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Focusing in on Canadian, offshore wind

This issue of *Wind Systems* is here to help get you primed and ready for two big wind trade shows coming up next month.

First up is the CanWEA Annual Conference & Exhibition October 8-10 in Calgary, Alberta. Billed as Canada's largest wind-energy conference, Calgary will be the focal point for all members of the wind-energy sector to come together to address key issues facing the industry today.

According to CanWEA's website, this year's conference is expected to host almost 1,200 attendees representing a wide range of interests, including project developers; manufacturers; federal, provincial, and municipal governments; utilities; consultants; communities; and students.

After that, we have the AWEA Offshore WINDPOWER 2019 Conference October 22-23 in Boston, Massachusetts.

If you're planning to attend the conference, you can certainly expect a broad range of developers and experts to be on hand to answer questions and to help network some contacts in this exciting venture.

Our September issue is dedicated to these two major wind conferences by using our inFocus section, as well as other monthly features, to spotlight wind energy both offshore and in Canada.

To begin with, an article from CanWEA explains how wind energy is a competitive choice that will offer affordable, flexible, and clean power to a modernized grid in Canada.

The coverage of Canadian wind continues in our Crosswinds section, where Canada's foremost cleantech journalist predicts a smarter, better system with renewable energy leading the way.

Offshore has been in the news quite a bit lately, and we take a look at the present and future of this exciting U.S. venture on both sides of the country.

An article from NOIA reflects the hunger the East Coast shares for more offshore wind capability, while an article from Stoel Rives LLP looks at the challenges of getting steel in the water off the West Coast.

In this month's Conversation, I had the pleasure to talk with Laura Smith Morton, AWEA's senior director, Policy and Regulatory Affairs, Offshore Wind. In her first official interview since taking on her new role, she discusses the many positive aspects of what offshore wind can bring to not only the East Coast, but to the entire U.S.

So, if you're headed to Beantown or beyond the border to Calgary, let *Wind Systems* be your companion as we bring you some of the latest wind industry news and happenings.

And, as always, thanks for reading!



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Record wind activity rises in 2nd quarter

From AWEA

U.S. wind-farm development activity rose to a new high point in the second quarter of 2019, according to new data from the American Wind Energy Association (AWEA). Strong consumer demand from Fortune 500 businesses and utilities as well as calls from multiple states for offshore projects added to wind power's growing development pipeline. At the same time, wind-turbine manufacturers saw an increasing number of factory orders for more powerful wind turbines capable of powering almost twice the number of homes as an average wind turbine installed in the past few years.

These findings and the latest industry data are highlighted in AWEA's newly released U.S. Wind Industry Second Quarter 2019 Market Report. AWEA market reports provide an authoritative status update for the U.S. wind energy industry, which continues to supply a growing share of the American electricity generation while creating well-paying careers and economic opportunity in communities across the country.

The record 41,801 MW of U.S. wind capacity under construction or in advanced stages of development represents a 10 percent increase over the level of activity this time last year. The wind-project pipeline grew 7 percent in the second quarter with 7,290 MW in new construction and advanced development activity announced.



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



GCube's analysis of claims data gathered from construction projects and operational offshore wind farms highlights several key trends that must be carefully managed in order to ensure project success. (Courtesy: Shutterstock)

Analysis: Offshore wind must quickly respond to changing global risk

As the offshore wind sector expands globally, prices fall, and technology evolves, asset owners and investors are becoming increasingly exposed to technical and supply chain risks, alongside natural catastrophe and extreme weather. More sustainable approaches to risk management and insurance are required to ensure this changing risk profile does not affect project delivery and successful long-term operations.

This is according to GCube Insurance, the specialist provider of renewable energy insurance services, which underwrites more than 13.5 GW of offshore wind capacity in markets including Europe, the U.S., Taiwan, and Japan.

GCube's analysis of claims data gathered over the past 12 months from construction projects and operational offshore wind farms highlights several key trends that must be carefully managed in order to ensure project success. These include:

- ▶ A number of costly inter-array cable faults caused by malfunction of fiber optics designed to monitor cable performance. Cabling losses account for 55 percent of total claims handled by GCube in the past 12 months.

- ▶ A rise in the frequency and severity of claims relating to foundations — particularly monopiles installed at deep water sites. Foundation-related losses now account for 35 percent of total claims.

- ▶ Significant mechanical breakdown losses incurred at all but one of the floating wind installations currently in operation worldwide.

- ▶ Increased exposure to natural catastrophe in the Taiwanese and U.S. offshore wind markets as well as losses involving extreme weather events that cause significant project damage but do not fall under conventional definitions of natural catastrophe.

- ▶ Ongoing issues related to contractor error as the industry drives to reduce the levelized cost of energy in

established markets, putting pressure on the supply chain, and begins to work with inexperienced local teams in emerging markets. Human error is involved in 70 percent of total claims over the past 12 months.

“Many of these claims trends could be marked down as ‘growing pains’ linked to global expansion and a drive for cost parity with conventional energy,” said Jatin Sharma, president of GCube Insurance Services. “However, if they are not properly managed, they will put these goals at risk.”

“If the industry continues to squeeze the supply chain, while at the same time commercializing new technologies in new global markets, it will become increasingly vulnerable to large-scale financial losses that dent investor confidence and put projects at risk,” Sharma said. “A long-term, responsible outlook is required — both from offshore wind asset developers and owners, and from insurance providers — to ensure that lessons are learned quickly and take into account the changing risk profile of construction and operation.”

GCube will bring together leading offshore wind personnel at its invitation-only Offshore Wind Risk Seminar in London September 24.

MORE INFO www.gcube-insurance.com

Greenbyte targets U.S. renewables with energy cloud offering

Greenbyte, a developer and enabler of smart data software to drive productivity in renewables, has significantly bolstered its presence in the United States with the opening of a new Chicago office. The new location will serve as a regional hub for the nationwide rollout of the Greenbyte Energy Cloud, an open, versatile and user-friendly monitoring and asset management platform for renewable energy port-

folio owners and Independent Power Producers (IPPs).

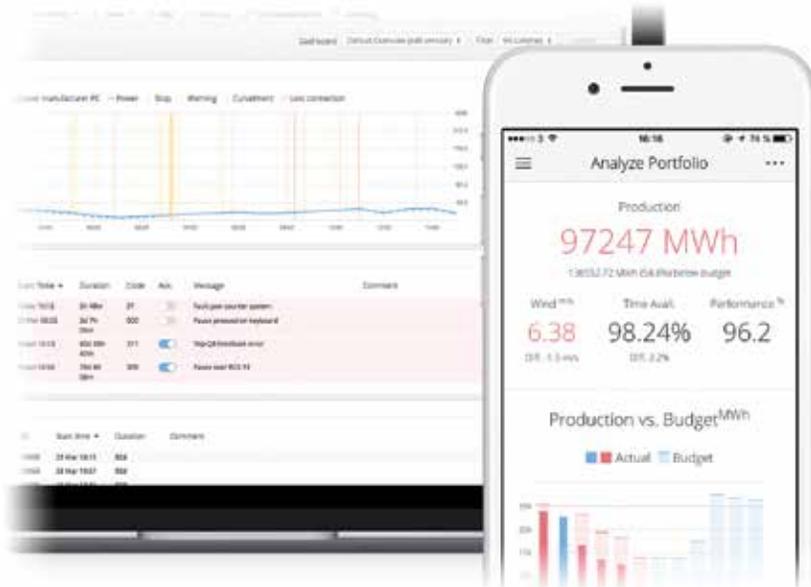
The Chicago office will establish a new center for sales, support, and customer success, ensuring that Greenbyte's expanding pool of North American customers is served to the highest level by a U.S.-based team. This growing team has a wealth of renewables experience and will work with U.S. businesses to implement Greenbyte's monitoring and asset management platform, which delivers proven productivity gains across multi-technology portfolios.

While digitalization has rapidly become a buzzword in the U.S. renewable energy industry, for many it remains an unrealized opportunity. Many digital data management platforms in use have been developed as bespoke solutions for individual projects or portfolios, are focused on a single technology, or have been designed to direct users toward particular hardware choices or specific engineering and consultancy services.

Ultimately, this narrows the opportunities available to asset and portfolio owners, rather than creating the flexibility they need to analyze, understand, and act on their performance data.

“North American portfolio owners too often find themselves using numerous different monitoring and asset management tools, across a wide range of generation types and technologies,” said Eric Bergman, senior account executive in Greenbyte's U.S. team. “Not having a consolidated asset management platform for these diverse portfolios is both costly and inefficient to system owners and stakeholders and leads to a lack of transparency on fleet performance, which typically takes its toll as lost energy and revenue.”

“Strengthening Greenbyte's U.S. presence supports our objective of bringing renewables stakeholders a single source of truth that broadens,



Greenbyte's monitoring and asset management platform delivers proven productivity gains across multi-technology portfolios. (Courtesy: Greenbyte)

rather than limits, their future choices," he said.

Greenbyte Energy Cloud has been designed to provide asset managers and portfolio operators with a single, user-friendly point of access to data from a multitude of sources, from on-site resource measurements and SCADA to third-party data analytics services. It will enable U.S.-based customers to monitor all renewable energy types, including storage assets.

Greenbyte's system is already in use by a number of leading U.S. renewable energy businesses. These include Longroad Energy, a developer and operator managing a portfolio of 1.5 GW of operational wind and solar projects across the country, including more than 800 MW for third-party owners.

Longroad is using Energy Cloud as a versatile hub for all critical performance data, supporting asset management, operations and maintenance (O&M), and remote monitoring of this diverse asset base. In turn, Longroad uses these data to inform decisions that reduce costs, increase portfolio efficiency, and drive revenue.

"While many systems on the market prescribe certain portfolio-wide asset

management approaches and decisions, Greenbyte Energy Cloud creates the flexibility and scalability we need to effectively manage our expanding wind and solar asset base," said Jeremy Law, vice president of Asset Management at Longroad Energy.

MORE INFO www.greenbyte.com

Study: Wind resource assessments reach 100% mean accuracy

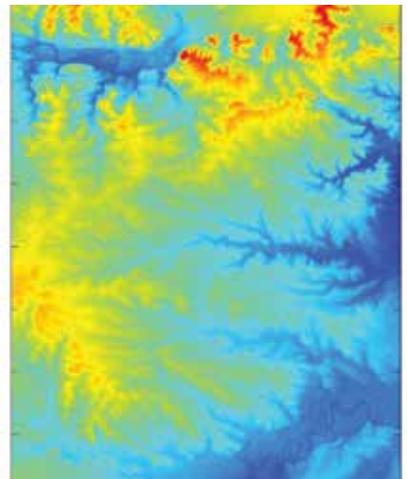
ArcVera Renewables, a leading provider of consulting and technical services for wind and solar projects with more than 30 years of experience, recently developed and published an ambitious benchmark report aimed to deliver a thorough analysis of the performance of its wind-energy resource assessment (WERA) practice across a broad range of operating wind projects.

Based on a dataset composed of 31 projects it worked on in the United States, combining 3.5 GW of installed capacity and 212 years of operation, the report provides a detailed comparison between the pre-construction assessments using ArcVera's

advanced WERA practices and the actual post-construction energy production data.

The results of the study show that ArcVera's wind-assessment techniques are accurate to within about 1 percent on average of reported project P50 energy production, which becomes near zero mean bias after accounting for grid curtailment. In addition, the benchmark study indicated that ArcVera's wind assessments have lower individual project performance variation than in the past. With an average project performance bias close to zero, ArcVera's advanced methodology yields an average project performance of 98.8 percent for the 31 projects. Given that estimates of grid curtailment losses, typically at 1 to 1.5 percent, are not corrected for in most benchmark assessments, ArcVera's overall project performance is effectively 100 percent in terms of accuracy.

What's more impressive, the results show the risk of building a wind farm that significantly over- or under-performs is limited by applying ArcVera's techniques, with an industry-leading 4.7 percent standard deviation of proj-



To improve the accuracy of its energy-yield estimates, ArcVera Renewables has used high resolution mesoscale wind flow modeling in its Wind Energy Resource Assessment (WERA) methodology since 2012. Pictured is a hub-height wind speed map created using a full physics, 200-meter resolution mesoscale model run, down-scaled to 30-meter resolution terrain. The range of wind speeds shown in the image is 4-8 m/s. (Courtesy: ArcVera Renewables)

ect performance. No firm is currently assessing wind farms with the accuracy achieved by ArcVera.

“For over 30 years, ArcVera Renewables has provided finance-grade consulting and technical services for wind- and solar-energy clients worldwide, including the very first bankable WERA delivered in 1989 in California,” said John Bosche, president and principal engineer at ArcVera Renewables. “Our track record is second to none, and we wanted to make public the data that supports that claim. We have consistently delivered accurate and bankable insights backed by advanced technical expertise and decades of global experience. That kind of highly specialized services is what you need to make sure that confident project development decisions are taken, maximum technically-driven advantage is secured, and performance risk is minimized.”

MORE INFO www.arcvera.com

First vertical axis wind turbine awarded certification

Hi-VAWT’s DS3000 small wind turbine is the latest model to achieve certification under the ICC-ES Small Wind Certification Council (ICC-SWCC) Small Wind Turbine (SWT) Program. It is also the first vertical-axis wind turbine (VAWT) to complete the rigorous ICC-SWCC certification process.

Vertical-axis turbines use a unique geometry and feature distinctive vertical blades that are arranged perpendicularly through the wind stream. The Hi-VAWT DS3000 turbine has been granted certification SWCC-18-02, which demonstrates compliance with the AWEA 9.1 standard that serves as the basis of the ICC-SWCC SWT program. Hi-VAWT is based in Taiwan and is represented in the U.S. by Colite Technologies, who submitted the turbine for certification.

The DS3000 turbine’s product information, test reports, and calculations were thoroughly reviewed to confirm

that all requirements of the ICC-SWCC SWT program were satisfied. The DS3000 is a three-blade, vertical-axis wind turbine with a combination Darrieus-Savonius rotor with a 3.7-meter diameter. ICC-SWCC rated its annual energy production at 2,460 kWh per year* and 1.4 kW rated power at 11 m/s wind, and a rated sound level of 42.3 dB(A)**.

* Annual energy production rating as-

umes average annual wind speed of 5 m/s with a Rayleigh wind-speed distribution, sea level air density and 100 percent availability. Actual production will vary depending on site conditions.

** Assumes the sound level will not be exceeded 95 percent of the time assuming the wind conditions above and observed 60 m from rotor center. ↘

MORE INFO smallwindcertification.org



IN FOCUS

CANADA ▸ OFFSHORE

WIND ENERGY THE COMPETITIVE CHOICE FOR CANADA

Over the past decade, Canada installed new wind-energy capacity at a pace closer to 1,000 MW per year. (Courtesy: CanWEA)



Affordable, flexible, and clean, wind energy is key to a modernized Canadian electricity grid.

By TRACY WALDEN

In Canada and around the world, wind energy is providing more affordable and clean energy than ever before. Today, wind energy is installed in more than 90 countries and is one of the fastest-growing, lowest-cost forms of electricity. Last year, Canada took eighth place in the world for total onshore installed capacity, following a decade that saw wind energy as the largest source of new electricity generation in the country.

With 12,816 MW of installed capacity across 12 provinces and territories, more than 299 communities have directly benefited from wind energy in Canada, including involvement with more than 35 Indigenous communities. Wind energy in Canada has attracted more than \$23 billion in investment, created more than 58,000 person-years of employment in construction and operations, and it continues to provide annual land lease payments to landowners and contribute property taxes to local municipalities.

It does all of this while providing the lowest cost option for new electricity generation in Canada and without emitting air pollutants or greenhouse gases. As energy decision-makers look at ways to meet the growing electricity needs of families and businesses, wind power is the compelling choice.

AN AFFORDABLE SOLUTION

Wind energy has many attributes that make it a great choice for new electricity generation in Canada, but one attribute stands apart – price.

Competition and innovation are dramatically driving the price of wind energy down. In the past 10 years, the levelized cost of wind energy fell by 69 percent between 2009 and 2018, according to Lazard's annual study in the United States. And costs are expected to continue falling. Bloomberg New Energy Finance forecasts wind energy costs will drop another 48 percent by 2050.

Innovation in wind-energy technology, tools, and practices are helping to drive this price drop. Larger turbines can generate more power from a given resource, and technology advances in monitoring and optimization allow more efficient wind harvesting.

In Canada, the impact of this trend has been reflected in the record-low wind-energy contract prices achieved in recent procurement auctions. Alberta's three recent auctions secured 1,363 MW of wind energy at average weighted prices of \$37 to \$39 per megawatt hour. The winning bid for Saskatchewan's most recent procurement came in below \$35 per megawatt hour. These prices make wind energy the lowest-cost option for new electricity generation in the country.



Currently, wind energy meets approximately 6 percent of Canada's electricity demand, producing enough energy to power approximately 3.3 million homes. (Courtesy: CanWEA)

A CLEAN SOURCE OF POWER

Canadians are increasingly concerned about the impact of electricity generation on our environment, and wind energy is one of the most environmentally sustainable forms of electricity generation. It produces no air or water pollution, generates no toxic, hazardous, or radioactive waste and uses significantly less water than virtually all other forms of electricity generation. The National Renewable Energy Laboratory report, *Life Cycle Greenhouse Gas Emissions from Electricity Generation*, has demonstrated that wind energy is one of the most environmentally-sustainable forms of generation even when impacts are considered on a life-cycle basis for all of the resources required to enable wind energy to be produced.

Canada has committed to reducing its greenhouse gas emissions by 30 percent below 2005 levels by the year 2030 and recognizes the importance of a clean electricity grid in supporting that objective. Canada also has signaled long-term intentions consistent with the Paris Agreement on Climate Change by releasing a mid-century greenhouse gas strategy that envisions reducing its emissions by at least 80 percent below 2005 levels by the year 2050. This will require Canada to move to an essentially 100 percent non-emitting grid by 2050.

Studies have consistently demonstrated that significant carbon reductions on the order of what is required to meet the commitments in the Paris Accord can only be achieved

if Canada electrifies key segments of the economy that can be plugged in, such as transportation, buildings, and industries. And there is little doubt that the power for this electrification must be affordable, and it must be clean — a demand that wind energy is well positioned to help with.

A RELIABLE ELECTRICITY GRID

Levels of wind-energy integration are going up, and in many jurisdictions around the world, large amounts of wind energy are being reliably and cost-effectively integrated within the electricity grid. Several European countries get a fifth or more of their electricity from wind, while Denmark generates more than half of its electricity from wind turbines.

Currently, wind energy meets approximately 6 percent of Canada's electricity demand, producing enough energy to power approximately 3.3 million homes. In Canada, the 2016 Pan-Canadian Wind Integration study shows that wind energy can reliably supply more than one-third of Canada's power needs. In fact, one Canadian province and six U.S. states already generate 20 percent or more of their electricity using wind energy.

Systems operators are able to balance variable supply from wind energy with demand thanks to a number of technology improvements, such as larger wind turbines, increased digitalization, enhanced forecasting, and better alignment of variable generation with flexible generation such as hydropower or energy storage technologies. Looking

ahead, Bloomberg's 2019 New Energy Outlook forecasts that a boom in batteries means wind and solar energy will provide almost 50 percent of global electricity by 2050.

These developments are helping to accommodate the variability of renewable energy options and enable high levels of integration without negative impacts on reliability. In fact, wind energy is also now demonstrating that it can provide a suite of ancillary services that system operators can use to maintain grid reliability day-to-day and in the event of system imbalances or emergencies.

RESPONDING TO A GROWING DEMAND

In its most recent energy supply and demand projections to 2040, Canada's National Energy Board (NEB) published a "reference case" (business-as-usual scenario) that indicated the nation will need new electricity generation facilities to power the coming decades. This reference case predicts that wind energy will be a major contributor of that new power through the installation of an average of 510 MW of new wind-energy capacity every year. While this significant projected growth reflects wind energy's cost-competitiveness, there is room for even more growth.

Over the past decade, Canada installed new wind-energy capacity at a pace closer to 1,000 MW per year. Looking ahead, Canada will need more low-cost, reliable, and clean electricity – particularly in the face of climate change. Fortunately, wind-energy projects can be built rapidly at different scales by a wide variety of stakeholders, enabling Canada to flexibly harness wind in response to growing demand for renewable electricity.

The grid of the future will be far more diverse, decentralized, flexible, and participatory. This is because global competition and innovation are driving down costs and spurring rapid growth of a range of technologies that are disrupting the electricity grid and changing how supply and demand are managed. From electricity storage to energy efficiency to a smart grid, innovations are creating many possibilities for synergies that can allow Canada to make the most of its abundant wind and other renewable energy resources.

EXPLORING OPPORTUNITIES FOR GROWTH

This fall, Canada's largest wind-energy conference will attract more than 1,200 industry leaders in Calgary, Alberta, from October 8 to 10. The 35th Annual CanWEA Conference and Exhibition (windenergyevent.ca) will see attendees not only celebrate the successes achieved thus far, but also explore the current and emerging opportunities to drive continued growth in the face of a rapidly advancing global energy transition.

Over three days, business executives, technical experts, decision makers, and government representatives will highlight the key issues facing wind energy today and identify the innovative trends that will guide the future of clean energy growth. They will discuss the big picture of Canada's evolving electricity system and growing wind-energy

industry; navigate changing market and policy dynamics; examine the disruptive technologies and rapid innovation that are affecting Canada's electric utilities; and explore the role of wind energy in supporting grid reliability.

The CanWEA Annual Conference & Exhibition will provide an unparalleled opportunity for all members and stakeholders of the wind-energy industry to focus on the opportunities and solutions that will ensure Canada remains competitive in a low-carbon global economy.

CANADA'S RENEWABLE ENERGY FUTURE

The energy sector is evolving rapidly, and customers – including homeowners, commercial and industrial businesses, utilities, system operators, and governments at large – are increasingly demanding renewable, affordable, clean, and flexible energy options. Canada's electricity system will need significantly increased amounts of renewable energy in a more flexible electricity grid if it is to be affordable, reliable and climate-friendly.

The wind-energy industry will play an integral role in this transition, and it will do so alongside other energy technologies such as solar energy and energy storage. ↘

ABOUT THE AUTHOR

Tracy Walden is VP of Communications and Events with the Canadian Wind Energy Association.

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OFFSHORE WIND'S WESTWARD EXPANSION

As the world's fifth-largest economy with a power-hungry population, an extensive coastline with strong winds, and a progressive legislature and governor, California is positioning itself to lead the offshore wind industry on the West Coast. (Courtesy: Stoel Rives LLP)

As offshore wind eyes the West Coast of California, project sponsors will need to carefully consider the financing, regulatory, and permitting issues that will develop.

By **CHERISE GAFFNEY, TIM TAYLOR, CHAD MARRIOTT, and VIET NGUYEN**

Permitting and financing offshore wind projects is a complex business — but one that has made great strides on the East Coast of the United States in recent years. And it makes sense that the first wave of development has focused on high-load, transmission-constrained regions of the East Coast. High power prices, coupled with relatively shallow water depths and a generally supportive political climate, have made New York and New England the epicenter of the industry in the United States to date.

But make no mistake, the same offshore wind developers that are capitalizing on opportunities on the eastern seaboard have their eyes on California as the natural target for the second wave of U.S. development. As the world's fifth-largest economy with a power-hungry population, an extensive coastline with strong winds, and a progressive legislature and governor, California is positioning itself to lead the offshore wind industry on the West Coast. That said, financial considerations (including tax credits), environmental regulations, and California's unique permitting regime may offer new challenges to those who want to develop projects in its deep Pacific Ocean waters.

FINANCIAL CONSIDERATIONS

With both a relatively long timetable for offshore wind in California and a steep learning curve, the financing landscape is likely to change over time. Large balance sheet sponsors (as equity) and banks (as debt) — many of them from Europe — are expected to continue to dominate the field. However, the overall capital stack that sponsors have looked to in financing onshore projects over the last decade will almost certainly evolve over the next five to 10 years. For example, the production tax credit (PTC) and the investment tax credit (ITC) will have expired — possibly, without renewal. Even if one or both is eventually renewed, traditional tax equity that has fueled the growth of terrestrial wind in the United States generally represents a 12- to 18-month forward market. Since California offshore wind projects are still on the drawing board and will likely require construction periods of two years or more, it is premature to assume what role tax equity will play (if any).

For now, the safe assumption is that California offshore wind will not be able to rely on the same federal tax credits that have accounted for a substantial portion (typically 40 percent to 50 percent) of terrestrial wind financing. Indeed, turbine manufacturers continue to increase the size of their machines (e.g., GE Renewables' announcement of its 12-MW Haliade X), and other components of the supply chain are similarly planning for the phase-out of federal tax credits. If developers of California offshore wind projects are able to use such tax credits, it is unclear whether they would represent a comparable percentage of the capital stack.

Without the PTC or ITC, the gap fillers will likely be term debt and equity partnerships akin to some of the recently announced joint ventures, such as Engie-EDP, Ørsted-Ever-source, and EnBW North America-Trident Winds. Over a longer time horizon, as sponsors continue to understand and mitigate the novel development and operational risks facing floating offshore wind in California, it is also possible that private equity funds will begin to play a role in the overall financing picture.

EXTENSION OF THE TAX CREDITS FOR OFFSHORE WIND

Several groups are urging Congress to extend the ITC for offshore wind projects. Under current law, the ITC is available for wind projects (by election) only if construction begins on the project before 2020, which is an unattainable goal for offshore California development. Further, the full ITC (30 percent) is reduced by 20 percent for each year after 2016 that construction begins.

On June 25, 2019, the Offshore Wind Incentives for New Development Act (the Act) was introduced in both the U.S. Senate and the House of Representatives. The Act would extend the 30 percent ITC for projects where construction begins before January 1, 2026. Supporters of the Offshore Wind Act argue that, if passed, the Act would continue to incentivize offshore wind projects, which would, in turn, create jobs and address climate-control concerns. Moreover, they argue the expiration of the ITC will make offshore wind projects more expensive to develop and ultimately more expensive for energy consumers.

Passage of the Act is far from certain, however. It is clear that the Act will not pass as a freestanding bill; it will have to be included in a larger tax bill or, perhaps, a comprehensive budget and tax (omnibus) bill. In addition, with the 2020 presidential election approaching, passage of any major legislation before 2021 is politically problematic. Finally, the Act has drawn significant opposition, particularly from Sen. Charles Grassley, the chairman of the Senate Finance Committee. Grassley, who helped pass the original PTC more than 25 years ago, has indicated that he is prepared to allow the renewable energy tax credits to phase out as scheduled [1]. In 2015, Grassley advocated for an extension of the credits, pledging that the extension would be the last one.

California developers will no doubt keep a close eye on the potential extension of the tax credits for offshore wind, but they will be wise to take a conservative approach and prepare for a future without such tax credits.

ENVIRONMENTAL REGULATION AND PERMITTING

California offshore wind projects will need regulatory approvals from a number of federal and state agencies charged



The geographic makeup of California's coast will necessitate the need for floating platforms for turbines. (Courtesy: Stoel Rives LLP)

with managing and protecting submerged lands and coastal resources, endangered and threatened species, marine mammals, cultural resources, water quality, and existing economically beneficial ocean uses such as crabbing, fishing, shipping, and recreation. To say the permitting process can have significant impacts on projects' plans, development, and timing is an understatement. Developers will need to take a strategic approach to federal, state, and local permitting by understanding the approval process and requirements, knowing the most recent science on potential project impacts, and engaging resource agencies early regarding those impacts and potential mitigation measures. Patience is also advised.

FEDERAL APPROVALS

For successful offshore wind development, it will be important to work closely with a number of federal agencies.

The Bureau of Ocean Energy Management (BOEM) has jurisdiction over renewable projects located on the Outer Continental Shelf (OCS), the area three nautical miles from California's coast. BOEM is responsible for granting leases, easements, and rights-of-way for renewable energy development activities, including the siting and construction of offshore wind projects on the OCS. BOEM's competitive leasing program begins with the agency issuing a Request for Interest and involves multiple phases of public notice, development of site information, collection of information from potential developers, delineation of an appropriate lease area, analysis of potential environmental impacts under the National Environmental Policy Act (NEPA), and the holding of a lease sale auction. The winner of the lease submits a site assessment plan (SAP) for BOEM's approval to

allow for resource assessment and technology testing, and then a construction and operations plan (COP) describing proposed offshore wind facilities and construction and operation plans.

BOEM's process for approving a COP involves multiple environmental and resource reviews. BOEM will review the site-specific plans under NEPA, which will include an opportunity for public review and comment. Depending on the potential for significant environmental impacts, BOEM may prepare an environmental assessment (EA) and a finding of no significant impact (FONSI), or it may proceed with the preparation of an environmental impact statement (EIS), a considerably longer and more detailed process.

BOEM must also consider the potential impact of its approvals on historic properties under the National Historic Preservation Act (NHPA) section 106 process. Through this process, BOEM or the developer, as BOEM's representative, will consult with the state or tribal historic preservation officer and interested tribes to determine whether the project will affect any properties that are listed, or are eligible for listing, in the National Register of Historic Places. This process may result in an agreement on measures that the developer must take to avoid, minimize, or mitigate for any adverse effects. In most circumstances, BOEM will also conduct a "government-to-government" consultation with tribes.

Finally, BOEM will consult with the National Marine Fisheries Service (NMFS) and United States Fish and Wildlife Service (USFWS) under the Endangered Species Act (ESA) to confirm that construction and operation of the offshore wind project is not likely to jeopardize listed species or destroy or adversely modify their critical habitat. The developer may also be required to apply for and obtain an authorization under the Marine Mammal Protection Act (MMPA) if the project is expected to harm whales, sea lions, or other marine mammals. This may be the case if, for example, NMFS believes the noise from the project may cause whales to move away from the project area. These ESA and MMPA consultation processes may take one year or more to complete, and may result in conditions being placed on the project to minimize any potential impacts to protected species.

Other federal agency approvals will also likely be required, depending on the project. For example, a United States Army Corps of Engineers approval under section 404 of the Clean Water Act will be required for any dredge or fill operations, including trenching for offshore cables or wetland fill that may be associated with onshore facilities. A United States Coast Guard Private Aid to Navigation Permit also will be necessary to ensure compliance with private and uniform aid marking requirements and to ensure waterway safety.

Additional federal approvals may be required if the project requires a right-of-way across a federal park, highway, or other federal lands. Federal agencies can generally rely on the environmental reviews conducted by the lead agency,

here BOEM, under NEPA, ESA, NHPA and the Coastal Zone Management Act, and would not be required to conduct separate reviews.

STATE APPROVALS

A number of California agencies can be expected to play a role in offshore wind development along the state's 840-mile coast.

Under the California Coastal Act (Coastal Act), the Coastal Commission has jurisdiction over the "environmental and human-based resources of the California coast and ocean ... for use by current and future generations." [2]

The Coastal Commission regulates the development within the coastal zone (defined as offshore to the state's jurisdictional boundaries and variable distances inland — sometimes as much as five miles) and affected local coastal communities. As with other offshore energy development industries, offshore wind is subject to the Coastal Commission's authority to determine consistency with the Coastal Act.

The State Lands Commission is responsible for development and other operations over submerged public trust lands in the state. Typically, Commission jurisdiction is accountable for in-water projects such as docks, marinas, and ports, but approvals will also be required for onshore cables from offshore wind turbines that breach the shoreline. These facilities are subject to discretionary permitting in the form of fixed-term leases issued by the Coastal Commission and may be heavily conditioned to protect public access, including coastal access, and the natural environment.

The California Department of Fish & Wildlife administers the California Endangered Species Act (CESA) and will be called upon to determine whether any part of an offshore wind project affects threatened or endangered species or their habitat. Proponents are wise to understand the intricacies of CESA, including how it both complements and differs from the federal ESA, and whether incidental-take permits are required for state-listed species.

Finally, local agencies may have a hand in offshore development either through focused planning tools, such as Local Coastal Programs, or other onshore local permitting and approval processes. The extensive California coastline includes 76 cities and counties, each with its own regulatory scheme for review and permitting of onshore components. Careful scrutiny of the applicable local government's codes and legislative enactments warrant close scrutiny as part of a project's due diligence effort.

Discretionary actions by public agencies in California that may have a significant physical effect on the environment are subject to the California Environmental Quality Act (CEQA). This can be in addition to the review described above under NEPA, though there are often opportunities for parallel and sometimes complementary processes. Wind developers must consider the substantial time and cost implications routinely associated with CEQA compliance. CEQA mandates public notice and participation and, when

relevant, the mitigation or avoidance of potentially significant impacts. With the exception of the Coastal Commission, which is subject to an equivalent CEQA process known as a Certified Regulatory Program, each of the agencies identified must fully comply with CEQA before approving a project.

THE WAY FORWARD

California almost certainly will be the next hot spot for offshore wind development. As project sponsors move into California, they will need to carefully consider the financing, regulatory, and permitting issues that arise — some of which will be familiar and others that will be unique to the waters of the Pacific Coast. ↵

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OFFSHORE WIND IS READY FOR ITS AMERICAN MOMENT

Companies that support the U.S. offshore oil and gas sector in the Gulf of Mexico helped build and install the nation's first offshore wind project, Block Island Wind Farm. (Courtesy: Ørsted)



With the inherent synergies between offshore wind and offshore oil and gas with respect to jobs, manufacturing, and expertise, the offshore oil and gas supply chain stands to benefit in a big way from the coming U.S. offshore wind boom.

By NICOLETTE NYE

Offshore wind has arrived in the U.S., and it is poised to take flight off the East Coast. The Bureau of Ocean Energy Management (BOEM) has issued 15 active offshore wind leases which cover 1.7 million acres in the Atlantic outer continental shelf (OCS) and have generated more than \$473 million to the U.S. Treasury. BOEM's latest sale, held in December of 2018, fetched an eye-popping \$405 million for three wind leases offshore Massachusetts.

Today, offshore wind projects totaling 3,110 MW of capacity are contracted to provide electricity in Rhode Island, Massachusetts, Connecticut, New York, New Jersey, Maryland, and Virginia. Additional offshore wind-power contracts are expected to be signed this year in New York and Maine, bringing to eight the total number of states to which offshore wind power will soon be providing electricity. With more projects in the pipeline, the future of offshore wind in the U.S. appears bright.

With the inherent synergies between offshore wind and offshore oil and gas, with respect to jobs, manufacturing, and expertise, the offshore oil and gas supply chain stands to benefit in a big way from the coming U.S. offshore wind boom. In fact, it is already playing a role.

Companies that support the U.S. offshore oil and gas sector in the Gulf of Mexico helped build and install the nation's first offshore wind project, Block Island Wind Farm (BIWF), which has been operating offshore Rhode Island since 2016. Louisiana-based Gulf Island Fabrication, Inc. constructed the jacket foundations supporting BIWF's five turbines. Lift boat operator Falcon Global (formerly Montco Offshore), also based in Louisiana, provided feeder vessels and crews to install BIWF.

\$70B CAPEX REVENUE

In a recent white paper, the University of Delaware's Special Initiative on Offshore Wind (SIOW) estimates that America's growing offshore wind-power industry — projected to generate 18.6 GW of clean, cost-effective power in seven states on the Atlantic Seaboard by 2030 — presents a nearly \$70 billion CAPEX revenue opportunity to businesses in the offshore energy supply chain. The report identifies significant opportunities for companies that will build, supply, and support the U.S. offshore wind sector, including the need to procure, fabricate, and install 1,700 wind-turbine generators, 1,750 subsea foundations, 45 offshore substations, 16 onshore substations, and approximately 5,000 miles of cable. This is a tremendous opportunity for countless companies that historically have been tied to the ups-and-downs of oil prices. The chance to diversify their portfolios and strengthen their long-term outlook is an unprecedented opportunity.

While this capital investment alone is massive, the operations and maintenance needs also will be substantial,



The stage is set for offshore wind to boom off the Atlantic coast, and with BOEM working to also start the process in the Pacific, developers and companies in the offshore energy supply chain need to get ready to build. (Courtesy: Ørsted)

driving their own supply chain demands and opportunities. A companion report that looks at operational expenditures is expected in the coming months. Just as the capital expenditure side of the equation will equal billions of dollars spent, the operational side is expected to inject billions of dollars of spending in the coming years as well. American-built, American-operated, and American-produced energy is something every policymaker should stand behind.

The stage is set for offshore wind to boom off the Atlantic coast, and with BOEM working to also start the process in the Pacific, developers and companies in the offshore energy supply chain need to get ready to build. To that end, the National Ocean Industries Association (NOIA) and the Offshore Marine Service Association (OMSA) are jointly hosting an offshore wind summit in New Orleans September 19 to further the industry's understanding of the emerging U.S. offshore wind market and the opportunities it presents. Details of the NOIA-OMSA Offshore Wind Summit: Advancing U.S. Vessel Opportunities in the Emerging Offshore Wind Sector are available at www.offshoremarine.org.

American offshore wind energy is ready to soar, and American companies can lead the way. ↴

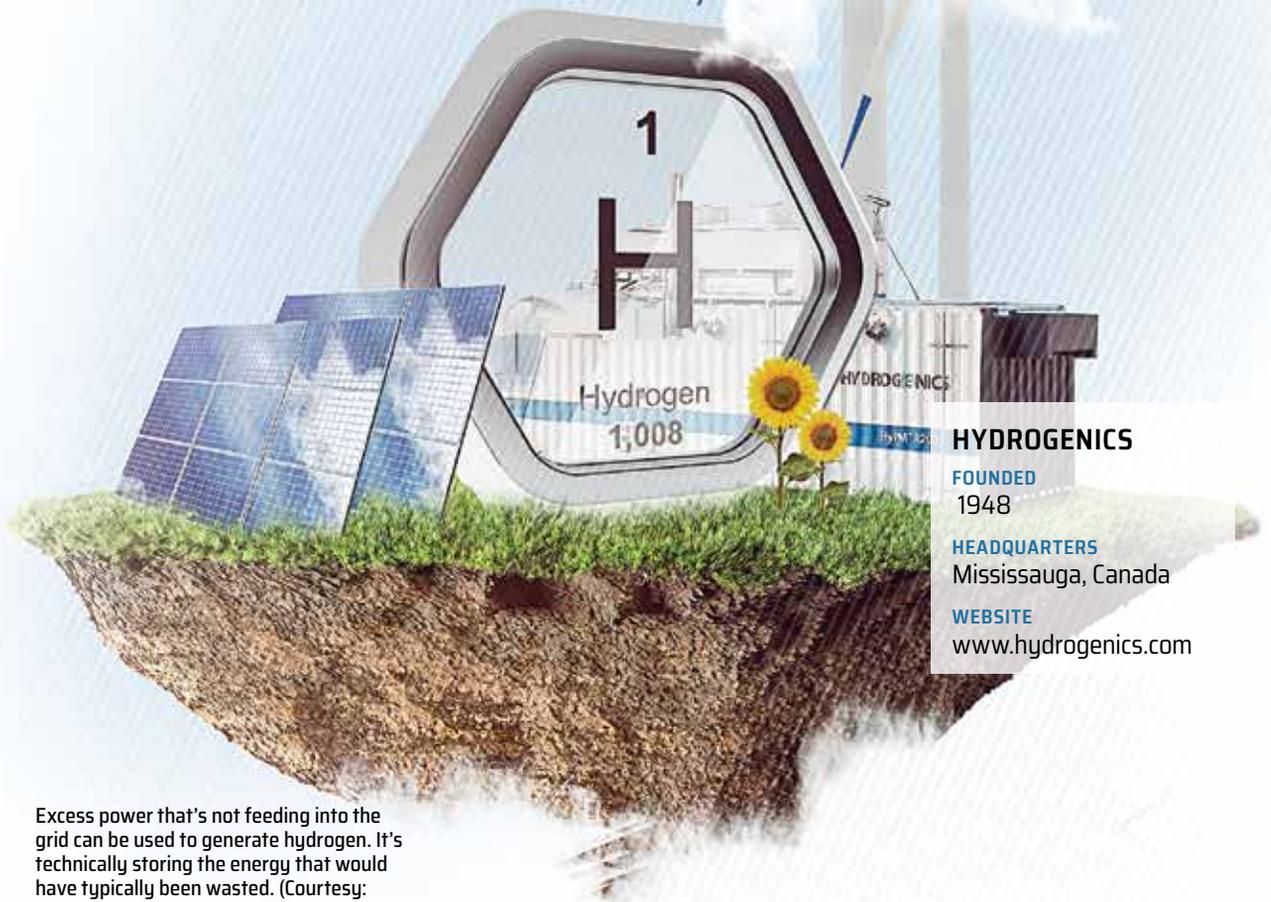
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PROFILE

HYDROGENICS

TRANSFORMING WIND INTO HYDROGEN



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Excess power that's not feeding into the grid can be used to generate hydrogen. It's technically storing the energy that would have typically been wasted. (Courtesy: Hydrogenics)

Hydrogenics, a leading producer of water electrolyzers and hydrogen fuel cells, has taken its innovative technology to the next level — allowing wind farms to channel their renewable energy into hydrogen-based alternatives.

By **KENNETH CARTER** ▶ Wind Systems editor

As the name implies, wind energy only produces power when the wind is blowing; however, a wind farm is often generating energy even when demands are low. The result is, essentially, wasted electricity.

But what if that wind energy could be stored for future use?

That's part of the working model behind Hydrogenics. The company makes water electrolyzers. These devices use electricity to split water into hydrogen and oxygen and can be operated in a dynamic way, using renewable power such as wind. The basic principle is that wind farms can create hydrogen from their energy production, allowing the energy to be stored and put to use in fuel cells or used in combination with natural gas for other types of energy needs, according to Angus Brown, marketing manager of Energy Infrastructure with Hydrogenics.

"If you use the excess power that's not feeding into the grid, you can switch over to generating hydrogen; it's technically storing the energy that would have typically been wasted, which is generally the biggest criticism you hear of solar or wind is that it's only good when the wind is blowing or the sun is shining," he said. "We offer a solution to get more value out of your wind and other renewable energy assets. Additionally, with renewable energy prices dropping and more and more fuel cell applications being developed, the demand for emission-free green hydrogen is on the rise, and wind farms can now utilize their assets in different ways to serve new markets. Hydrogen can actually be a catalyst for more wind energy growth as water electrolyzers offer the means to balance variable wind energy and supply hydrogen to refueling stations or for industrial needs."

EXPANDING EXPERTISE

When Hydrogenics began more than 70 years ago as the Electrolyser Corporation, it was creating hydrogen with water electrolyzers primarily for industrial use. Later, in the '90s as Hydrogenics, the company expanded into hydrogen fuel cell production. Hydrogen fuel cells use hydrogen in combination with oxygen from the air to generate power and pure water as a byproduct without any harmful emission released in the atmosphere, making it a very attractive "zero-emission" solution for power generation in electric vehicles and stationary power generation.

"It was a strategic decision on our part to ensure that we understood both sides of the hydrogen equation," Brown said.

Eventually, that company expansion focused on it complementing renewable energy. "Over the last 10 years, we've really turned toward looking at renewable hydrogen," Brown said. "Wind is obviously one of the cleanest, cheapest, and most accessible power sources that we can harness to generate carbon-free renewable hydrogen."

With wind and other renewables such as solar and hydro used to generate hydrogen, it's a step closer to a zero-emissions economy, according to Brown. Several regions of the world, such as Germany, Japan, California, China, and Australia, already are at the forefront of this movement.

"Wind and solar are still always going to be essential pieces of a healthy energy mix," Brown said. "Hydrogen and wind complement one another. You can actually use hydrogen to harness the full value of wind."

SAFE PRODUCTION

Brown also makes a case that hydrogen, despite its volatile nature, is quite safe, historically speaking.

"It's actually a fairly safe commodity in terms of its long track record," he said. "And there are numerous safety precautions that are put into place."

Much like the industrial gas sector, there are monitoring systems, as well as preventive maintenance safeguards that carefully look for inconsistencies that could result in a problem, Brown said. For Hydrogenics, safety has always been at the core of the design and operation of its products.

DECADES OF EXPERIENCE

Since Hydrogenics has been an established supplier of hydrogen for so long, its experience and customer relationships have played strongly into how it generates new business, according to Brown. And sometimes that success becomes evident when bigger companies notice. Air Liquide entered into a \$20.5 million (U.S.) Private Placement with Hydrogenics earlier this year, and Fortune 500-ranked Cummins Inc. is actively trying to acquire Hydrogenics.

"When people talk about the top three fuel cell or hydrogen generation companies, generally we'll always float to the top," he said. "And a lot of it is word of mouth and project recognition. We have the largest hydrogen generation facility being built in Quebec right now, and it's going to be run on renewable hydroelectric power. When you start looking around to see where the big energy-storage products have occurred, we've been fortunate enough to be involved in most of them."

That means Hydrogenics often gets inquiries from companies new to the hydrogen game and who are wanting to get involved, perhaps for the first time, according to Brown. Getting started can involve a lot of moving parts, and Hydrogenics has gotten quite proficient at understanding and navigating them.

WAYS HYDROGEN CAN HELP

Location and local utilization of hydrogen is often a key factor in determining the viability of a hydrogen project. If a wind farm is in a remote location and there is not an

immediate need or use for hydrogen, it may be difficult to find an economic business case as hydrogen transport can be costly. But there are many situations where the logistics and need for fully decarbonized power and/or power storage make the business case for hydrogen very compelling.

Once hydrogen is generated, it can be used for a variety of applications requiring high-quality and low-carbon hydrogen for their processes, such as the ammonia and oil industries. It can also be used to supply hydrogen to refueling stations for Fuel Cell Electric Vehicles (FCEVs), or even to reduce overall emissions from natural gas by supplementing it with hydrogen directly into the natural gas grid for utilities.

“Sometimes it’s a combination of political will around the emission-free aspects as well as the regional need for the hydrogen, and sometimes it’s just a matter of capturing and storing wind, solar, or hydro capacity in a way that be commoditized,” Brown said. “That’s what you’re seeing between Japan, New Zealand, and Australia — who are developing hydrogen as an international commodity, as well as utilizing it locally to decarbonize their power and transportation sectors. With the declining costs of renewable energy and declining costs of electrolyzer technology to produce hydrogen, prices are already competitive with and will soon be lower than producing hydrogen from traditional methods such as reforming fossil fuels, which generates significant quantities of CO₂ in the atmosphere.”

Hydrogenics has been successful in implementing similar hydrogen production through wind energy in several places around the globe, according to Brown.

For example:

► In Thailand, the EGAT Lam Takhong Wind Hydrogen Project used curtailed energy from a 24-MW wind farm to generate hydrogen, which was used to power the facility using 300 kW fuel cells.

► At a German wind farm, excess energy is used to create hydrogen that is fed into the local gas pipeline and used in a hydrogen refueling station for cars and buses, helping to reduce the region’s carbon footprint.

► And in Belgium, the extra power from a wind farm is used to produce hydrogen, which is then used in fuel-cell powered forklifts.

REDUCING CARBON EMISSIONS

The word is spreading about what Hydrogenics can do to reduce carbon emissions by using wind and other renewable energy in ways that go beyond the status quo, but also seem to make a lot of common sense as well.

“What we’ve seen over the last few years is a pickup in the fuel-cell business for transportation, and that’s having a trickle-down effect on demand for generation,” Brown said.

And the need to diversify a wind farm’s workload becomes even more compelling as energy contracts near their end, according to Brown. Once those contracts end, a wind farm can become a stranded asset.

“Once your supply contract expires, you’ve got to renew



Wind-generated hydrogen can also be used to supply hydrogen to refueling stations for Fuel Cell Electric Vehicles (FCEVs). (Courtesy: Hydrogenics)

it. If you could renew it at a decent price, great, you can still contribute toward the grid, but if you can’t or if it’s only an intermittent supply, then how do you fully utilize your wind assets?” he said. “Generation of hydrogen is a great opportunity. Like with all renewables, for them not to be utilized at every opportunity when the sun is shining or the wind is blowing is a shame. Additionally, by combining wind and hydrogen generation, renewable hydrogen costs can be secured over a long period of time and act as a hedging mechanism for large industries against hydrogen produced from natural gas — an important consideration in a global economy that is increasingly putting value into reducing CO₂ emissions.”

COMPACT AND ECONOMICAL

Hydrogenics’ electrolyzer technology has a small footprint, according to Brown, and it can be scaled dramatically.

“It can be placed almost anywhere,” he said. “Whether or not you just have excess power to utilize or you want your entire wind farm to generate nothing but hydrogen, the electrolyzers can be modularized and scaled to fit a variety of power ranges.”

And as the technology becomes more commonplace, the costs inevitably fall, making it an even more viable option in the future, according to Brown.

“The cost of the electrolyzers, as well as the cost of fuel cells, have fallen dramatically over the last 10 years,” he said. “Where the technology was once seen as a little bit of a novelty, it’s now market proven and becoming more and more economically feasible. Plus, if you account for the emission restrictions and carbon taxes being applied all around the world, the economic case has never been better for hydrogen.”

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decarbonizing traditional power markets. We're succeeding because of people like Cliff. While our leadership comes from our technology, our success is the result of one essential ingredient – the human one. Our experts, our engineers, our researchers and our day-to-day people are focused on advancing hydrogen technology for a better, earth-friendly energy source. Learn how the human factor is changing the world at [Hydrogenics.com](https://hydrogenics.com)

HYDROGENICS

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



Laura Smith Morton

Senior Director, Policy and Regulatory Affairs, Offshore Wind ▸ American Wind Energy Association (AWEA)

“The U.S. has a vast offshore wind resource with the technical potential of more than 2,000 gigawatts.”

▸ What is your role with AWEA, and how did your background help you prepare for it?

I lead the American Wind Energy Association’s offshore wind policy and regulatory portfolio. That means a lot of time spent advocating before federal agencies regarding policies, regulations, and general approaches for offshore wind. I also work on the Hill in coordination with AWEA’s Federal Affairs team. All of my work is guided by the priorities of AWEA’s business membership – offshore wind developers and lease holders, the supply chain, and turbine manufacturers. The offshore wind supply chain includes a very diverse group of companies that, for instance, build foundations, construction and service vessels, and much more. We balance a broad range of priorities and perspectives, but at the end of the day we’re all rowing together toward our goal to build a U.S. offshore wind industry at scale.

Personally, it’s immensely gratifying to be back working on offshore wind issues at this critical moment for the industry. I just began work for AWEA earlier this summer, but in total I’ve worked on offshore wind issues for more than 10 years. That includes time spent as a regulatory attorney and in senior roles at the Department of Energy, Council on Environmental Quality, and the National Oceanic and Atmospheric Administration. I also led DOE’s collaboration with the Department of the Interior to produce the original National Offshore Wind Strategy, which charted a course to build the U.S. offshore wind industry. Having led interagency teams charged with creating efficiencies in the permitting process for clean-energy projects, I know how important it is for the future of offshore wind investments to make sure the regulatory process works for our members AND other ocean users.

▸ Why is offshore wind important to the U.S.? Doesn’t the country still have plenty of untapped land for onshore farms?

There’s no doubt that land-based wind will continue to grow and play a large role in many parts of the country. But as

you know, nearly 80 percent of U.S. electricity demand is in coastal states. Offshore wind is close to those population centers and has the technical potential of producing more than 2,000 GW of wind.

We also have huge amount of momentum now with offshore wind. Companies have invested more than \$470 million just for the opportunity to develop projects and are investing millions in local economies, ports, coastal infrastructure, and the workforce.

We also have the potential to grow tens of thousands of U.S. jobs as we build these projects. In fact, a recent study estimates that the first 8 GW are expected to create 36,000 jobs within the next 10 years. There are 74 different occupations required to build a wind farm – from electricians and welders to iron workers, pile drivers, engineers, vessel operators, and scientists.

The U.S. also has a lot of businesses with expertise in offshore infrastructure, including oil and gas supply chain businesses, that are looking for opportunities in offshore wind. We’ve already seen this with the Block Island project. The foundations for the project were built by U.S. craftsmen trained in oil and gas fabrication and a Louisiana liftboat operator used its experienced crews and vessels as feeder vessels for the project.

▸ You recently toured the Block Island facility. What did you take away from that visit?

It was great to see America’s first offshore wind farm in person. Seeing the turbines spinning and delivering clean electricity to consumers shows that offshore wind power is real and possible for the U.S. A 6-MW offshore wind turbine like the ones at Block Island can power approximately 2,300 homes, and manufacturers are working on even more powerful models above 10 MW.

We also saw the U.S. jobs that can be created from wind-farm operations. As we passed by the turbines, we saw a worker suspended from a turbine blade performing a regular maintenance inspection and a specialized offshore wind support vessel designed to safely transfer crew on and off

the wind turbines. The vessel is owned and operated by Rhode Island-based Atlantic Wind Transfers, the first U.S. offshore wind-farm support company,

Tourism is also up for Block Island. As we returned to the terminal, folks were waiting in line to take the ferry. Overall, the project stands as proof that U.S. offshore wind farms can and will be successful.

➤ **East Coast wind is obviously a priority right now, but is there anything being done to get steel in the water on the West Coast?**

You bet. BOEM has already put out call areas in California. They've announced in their path forward that they anticipate finalizing those by the end of the year and that they're planning to hold an auction next year in 2020. There are more than a dozen developers that have expressed their interest in development to BOEM. Investments are also being made to develop innovative floating wind technology given the depth of the waters off the West Coast.

➤ **Can you explain what the recent news about Vineyard Wind* means for the future of offshore wind in the U.S.?**

There's no doubt that that we are concerned about the delay, particularly because it was inconsistent to the Administration's commitment to regulatory certainty and efficient processing of these large energy infrastructure projects.

The industry is committed to working with other ocean users to develop our projects safely and responsibly and understands the need to perform thoughtful impact assessments.

That being said, all capital-intensive energy industries need regulatory stability and certainly. A nascent industry like offshore wind needs a predictable pathway to ensure that investments are made here in the U.S. to realize the potential for a stronger maritime economy.

Supply chain businesses are certainly watching the regulatory process closely as they prepare to make decisions about new factories, port infrastructure, installation and service vessels and other capital investments.

We are confident that BOEM is going to complete its supplemental review by the end of this year or early next and will continue processing other projects and lease sales in the pipeline. The potential for offshore wind job creation and infrastructure investment can't be ignored.

➤ **What can the U.S. learn from established offshore wind farms in Europe?**

The answer—just to put it briefly—is a lot. There are decades of experience developing these projects and over 18 GW installed. While there is no doubt that this is a new industry in the U.S., and that there certainly are some differences, the U.S. can learn from the long-standing European experience on a number of areas including vessel navigation and safety, distances between turbines, potential environmental impacts to wildlife, compatibility with commercial fishing and other ocean uses, and O&M practices.

➤ **Where do you see the U.S. offshore wind in the next 10 to 20 years?**



A 6-MW offshore wind turbine like the ones at Block Island can power approximately 2,300 homes, and manufacturers are working on even more powerful models above 10 MW.

We'll certainly see the first phase of large-scale offshore wind deployment in the Northeast and mid-Atlantic. We have developers planning to put steel in the water between 2020 and 2024. That's obviously quite near-term. Recent industry forecasts estimate that between 11 and 16 GW could be in development and come online before 2030.

With BOEM setting a path forward to auction leased areas off the West Coast, we're looking for more development out west and more investments in floating wind. States remain a major driver for offshore wind deployment. With state targets in place for nearly 22 GW of offshore wind by 2035, there's a strong signal to businesses making investments in the future of offshore wind.

And again, we can't forget that that a recent report has projected offshore wind could spur over \$70 billion in new capital investment, as well as tens of thousands of American jobs by 2030.

Bottom line, this industry will achieve scale in the U.S.; Federal leases have been issued, and hundreds of millions paid to the U.S. Treasury. We have high state procurements, significant investments being made in ports, coastal infrastructure, and communities, developing supply chains, and a growing workforce. ↙

MORE INFO www.awea.org

*The Interior Department recently ordered an additional study for Vineyard Wind's proposed offshore wind farm, potentially leading to delays.



A Bat Deterrent Unit installed on a wind turbine at Red Horse 2. (Courtesy: NRG Systems)

INNOVATION

NRG provides bat deterrent solution to Arizona wind farm

NRG Systems, Inc. recently announced that Red Horse 2 in Cochise County, Arizona, has installed Bat Deterrent Systems on its 15 turbines. Located 80 miles east of Tucson, Arizona, Red Horse 2 is one of the first combined wind and solar projects in the United States.

Red Horse 2 is owned and operated by D. E. Shaw Renewable Investments (DESRI), the first commercial adopters of NRG's Bat Deterrent System. DESRI previously installed

Bat Deterrent Systems on all 30 turbines at its Kawaioloa Wind facility in Hawaii.

"After a smooth procurement and installation process at Kawaioloa Wind, we are excited to be deepening our commitment to wildlife conservation, as well as our collaboration with NRG Systems, by implementing this pioneering technology at Red Horse 2," said Bryan Martin, chief executive officer for DESRI.

"Our goal has always been to minimize the impact of renewable energy production on surrounding habitats," said Brita Woeck, environmental compliance officer for Red Horse 2. "By installing NRG's Bat Deterrent Systems at Red Horse 2, we are hopeful that we can further reduce bat take

at the farm."

"DESRI has been a strong ally for us, and we are eager to help them protect bats," said Brogan Morton, senior product manager at NRG Systems. "It is exciting to see our vision of how the wind industry can play a part in bat conservation coming to life."

Energy generated at Red Horse 2 is purchased by Tucson Electric Power and is playing a key role in helping the utility achieve its goal of getting 30 percent of its electricity from renewables by 2030.

A growing number of wind farms are seeking solutions to bat fatalities that NRG's pioneering bat deterrent technology can address.

MORE INFO nrgsystems.com

INNOVATION

LUTZE expands its cable entry system offering

LUTZE Inc. recently introduced the new Cablefix® X cable entry system to complement its existing cable and cable management portfolio. Featuring multi-layered X-seal technology, Cablefix® X is designed to simplify installation without compromising ingress protection.

The X membrane seals are closed by default, eliminating the need to plug unused entry points. These innovative cable entry systems achieve Type 4X, 12, and 13 with a protection class of IP65.

Cablefix® X is available with 12 or 23 entry points and provides a great space saving alternative to traditional cable glands. Cablefix® X requires only one enclosure cut out and can be installed onto enclosures of any wall thickness with four mounting bolts. For enclosures with a wall thickness of 1.5mm, Cablefix® X is available with a snap-in mounting option.

Cablefix® X innovative features include:

- Cables install easily by pushing the end through the seal from the front.
- Saves up to 50 percent installation space and 80 percent installation time vs. using individual cable glands.
- Standard 112mm x 36mm cutout makes cabinet preparation easy.
- Compatible with all major control cabinets and electrical enclosures.

LUTZE Inc. designs and manufactures control products for factory automation and specializes in flexible industrial control and power cables such as LUTZE Silflex®, LUTZE Superflex®, and DRIVEFLEX® VFD cables.

The company also offers grounding and wire management products, compact power supplies, LOCC-Box-intelligent DC circuit protection device, LSC-wiring systems

for control cabinets, and relays for industrial applications.

MORE INFO www.lutze.com

CONSTRUCTION

Transport experience enables time-saving move for wind farm

Mauritania's lengthy shoreline has considerable wind-power potential and so the country is looking to increase its ratio of renewable energy. This has led to the commissioning of the 122 million euro Boulenour Wind Power Project.

ALE mobilized its specialist transport services to complete the transportation and installation of two electrical transformers, saving time and

costs for a 100-MW wind-farm project near Nouadhibou, Mauritania. Its experience in transportation across a range of sectors enabled it to eliminate a third from the operation's schedule, which also saved costs.

The abnormal load transport of the electrical transformers, weighing 95 metric tons each, crossed more than 100 kilometers. The route began at the Port of Nouadhibou and finished at a transformation center.

Once on site, the transformers were unloaded using heavy-duty lifting equipment and discharged directly onto rails embedded in concrete. This enabled the transformers to be rolled on their own wheels to their final position.

ALE was able to mobilize a team at short notice for the operation. For the specialist transport and installation, ALE used 6 axle lines of conventional trailer with a 250 metric ton capacity

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tractor, then 90 metric ton capacity hydraulic jacks for the unloading.

MORE INFO www.ale-heavylift.com

CONSTRUCTION

Collett delivers final components to Clocaenog Wind Farm

Since the first deliveries in January, for the past six months Collett & Sons Ltd has been traveling the 70-mile route from Ellesmere Port to Clocaenog Forest Wind Farm, steadily delivering the turbine components to the North Wales site.

Collett has made the final journey from the port to the development site, delivering the final tower sections to complete the project.

Through the snow of January, the storms of February, and the record-breaking heat of July, Collett methodically delivered each of the 270 components. With a total of 121 abnormal load convoys and 15 self-escorted convoys, Collett covered a staggering 16,929 miles with a total of 12,420 metric tons.

Construction is now underway of the 27 V105 Vestas turbines, which will form Innogy Renewable UK's North Wales site. Once operational, Clocaenog Forest will have an installed capacity of 96 MW and will generate enough renewable energy for the equivalent domestic needs of up to 63,800 average households per year.

MORE INFO www.collett.co.uk

MAINTENANCE

Snap-on's new torque wrench can achieve faster speeds

The new SpinTORQ 360 Continuous Rotation Torque Wrench from Snap-on Industrial is a continuously spin-



The SpinTORQ 360 is built for heavy duty bolting, heavy equipment maintenance, and more. (Courtesy: Snap-on Industrial)

ning, low profile torque wrench and is 80 percent faster than ratcheting hydraulic wrenches.

The pneumatic-powered SpinTORQ 360 can access tight spaces, thanks to its low-profile head that continuously rotates 360 degrees to provide maximum torque in both forward and reverse directions. With continuous rotation, the SpinTORQ 360 locks into position when energized and is securely in place until the tool stalls — increasing safety compared to ratcheting wrenches, which may fall off the nut when the cylinder retracts.

The SpinTORQ 360's highly efficient epicyclic gearbox and double-enveloping worm gear design provides reliable, repeatable performance, and its automatic two-speed operation allows for fast rundown speeds, as well as precise final torque speeds.

The SpinTORQ 360 is engineered and built for heavy duty bolting, heavy equipment maintenance, and it is designed to standard ANSI and API piping flange dimensions, so the tool rests against adjacent nuts during use. An assortment of stack sockets and inserts are available to cover a wide range of hex sizes.

Features and benefits of the new SpinTORQ 360 include:

- ▀ Accuracy of applied torque: ± 5 percent; torque range between 200 and 8,000-foot pounds.

- ▀ Wrench head indexes independently from the tool's gearbox, allowing the handle to be ergonomically positioned during operation.

- ▀ Secondary safety trigger requires the operator's hands to be

placed safely away from pinch points during operation.

- ▀ Three motor sizes; 10 wrenches sizes.

- ▀ Manual or robotic control.

- ▀ Durable powder coating ideal for demanding work environments.

- ▀ Hydraulic models available.

- ▀ A filter/regulator/lubricator (part number PTMFRL) is required to operate the SpinTORQ 360.

MORE INFO www.snapon.com/industrial

MAINTENANCE

Chartwell confirms second Seacat Services CTV order

Class-leading offshore energy support vessel (OESV) operator, Seacat Services, has taken up its option to build a second multi-million-pound Chartwell 24 catamaran for the offshore wind sector. Seacat Rainbow, designed by Chartwell Marine, a pioneer in next generation vessel design, will enter construction immediately at Isle of Wight shipyard Diverse Marine.

Recent multi-vessel contract wins and charter extensions from valued long-term customers have led to high levels of forward utilization for the Seacat Services fleet, creating a strong commercial case for further expansion. Seacat Rainbow will join sister Chartwell 24 vessel Seacat Weatherly, which is currently being built at Diverse Marine, on track for delivery and due to be completed in April 2020.

With the next generation of OESVs now progressing from the drawing board into build, vessel operators are making decisions that will determine the future make-up of offshore wind fleets in Europe, the U.S., and Asia. Seacat Services' second order of the Chartwell 24 demonstrates utmost confidence from the OESV operator that the Chartwell Marine design is best-placed to meet the logistical demands of project construction and operation.

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

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“The offshore wind sector is at a pivotal point, where lessons learned from development and operation to date must quickly be applied to achieve true global scale,” said Andy Page, managing director, Chartwell Marine. “Seacat Services continues to demonstrate that it is not willing to compromise on the attributes that make a safe, reliable, and efficient offshore energy support vessel.”

“Chartwell Marine’s pioneering approach, backed up by strong technical R&D expertise and extensive dialogue with operators and wind-farm stakeholders, gives us enormous confidence in the design,” said Ian Baylis, managing director of Seacat Services. “The investment case for this second vessel was clear cut, and we look forward to bringing both Rainbow and Weatherly into the fleet to show how this translates into the highest levels of performance and service for our customers.”

Seacat Rainbow will be identical in specification to Seacat Weatherly, showing Seacat Services’ belief in the design and ingredients which make up the Chartwell 24. These include a number of market-first innovations to optimize the safety of crew and cargo transfers, and maximize the performance and technical availability of the vessel – ultimately translating to more “time on turbine” for wind-farm technicians.

MORE INFO www.seacatservices.co.uk

MAINTENANCE

Altitec Academy earns GWO blade-repair certification

Altitec Academy, the rotor blade technician training program from Altitec, a leading wind-turbine blade repair and inspection specialist, has secured the blade repair certification from the Global Wind Organization (GWO) for its training centers in London and Cape Town. The certification also allows Altitec to conduct GWO training



DNV-GL hands over the GWO certification to the Altitec team. (Courtesy: Altitec)

in Australia. Altitec Academy trains upwards of 150 new rotor blade technicians a year in their training centers around the world. The new certification builds on the successful assessment of the training program by DNV GL in 2018, and long-standing industry endorsement for the Altitec Academy.

Industry-wide accreditation for blade-repair training is needed to reassure job-seekers of a future in wind energy and encourage more people to consider blade-repair roles. As a provider of training and blade-repair services, Altitec has been a strong advocate of certification for a number of years. This independent and widely recognized qualification for blade repair from the GWO, together with high-quality training and a commitment to excellence by blade servicing teams, will help to reduce the skills gap in the industry while the demand for blade repair services continues to expand.

The GWO certification has benefits for both technicians and employers. The introduction of the certification will make it easier for technicians to work across multiple sites and contractors over their careers, while for employers, it will provide reassurance that the technicians they hire have the knowledge required to safely perform their jobs.

“Our rotor-blade technicians spend

their careers learning,” said Tom Dyffort, managing director, Altitec Group. “As blade technology develops and wind farms are built in unusual locations, blade technicians have to evolve approaches to deal with new forms of wear, tear, and weathering of blades. Fundamental to this career-long learning process is a solid foundation of the processes and skills needed for blade repair. As a basis for that, we are pleased to be able to demonstrate we meet the GWO standards for blade repair in the Altitec Academy.”

MORE INFO www.altitec.co.uk

MAINTENANCE

Dropsafe: Guidelines show how to prevent offshore drops

The publication of the *Reliable Securing Booklet for Offshore Wind* by G+, the global health and safety organization for the offshore wind industry, has provided much-needed safety recommendations for wind-farm owners and operators grappling with the risks posed by dropped objects.

This is according to Dropsafe, the global leader in dropped-object prevention. Dropsafe has highlighted that these new guidelines constitute an essential first step in transferring lessons learnt from other high-risk offshore industries such as oil & gas.

Publication of the reliable securing guidelines has come off the back of 2018 safety statistics released by G+, which demonstrate a 60 percent reduction in dropped object incidents on offshore wind farms compared to 2017. This highlights an increasingly diligent response to the risks posed by dropped objects, but the industry still has a long way to go in adopting best practice prevention systems.

Dropsafe attests that the G+ reliable securing guidelines will address a longstanding gap in industry safety. They will inform sector decision makers not only of the specific dropped-ob-

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ject risks entailed in offshore-wind development and operation, but also — critically — of the prevention systems they should install.

Dropped objects — ranging from loose fixtures to dropped handheld tools and equipment — pose a threat to the safety of personnel, integrity of equipment, financial performance, and, ultimately, the reputation of offshore wind stakeholders. In Dropsafe's 2018 whitepaper, *The Neglected Hazard*, it was outlined that, for the offshore wind industry to maintain its fast growth rate, it must be able to show that offshore wind farms are safe places in which to work.

The G+ reliable securing guidelines recommend the use of dropped-object prevention technology, including barrier systems, tethering nets, and pouches, to mitigate the potential risks dropped objects pose. The guidelines are based on those originally developed by safety body DROPS and are a culmination of what has been learned over several years about dropped-object risk and prevention strategy in the offshore oil and gas industries.

MORE INFO www.dropsafe.com

► MANUFACTURING

Siemens Gamesa awarded largest U.S. offshore order to date

Siemens Gamesa has been conditionally awarded the contract to deliver offshore wind turbines totaling 880 MW for the Sunrise Wind project, which will be the company's largest offshore wind project in the U.S. Ørsted and Eversource were awarded this capacity by New York State in July. SG 8.0-167 DD offshore wind turbines will be used at the project in federal waters about 30 miles off Montauk Point in New York. A service agreement is included. The Sunrise Wind project is expected to be operational in 2024.

The 704-MW Revolution Wind off-

shore project will be 15 miles off the coast of Rhode Island. The project will use SG 8.0-167 DD wind turbines and is expected to be online by 2023. Once operational, Revolution Wind will deliver power to Rhode Island and Connecticut.

Additionally, SGRE was conditionally awarded the contract to deliver SG 8.0-167 DD offshore wind turbines for the 130 MW South Fork offshore wind-power project. Located 35 miles off Long Island, New York, it is expected to be operational by the end of 2022 and will deliver power to the Long Island Power Authority.

► Siemens Gamesa has long been the global market leader in offshore wind with 12.5 GW installed. ►

"An order of this size is a testament to the confidence which Ørsted and Eversource place in Siemens Gamesa," said Andreas Nauen, CEO of the Siemens Gamesa Offshore Business Unit. "Delivering clean energy for generations to come — now on a large-scale basis in the U.S. offshore market — is a goal we are proud to share with Ørsted and Eversource. We are committed to doing so safely and with a strong focus on reducing the levelized cost of energy from offshore wind in this rapidly developing market."

"We had already secured a U.S. construction pipeline of almost 1 GW before the end of 2018 and have been looking into further growth in the U.S. offshore wind market," said Anders Lindberg, executive vice president, EPC, at Ørsted. "We saw an opportunity to secure a bigger turbine volume early in order to gain economies of scale, and Siemens Gamesa was able to provide an attractive offering for this large volume."

"Siemens Gamesa has long been

the global market leader in offshore wind with 12.5 GW installed," said Steve Dayney, head of Offshore North America at Siemens Gamesa Renewable Energy. "This major order signals that we are well positioned to maintain this leadership role in the budding U.S. market. We have always believed in the potential of this market, and with the partnership of Ørsted and Eversource, we are excited to bring 1.7 GW of clean, reliable offshore wind electricity to American communities in the Northeast."

MORE INFO www.siemensgamesa.com

► MANUFACTURING

Vestas to build new nacelle, hub assembly factory in India

The global demand for wind energy continues to grow both in volume and the number of markets where wind energy offers a sustainable and cost-competitive solution for meeting the world's energy needs.

To address this, improve competitiveness, and expand its supply chain footprint in India, Vestas intends to establish a new nacelle and hub assembly factory in Chennai in the state of Tamil Nadu. The new factory will combine Vestas' two existing facilities in the state of Tamil Nadu, creating an expanded, optimized, and scalable production hub with four times as many local manufacturing jobs in the state.

While the new facility will serve the growing wind market in the region, it will also act as a strategic export hub leveraging Vestas' global reach. The new factory is expected to be operational by the end of 2020, where it will add to Vestas' strong current presence across India, including a sales office in Mumbai, a R&D center in Chennai, and a blade-manufacturing facility in Ahmedabad. ✎

MORE INFO www.vestas.com

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THE FUTURE OF WIND

THE FUTURE OF THE GRID



The future of the electricity grid will be a key topic at the 2019 CanWEA Wind Energy Conference and Exhibition (October 8-10) in Calgary, the largest national event of its kind. (Courtesy: CanWEA)

Canada's foremost cleantech journalist predicts a smarter, better system, with renewable energy leading the way.

By BEN FORREST

There is a global energy transition underway, and Canada has a huge opportunity to join the front ranks of this vital project," said Chris Turner, award-winning journalist and author and cleantech crusader. "We have extraordinary renewable energy resources, conventional energy resources, and a really strong tech sector — all the tools we need to become global leaders."

As a university student in the mid-1990s, Turner was already well-acquainted in the need to diversify Canada's energy system and modernize the electricity grid, in part by embracing renewable sources such as solar and wind.

He came to the topic through an interest in climate change, which he saw as the ultimate big idea — the major public policy issue of the next 50 years — and he wrote extensively about the low-carbon economy in books such as *The Leap* (2011) and *The Geography of Hope* (2008).

"What the grid does is going to be fundamentally transformed," Turner said, who is a Governor General's Award-nominee and a featured speaker at the CanWEA Spring Forum earlier this year. "It's got a lot more renewable energy on it; it's got a lot more options on it; it's got some storage on it, probably a lot more people producing at least some of their own power ... certainly a lot less big, centralized utilities."

CANWEA 2019: MAPPING THE FUTURE

As Canada's energy system continues to diversify, the grid is expected to evolve from a hub-and-spoke system to a decentralized "smart grid" with multiple energy sources, multiple entry points, and greater flexibility.

"I think the one-size-fits all approach is going to be long gone," Turner said.

He compares the future electricity grid to telecommunications after the dot-com boom. "You went from just a handful of providers who all use basically the same equipment to deliver basically the same service — to digital telecommunication today, where it's a ubiquitous and constantly evolving system," he said.

At CanWEA 2019 in Calgary, the Opening Plenary will focus on the future of the grid, setting the stage for the rest of the conference and focusing on the big picture of the clean-energy transition — where we've come from, where we're going, and how industry leaders plan to get there.

Canada's electricity system will need significantly more wind and solar energy and more energy storage in a more flexible electricity grid if it is to be affordable, reliable, and climate-friendly.

Other sessions at the conference will go in-depth about disruptive technologies and rapid innovation in wind energy; navigating political change in Alberta; and repowering, decommissioning, and reclaiming legacy wind-energy sites.

"The trajectory has been extraordinarily positive," said Turner, who has been on the renewable energy beat for more



Chris Turner and Robert Hornung, president of CanWEA, discuss Alberta's wind and the global energy transition at the 2019 Spring Forum. (Courtesy: CanWEA)



Canada's installed wind energy capacity as of December 2018. (Courtesy: CanWEA)

than a decade. "From the energy side, everything's moving faster and better than we would have guessed when I started writing about it."

CHANGE IS IN THE WIND

While political factors make it impossible to predict exactly what the grid will look like decades from now — Turner said there's no point projecting beyond two election cycles — a massive amount of progress is being made.

In keeping with global trends, wind has been the largest source of new electricity in Canada for more than a decade, accounting for about 6 percent of all electricity nationwide in 2017.

In some jurisdictions, wind contributed significantly more. In Prince Edward Island, 28 percent of electricity came from wind, while in Nova Scotia it was 12 percent.

Demand for all sources of renewable energy is increasing, and Canada has only begun to scratch the surface of what's possible when it comes to wind power.

"The Canadian potential doesn't have any obvious limits," Turner said. "The country is so big, has so much high-quality wind resources — we've barely begun to even



In keeping with global trends, wind has been the largest source of new electricity in Canada for more than a decade, accounting for about 6 percent of all electricity nationwide in 2017. (Courtesy: CanWEA)

talk about off-shore, and we have the most coastline of any country in the world.”

BUILDING A BETTER FUTURE

The electricity grid of the future will be far more diverse, decentralized, and participatory, boosted in large part by wind and other sources of renewable energy.

“You’ll still have the huge hydro dams, and probably some legacy gas and nuclear as well,” Turner said.

But smaller energy-production sites, like wind farms, will also feed into the grid at multiple sites, with advanced metering that will measure power use and restore power outages faster.

Distribution will be at least partially automated and informed by analytics that improve planning and operations.

What appears certain is that wind will continue to be an integral part of Canada’s energy diversification and the transition to a low-carbon economy.

“Wind is as an increasingly mature technology that can be deployed anywhere at multiple different kinds of scale,” Turner said. “It’s going to have a huge role to play.” ✎

MORE INFO windenergyevent.ca/event-schedule



The electricity grid of the future will be far more diverse, decentralized, and participatory, boosted in large part by wind and other sources of renewable energy. (Courtesy: CanWEA)

ABOUT THE AUTHOR

Ben Forrest is a freelance writer with 3flow communications and Hannover Fairs (Canada), the organizer of CanWEA 2019 — Canada’s largest national wind-energy conference exhibition. Hannover Fairs (Canada) is a subsidiary of Deutsche Messe — one of the world’s largest and most active event organizers.

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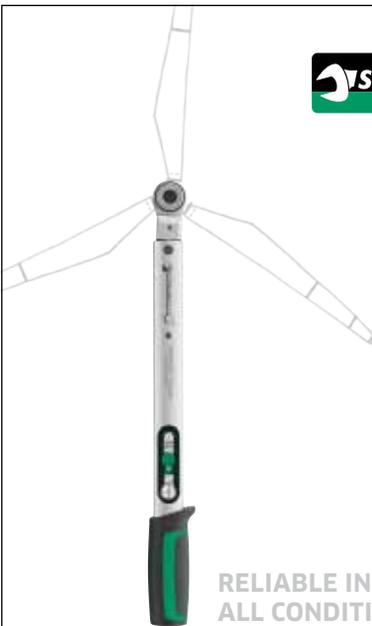
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