The rotor assembly is a "symbolic moment," said X1 Wind CEO Alex Ravenos. (Courtesy: X1 Wind)

CONSTRUCTION

X1 Wind completes rotor assembly for 'downwind' platform

X1 Wind has completed the full rotor assembly of the firm's X30 prototype. Fitted with a specially adapted V29 Vestas turbine, the unique "downwind" system is able to "weathervane" and orientate passively with the wind to maximize energy yields.

The tripod-like platform also features greater structural efficiency, with a lighter and more scalable design, while keeping environmental impact on the ocean to a minimum.

"We are thrilled to complete this latest milestone as we move toward deployment," said X1 Wind CEO Alex Raventos. "The rotor assembly represents a symbolic moment in this project, fitting the blades, which will ultimately harness the wind and demonstrate our downwind design. Strong summer trade winds in Gran Canaria brought minor delays after the initial load-out, but this exciting period brings the assembly process to fruition.

"In the coming weeks, we will engage in cable and anchor installations before the platform is stationed at a 50-meter water depth for final commissioning. From the outset, X1 Wind has been committed to find a more efficient structural approach for floating wind compared to more traditional systems. We believe we have now developed the technology to take full advantage of the marine environment, while respecting the future sustainability of the ocean. Our system will drive greater structural efficiency, reducing loads, especially the bending moments at the base of the tower, allowing for a lighter design."

Co-founder Carlos Casanovas said the industry-wide approach for land-based turbines has traditionally focused on upwind rotors to avoid the so-called "tower shadow" effect. However, upwind configurations require specific measures to prevent tower strikes, with the challenge increasing as turbine blades get longer.

"With 100-meter-plus blades becoming more prevalent in offshore environments, significant measures are needed to avoid tower strikes," he said. "This typically involves increasing the distance between the blades and tower applying a tilt and cone angle, and designing more costly pre-bent and

Pattern Canada's Grand Renewable Wind facility in Haldimand County, Ontario. (Courtesy: Pattern Energy)

stiffer blades, which also makes them heavier. However, these measures come with increased manufacturing complexity, cost, and potential loss of power generation. Using a downwind configuration reduces the risk of tower strikes, opening up the possibility of using lighter, more flexible and, therefore, cheaper large-scale wind turbine designs. These are key characteristics, which will enable the development of future 'extreme-scale' downwind structures with research already being conducted on 200m blades and 50MW power ratings." X1 Wind is a floating wind technology developer based in Spain. The firm's mission is to provide scalable solutions that deliver clean, affordable energy while reducing carbon emissions.

MORE INFO www.x1wind.com

CONSTRUCTION

Pattern Energy starts construction on Alberta wind project

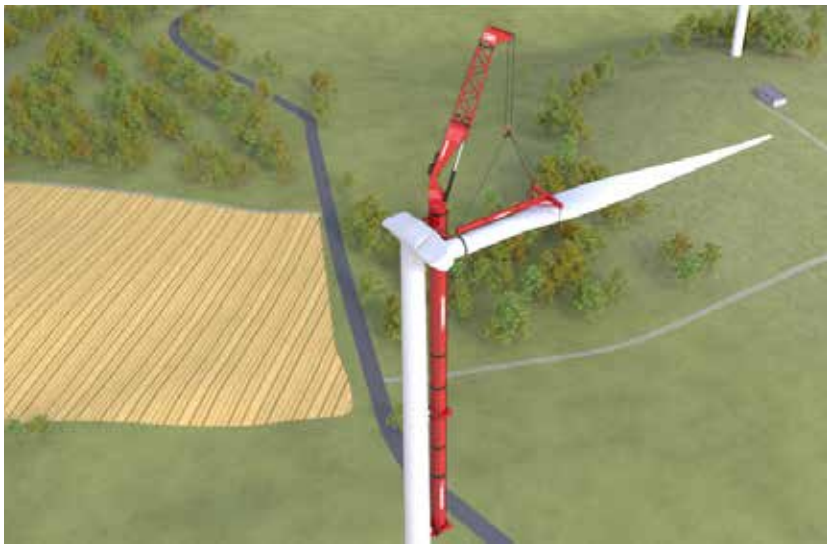
Pattern Energy recently announced it has started construction of its Lanfine Wind power project in Alberta, Canada. The 150-MW project, which will provide enough clean energy to power approximately 25,000 homes in Alberta each year, is expected to enter full commercial operation by the end of 2022.

"The Lanfine Wind project is bringing substantial economic and environmental benefits to Alberta by creating hundreds of new jobs, generating millions in revenue locally, and establishing strong community benefits," said Mike Garland, CEO of Pattern Energy.

The Lanfine Wind project will use 35 Vestas V150-4.2 MW turbines, delivered in 4.3 MW operating mode. The project will be south and west of Oyen, Alberta.

The projected investment into Alberta of about C$350 million will include up to 200 construction jobs. Lanfine Wind will also generate landowner revenue and provide tax revenue to the local community. Further, a community benefits program funded by the project will support local initiatives and community-based organizations.

Including Lanfine Wind, Pattern Canada has now brought 11 wind energy projects into construction and operation across five provinces over



With the WTA, relocation time is reduced by approximately 50 percent. (Courtesy: Mammoet)

Kim Sandgaard-Mørk, executive vice president for renewables certification at DNV. (Courtesy: DNV)

the last decade, creating thousands of Canadian jobs and millions of dollars in direct economic benefits to our local communities.

Pattern Energy is one of the world's largest privately-owned developers and operators of wind, solar, transmission, and energy-storage projects. Its operational portfolio includes 28 renewable energy facilities that use technology with an operating capacity of 4.4 GW in the United States, Canada and Japan.

MORE INFO patternenergy.com

CONSTRUCTION

Onshore wind crane takes step closer to reality

As developers chase stronger flows, onshore wind hub heights are growing beyond the reach of conventional crawler cranes. Mammoet's new WTA lifting system allows theoretically infinite hub heights and paves the way toward emissions-free turbine erection.

The WTA assembles wind-turbine generators by attaching directly to the tower itself, using a series of clamps to self-assemble and then climb to each lift location. It assembles tower sections, hubs and nacelles, and has a capacity of 150 tons.

Its innovative concept means the WTA can keep working when conventional crawler cranes can't. It operates in wind speeds up to 20m/s, reducing downtime during construction and extending the build season.

As the WTA has a significantly reduced footprint and is much smaller and lighter than any type of crawler crane, it actively lowers the need for groundwork on site. Pads can be smaller, and ground pressure requirements are lessened — maxing out at the 15 tons/square meter typically needed for assist cranes.

The system's small size means quicker and more cost-effective mobilization. While a conventional crawler crane can require up to 50 truck loads to reach site, the WTA gets there with just nine.

With no boom laydown requirement, much fewer components, and a lower total weight, the WTA is also faster from pad to pad. In fact, relocation time is reduced by about 50 percent, compared to using crawler cranes. It therefore shaves weeks off wind-farm construction schedules.

Powered entirely by electricity, it also opens the door for a 100-percent emissions-free journey from factory to first megawatt — with transport to site via electric or hydrogen-powered truck, on site maneuvers via ePPU-enhanced SPMT, and carbon-free WTA lifting.

The WTA system is now design-ready and can be ready to enter the market during the second quarter of 2023.

MORE INFO mammoet.com/onshore-wind

INNOVATION

DNV seeks partners for joint offshore wind projects

DNV is seeking partners for a new joint industry project (JIP) for floating offshore wind substations.

The plan is to improve tech development and standards.

"In DNV's latest Energy Transition Outlook Report, we predict that by 2050, the installed floating wind capacity will have grown to over 260 GW and that the technology will reach commercial-scale deployment in the next 15 years," said Kim Sandgaard-Mørk, executive vice president

for Renewables Certification at DNV. "Although essential for scaling floating offshore wind farms, floating substations have not received the same degree of attention as their turbine counterparts, therefore we are initiating this JIP."

"Together with partners from the industry, DNV developed the standard DNV-ST-0145 Offshore Substations," said Markus Kochmann, head of offshore substations in renewables certification at DNV. "Over the past 10 years, this standard became widely used in the industry. The current standard focuses on bottom-fixed substations, but we see a growing trend toward floating wind, and we want to use this JIP to support the industry by developing rules applicable for floating substations."

The plan is to carry the project out over one year, beginning in the fourth quarter of 2021.

"Substations are the heart of each offshore wind farm as they collect the electrical energy produced in wind turbines and convert the electricity for the transfer to consumers onshore via export cables," said Kristin Nergaard Berg, Senior Principal Consultant at DNV and Project Manager for the JIP. "We see a huge interest from the industry to join our JIP. Over 50 participants from more than 20 companies spanning across the entire value chain for offshore wind joined DNV in a first workshop where the scope of work has been discussed."

"A call for more interested partners is still open, and we are looking forward to welcome more companies onboard to enhance technology development for floating offshore wind substations," she said.

The results of this JIP will be used to update the DNV-ST-0145 standard, making it applicable for floating offshore substations.

DNV is committed to realizing the goals of the Paris Climate Agreement and supports customers to transition faster to a deeply decarbonized energy system.

MORE INFO www.dnv.com

INNOVATION

Mammoet launches offshore wind innovation challenge

Mammoet and Offshore Wind Innovators are challenging innovators to find a solution for transferring and lifting components to floating and fixed-bottom offshore wind turbines.

Conventional wind turbines are getting bigger and are being built in large quantities, while floating wind farms are the new kid on the block. The intensity and complexity of maintenance is rising.

The two companies, in cooperation with TKI Wind op Zee, are launching the fifth Offshore Wind Innovation Challenge. The challenge will focus on finding solutions for the safe and efficient transfer of objects from a floating vessel to offshore wind structures to reduce the cost and the scheduled impact of maintenance. The use of large (floating) installation vessels should be prevented and the companies are looking for solutions.

The challenge is split into three sub-sections:

- How do you position the barge, ship, or vessel close to the wind turbine foundation, floater, or tower?
- How do you transfer the components required for maintenance from a barge, ship or vessel onto the wind turbine structure, or floating foundation?
- How do you transfer and lift the components toward the nacelle?

SME entrepreneurs can apply for the challenge until January 7, 2022. Then the entrepreneurs can present their idea or proven (complete or partial) solution during a January 21 session.

After that, companies can optimize their solutions until an April 2 deadline, with feedback and collaboration with Mammoet and TKI Wind op Zee. The finalists will be invited to pitch their developed concept to a broad audience during the Innovation Challenge Finals on May 13, 2022.

Mammoet's testing device can test high-capacity equipment to high loads with low risk and minimal impact to operations. (Courtesy: Mammoet)

The participants will be able to create brand awareness and visibility of their innovations in the offshore wind community. In addition, they will get coaching and the chance to collaborate with Mammoet and its subsidiary company Conbit.

The first four editions of the Offshore Wind Innovation Challenge led to partnerships between almost all winners and leading companies.

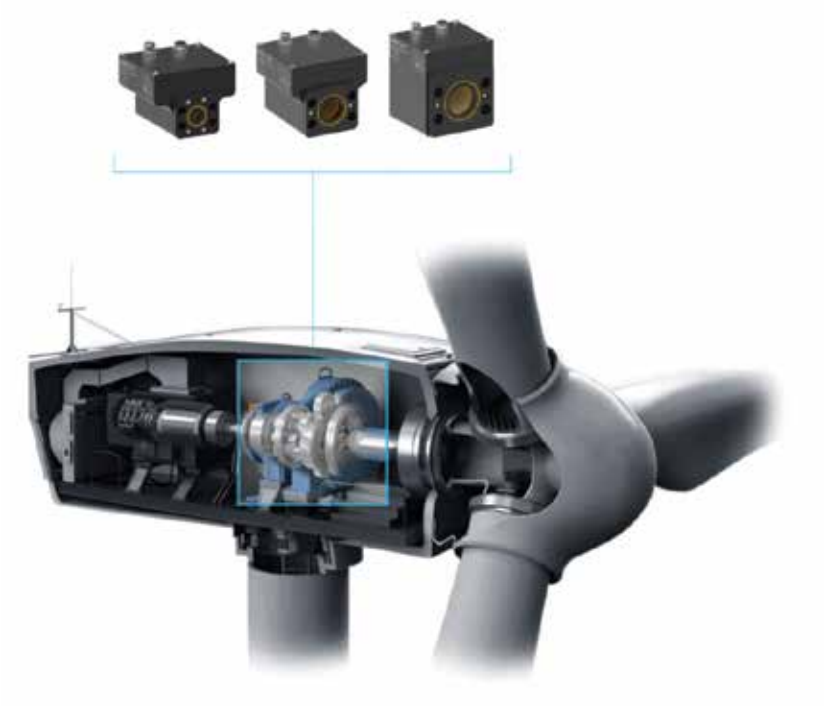
MORE INFO www.offshorewindinnovators.nl

INNOVATION

Gastops ships first MetalSCAN turbine monitoring sensors

Gastops, a leader in critical component condition intelligence, announced the first volume shipments of the MetalSCAN MS3500 online condition monitoring sensors to a major wind-turbine manufacturer for their next generation platform, the fourth manufacturer to adopt MetalSCAN technology as standard equipment.

The MS3500 series provides the wind-energy industry with online access to real-time condition monitoring data, which enables the earliest reli-



Designed specifically for wind-turbine platforms, the MetalSCAN M3500 oil debris monitoring system provides continuous monitoring of the gearbox. (Courtesy: Gastops)

able detection of component damage available on the market today.

"MetalSCAN MS3500 replaces the MS3000 series to further enhance the value proposition for the world's leading wind turbine manufacturers by helping wind-energy operators reduce costs and risk," said Cedric Ouellet, director of energy and industrial at Gastops. "With the MS3500 series, we have introduced key new functionality and connectivity capabilities to support Industrial Internet of Things (IIoT) implementations at a lower price point, all while maintaining the performance and reliability for which Gastops is recognized."

The MetalSCAN MS3500 series delivers real-time detection of 100 percent of ferrous and non-ferrous metal particles generated during component damage. The sensors generate continuous component condition data to provide advance warning of abnormal component wear or debris accumulation exceeding defined limits. This intelligence gives wind-energy operators the power to plan maintenance in advance, predict the remaining useful life of critical equipment, and avoid secondary damage that leads to costly component replacements.

"Our MetalSCAN technology was developed to meet the demanding standards of the aviation and defense markets," said Shaun Horning, president and CEO of Gastops. "As with our previous generation of sensors, the MS3500 series packages that advanced technology into a market leading solution that is now more valuable than ever to both wind turbine manufacturers and operators. We are very excited to be bringing our latest innovations to the renewable energy industry."

Gastops provides intelligent condition monitoring solutions used in aerospace, defense, energy, and industrial applications to optimize the availability, performance, and safety of critical assets, offering online monitoring sensors, at-line analysis, complex modeling and simulation, laboratory testing, engineering, design, and MRO services that predict performance to enable proactive operating decisions. Gastops has been providing insights into the condition of critical equipment since 1979.

MORE INFO www.gastops.com

INNOVATION

NREL determines how to transport wind-turbine blades

Researchers at the U.S. Department of Energy's (DOE's) National Renewable Energy Laboratory (NREL) have determined how to transport massive wind-turbine blades to parts of the country at a lower cost than segmented blades, but the solution will require some flexibility on the part of industry.

Manufacturing blades that can bend with "controlled flexing" will allow railroads to ship longer blades around the United States. Because of bends, twists, and turns in railroad lines, the upper limit for transporting single-piece land-based blades by rail is currently 75 meters.

The conceptual design envisioned by researchers would stretch that limit to 100 meters or beyond for land-based turbines. Blades of this length are already being proposed for offshore wind turbines and can be transported via barge, but they have not been installed inland due to the transportation constraints.

For land-based turbines, the longer blades could be shipped attached across the length of four railcars.

Longer blades and taller wind turbines allow for the greater production of energy, even in areas where wind speeds are low. Seeking an economical solution to installing wind turbines has kept wind farms from regions where the resource could potentially be harvested, including the southeast United States.

The flexible blade technology may enable more deployment in these areas in the future due to the lower cost. Lowering the cost of transportation

Longer blades and taller wind turbines allow for the greater production of energy, even in areas where wind speeds are low. (Courtesy: NREL, SSP Technology A/S)

and enabling rotors with a higher capacity factor could make these deployments more economically feasible.

"This research can aid in massive deployment of wind energy in different regions of the country—even parts of the country that typically haven't seen as much deployment," said Nick Johnson, a mechanical engineer at NREL's National Wind Technology Center and co-lead of the U.S. Department of Energy's Big Adaptive Rotor Project (BAR).

Blades already possess some flexibility. Traditional blades can have deflections of about 10% of the blade length from the root where they are attached to the turbine to the tip. For the blades envisioned by the BAR research, this increases to 20% to allow for the flexibility required for rail transportation.

Johnson said he sees industry adopting the flexible blades about five years out. "We have an industry advisory panel and have had great input and feedback from the members. They've kind of steered us in this direction. They think it's a promising idea, and certainly worthwhile as the impact could be significant," Johnson said.

MORE INFO www.nrel.gov

MAINTENANCE

ONYX Insight launches AI HUB for wind sector

ONYX Insight, a provider of predictive data analytics and engineering expertise to the global wind industry, has launched its AI HUB full-turbine predictive analytics platform, bringing disparate data streams together to streamline operations and maintenance decision-making while eliminating data silos.

While the wind industry is looking to ramp up its growth, previous generations' software platforms are making the growth more difficult. Previous platforms can only handle one data source at a time, which causes site engineers to use separate platforms to manage large fleets.

Data is often held offline in inefficient spreadsheets, and the AI HUB centralizes critical data streams such as vibration, oil sensor and pitch bearing monitoring, allowing operators to benefit from advanced analytics using engineering-enhanced machine learning.

The AI HUB platform connects engineering and site teams. (Courtesy: ONYX Insight)

The flexible XD Tubing is installed in wind turbine components that are at a higher risk of fire such as the converter cabinet, transformer, and brake. (Courtesy: Firetrace)

Operators are upgrading their approaches to O&M from turbine-by-turbine analysis to fleet-level strategic control. The AI HUB platform connects engineering and site teams, while automating labor-intensive yet unproductive data standardization and case management functions to free up resources.

"Wind-farm owners and operators are rising to the challenge of net zero admirably, but have found their ambitious digitalization strategies hampered by software solutions that are built for a smaller, less dynamic sector," said Won Shin, global vice president of products,

ONYX Insight. "As wind scales, so does the ambition of industry stakeholders. We have created AI HUB to match that ambition."

AI HUB has four new modules to integrate data from diverse wind assets:

- **Pitch Bearing Monitoring:** Advanced analytics and online sensor solutions to detect early warning signs of impending pitch bearing failures.
- **Blade Drone Analytics:** Drone agnostic blade analytic software for fleet-level blade defect analysis and repair management.
- **Case Management:** More efficient workflows to bring all analytics into one place for better collaboration and communication.
- **Lost Energy Intel:** Machine Learning powered SCADA analytics identifying issues causing the most lost energy and reliability problems.

MORE INFO onyxinsight.com

MAINTENANCE

Firetrace launches XD tubing for offshore wind turbines

Firetrace, a provider of fire suppression systems for the wind industry, has launched XD Tubing, a flexible fire detection tubing with enhanced chemical durability, to mitigate the risk of fire and total loss in offshore and near shore wind turbines.

XD Detection Tubing detects fires by sensing either heat or flame, and resists corrosion, creep, and ozone exposure as found in both offshore and near-shore turbine environments.

As demand for technologies that ensure stability and safety ramps up with the addition of new offshore wind capacity, the risk of wind turbine fire, is at the forefront of many wind developers' safety initiatives.

XD tubing improves the efficiency of identifying and suppressing wind-turbine fires to prevent a catastrophic event and reputational crisis, while helping end-users save on maintenance costs by providing an

automatic solution to combating turbine fires.

The product launched following accelerated environmental exposure testing that simulates the field service conditions on the polymeric fire detection tubing for corrosion, creep resistance and ozone exposure. The XD tubing performed ideally in the saltwater and zinc galvanic corrosion testing as well as elevated ozone exposure found in ocean environments.

The testing found the XD tubing material provides enhanced resistance in applications that have historically proven to be challenging to standard detection tubing. Creep resistance testing indicated the likelihood of creep rupture failure as a function of normal services is low, and ozone exposure testing indicated no damage after exposure that mimics 10 years or more of real-world concentrated ozone exposure.

"This product was designed to ensure that near-shore and offshore turbines could have the most robust and cost-effective fire suppression solution available in wind turbines worldwide," said Angela Krcmar, Firetrace's global sales manager. "Following an extensive testing period, we're happy to announce the launch of XD Detection Tubing, so that we can continue our work with world-leading OEMs/developers dedicated to combating climate change and ensuring the safety of their staff and the industry."

MORE INFO www.firetrace.com/xd

MANUFACTURING

Bladt Industries wins its largest offshore wind project contract

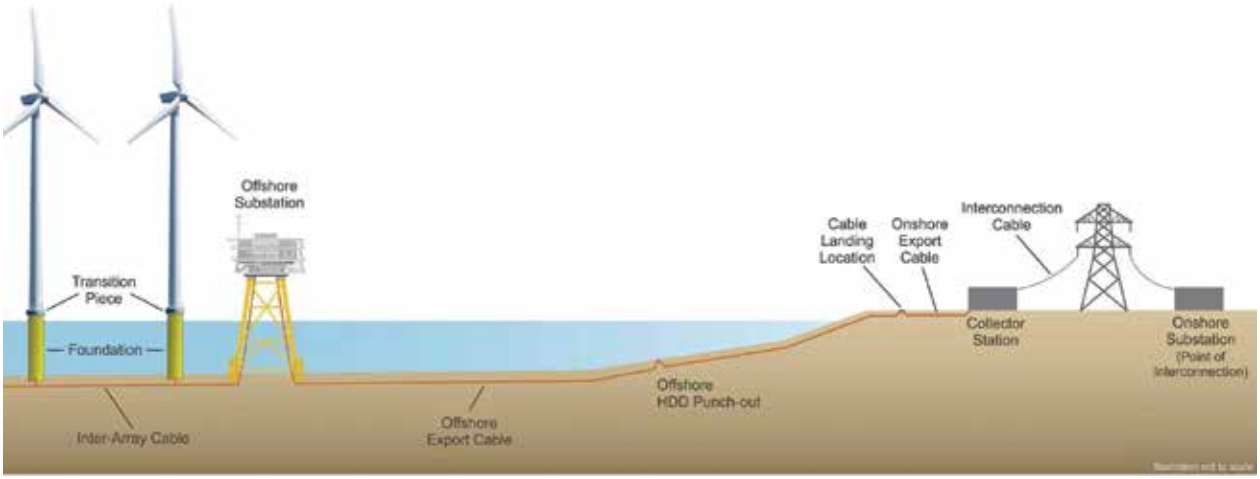
Bladt Industries, a Danish renewable energy company, will supply 176 transition pieces to the U.S. Coastal Virginia Offshore Wind (CVOW) project. The order is the largest transition piece contract in Bladt's history.

The project is in U.S. federal water, 43.5 kilometers east of Virginia Beach.

"We are proud to be selected by Dominion Energy for this contract based our experience and proven track record. Likewise, we are extremely proud to be part of building up the growing American offshore wind industry," said CEO Anders Søe-Jensen. "It's a great day for us at Bladt Industries. The order is the largest in our history and will occupy a significant part of our capacity in the coming years."

Production starts at Bladt's Aalborg, Denmark site in March 2023. The transition pieces are up to 30 meters high and close to eight meters in diameter. Each element weighs 540 to 570 tons, including secondary steel.

"We are the world leader in manufacturing of transition pieces and have so far delivered to a third of the world's offshore wind turbines foundations,"



The first two CVOW pilot test turbines are up and running 27 miles off the coast of Virginia Beach. (Courtesy: Dominion Energy)

Søe-Jensen said. "This project consolidates our position and gives us an even better starting point for the U.S. market."

In the last 25 years, Bladt has delivered more than 2,500 offshore wind turbine foundations.

MORE INFO www.bladt.dk

Vestas will provide 138 V236-15.0 MW turbines for Empire Wind 1 and 2 .(Courtesy: Equinor)

MANUFACTURING

Empire Offshore Wind names Vestas as preferred supplier

Empire Offshore Wind, a joint venture between Equinor and BP, has named Vestas as the preferred turbine supplier for the 2.1 GW Empire Wind 1 and Empire Wind 2 offshore wind projects in New York.

Vestas will provide 138 V236-15.0 MW turbines for Empire Wind 1 and 2, 15 to 30 miles off the coast of Long Island. With this project, New York, Equinor, BP, and Vestas are together taking a leading role in the U.S. offshore industry development and bringing the USA closer to achieving President Joe Biden's goal of 30 GW of offshore wind capacity installed by 2030 as well as New York state's goal of installing 9 GW of offshore wind capacity by 2035.

"We are honored to partner with Equinor and BP as preferred supplier for the Empire wind projects and provide our V236-15.0 MW turbine to help New York achieve its ambitious offshore wind energy goals," said Laura Beane, president of Vestas North America.

"To be part of a landmark project like Empire Wind 1 and 2 is a testament to the hard work of Vestas colleagues across the world dedicated to developing offshore technology capable of delivering reliable, resilient, and sustainable wind energy to communities around the world."

The tower sections for Empire Wind 1 and 2 are planned to be sourced from the Marmen/ Welcon plant, which is being developed in Port of Albany. For staging of turbine components, Vestas will use the South Brooklyn Marine Terminal's upgraded port, developing a local New York-based, supply chain to provide services in the staging, pre-assembly and installation activities.

Vestas has established local partnerships and supply chains to serve regional markets, including more than 1,000 suppliers in U.S. that support onshore business.

In addition, Vestas will deliver a comprehensive multi-year solution to service the wind farm when operational, with the goal to establish a New York-based service organization that provides local employment opportunities.

MORE INFO www.vestas.com