- ▶ Synchronous condensers.
- ▶ HVDC VSC technology.

FACTS are dynamic shunt compensation tools. They can increase the power transmission capabilities of existing grids and are also useful for congestion management. FACTS enable wind farms to transfer additional power over the existing grid infrastructure. Common examples of FACTS are static VAR compensators (SVCs) and static synchronous compensators (STATCOMs).

Systems with fast regulation properties are important when the proportion of wind power in the grid is high. These systems need to react quickly and normalize any fluctuations in wind-power generation. They can maintain grid reliability by balancing the real and reactive power of the wind power system.

Additionally, developers need to address the full range of interconnection issues specified in the regional grid code. They should also identify and meet requirements defined by regulatory authorities including the North American Electric Reliability Corporation (NERC), Regional Transmission Owner (RTO) and Independent System Operator (ISO) organizations.

The main concerns of these regulatory authorities include the reactive power and black-start capability of systems dominated by intermittent wind resources, in addition to the performance of wind systems during normal and contingency operational conditions and the effects of cable system energization and generator synchronization on system voltage. Synchronous condensers and energy storage systems can provide synthetic inertia. This can improve the performance and frequency response of the grids where wind generation exceeds fossil-fuel and hydro-based generation.

Shunt reactors improve the performance of long AC cable systems. They absorb the reactive power generated within the AC cables. Shunt reactors are connected directly to the power circuit or the tertiary winding of a three-winding transformer, which can be either a permanent or switched connection using a circuit breaker. Using a shunt reactor with a variable rating can optimize the consumption of reactive power in the system. Variable shunt reactors (VSRs) are economical solutions if the load variation is slow. The FACTS shunt devices should be identified during the conceptual and design phases of the wind farm.

PROTECTION AND CONTROL SYSTEMS

Offshore wind farms should ensure the consistent availability, reliability, and deliverability of power when needed. Automatic and remote-monitoring systems optimize these functions. These remote systems collectively form a “digital substation.” Digital substations understand, predict, and optimize system performance, which can prevent unplanned shutdowns. Additionally, digital substations reduce maintenance requirements, needed footprint, and operational costs.

The system uses intelligent electronic protective relays to monitor potential faults in the system. The relays can monitor several real-time variables in the power system. This includes the flow of current from the offshore substation. If a fault is found, the system can isolate and break the power flowing through a specific cable.

In offshore wind systems, device intelligence can save costs and enhance safety. The technology limits the risks and costs of on-site troubleshooting. The systems can provide real-time notifications on the condition of the wind-power assets before complications arise. They also allow operators to take equipment offline and do remote modifications.

In the U.S., new power-generation infrastructure should comply with the NERC Critical Infrastructure Protection Plan (NERC – CIP). This plan consists of nine standards and 45 requirements covering the security of electronic perimeters, protection of critical cyber assets, and disaster recovery planning among others.

Cybersecurity is a key component of the NERC – CIP features. This is because of the vulnerability of digitalized assets. Multiple layers of defense are incorporated in the architecture of the substation’s automation and control system. Cybersecurity solutions should be compliant with the latest industry standards. Other examples of technologies that address cybersecurity concerns include next-generation firewalls, access control, patch management, and detailed audit trails of user activities.

WELCOMING EXPERT INSIGHTS

Offshore wind energy is still in its relative infancy in the U.S. As such, the sector is constantly evolving, so seeking expert advice early in the project can save developers a lot of time and resources. Tapping into the experience of experts in the field can also avert various risks in the project.

The U.S. Bureau of Ocean Energy Management (BOEM) has an offshore wind-energy program. This program divides offshore wind energy project development into four distinct phases:

- Planning and analysis.
- Leasing.
- Site assessment.
- Construction and operations.

Expert analysis can help to narrow down the viable BOEM lease sites that developers should pursue. Expert advice can also help them to identify and avoid challenges that may delay the project. Some of the services offered by



Advanced solutions are now available that can reduce the risks and costs of offshore wind power integration without requiring huge changes to the grid. (Courtesy: ABB)

energy-development experts include economic feasibility analysis, regulatory framework analysis, system impact studies, grid code compliance, grid integration analysis, grid interconnection planning, and advisory services.

CONCLUSION

Offshore wind-power projects are vast endeavors that involve a wide range of stakeholders. The key to the successful implementation of such projects is to leverage modern technology and conventional wisdom. Learning from best practices applied in the industry is a valuable starting point. Embracing advanced technology opens opportunities for the long-term viability of the project. ✌

ABOUT THE AUTHOR

Fabio Fracaroli leads business and market development activities for the Renewables Segment in North America for ABB Power Grids. A sales and market leader with 18-plus years of international experience in manufacturing, project management, and business development in the power industry, Fracaroli is passionate about the energy market and has broad knowledge of industrials markets such as chemicals, oil and gas, transportation, metals and mining, data centers, and renewables.

PROFILE

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Cvi's WindKit is the "go-to" nitrogen delivery system for wind farm service technicians. (Courtesy: Cvi)

WTG-HPSK
Wind Turbine Generator
HIGH PRESSURE SERVICE KIT

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For nearly 40 years, Cv International has been supporting the wind industry, as well as aviation, oil and gas, and other utility industries with a variety of platforms, safety apparatus, nitrogen generation and delivery solutions.

By **KENNETH CARTER** ▸ Wind Systems editor

Companies within the wind industry are — more often than not — environmentally conscious, but Cv International (Cvi) takes its social responsibility a step further: The nitrogen-servicing business is a Service Disabled Veteran Owned Small Business.

“The majority of the ownership falls into the disabled vet category,” said Cv International Chairman Dan Warden. “We hire a lot of veterans on our workforce as well. We’re proud of that, and we give back to numerous veteran foundations — one, in particular, the Valor Foundation, supports veterans and first responder causes.”

In addition to hiring veterans, Cvi is partnered with Pacific Power making the company 100 percent powered by wind energy, according to Chris Hardy, director of sales.

“We just wanted to bring it around full circle,” he said. “We believe in it; we support it, and it just makes sense.”

WIND TECH SAFETY

Among Cvi’s products and services is the WindKit, a portable nitrogen delivery system designed with a wind technician’s overall safety in mind.

As part of a turbine’s maintenance cycle, nitrogen is used in the turbine’s accumulator because it is an inert high pressure gas.

The challenge arises in how to get the nitrogen hundreds of feet into the air. Cvi had already made a name for itself in the aerospace world by designing a mobile nitrogen generation system for the U.S. Army in the early 1980s. So, when Vestas contacted Warden about designing a system to more efficiently transport nitrogen to a turbine nacelle, he said it was an easy decision to expand the company into wind.

“Vestas out of Portland contacted me and said, ‘We have these accumulators in the top of the turbines that need to be charged with nitrogen. Currently we’re hauling large 350-pound bottles up to the top of these turbines, and we’ve had multiple injuries,’” he said. “We took a product that we had for aviation called our nitrogen backpack charging system, which basically is a bottle, it looks like a scuba system or a fire protection breathing air system that the firefighters use, and we redid that system so they could use it up in the wind turbine. It’s a cylinder that they hang from a beam in the turbine. Then, with our valves and regulators for safety purposes and a long hose, they’re able to recharge the accumulators, and it’s a much smaller and lighter bottle.”

The bottle itself weighs about 10 to 15 pounds versus what was weighing upwards of 300 pounds, according to Warden.

SMALL BUT INNOVATIVE

Since working with Vestas, Cvi has grown its portfolio to include more wind companies, including E.ON, Avangrid, EDF, EDP, and Siemens.

Because of that, Cvi has grown every year since it opened its doors, according to Warden.

“We’re now about 35 employees doing annual revenues between \$25 (million) and \$30 million,” he said. “We’re a small business, yet we’re very innovative. We like to work with customers that have a problem and come up with a solution for them. We really don’t take a cookie-cutter approach to anything that we do, which makes us different. We have a full cadre of professionals. We have three mechanical engineers, two of which have their PE license. We have some first-class folks that are doing a lot of our CAD design, and we also have a graphic designer on the team. Then, we have a welding staff, machine shop, assembly, and installers all on our team. We outsource very little, which allows us to keep the costs down and the quality high.”

Because of that, Warden emphasized Cvi’s customers come first, with the company’s employees a close second.

“We take care of our employees because if we take care of our employees, our customers are going to be taken care of,” he said. “That’s our philosophy. We really listen to what the customers’ needs are. We try to come up with that solution for them that best fits their need at the time.”

Hardy agreed with Warden’s sentiment.

WORKING CLOSELY WITH CUSTOMERS

“If you go to our website, it says right on the home page, ‘Global challenges, innovative solutions,’” he said. “This is kind of echoing what Dan was saying as far as our ability to shift and move for our customers and get them what they need in the end because we have a machine shop; we have engineering; we have everything that it takes to get the job done, and any kind of challenges that come up, we meet head on.”

Not only does Cvi work with its customers, it actually teams up with them, according to Hardy.

“We team up with these companies,” he said. “We partner with them and work through the issues. By having this full engineering team and a machine shop, we have the ability to work through issues hand in hand.”

Warden used E.ON as an example of how Cvi works with a customer in order to obtain the optimal results.

“E.ON is a big company in the servicing industry, and they were having some real hard times with some of the different models of accumulators up in the top of these towers,” he said. “We tried to come up with a package for them so that they have a kit when they go in the top of the tower.



Chairman Dan Warden said Cvi will be able to offer offshore wind the “total package” when it comes to nitrogen needs. (Courtesy: Cvi)

They don’t have to go back down and get another fitting or another adapter. We’ve come up with a kit that has the various types of fittings. Where before, they’d have to stop and order a fitting. We’ve helped them solve that problem, and it’s saving them time and money.”

Because Cvi worked with E.ON on that challenge, it was easy to adapt that same technology for other wind companies, like Vestas, according to Warden.

“We basically had Vestas’ solution for that problem they had in 2011 in about 60 to 90 days,” he said. “Because we were able to take a product that had already been in the market in aviation, and we did some testing and modifications with it and then we presented it to Vestas and they were blown away because, again, we’re pretty nimble because we’re a small business. We can get things done a little bit faster. It doesn’t have to go up the corporate ladder and get 10 and 20 approvals.”

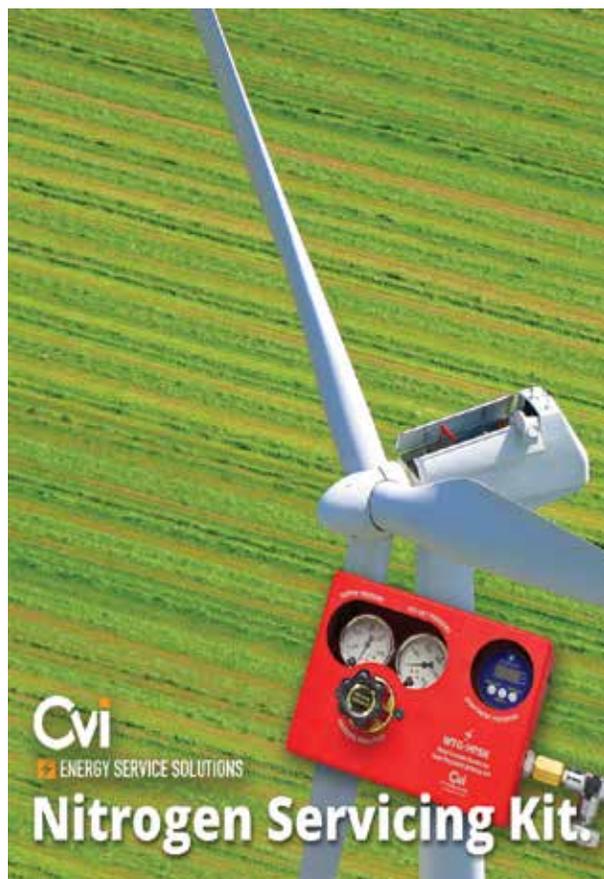
EXTENSIVE MILITARY HISTORY

Cvi has a long history with the U.S. military, according to Hardy, which has been a huge boost to Cvi’s innovative spirit.

“We’ve been dealing hand-in-hand with the U.S. military for over 30 years, helping them with their issues,” he said. “That’s where this equipment came from. It was born in the deserts of Iraq and eventually has transformed and made it into the wind-farm fields of America.”

And Warden said Cvi isn’t afraid to invest when the need presents itself.

“We’re not afraid to spend money to help a customer, as long as we know at the end that it’s going to be a product they can use and one that eventually we can sell to others,” he said. “We’re willing to invest money on the front side for development. Most companies our size do not have



The WindKit efficiently interfaces with, supplies and controls high-pressure nitrogen gas to today’s wind-turbine generators. (Courtesy: Cvi)

one or two mechanical engineers on staff, where we have three, plus two CAD guys, so we invest up front to get a solution to the customer.”

OFFSHORE OUTLOOK

With the prospect of U.S. offshore wind increasing, Warden and Hardy are both excited about what Cvi will be able to offer.

“Because we are steeped with the military in high pressure nitrogen generation and servicing, we feel that we are positioned perfectly for this new sector,” Hardy said. “As we move from land-based wind farms to offshore wind farms, with our knowledge and our ability in high pressure nitrogen generation and servicing, we’re right at the top of the class when it comes to this.”

Warden points out that with land-based wind farms, the nitrogen is brought in as a big bank of cylinders, which is used to fill the WindKit bottles where they eventually end up at the top of a turbine for servicing.

However, with offshore wind, a nitrogen generator will be more advantageous to that environment.

“In offshore, we’re going to be able to give them a total package, total solution,” Warden said. “In other words, we have nitrogen generators that make the nitrogen. They can put that on a servicing ship that services the offshore sites when they use our WindKit to actually fill the accumulators. We’re one of the few folks in this industry that has a total life cycle of nitrogen solution.”

CIRCLING BACK TO SAFETY

The bottom line is wind is going to be an essential part of all energy solutions going forward, and Warden said a WindKit will be not just an important tool for sake of efficiency, but it can be a vital tool to the safety of the actual wind technician.

“We’re just going to continue to improve the product and try to get the word out,” he said. “We’re only working with a handful of servicing groups, but we’d like to get the word out a little better so that they under-

stand that this is an alternative, and it’s a safe alternative, and it’s about the safety and health of those folks that are working on those sites. That’s what this product does.”

With that in mind, Hardy pointed out that Cvi is primarily focused on worker safety.

“Safety first is the biggest part, be-

cause you’re dealing with incredibly high pressures,” he said. “Whether you’re using our equipment or not, you’re dealing with high pressures. Our equipment just makes it a lot easier and a lot safer to deal with those pressures. It’s time savings as well. Our equipment allows these techs to get their job done a lot quicker.”

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Jana Adams

Senior Vice President Member Value & Experience ▸ AWEA

“On the days that CLEANPOWER would have happened, you can click a link and listen to (President) Tom Kiernan give his remarks about the state of AWEA and the state of the industry.”

With the COVID-19 pandemic forcing AWEA to cancel this year’s CLEANPOWER tradeshow in Denver, Colorado, Jana Adams, AWEA’s senior vice president, Member Value & Experience, took some time out of her busy schedule to talk with *Wind Systems* about how that decision was made and what it means for CLEANPOWER 2021.

▸ **Planning this trade show every year is a monumental task. Was there any kind of “gear stripping” involved when the decision was made to cancel it?**

It wasn’t really quick. In some respects, you continue to plan and plan for something to happen until you’re not. So, certainly things were still happening; we were working with speakers and finalizing sessions and doing a lot, but there was also a recognition that it’s very possible that we’re going to have to cancel it.

Once the circumstances got to such an extreme that we recognized first that our international exhibitors physically could not get there — they could not ship their materials; they could not travel there — we did pull the trigger on canceling the international exhibition portion. That was hard because that’s a big part of what we do is bring together the full global wind community.

Shortly after that, we realized that it wasn’t substantially different for our domestic exhibitors. And in fact we were notified in advance that the convention center in Denver was going to be used in COVID-19 response relief efforts. Therefore, we couldn’t have the conference because the convention center was no longer available to companies.

So, it’s awful that’s happening. It certainly made the decision clear. And once we had heard that that was happening, we went ahead and made the announcement that we were canceling the event.

▸ **When did they make the decision to turn the convention center into a COVID-19 center?**

It was officially announced, I believe (April 6). We did get a heads up a little bit early just to let us know for our planning purposes that that was very likely going to happen.

▸ **Walk me through how the decision to cancel was finalized and the process of getting the word out.**

As mentioned, we were monitoring the situation, seeing what part of the industry would be physically able to participate. And we came to the conclusion that they weren’t. So, we just talked internally, and honestly, we got a lot of advice from different trade show organizers that if an event gets canceled for something out of your control, you simply tell everybody you’re transferring their support to the next year. But that’s really not something that we do. People make decisions for a variety of reasons to go to an event: It could be because it’s in Denver; it could be because it’s in 2020, and it aligns with their annual strategies that year, but they might not know about the next year.

So we did offer our exhibitors either the ability to transfer their support to 2021 or seek a refund. And we certainly provided some incentives for supporters to make the decision to transfer their support to 2021, and almost 70 percent are doing that. We feel really good about where we are. I talk a lot about silver linings just in general, and we are way ahead for 2021.

▸ **Will not having this big physical venue to meet and plan for wind power’s future shape how the industry does business this year and next?**

I think that is being shaped much more by the larger coronavirus pandemic situation than it is the cancellation of a singular event. That is obviously an important part of a lot of business development activities. A lot of new technologies are displayed; a lot of new thinking and learning is shared through our conference sessions. I think for certain it has an impact, but I think that the impact is much larger from

just the situation we're in, in general.

Another big disappointment is the fact that this was the first year that other renewables were going to be featured. Were there any challenges in making that happen this year that could be better approached now that you essentially have an extra year of planning?

More time generally is helpful. So, I'd say yes, for sure. We made the announcement last year in Houston, but people were already doing their budgets, and so by the time everything was ready to launch in a larger, more pan-renewable focus, it was going to be pan renewable, and it was going to be great, but I think you're absolutely spot on, we're going to have more time and people have just a little bit more runway to plan for 2021.

▀ **Are you planning on offering any virtual supplements to some of the programs that were scheduled?**

We're doing a couple of things. One is we are launching a virtual spring and summer learning series, so that will be announced within the next couple of weeks. So, by the end of April we'll have that all scheduled. It's going to be a series of webinars over the course of probably May 1 to mid-June. That will, I think, help replace some of the content that happens at CLEANPOWER, but it is different. It's just a cool summer learning series.

Then, specific to some important information that we always spotlight at CLEANPOWER, is the state of the industry. And I think that's such an important message for right now given the economic environment in the country, that we are going to host those speeches on the days that CLEANPOWER would have happened, and there'll be a live streaming login, or you can click a link and listen to Tom Kiernan give his remarks about the state of AWEA and the state of the industry. We'll have some of our board members give remarks as well. So, we're excited to be able to continue to deliver that important message to the industry and that will happen on June 2 and 3.

▀ **With other events still scheduled for later in the year, do you anticipate those shows growing from what the attendance has been historically? You've got your offshore show in October.**

I think that that show in particular has been growing very, very quickly with double digit growth numbers year over year for the last several years. I imagine that will continue, but I think we've got a little bit of recovery to go in the country before we can be certain about that. But assuming that we're well on the path to recovery, I think that those events will be popular. People are, I think, ready to go and participate and get back to normal. It's not time to do that yet, but when it is, I imagine events are going to be successful in the fall.

▀ **Will this year's cancellation have an effect on CLEANPOWER 2021?**

I think CLEANPOWER 2021 is going to be amazing. We're way ahead, as I mentioned, in terms of support, starting with 70 percent of our 2020 supporters. And Indianapolis



is going to be a fantastic city for the conference for a couple of reasons:

One, we've got a good base of support and membership within Indiana. It's new for us. It's a really great facility. It's one of those great convention towns where things are close by: The hotels are close, and it's very walkable. They've done just a really good job developing that downtown convention center area. So we're excited about that, and they're excited to have us. They actually did a big press release. We had the lieutenant governor with us; they're thrilled to have such an important renewable trade show coming to their city. We know that's all going to come together and make it a really great inaugural CLEANPOWER. ✌

MORE INFO awea.org



Siemens Gamesa wind farm in Vietnam. (Courtesy: Siemens Gamesa)

► CONSTRUCTION

Siemens Gamesa helps to unlock renewable potential in Vietnam

Vietnam has some of the best wind resources in Southeast Asia. In an effort to tap the country's potential and provide more clean energy to the country, Siemens Gamesa Renewable Energy will supply 25 SG 4.5-145 for one of the nation's largest wind farms. With a total capacity of 113 MW, the Hoa Thang 1.2 wind farm will generate enough electricity to meet the demands of more than 240,000 Vietnamese following its commissioning in 2021.

The deal also marks the largest order in the country for Siemens Gamesa.

Additionally, the company has secured a long-term 10-year service contract.

The project is in the Bac Binh district, Binh Thuan province on the South-Central coast of Vietnam, and it is developed by Hoa Thang Energy Joint Stock Company, a special-purpose vehicle of Vietnam's construction group Trading Construction Works Organization (WTO), which has close to 60 years construction experience.

Hoa Thang Energy is a pioneer of renewable energy in Vietnam, where the fast-growing economy has seen electricity demand rise by about 10 percent annually. The Vietnamese government estimates that total power generating capacity will reach 125 to 130 GW by 2030, up from 46 GW in 2018. In order to mitigate climate concerns, the government also aims for renewable energy to account for 15 to

20 percent of its total energy output by 2030 and has established a target of developing 6 GW of wind power capacity by 2030.

"With an accumulated installation of 101 GW, Siemens Gamesa can leverage its global expertise and footprint to partner with Hoa Thang Energy to develop one of the largest wind farms in Vietnam. As market scale and financing are helping to unlock potential in Vietnam, we are committed to supporting our Vietnamese customers to accelerate the penetration of renewable energy and bring clean power for generations to come," said Richard Paul Luijendijk, CEO of Siemens Gamesa's Onshore business unit in APAC.

"With deep rooting in Vietnam, we are pleased to partner with Siemens Gamesa and leverage its industry-leading experience and reputation to de-

velop renewable energy in the country,” said Nguyen Thanh Oai, CEO of Trading Construction Works Organization. “We selected Siemens Gamesa as the most appropriate supplier for our first wind farm project. This first ever cooperation between the two companies will lay a good foundation for us to further explore the wind market in Vietnam.”

Siemens Gamesa has been expanding in the Asia Pacific markets since the 1980s and has installed more than 8.4 GW of onshore turbines in China, Pakistan, Japan, South Korea, Indonesia, the Philippines, Thailand, Australia and New Zealand. In the offshore segment, the company successfully completed the installation of Taiwan’s first offshore wind power project in 2019 (128 MW) and in addition reached close to 2 GW of firm orders. The company also signed preferred supplier agreements for an additional 755 MW combined volume in Japan and Taiwan.

MORE INFO www.siemensgamesa.com

CONSTRUCTION

Vestas supplies turbines for Akita Noshiro project

Vestas has received a 139-MW order from MHI Vestas Offshore Wind to supply 33 Vestas V117-4.2MW typhoon variant turbines for Akita Noshiro Offshore Wind Farm Project. Located in Japan’s northern Akita prefecture, the wind farm will be the first utility-scale offshore project in Japan.

The wind farm is owned by Akita Offshore Wind Corporation, a special purpose company led by Marubeni Corporation, with additional Japanese project sponsors. MHI Vestas Offshore Wind will be responsible for the overall construction of the project.

The V117-4.2 MW Typhoon turbine offers maximum energy production

in medium- to high-wind speeds. It strengthens the 4-MW platform’s performance in extreme wind conditions expanding reach into areas with very strong wind and typhoon type weather. Specifically designed for the Japanese climatic conditions, this technology has fulfilled all local certification requirements and can be

applied for both onshore and offshore projects.

“We are happy to be able to support MHI Vestas, our joint venture that focuses on offshore wind, in their first firm order in Japan,” said Clive Turton, president of Vestas Asia Pacific. “This order showcases Vestas’ experience in Japan and our comprehensive turbine



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Akita Noshiro Offshore Wind Farm Project will be the first utility-scale offshore project in Japan. (Courtesy: MHI Vestas Offshore Wind)

portfolio to have the right turbine variant to fit the market's needs."

Vestas installed its first turbine in Japan in 1995 and has since installed a total of 629 MW.

"Japan is an important market to us, and we will continue to work closely with our customers and partners to offer best-in-class renewable energy solutions to support Japan's clean energy transition," said Netoshi Kuriyama, vice president of Sales and Japan Country Manager for Vestas. "With wind becoming a more important energy source in Japan, we are witnessing drastic increase in activities."

Turbine delivery is scheduled in the second half of 2021 and installation is expected to start in 2022.

MHI Vestas Offshore Wind is a joint venture between Vestas Wind Systems A/S and Mitsubishi Heavy Industries.

MORE INFO www.vestas.com

CONSTRUCTION

Two PEMA production automation lines delivered to Taiwan

Pemamek has delivered two PEMA production automation lines, designed for foundation pin pile production, to

CSBC Corporation, Taiwan.

The investment is a part of CSBC's business development initiative to become an offshore wind-energy turnkey provider and expand its operations in the national offshore wind-energy markets.

The modern production automation solutions will enable CSBC to significantly increase its competitiveness,

but also boost manufacturing capacity and end-product quality.

"We are glad to cooperate with experienced production solution provider for the wind energy sector," said Leo Chen, executive vice president for CSBC Corporation, Taiwan. "This investment will reinforce CSBC's position as the key player in the Taiwanese offshore wind energy markets and support the company to take a major leap towards future goals."

The delivery included two extensive PEMA production automation lines designed to manufacture pin piles for offshore jacket foundations. The technologically advanced lines have the capacity of processing pin piles up to 350 tons and 90 meters.

The PEMA production line for foundation pin piles include:

- ▶ Three longitudinal seam welding stations.
- ▶ Two assembly stations capable of welding internal circular seams.
- ▶ Two welding platforms that weld simultaneously with two welding heads.
- ▶ Integrated heavy-duty roller beds with polyurethane rollers.



The PEMA production automation lines have the capacity of processing pin piles up to 350 tons and 90 meters. (Courtesy: Pemamek)

▼ Hi-tech PEMA WeldControl 500 control system with laser-tracking, designed for multi-pass welding.

In addition to the machinery, the agreement includes training, production start-up support, preventive maintenance package, and local service support with an authorized PEMA service partner.

Manufacturing with the PEMA production lines has already started at full speed as CSBC will supply a significant number of foundation pin-piles for Ørsted's 900-MW Greater Changhua, scheduled for 2021.

MORE INFO www.pemamek.com

▼ CONSTRUCTION

Zadok Technologies hires new VP of Operations

Quality Companies, the global offshore and onshore construction, fabrication and electrical and instrumentation company, has appointed Wayne Lacey as vice president of operations for Zadok Technologies.



Wayne Lacey.
(Courtesy: Quality Companies)

Based in Houston, Lacey will be responsible for supervising and managing the sustainability

and profitability of all of Zadok Technologies' operational procedures.

Lacey joins Zadok Technologies from his role as president of Cotech IRM Services Inc., where he was responsible for the company's launch and successful growth since 2007.

Previously, he served in a number of project and operational management roles in the oil and gas industry around the globe.

"Wayne brings a wealth of leadership, project management, and problem solving skills to Zadok Tech-

nologies, having previously grown a start-up company into a successful, multi-million dollar corporation," said Clay Nunnally, CEO of Quality Companies. "His entrepreneurial spirit, along with his global breadth of experience, promises to bring great value to the Zadok Technologies brand. We welcome him to the leadership team."

"Having successfully managed people, projects, and assets across Asia, Africa, Europe, and the Americas, I am excited to now bring my experiences to Zadok Technologies – an international leader in instrumentation and electrical, testing and inspection, fabrication and telecommunication services," Lacey said. "I look forward to the challenges and triumphs that lie ahead."

Lacey holds a degree in psychology from the University of Phoenix.

MORE INFO qualitycompanies.com

▼ INNOVATION

Brüel & Kjær Vibro launch new condition monitoring field device

Brüel & Kjær Vibro, one of the leading worldwide independent suppliers of condition monitoring solutions for rotating machinery, has launched its next-generation VCM-3 condition monitoring platform for a wide range of industries.

The VCM-3 is designed to increase the uptime and reduce overall life-cycle costs of pumps, fans, motors, gearboxes and many other types of machines, while increasing reliability.

The field-proven VCM-3 is a 12-channel data acquisition hub targeted at full featured monitoring of auxiliary machines, balance-of-plant (BOP) non-critical machines and other assets in industries where



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The VCM-3 is designed to increase the uptime and reduce overall life-cycle costs of pumps, fans, motors, gearboxes and many other types of machines, while increasing reliability. (Courtesy: Brüel & Kjær Vibro)

cost-effective condition monitoring is required without machine protection. It features enhanced condition monitoring measurement techniques, easy system integration, built-in cyber security, and simple IT solution installation.

“The VCM-3 is designed to end any frustration monitoring your BOP and smaller, less critical machines,” said Albert Vontz, head of business unit industrial at Brüel & Kjær Vibro. “It is a more reliable and secure alternative to difficult walk-around monitoring rounds, and cost-effectively fills the gap between portables and rack-based systems. The VCM-3 has a powerful data acquisition and processing unit that provides a scalable platform for expansion, customization and development of future new monitoring methods.”

Users with all levels of in-house monitoring expertise can operate the platform’s diagnostic tools.

Key benefits of the platform include:

- ▀ Simultaneous input channels with high sampling frequency.
- ▀ Very easy to install.

- ▀ Robust cyber security.
- ▀ Internal (device) OPC UA server and storage.

A worldwide network of sales and service offices and partners supports the VCM-3.

MORE INFO www.bkviibro.com

▀ INNOVATION

Leosphere launches Windcube Insights analytics software

Leosphere, a Vaisala company that specializes in developing, manufacturing, and servicing turnkey wind Lidar (light detection and ranging) instruments for wind energy, aviation, meteorology, and air quality, recently launched Windcube Insights at Wind Operations Europe 2020 in Munich.

Windcube Insights is a proprietary data analytics software designed specifically for the Windcube Nacelle (previously called Wind Iris) na-

celle-mounted Lidar that simplifies the wind turbine power performance testing process.

“This new tool empowers operators with International Electrotechnical Commission (IEC)-compliant data to verify that turbines are performing as promised so they can maximize the energy output of their wind farm,” said Alexandre Sauvage, CEO of Leosphere. “The easy-to-use software allows operators to perform power performance testing and suggest operational optimization — quickly, accurately and efficiently.”

Windcube Insights enables true and fully transparent data analysis and reporting for Windcube Nacelle customers — all within a web-based user interface. The software is the first in the industry to enable the upload of both Windcube Nacelle Lidar and supervisory control and data acquisition (SCADA) turbine performance data with a simplified data synchronization process.

The method of operation:

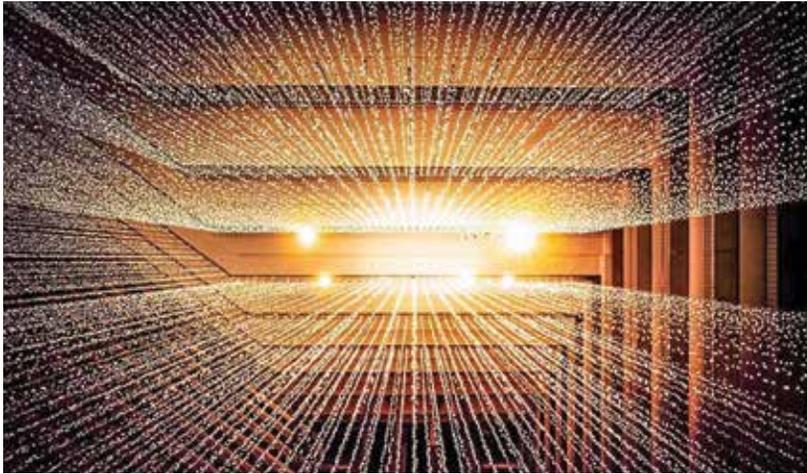
- ▀ A variety of standardized Lidar and turbine data filters are available and fully configurable by the user, simplifying preparation of the data sets.

- ▀ The software leverages those data sets to calculate and display the power curve, and the complete set of IEC requirements can be applied with embedded guidelines that reference the proper IEC standard sections, making the service fully transparent and understandable.

- ▀ The production data, along with standardized uncertainties, are calculated and can be exported in the form of a traditional report table.

The handling of IEC standard requirements for issuing a power performance test (PPT) is complex, requires deep expertise, and represents a potential source of error. However, such testing is necessary for regulatory compliance, warranty verification, and turbine performance verification during both the development and operations phases.

Determining the power curve of a wind turbine in accordance with recognized standards is valuable because



Windcube Insights enables true and fully transparent data analysis and reporting for Windcube Nacelle customers — all within a web-based user interface. (Courtesy: Vaisala)

the power curve is one of the most important characteristics of the economic value of a wind project.

The Windcube Nacelle Lidar measures the wind conditions at hub height ahead of the turbine, enabling operators and wind turbine original equipment manufacturers (OEMs) to efficiently and accurately assess performance and optimize design and production efficiency. When fully integrated within the wind turbine, Windcube Nacelle enables load reduction, design costs reduction, and continuous production gains.

Seeing the global energy demand accelerate at its fastest pace in more than a decade, wind energy and other clean energies are increasingly becoming further engrained into the world's equation for energy demand.

Since 2010, the size of the global wind power market has increased by 35 percent, and the global market is expected to approach \$ 125 billion by 2030.

“Without Windcube Insights, Lidar users would have to build their own software programs to analyze the data being collected by the nacelle Lidar and the wind turbine,” Sauvage said. “We’ve simplified the process of applying filters, calculating the uncertainties described in recognized IEC standards and displaying data, ultimately creating a simple way to support the

utilization of nacelle-mounted Lidar following IEC standards and industry best practices. Windcube Insights is just another example of Leosphere’s commitment to innovation and to making our customers’ lives better by introducing tools to help them maximize efficiency and productivity.”

MORE INFO www.vaisala.com

MAINTENANCE

PSG unveils Checkmate Xplorer harness

Pure Safety Group™ (PSG), manufacturer of fall protection equipment used by workers at height, has introduced the new Checkmate® Xplorer industrial full body harness for fall protection to the U.S. market.

The harness, designed to be more comfortable than conventional harnesses during periods of suspension and frequent loading, features visual alert stitching, an intuitive way for the user to understand the correct way to wear the harness. Its limited slip dorsal D-ring has a precise amount of vertical adjustment built in and is designed to keep the D-ring in place after multiple loadings. Its large front

ring allows for multiple attachments and uses a lightweight aluminum quick-connect buckle to ensure a safe final connection.

Hardware on the Xplorer is specifically designed to be ergonomically suited to the product’s functions, reducing wear on the webbing, allowing easy connections, and providing critical pivot points for a greater range of motion. For maximum comfort, the harness features unique curved webbing that follows the contours of the body for a closer fit and an innovative sub-pelvic assembly for greater support and increased comfort during suspension. The Xplorer meets or exceeds the requirements of OSHA 1910.140, OSHA 1926.502, ANSI Z359.11-2014, EN 361:2002, EN12277:2007 Type A, and EN358:2000.

MORE INFO www.puresafetygroup.com



The Checkmate Xplorer industrial body harness is designed to be more comfortable than conventional harnesses during periods of suspension and frequent loading. (Courtesy: PSG)



Windsourcing.com gains Bergolin as important partner for rotor blade coating products. (Courtesy: windsourcing.com)

MAINTENANCE

Windsourcing.com and Bergolin become partners

Windsourcing.com GmbH, the Hamburg-based distributor for wind turbine spare parts and repair material, is expanding its range of products to include the highly sought-after rotor blade repair products from Bergolin.

With the Bergolin GmbH & Co. KG, Windsourcing.com has succeeded in gaining an important market partner whose products are used on more than 100,000 rotor blades and certified by various wind turbine manufacturers.

“With Bergolin as one of the market-leading manufacturers of rotor blade coatings, we can offer an even better service as a trading and logistics partner,” said Stefan Weber, managing director of Windsourcing.com GmbH. “By sourcing directly from Bergolin, we are able to deliver products much

faster and more competitively. This partnership is a further milestone for us in the continuous expansion of our product portfolio for the repair and maintenance of wind turbines.”

For 100 years, the industrial coatings manufacturer has offered a wide range of paints and coatings. The Lower Saxony company has made a name for itself internationally, particularly with the high-quality coatings for rotor blades of wind turbines.

MORE INFO www.windsourcing.com

MAINTENANCE

Cv International launches new, interactive website

Cv International recently launched a new website. The site serves as destination for all things Cv International – a new interactive experience to source and shop nitrogen generation, fill, storage and delivery systems, as well as a myriad of aviation ground support equipment, maintenance platforms, stands, docks, towers, and gas sampling products.

Cv International offers a variety of products tailored to both safety and service within the energy sector. The company encourages everyone to take a stroll through its new site. It’s bright, fun, informative – and when used correctly – absolutely socially distant.

MORE INFO cvintl.com

MANUFACTURING

Vestas wins 99 MW order and service contract in China

Vestas has secured a 99 MW order for two projects in Jiangsu Province in China.



The V110-2.2 MW turbine. (Courtesy: Vestas)

Both projects will feature a mixed site configuration consisting of V155-3.3 MW and V110-2.2 MW turbines.

The order includes a supply of 16 V155-3.3 MW and 21 V110-2.2 MW turbines as well as a 20-year Active Output Management 4000 (AOM 4000) service agreement.

This is the second order of V155-3.3 MW turbines, Vestas' latest 4 MW platform variant designed for low-wind conditions since its introduction in China in June 2019. The order also features Vestas' first 20-year service agreement in China, a milestone that showcases how Vestas, by leveraging its industry-leading service capabilities, can optimize life-time performance and improve business case certainty for its customers in the world's largest wind market.

"The order is significant in two ways, as it demonstrates the V155-3.3 MW turbine's suitability for China's low wind market and marks our Chinese customer's increasing trust in Vestas' long-term service capabilities and commitment," said Thomas Keller, president of Vestas China. "I believe with the shift of attention to the entire lifecycle of wind farms, more of our Chinese customers will partner with us on long-term service contracts."

The order takes Vestas' announced order intake in China to about 550 MW

in the first quarter of 2020.

Deliveries are expected to begin in the second quarter of 2020, while commissioning is planned for the third quarter in the same year.

Customer's name and project's name are undisclosed under customer's request.

MORE INFO www.vestas.com

MANUFACTURING

Siemens to supply 170-meter-rotor turbines in Sweden

Siemens Gamesa continues to push the boundaries of onshore wind power following the first order for industry leading 170-meter rotor wind turbine.

The company will deliver eight units of the SG 5.8-170 to Danish developer and wind-turbine operator Eurowind Energy A/S for the Knöstad project (46 MW) near Karlstad, in Sweden.

The landmark order will mark the debut of the onshore wind turbine with the largest rotor in the industry, capable of capturing more wind in medium- and low-wind sites. Additionally,

the turbines will operate at a capacity of up to 6.2 MW, resulting in record high annual energy production (AEP). Siemens Gamesa has also secured a 25-year full-service agreement.

This will be the second project to feature the Siemens Gamesa 5.X platform in Sweden. In December, the company reached an agreement to supply 35 SG 5.8-155 to Arise AB and Foresight for the Skaftåsen project. In less than a year since its launch, the company has secured orders for the turbine's two variants, which have rotors of 155 and 170 meters respectively.

"We are delighted to see how fast this platform is penetrating the Scandinavian market, one of the most sophisticated in the world when it comes to wind power," said Alfonso Faubel, Siemens Gamesa's Onshore CEO. "This deal also marks an extension of our strong partnership with Eurowind Energy A/S having worked together in the Thorup Sletten project. It is always rewarding to see customers committed to strengthening our collaboration."

"After a successful integration of the Thorup Sletten project in Denmark, the country's largest onshore wind farm in operation, we are happy to further strengthen our relationship with Siemens Gamesa with the Knöstad project," said Jens Rasmussen, CEO of Eurowind Energy A/S. "We are looking forward to start building with the largest onshore turbine available at present. At Eurowind Energy A/S, we believe that a continuous improvement of LCOE is evident for the industry, and we consider the SG 5.8-170 as a step in this direction."

As one of the largest consumers of electricity per capita in the world, Sweden has pioneered the adoption of new technologies to bring down both the cost of the electricity and CO2 emissions. According to WindEurope, the country is expected to double its wind capacity from 7.4 GW to 14.9 GW by 2023, and the government has set a target of 100 percent renewable electricity production by 2040. One single SG 5.8-170 turbine is capable of providing enough power for close to 5,000 Euro-



Siemens Gamesa will deliver eight units of the SG 5.8-170 to Danish developer and wind-turbine operator Eurowind Energy A/S. (Courtesy: Siemens Gamesa)

pean homes a year, while avoiding the emission of 15,000 metric tons of CO₂ over the same period, the equivalent to planting 200,000 trees.

The wind turbines will be installed during the second half of 2021 in an area of forest. They will have a 115-meter hub height tower, meeting the maximum height permitted even with the turbine's large rotor size.

The Siemens Gamesa 5.X combines the best of the company's engineering

schools, producing a technologically superior wind turbine built on proven solutions to reduce risks. The platform introduces the largest unit capacity in the Siemens Gamesa onshore portfolio and the largest rotor diameters, 155 and 170 meters, which optimize performance in high-, medium- and low-wind conditions.

With a highly flexible design that enhances the entire value chain, from manufacturing through logistics to

construction and service, the platform's versatility makes it suitable for a broad range of sites. The platform also integrates advanced control technologies and strategies to offer flexible power ratings depending on noise requirements, ambient temperature and electrical performance, further expanding its suitability for all kind of sites. ✈

MORE INFO www.siemensgamesa.com

▾ We are delighted to see how fast this platform is penetrating the Scandinavian market, one of the most sophisticated in the world when it comes to wind power. ▹

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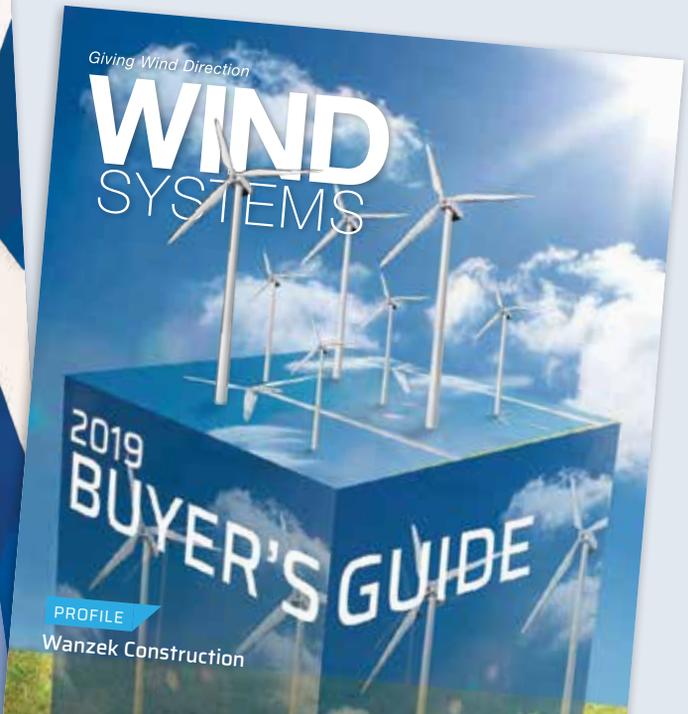
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ADVANCEMENTS IN DISTRIBUTION GRID MONITORING



Utilities face increased voltage volatility from distributed wind-power generation.

By DEL WILLIAMS

The power distribution grid is undergoing unprecedented levels of change. The traditional one-way model of voltage regulation presumed voltages dropping predictably along feeders from substation to customers.

However, the growth of distributed wind-energy systems is rendering traditional models and regulation techniques incapable of maintaining delivered voltages within ANSI C84.1 guidelines.

According to the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE) website, (www.energy.gov/eere/wind/distributed-wind) the Wind Energy Technologies Office defines distributed wind in terms of technology application, based on a wind plant's location relative to end-use and power distribution infrastructure, rather than technology or project size.

The growth potential of distributed wind-energy systems is enormous.

"An analysis of behind-the-meter distributed wind potential in the United States found that distributed wind systems are technically feasible for approximately 49.5 million residential, commercial, or industrial sites, or about 44 percent of all U.S. buildings," the EERE website said.

This is spurring new approaches in grid measurement, monitoring, and control that provide real time measurements that enable distribution management applications to better manage voltages and maintain high power quality.

VOLTAGE FLUCTUATION FROM DISTRIBUTED WIND

The traditional power delivery model pushes electricity from a centralized power generation plant through distribution feeders to the point of consumption. Power is consumed along the line with utilities using tap changers, voltage regulators, and capacitor banks to regulate voltage to ensure delivery remains within an ANSI guideline range of ± 5 percent all the way to the end of the line. Historically, the key concern was ensuring voltages did not fall below or above these standards.

Enter distributed wind-energy systems. These are commonly installed on, but are not limited to, residential, agricultural, commercial, industrial, and community sites, and can range in size from a 5-kilowatt turbine at a home to multi-megawatt turbines at a manufacturing facility or connected to a local distribution system, according to the EERE website.

These points of power generation inject power along the distribution feeder, which may increase or decrease voltage levels outside ANSI guidelines. In other words, increasing integration of renewables means variable load and generation fluctuations that work against the constant voltage profile model.

In addition, distributed wind is, by nature, intermittent. Managing unpredictable intermittency without measurement, monitoring, and control is even more difficult and may result in oscillatory voltages in the system. Voltage rises at injection points may also create reverse systemic power flow.

As a result, utilities require more advanced power monitoring and control systems that can precisely and quickly measure voltage to enable their distribution management systems (DMS) to respond and regulate the voltage on their feeder lines. But this means DER integration needs real-time data to implement their control strategies.

"The issue goes beyond simply burnt toast in a home," said Ray Wright, VP Product Management, Power Products at NovaTech. "What we are concerned about with unpredictable voltage delivery is the disruption of service to household, commercial, and industrial customers all along the feeder, including damage to motors and equipment and interruption of service."

MORE PRECISE MONITORING AND CONTROL

The challenge of effectively controlling unpredictable, variable and potentially bi-directional voltage flow starts with measurement. The only way to control this kind of variability is to have measurements along distribution feeder lines that are accurate and that can communicate data to control systems fast enough to modulate the voltage and keep it under control — essentially in real-time.

Voltage delivery monitoring and control can be the domain of DMS. These systems have evolved over the years with advanced DMS models now in use that use volt/var optimization (VVO) where capacitor banks, voltage regulators, and solid-state systems are switched on and off to maintain acceptable levels of power factor and voltage. More recently, distributed energy resource management systems (DERMS) have emerged in response to the increasing amount of renewables-based distributed energy resources. These are complex control systems for monitoring and controlling sources of energy.

"DERMS requires accurate, real-time measurement of voltages, loads, reactive power, fault data, and even weather data," Wright said. "A key consideration has been how to design and install these monitoring systems in a way that is cost-effective for utilities. This has called into question the traditional approach of grid monitoring with conventional magnetic current transformer (CT) and potential transformer (PT). The installed cost of CTs and PTs is expensive and time-consuming, plus the feeder must be powered down for their installation."

An alternative lower-cost approach is to employ low voltage (0-10V AC) sensor technology for all voltage and current measurements. These sensors are safe, accurate for all re-

▼ What we are concerned about with unpredictable voltage delivery is the disruption of service to household, commercial, and industrial customers all along the feeder, including damage to motors and equipment and interruption of service. ▼



A DGM is a pole-top measurement system. (Courtesy: NovaTech)



Three raw voltages and currents can be wired to a Bitronics distribution grid monitor (DGM). (Courtesy: NovaTech)

quired measurements, and can be installed without taking an outage.

Three raw voltages and currents can be wired to a Bitronics distribution grid monitor (DGM), a pole-top measurement system, and dozens of useful measurements made including voltages to better than 0.5 percent, loads, power factor, real, and reactive power. An ANSI 51 overcurrent element enables reporting of fault pickup and peak fault currents. All these measurements are reported to DMS and DERMS through DNP3 over radio.

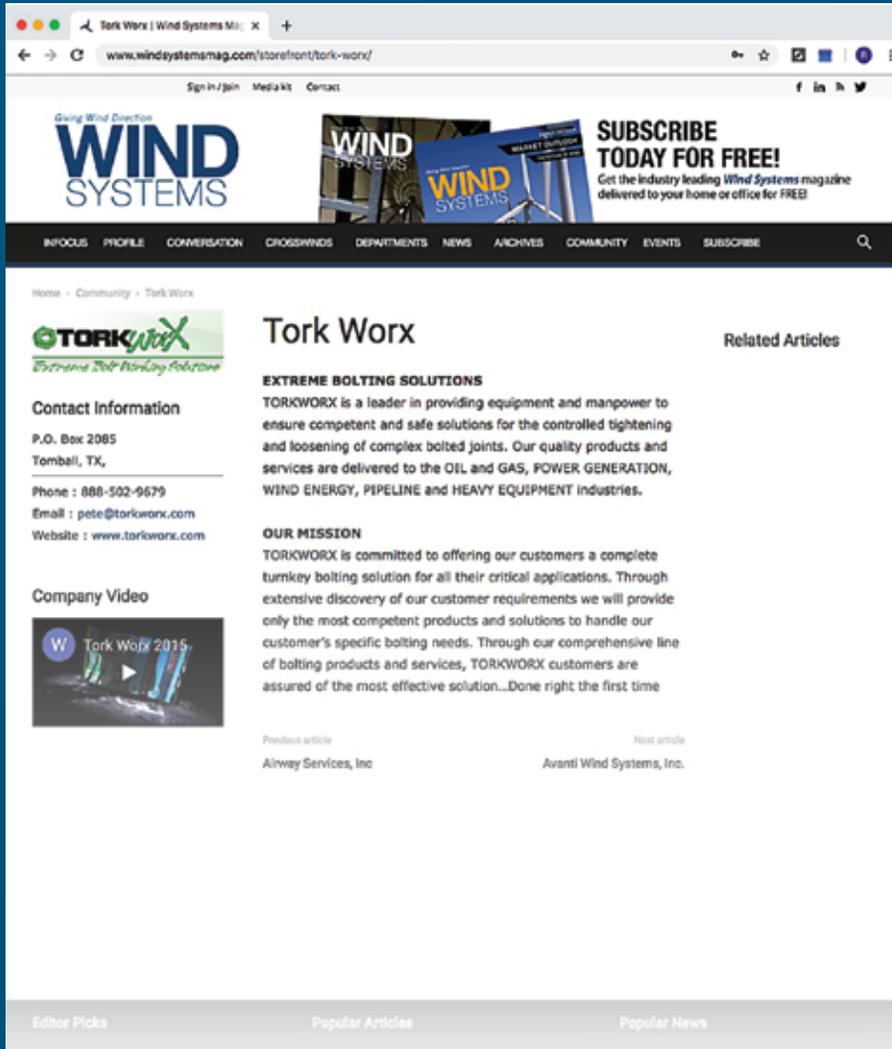
“Initial DGM deployment at a New England utility drove further DGM enhancements,” Wright said. “This includes new measurements for ‘normalized voltage’ to accommodate sensor readings instead of PTs and CTs, additional surge suppression, and ‘safety shields’ to prevent tampering of cable connectors. This major project was driven by a utility commission mandate to accurately measure and report end-of-line voltages.”

Given that the trends indicate distributed wind-energy system integration will increase significantly each year, so too will the need to maintain voltages, power factor, and frequency within desired limits. New grid measurement and monitoring technologies are essential to keep these factors under control. ↘

ABOUT THE AUTHOR

Del Williams is a technical writer based in Torrance, California. For more information on advanced distribution grid monitors, visit NovaTech at www.novatechweb.com or call 1-844-668-2832.

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