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IN FOCUS

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Undersea cables need to be designed and built with additional protection.

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▾ THE FUTURE OF WIND



DIRECTION

Report: Strengthening U.S. 'Electric Highway' will fast-track growth ▾ Connecticut bill will allow up to 2,000 MW of procured wind energy ▾ IRENA report reaffirms renewables as low-cost key to boost climate action



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Max Bögl Wind AG has developed a Hybrid Tower technology that meets the growing need for taller hub heights while addressing challenges surrounding transportation issues and more.

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THE BUSINESS OF WIND



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MAKE PLANS TO ATTEND TOP-RATED CONFERENCES

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Wind Energy Finance & Investment Conference

October 1 – 2, 2019 | New York, NY

Offshore WINDPOWER Conference and Exhibition

October 22 – 23, 2019 | Boston, MA

Clean Energy Executive Summit

November 19 - 21, 2019 | Carlsbad, CA

Wind Project O&M and Safety Conference

February 26 – 27, 2020 | San Diego, CA

Wind Project Siting and Environmental Compliance Conference

April 7 - 9, 2020 | Washington, DC

CLEANPOWER 2020

June 1 - 4, 2020 | Denver, CO



www.awea.org

Houston plays host to another successful WINDPOWER

It may be the July issue, but for me, it's only been a few weeks since my team and I returned from WINDPOWER 2019 in Houston.

We made some amazing connections while there, including some that you will be able to see in this very issue.

It's always a pleasure to meet people who are as passionate about wind power as we are, and that enthusiasm was evident by the amazing and eclectic bunch of attendees who stopped by our booth to share their stories.

As we've done for many years now at WINDPOWER, *Wind Systems* gave away awesome Snap-on toolboxes to three lucky attendees who entered our daily drawing.

Those winners were:

▣ Salvatore Parisi, with ITW Performance Polymers.

▣ Nicolette Nye, with National Ocean Industries Association.

▣ Dan Olson, with GE Renewables.

Congratulations to all our winners, and keep an

eye out for that delivery.

You'll also find a lot of interesting articles in our July issue.

In our inFocus section, we have the latest developments in dealing with undersea cables that will make it possible to move newly generated power to the homes and businesses that need it. We also take a look at safety issues that are often a challenge when working at height. The proper equipment, as well as the latest regulations, are paramount.

In Crosswinds, I had the opportunity to talk with developers at Max Bögl, where they are revolutionizing how turbine towers are constructed in order to address the growing challenge of transporting massively tall structures to their final destination.

I hope you enjoy what we've gathered for this issue. Stay cool this summer, and, as always, thanks for reading!



Salvatore Parisi



Nicolette Nye



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AWEA announces new CLEANPOWER exhibition hub

From AWEA

During WINDPOWER 2019's general session in Houston, Texas, AWEA CEO Tom Kiernan announced the creation of CLEANPOWER, a new exhibition hub that will bring together the utility-scale wind power, solar power, and energy storage industries when it launches in Denver next May.

"The future of American energy is clean and renewable," Kiernan said in May. "We're proud to announce CLEANPOWER, an exhibition hub designed from the ground up for the diverse clean-energy industry and supply chain professionals who are building that future. We've welcomed multi-technology businesses at WINDPOWER for years. Now we're throwing the doors open, creating an even bigger opportunity for companies in wind, solar, storage, and other clean-energy technologies to learn and do business across the utility-scale power sector."

The WINDPOWER Conference and Exhibition will continue as the heart of CLEANPOWER, with the addition of exhibition space and conference programming for utility-scale solar, storage, and other clean energy technologies. By incorporating these technologies into a single exhibition hub, CLEANPOWER will create efficiencies for exhibitors and attendees with multi-technology business models. Pure play businesses will benefit from increased show traffic and opportunities to build beneficial partnerships across the cleantech industry.

CLEANPOWER marks the latest evolution of AWEA's conferences and exhibitions, which have existed in one form or another since 1974. In recent years, the content of WINDPOWER and AWEA's other conferences has evolved in step with trends in the power sector toward multi-technology businesses and projects. Already, nearly half of WINDPOWER attendees and exhibitors have multi-technology business units.



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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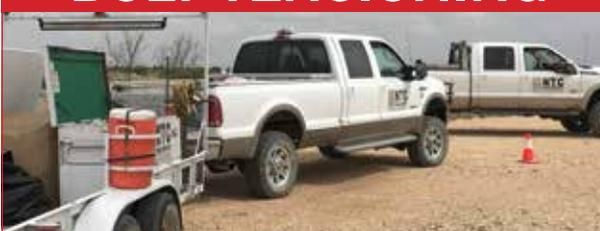
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DIRECTION

THE FUTURE OF WIND

Technology-driven changes in the sources of electricity supply and demand are increasing the importance of transmission. (Courtesy: Shutterstock)

Strengthening U.S. ‘Electric Highway’ will fast-track growth, report says

The United States urgently needs a 21st Century update of its aging power grid and the solution, well-planned transmission investment, will more than pay for itself according to a recent report by the American Wind Energy Association (AWEA). *Grid Vision: The Electric Highway to a 21st Century Economy* outlines why an interconnected, modern transmission grid is more important than ever as distributed solar, energy storage, and electric vehicles scale up, and maps out key policy reforms centered around the “Three Ps” of Planning, Paying, and Permitting that are needed to make the vision a reality.

Amy Farrell, AWEA senior vice president, Government and Public Affairs, released the report at Politico’s Reinventing American Energy event. A full transcript of Farrell’s remarks is available at www.aweablog.org.

“No matter your end goal – improving resiliency and reliability, driving down electricity costs, or reducing carbon emissions – modernizing the grid and expanding transmission is a common denominator,” Farrell said. “Today’s report presents overwhelming evidence that investing in transmission is a no-regrets down payment for future economic growth.”

The American Society of Civil Engineers recently gave America’s electricity infrastructure a mark of “D+,” and grid congestion and power outages cost American businesses billions of dollars each year. Amid these problems, consumers are demanding clean electricity to power more of their lives. The nation’s power grid is being asked to do more than ever before and failing to modernize this infrastructure drags the U.S. economy down in the global marketplace.

AWEA’s new report charts dozens of independent studies from across the country that quantify how transmission investments support consumer savings, improved grid reliability and resilience, a cleaner environment, and a more competitive economy. Grid op-

erator analysis consistently finds that well-designed transmission projects provide consumer benefits two- to four-times greater than their costs by unlocking low-cost energy sources, such as wind and solar, and reducing electricity market congestion.

Technology-driven changes in the sources of electricity supply and demand are increasing the importance of transmission. A strong transmission system is essential for getting more of our electricity from solar power, whether located on a rooftop or in a large installation in the desert. Battery storage, demand response, and other new technologies are valuable complements to transmission, but cannot substitute for transmission’s ability to move large amounts of power long distances. Electrification of transportation and building and water heating is also increasing the demand for a strong transmission system.

Substantial private investment is waiting to move on transmission, but projects struggle to be built under

excessively long regulatory timelines and red tape. Centered around the “Three Ps” of Planning, Paying, and Permitting, the paper outlines the policy reforms needed to realize the benefits of an expanded, improved, and interconnected transmission system.

“We all seem to agree on the challenge. We have an obvious solution and billions in private investment ready to invest,” Farrell said. “We don’t have to wait – the bipartisan support exists to act now. Let’s make a smart down payment on our future by updating and expanding America’s electric grid.”

MORE INFO awea.org

Connecticut bill will allow up to 2,000 MW of procured energy

Vineyard Wind LLC, a leading offshore wind developer based in New England, recently congratulated Gov. Ned Lamont for his signing of House Bill (HB)



Vineyard Wind is developing an 800-MW project in federal waters south of Martha’s Vineyard. (Courtesy: Vineyard Wind)

7156, a bill that will allow for as much as 2,000 MW of offshore wind power to be procured by the state.

“With the stroke of a pen ... Governor Lamont made history,” said Erich Stephens, chief development officer for Vineyard Wind. “This legislation has the potential to make Connecticut a major player in offshore wind power, an industry that’s poised for tremendous growth in the coming years. Our plan, which will invest millions into the city of Bridgeport, would turn offshore wind into statewide industry and create good paying jobs with good benefits.”

Vineyard Wind is looking to work with the city of Bridgeport and an existing Connecticut business along the city’s harbor, Bridgeport Boatworks. If the company is accepted as a supplier of wind energy for the state, it will invest millions of dollars in the revitalization of Bridgeport Harbor, so that the harbor can be used as a staging area for the ongoing construction of a facility off the coast of Martha’s Vineyard.

Vineyard Wind is a New England-based company and the leading U.S. offshore wind developer, currently developing and financing the nation’s first commercial-scale offshore wind farm — an 800 MW project in federal waters south of Martha’s Vineyard.

The project is set to begin construction later this year. Vineyard Wind is backed by two of the world’s most successful and experienced offshore wind project developers and investors — Copenhagen Infrastructure Partners (CIP) and Avangrid Renewables. CIP manages more than \$8 billion in clean-energy investments worldwide, and its partners are some of the world’s pioneers in the offshore wind industry. Avangrid Renewables is a subsidiary of AVANGRID, Inc. and one of the leading providers of wind energy in the U.S. It is part of the Iberdrola Group, one of the world’s largest wind-project developers with more than 15 GW of wind power capacity installed.

MORE INFO www.vineyardwind.com

IRENA: Renewables are low-cost key to boost climate action

Renewable power is the cheapest source of electricity in many parts of the world already today, the latest report from the International Renewable Energy Agency (IRENA) shows. The report contributes to the international discussion on raising climate action worldwide, ahead of Abu Dhabi’s global preparatory meeting for the United Nations Climate Action Summit in September.

With prices set to fall, the cost advantage of renewables will extend further, according to *Renewable Power Generation Costs in 2018*. This will strengthen the business case and solidify the role of renewables as the engine of the global energy transformation.

“Renewable power is the backbone of any development that aims to be sustainable,” said IRENA’s Director-General Francesco La Camera. “We must do everything we can to accelerate renewables if we are to meet the climate objectives of the Paris Agreement. Today’s report sends a

clear signal to the international community: Renewable energy provides countries with a low-cost climate solution that allows for scaling up action. To fully harness the economic opportunity of renewables, IRENA will work closely with our members and partners to facilitate on-the-ground solutions and concerted action that will result in renewable energy projects.”

The costs for renewable energy technologies decreased to a record low last year. The global weighted-average cost of electricity from concentrating solar power (CSP) declined by 26 percent, bioenergy by 14 percent, solar photovoltaics (PV) and onshore wind by 13 percent, hydropower by 12 percent and geothermal and offshore wind by 1 percent, respectively.

Cost reductions, particularly for solar and wind power technologies, are set to continue into the next decade, the new report finds.

According to IRENA’s global database, over three-quarters of the onshore wind and four-fifths of the solar PV capacity that is due to be commissioned next year will produce power at lower prices than the cheapest new coal, oil, or natural gas



The costs for renewable energy technologies decreased to a record low last year. (Courtesy: Winchell Joshua, U.S. Fish and Wildlife Service)

options. Crucially, they are set to do so without financial assistance.

Onshore wind and solar PV costs between 3 and 4 cents per kilowatt hour are already possible in areas with good resources and enabling regulatory and institutional frameworks. For example, record-low auction prices for solar PV in Chile, Mexico, Peru, Saudi Arabia, and the United Arab Emirates have seen a leveled cost of electricity as low as 3 cents per kilowatt hour.

Electrification on the basis of cost-competitive renewables is the backbone of the energy transformation and a key low-cost decarbonization solution in support of the climate goals set out in the Paris Agreement.

MORE INFO www.irena.org/publications

Siemens Gamesa appoints Alfonso Faubel as Onshore CEO

The Board of Directors of Siemens Gamesa Renewable Energy recently appointed Alfonso Faubel as the company's new Onshore Business CEO, effective July 29.

"We are very pleased that Alfonso Faubel is joining the company and look forward to working with him," said Markus Tacke, Siemens Gamesa CEO. "His broad industry experience will support the onshore business unit in addressing the challenging environment and continuing to deliver value to our customers."

Faubel, who has 30 years' experience in the automotive and energy industries, joins Siemens Gamesa from Sentient Science, where he was chief revenue officer of Energy and president of Europe.

Sentient Science is a digital provider of materials-science-based life prediction and extension technology in the global wind energy market.

Previously, he worked for Alstom-General Electric as senior vice president, Global Sales & Marketing, based in Switzerland, and as senior



Alfonso Faubel. (Courtesy: Siemens Gamesa)

vice president of the Alstom Wind Business, responsible for all activities related to Alstom's onshore and offshore wind business.

Faubel began his career in international industrial sales in 1988 at Ferrer in New York City. He transferred to Accenture in 1990 and to Exen in Rome in 1993. In 1996, he joined Delphi, where he held a number of positions, until moving to Alstom in 2009.

He has a degree in business administration and economics from Richmond, The American International University in London. He has worked in France, Germany, Switzerland, Italy, Spain, the U.S., and Mexico and speaks five languages.

"I am honored to join a global company of the caliber of Siemens Gamesa, which has such a clear commitment to delivering clean energy," Faubel said. "Onshore wind will be a key element of that vision, and I am ready to take on the challenge and contribute to reinforcing our leading position, delivering projects that create lasting value for all our stakeholders."

Faubel will replace Mark Albenze, who assumed this position on a temporary basis in addition to his role as CEO of the Service Business Unit. Albenze will now continue in his role as Service CEO. ✎

MORE INFO www.siemensgamesa.com

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A diver in full gear, including a helmet, mask, and various cables, is working on a large, dark, cylindrical submarine cable underwater. The diver is positioned in the upper left, reaching towards the cable on the right. The background is a clear, blue-green underwater environment with some bubbles and a sandy bottom.

IN FOCUS

WIRES & CABLE ▸ SAFETY

THE LATEST ADVANCEMENTS IN SUBMARINE CABLES PROTECTION



FMGC was recently involved in a project to develop a full range of articulated cast iron shells that protect, ballast, and stabilize subsea conducts (cables, pipes, etc.). (Courtesy: FMGC)

Undersea cables are vulnerable to many forces — both natural and man-made, so those cables need to be designed and built with additional protection in order to make them resistant and reliable.

By RALITSA PEYCHEVA

Even though hidden deep in the sea and invisible to us, submarine cables are of crucial importance for our daily lives. Undersea cables carry 99 percent of all intercontinental communication, which means that business and private communications, as well as financial transactions, are absolutely depending on their efficiency.

Submarine power cables are deployed as well in the offshore industry by oil and gas rigs and marine renewable energy installations to provide power, shore-to-platform and internal platform fiber-optic communications, and oceanographic monitoring and surveillance.

Unfortunately, undersea cables are vulnerable and do break or get damaged by ships' anchors, trawling, or due to some other environmental issues. For that reason, submarine cables need to be designed and built with additional protection, making them resistant and reliable enough. Submarine cable protection is of crucial importance for every offshore project.

POSSIBLE APPLICATIONS OF SUBMARINE CABLES

Submarine power cables are dedicated to the transportation of the electric power below the surface of the water. Most of the time, they are coupled with optic fibers in order to monitor the cables but also to ensure the communication of the data. Exposed to tough conditions as heat, cold, and saltwater, but as well to external events such as dragging anchors, dropping objects, and fishing, their protection is crucial to their performance. Their design and, most especially, armoring vary according to the seabed conditions and the expected potential issues.

In general, power and telecommunication submarine cables are deployed for the entire lifetime of the project, from the first step to decommissioning. They are of critical importance for the safe transfer of the power generated. The oil and gas industry is one of the first industries deploying undersea cables to connect oil and gas platforms to mainland power grids.

But despite being examples of advanced technology,

submarine cables remain vulnerable and relatively easy to damage.

They can get disrupted for a number of reasons that include natural disasters, fishing trawler nets dragging cables along with the catch, or accidents related to subsea installations. Since the damages happen unexpectedly, the availability of repair vessels is often limited and the elimination of the problem may take some time and incur high expenses.

Governments and industrial key players are uniting their expertise and funds to look for reliable submarine cable protection solutions. Many efforts have been made in design and material selection but also laying and maintenance vessels. The sector is in continuous development and in search of reliable innovative solutions.

AVAILABLE SUBMARINE CABLE PROTECTION SOLUTIONS

Depending on the industry, the seabed conditions, and the depth, there are various submarine protection systems available right now at the market. All of them share the same objective: protecting the submarine cables from fatigue, over-bending, and external factors.

Bend restrictors, bend stiffeners, protecting and ballasting shells, or split pipes are used at the bottom of the foundations to protect the cable near the platform. Most of the time, the entire system is called a CPS (cable protection system). Bend restrictors are applied to ensure the bending radius of the cable will not exceed the minimum bending radius defined by the manufacturer. Bend stiffeners are especially designed and manufactured for use in dynamic applications to prevent failure as a result of cyclic loading.

The shells, cylindrical half shells, or split pipes usually include bend restrictor functions and other connection elements and, therefore, are used as part of a complete cable protection system most of the time. They are especially adapted for the crossing of the scour protection at the bottom of the platforms as well as for rocky or challenging seabeds thanks to their abrasion resistance and stabilizing/ballasting abilities. This protection adds some stiffness to the point of connection to a rigid structure.

Concrete mattress, rock dumping, and rock bags are used to protect longer cable sections. However, the main solution to protect the longer section of cables (inter-array and export cables) is to bury the cable on the seabed. The rock dumping or the concrete mattress are used when burial is not possible or, in some cases, used as an added measure. The installation of the concrete mattresses is challenging due to the concerns related to the alignment and the “butting up” tolerances. This system requires specific means including frames, ROVs, etc.

Finally, the shells deserve a special word, since this is the only solution that can be used in both applications — in CPS but also to protect longer cable section. Moreover, at the shore landing areas and due to sedimentary movement, the shells are the most suitable solution. The protecting and ballasting shells are a simple, effective and easy-to-assemble solution. They are positioned along the cable and can additionally bal-



The use of cast iron for offshore ballasting shells ensures cable protection, stability, strength, and the best possible performance thanks to the mechanical properties of the material able to withstand the harshness of marine environments. (Courtesy: FMGC)

last the installation.

Most of the time, the mentioned solutions are made of composite materials and, most specifically, polymers such as polyurethane. The main advantage of polyurethane is its resistance to corrosion. Cast iron is corrosion resistant as well, and it provides an additional advantage with a ballasting/stabilization function.

CASE STUDY: PROTECTING AND BALLASTING CAST-IRON SHELLS

FMGC is a European leader in the design and manufacture of cast-iron counterweights. Some years ago, the French company started applying its expertise in ballast solutions to the offshore sector. Its participation at the IBOCS projects marks an important milestone in the development of the industry in France. The aim of the project was to develop a full range of articulated cast iron shells that protect, ballast, and stabilize subsea conducts (cables, pipes, etc.).

Made of ductile cast iron, the main goal of the FMGC is to provide a cost-effective solution that can reduce the cost of the cable protection thanks to its specific design. The solution is combining the protection, the stabilization, and the bend restrictor aspect in only one product that can be directly installed on the deck of the laying vessel. Thanks to the specific design, the need for other dedicated means and additional ships is drastically reduced.

These shells can be used as part of a cable protection system in addition to polyurethane products and also for the protection and stabilization of longer sections of cable for the shore landing or for rocky or challenging seabed where burial is not possible.

The solution can be easily adapted to various types of cables: from telecom cable of 20 mm to export cable of 300 mm.

The material choice in this case is important because of the unique mechanical properties of ductile cast iron withstanding the harshness of marine environments, resisting high impact, abrasion, and corrosion.

The French company Enedis, which manages 90 percent of the public electricity distribution network of continental France, has used the FMGC protecting and ballasting shells on several of its most challenging projects. One of the latest applications has been the protection and stabilization of an underwater cable, crossing the Fier d'Ars between Loix and Les Portes en Ré.

The feedback of Kerlann Marine, one of the companies that has been assigned by ENEDIS to lay the cables and install the shells: "After using some models of shells with different designs, the model used for the construction site of Houat 1 – IBL100 is very well studied; the implementation is fast and simple; the weight is correct for the displacement; the shell widths are well studied for curves."

FLOATING OFFSHORE WIND APPLICATIONS

All recent technological advancements in the offshore wind industry result in the increase of the viability of large offshore turbines capable of taking advantage of the higher wind speeds in greater water depths. Traditional bottom-fixed foundations are not suitable to these environmental conditions. Therefore, new floating platforms such as Floatgen,



Made of ductile cast iron, the main goal of the FMGC is to provide a cost-effective solution that can reduce the cost of the cable protection thanks to its specific design. (Courtesy: FMGC)

Hywind Scotland, and, most recently, Kincardine are about to rise and make the sector move steadily forward.

All floating structures need submarine cables to run through the water, from their substructure base to the seabed. This is a dynamic cable system that should transmit stable electric power from the floating offshore platform to a substation on land.

Exposed to greater levels of mechanical stress produced by marine currents and the movement of waves, these cables are subject to an increased risk of failure. The dynamic cables are attacked by the sea currents, the action of the waves, and the movement of the floating turbine platform itself; therefore, their protection is of critical importance.

As we have seen, there are quite a few solutions available for traditional subsea cables of a static offshore wind farms. Most of them, with some modifications, would be adaptable as well to dynamic submarine cables.

However, the cast iron protecting and ballasting shells feature best characteristics to adapt to a dynamic solution because of their flexibility and resistance.

While conventional submarine cables are dropped and secured on the seabed, the cables for floating offshore wind are continuously subjected to bending and twisting forces because of the tidal current and floater behavior, and, therefore, they are likely to suffer mechanical damage in various sections.

On the dynamic cable, we can consider the use of cast iron shells on the touch down point of the cable to limit the loads applied and ensure some restoring forces but also as a bend restrictor in the mid-water parts.

In addition, the gravity anchors can be used to offset the buoyancy elements such as on Lazy S or Steep S cable configurations.

The protecting and ballasting shells would easily allow the cables to follow the waves and tidal currents without encountering fatigue and failure.

The use of cast iron for offshore ballasting shells ensures cable protection, stability, strength, and the best possible performance thanks to the mechanical properties of the material able to withstand the harshness of marine environments.

A reliable cable protection system secures the performance of an offshore structure by protecting submarine power cables against various factors. The undersea cable industry is investing a lot in designing and manufacturing cost efficient solutions able to withstand the dynamic forces, but also leaving less footprint. And even though considerable care is taken to limit the factors leading to submarine cable damages, the problem remains and can lead to costly, widespread internet, communications, and power disruptions. ✎

ABOUT THE AUTHOR

Ralitsa Peycheva is a technical content manager at Farinia Group (www.farinia.com). She is interested in forging and casting techniques and the latest machinery and tools, and is curious about new manufacturing methods while respecting high-quality engineering.

THE RISE OF THE RESCUE KIT

Fall protection plans should not only identify anchor points, egress, access, and hazards but also a cohesive and simple rescue procedure. (Courtesy: @Petzl, LaFouche)

With the number of wind-energy workers on the rise, it becomes even more essential that they are equipped with the proper safety tools.

By SAMANTHA HEIM

According to Energy.gov, the “United States is home to one of the largest and fastest-growing wind markets in the world.” This growth emphasizes the importance of developing an efficient and effective rescue plan for those working inside and outside of turbines.

Rescue kits can be one element of developing a simple and effective rescue plan and can range from auto-descent devices to haul systems with a self-braking descender.

DEVELOPING A RESCUE PLAN

According to Occupational Health and Safety’s “Subpart M,” fall protection is required at “heights of six feet or greater above a lower level” or at “heights of less than six feet when working near dangerous equipment.” These plans should not only identify anchor points, egress, access, and hazards but also a cohesive and simple rescue procedure.

Additionally, OSHA requires that “the employer shall provide for prompt rescue of employees in the event of a fall or shall assure that employees are able to rescue themselves (1926.502(d)(20)).” A rescue plan should focus on removing fallen victims to the ground and hand off care to someone with advanced medical training. When developing a rescue plan, best practice is to identify factors such as the remoteness of the site, realistic response times, and what type of equipment and training can be provided.

Since the boom of wind energy in the early 2000s, OSHA has set certain requirements for training employees; however, most countries don’t have standards for the wind industry. The Global Wind Organisation, based in Denmark, was created to help establish minimum standards in the wind industry. As it remains though, contractors and operators are responsible for developing rescue plans and training for their employees.

WHY RESCUE KITS?

Personal protective equipment is the first step in arresting a fall, but what happens after a serious fall? Suspension trauma, or orthostatic intolerance, “can result in unconsciousness, followed by death, in less than 30 minutes,” according to the OSHA Safety and Health Information Bulletin. Symptoms of suspension trauma include dizziness, fatigue, sweating, and weakness.

The threat to fallen workers is a long period of immobility, which causes “an accumulation of blood in the legs (and) reduces the amount of blood in circulation.” Providing a rescue kit on hand can minimize the amount of time a worker is suspended, which is why mechanical advantage haul kits have been in demand and used for many years.

ALL SHAPES AND SIZES

There are two common types of rescue kits available for



According to the American Wind Energy Association, “U.S. wind power has more than tripled over the past decade” with more than 56,600 turbines “operating in 41 states, Guam, and Puerto Rico.” (Courtesy: @Petztl, LaFouche)

those who work at height. Deciding between the two depends on factors such as price, compactness, and ease-of-use. Some manufacturers provide auto-descent systems that range from a two- to three-foot-per-second descent and can evacuate one to two people. Others manufacture rescue kits



The I'D EVAC is a self-braking descender designed to handle a one- or two-person load. An auxiliary brake allows the user to increase the friction in accordance with the weight of the load and the rope diameter and to install or release a rope at any time. (Courtesy: @Petzl)

using a pulley system with a descent control device. Petzl, a manufacturer of professional safety equipment for more than 25 years, wanted to offer a closed, clean, and efficient system for workers in confined and vertical environments and developed the JAG RESCUE KIT®.

ADVANCING RESCUE KIT SIMPLICITY

Petzl's JAG RESCUE KIT® is a compact, lightweight, and ready-to-use rescue kit. As a leader in technical rescue equipment in specialized markets, Petzl wanted to offer a solution for at-height workers in all markets. The JAG RESCUE KIT® is designed for a pick-off rescue of an injured or incapacitated worker using a 4:1 mechanical advantage due to the double pulleys on the operator and victim end. Pulley sheaves are mounted on sealed ball bearings, which makes the JAG RESCUE KIT® highly efficient. A flexible cover around the 8mm haul rope gives the user a compact and tangle-free rescue option. Both ends are color-coded to differentiate the victim and operator end.

"This equipment was designed to perform two key functions: transfer the load of the casualty from his/her fall arrest system onto the rescue lowering system and to control the descent of the casualty to the ground," said Michel Goulet, professional division national sales manager at Petzl.



An anti-panic function on the I'D EVAC automatically stops the descent if the user pulls too hard on the handle. (Courtesy: @Petzl)

▼ The wind industry is growing at a rapid speed, which means fewer workers are hired with high-level rope access training and at-height rescue. ▼

BENEFITS OF THE SELF-BRAKING DESCENDER

The newest JAG RESCUE KIT® version uses an I'D EVAC, a self-braking descender designed to handle a one- or two-person load. Since the JAG RESCUE KIT® is often rigged in a vertical plane, with an anchor point directly above the casualty, the I'D EVAC® is designed with a handle specifically oriented to allow for comfortable descent control when lowering from the anchor.

The operator controls the incapacitated worker descent by pulling on the handle and controlling the descent speed by holding the rope with the brake hand as it slides through an auxiliary friction brake. An anti-panic function limits the risk of an accident due to uncontrolled lowering. Self-braking descenders provide rescuers the option to perform an accompanied or unaccompanied rescue operation depending on psychological, environmental, and physical obstruction factors.

JAG RESCUE KIT® FOR WIND

If not properly prepared and trained in rescue, the potential for things to go wrong — or get worse — during an actual rescue operation is increased. The advantage of Petzl's pre-rigged JAG RESCUE KIT® is the ease of which a rescuer can quickly transfer the suspended casualty's weight from the structure, or fall arrest lanyard, to the lowering system without having to re-position or disconnect any of the kit components when switching between hauling and lowering modes. Like with all equipment, users of the JAG RESCUE KIT® should be properly trained before a real-life situation occurs.

According to the American Wind Energy Association, "U.S. wind power has more than tripled over the past decade" with more than 56,600 turbines "operating in 41 states, Guam, and Puerto Rico." The wind industry is growing at a rapid speed, which means fewer workers are hired with high-level rope access training and at-height rescue. With the development of the JAG RESCUE KIT®, Petzl is dedicated to creating new systems for specialized markets such as the wind industry, and encourages the growth and success of renewable energy. ✌

ABOUT THE AUTHOR

Samantha Heim is the Media and Communications Specialist at Petzl America. For more information on at-height, PPE, and rescue equipment visit Petzl.com.



The JAG RESCUE KIT is a ready-to-use reversible rescue kit designed to easily pick off and lower a victim. (Courtesy: @Petzl)

PROPER CARE AND MAINTENANCE OF FALL-PROTECTION EQUIPMENT

Ongoing maintenance of fall-protection equipment goes hand-in-hand with regular inspection to keep everything in working order and workers as safe as possible. (Courtesy: Shutterstock)

It's always important to ensure fall-protection equipment for the worker is in top shape, which means systematic care and inspection is vital.

By **BAXTER BYRD**

Staying safe while working at height starts on the ground — long before a worker heads up the turbine for a maintenance or repair project.

EQUIPMENT INSPECTIONS

Regular inspections are the best way to always be aware of the current state of your equipment. Knowing the products' condition will allow you to take preemptive action if you encounter a problem.

Here's guidance on what is considered "regular" in the industry and who should be doing equipment inspection:

According to OSHA 1926.502(d)(21), personal fall arrest systems must be inspected prior to each use. This includes particular focus on wear, damage, and other deterioration, and defective components. If any of these issues are identified, the product must be removed from service.

ANSI A10.32-2012 states all fall-protection equipment should be inspected at least every six months after its initial service; inspection should be conducted by a competent person.

ANSI Z359 says equipment should be inspected by the user before each use and, additionally, by a competent person other than the user, at intervals of no more than one year.

Employers may create their own inspection criteria; however, it must be at least as stringent as those established by the relevant industry standards or the equipment manufacturer.

A competent person is someone assigned by the employer, who "is capable of identifying existing and predictable hazards in the surroundings or working conditions, which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them."

Competent persons are fully aware of and know how to recognize potential dangers on the jobsite. They are trained in the proper use of fall-protection equipment, from harness and lanyards, to anchors, guardrails, and ladders, including their proper maintenance. They are also able to take corrective measures to eliminate fall hazards, up to and including halting operations until the hazards have been mitigated. While the everyday care of fall-protection equipment is the responsibility of its user, the competent person plays a key role in making sure that care happens.

To make this easy to remember: A worker should inspect his/her gear, personally, before every use. A competent person should inspect the equipment once a year or more, as required by the manufacturer or local jobsite policies. Guardian Fall Protection, for example, requires a competent person inspection every 12 months per their product instructions. Having a person other than the user as part of the process means more eyes on the gear and more opportunities to catch something the first person missed.

Inspections should be recorded in a log of gear inspections. Many manufacturers provide templates to use, and most include helpful diagrams of the specific products to help inspectors "check off" all key components of the product. An example of comprehensive inspection forms can be found at tinyurl.com/inspectionforms.

PROPER MAINTENANCE

Ongoing maintenance of fall protection equipment goes hand-in-hand with regular inspection to keep everything in working order and workers as safe as possible.

Here are tips for proper care of fall-protection products:

- ▣ Keep harnesses and any gear with webbing away from sharp or rough surfaces.
- ▣ When gear gets dirty, use only water or a mild soap-and-water solution to clean it; more powerful cleaners can compromise the integrity, and thus the strength, of the material components.

- ▣ Store harnesses and lanyards in a cool, dry place free of moisture and ultraviolet (UV) rays. Excessive exposure to UV rays can degrade webbing integrity over time.

- ▣ If gear becomes wet, don't leave it in a heap after wearing because doing so will spur growth of mildew. Hang wet gear in a dry area in a configuration that exposes its webbing material, so it can dry slowly and naturally. Do not use a heat source, such as a hair dryer or sunlight, to speed drying.

- ▣ Consider using a dedicated storage bag for the product when not in use. A durable gear bag makes storage and portability easier and is an excellent way to keep track of one user's complete set of fall-protection equipment.

Every jobsite should implement proper equipment inspection and maintenance procedures to take care of the equipment that takes care of employees. Include step-by-step instructions in employee training, reinforce these behaviors when you see them at work, and take time to explain the importance of them when an employee is non-compliant with these processes. Consider a monthly inspection- or maintenance-focused toolbox talk to review new procedures and to give workers an opportunity to clarify any questions that may have come up over the course of their work.

Lifesaving equipment has an important job. Make sure it's tended to with intention and commitment, so it can do its job to the best of its abilities. ✎

ABOUT THE AUTHOR

Baxter Byrd is a technical writer with Pure Safety Group, the world's largest independent provider of fall-protection equipment and training. His primary mission is translating dense regulatory standards to increase understanding and practical applicability. When he's not writing, he's reading. Byrd holds a B.A. in communications from the University of Washington.

PROFILE

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Rather than offer one-size-fits-all products and services, Green IT works closely with its customers to understand their needs so it can deliver unique solutions. (Courtesy: Green IT)

Green IT Energy Applications' range of software and IT services gives owners improved visibility so they can make smarter decisions about their portfolios.

By **KENNETH CARTER** ▸ Wind Systems editor

It all started in an Iowa cornfield.

Today, Green IT Energy Applications is one of the renewable energy industry's leading providers of software and IT services. But as CEO Andrew Eisenberg explains, the company got its unlikely start "crawling around cornfields cataloging blade damage by day and scraping SCADA data by night."

The Green IT story begins in earnest with a 2003 preventative maintenance exercise that combined blade damage inspection photography and time-series SCADA data.

"Our initial engagement was to catalog damage with these giant telephoto lenses and build a database-driven application that overlaid production data on the maintenance records," Eisenberg said. "At the time, we were a boutique software firm with a jack-of-all-trades approach. This was an incredible opportunity to get up close and personal with wind-farm data and infrastructure. We dove in headfirst."

This early assignment set the tone for Green IT's consistently innovative combination of services.

THE BIRTH OF GREEN IT

Green IT's initial analysis of errant production data ignited a period of rapid expansion for the company, according to Eisenberg. As that contract renewed, Green IT adapted to meet increasingly complex requests from its customers — a process that led the company from preventative maintenance into landowner data.

"The initial contract began with a troubleshooting exer-

cise, then grew into an opportunity to develop a wind farm inventory system," he said. "Collecting SCADA data led to collecting critical contract data, and that dovetailed into landowner data, which created the multilayered solution it is today."

Green IT quickly scaled its software to meet a wide range of demands, including landowner payments, budget, risk management, and asset management, according to Eisenberg.

MAKING A DIFFERENCE

Over time, Green IT quietly established itself as an organization with the capacity to build unique digital tools to help renewable energy companies — wind owners, in particular — make their operations more efficient. Green IT's passion for the environment coupled with its willingness to innovate is what would cement the company's reputation.

"The global environmental movement to reduce and eventually eliminate our reliance on fossil fuels is one that continues to inspire our work at Green IT," Eisenberg said. "As we focus on targeting renewable energy ownership portfolios, we hope our technology can help facilitate a large-scale impact."

IS IT A SOFTWARE COMPANY? AN IT CONSULTING FIRM?

Despite Green IT's good standing in the industry, there is often confusion about the breadth of its services. Green IT's



Green IT's software meets a wide range of demands, including landowner payments, budget, risk management, and asset management. (Courtesy: Green IT)



On the software side, Green IT helps collect data from pipeline, construction, and operations, which enables owners to analyze the data in real-time, build reports, and connect teams within a common workspace. (Courtesy: Green IT)

two principal business units — software and IT services — both serve to give owners perspective on their portfolios, according to Eisenberg.

“It’s our job to be an extra set of eyes and ears for owners so they can get the most out of their assets,” he said. “Green IT often serves as a bridge between distinct parts of the business — risk management and enterprise resource planning; asset management and automation; regulatory and network architecture. It’s one of our greatest strengths that Green IT’s team is comprised of technical experts who have deep, hands-on experience with all aspects of the renewable energy industry.”

OVERSIGHT FROM ALL ANGLES

On the software side, Green IT helps collect data from pipeline, construction, and operations, which enables owners to analyze the data in real-time, build reports, and connect teams within a common workspace, according to Eisenberg. The software allows Green IT customers to oversee every aspect of a site by giving them access to all the data it generates.

“Our software transforms a static Power Purchase Agreement, for instance, into a series of actions, deliverables, and notifications,” he said. “From there, we are able to provide our customers oversight on the entire process.”

On the consulting side, Green IT’s Ownership IT program improves the consistency and security of operations

by identifying and eliminating vulnerabilities, according to Eisenberg.

“Owners are so focused on keeping turbines spinning, it’s understandable that their IT might fall by the wayside,” he said. “Neglected networks have the potential to rack up millions of dollars in fines, which is why we help audit and assess the infrastructure, build inventories, customize historization solutions, and help owners meet critical requirements.”

PARTNERING WITH CUSTOMERS

One of Green IT’s core values is that it views customers as partners, according to Eisenberg. Rather than offer one-size-fits-all products and services, Green IT works closely with its customers to understand their needs so it can deliver unique solutions.

“Typical IT consultants will diagnose a problem, forward a bill, then move on to the next problem,” he said. “We’re much more interested in helping our customers understand the inner workings of their portfolios. The goal is to give them more control. By serving as the Subject Matter Expert on all manner of technical areas, we help bring projects online and then walk our customers through any problems they encounter along the way.”

For instance, Green IT recently re-architected a network when a few crucial pieces of equipment reached end-of-life.

▼ We're much more interested in helping our customers understand the inner workings of their portfolios. The goal is to give them more control. ▼

“The facility had changed hands a number of times, so the as-built drawings were no longer available,” Eisenberg said. “We were brought in to assess the facility and mitigate cyber risk. Once we put the plan into action, we were quickly able to secure the facility, implement appropriate segmentation, and establish clear distinctions between each of the parties.”

EVER-EVOLVING TECHNOLOGY

Green IT's hands-on approach is not only a core value, but a smart strategy to stay ahead of the curve in an industry that demands constant reinvention, according to Eisenberg.

“Technology keeps changing,” he said. “Cybersecurity concerns and regulatory standards move in one direction. Year after year, NERC and ICS recommendations continue to tighten — this is a trend we don't see rolling backwards. AI and machine learning are certainly alluring parts of the future landscape, but in order to take advantage of these technologies, ownership requires standardization and con-

trol of data. Green IT ensures our customers adhere to a baseline of compliance by evolving our rich data collection and automated risk management.”

CLOUD-BASED PLATFORM

New advances in data collection mean new approaches to data storage. This is fine by Green IT, according to Eisenberg, which anticipated the industry's adoption of the cloud by a few years.

“I remember when we launched our first software platform, the fact that we were cloud-based was taboo; everyone had to have spinning discs in their closets,” he said. “The industry's embrace of cloud technology has been a boon for us on the software and data collection sides. We've been able to deliver better products at a more competitive price.”

FUTURE OF WIND

As Green IT and the wind industry evolve alongside each other, Eisenberg hopes to keep his organization nimble so it's ready to adapt to any new developments just around the bend.

“While repowering and offshore have already impacted the industry, I am most enthusiastic about Wind+,” he said. “The ability for storage to solve the variability quandary holds exciting potential to disrupt the energy landscape and further transform the industry.”

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Mike Rice

Commercial Director ▸ Dropsafe

“Dropsafe works with developers and operators in the wind-energy industry to develop the most advanced technology and quality manufacturing processes.”

▸ What are your responsibilities at Dropsafe?

As commercial director of Dropsafe, my responsibilities include helping raise awareness of the risks that dropped objects (DOs) pose and supporting our customers' initiatives to mitigate these risks.

Furthermore, I am responsible for developing our distribution network that allows customers to purchase Dropsafe products in the most efficient and cost-effective way.

▸ What types of products does Dropsafe provide for the wind-energy market?

The Dropsafe product range is made up of robust, versatile DO prevention solutions including a variety of specialized nets and barriers.

Dropsafe Nets securely enclose and tether overhead fixtures such as lights, speakers, and CCTV cameras to prevent DOs falling from height and threatening the safety of personnel.

Dropsafe has recently been contracted to provide 42 Dropsafe Nets to Swancor Renewables' Formosa 1 wind farm in Taiwan. On completion of construction, Formosa 1 will be Taiwan's first commercial-scale offshore wind project. The wind farm will have Dropsafe's DO prevention technology installed across all 20 of the Siemens-Gamesa turbines on site.

The Dropsafe Barrier consists of robust high-grade polymer panels that are clipped along the inside of guard railing such as those found on landing platforms around turbine towers, using a universal attachment system. The solution has been engineered to tackle many of the common challenges experienced in harsh offshore environments, including increased corrosion resistance.

The barrier system has gone through three years of development, involving extensive analysis, wind tunnel testing and third-party validation and certification.

At the time of writing, it is the only DO barrier to have achieved Type Approval from the American Bureau of Shipping (ABS) under the DOPP+ certification scheme.

The Dropsafe Pouch is a proven solution to preventing handheld object drops. The stainless-steel mesh pouch can secure items and be attached to an engineer working at height. For example, the Dropsafe Pouch can tether a rotor blade maintenance technician's laminating tool to their PPE when conducting blade-erosion repairs.

Dropsafe's solutions can significantly reduce or eliminate DO risks, providing a potentially life-saving back-up in case of disaster.

▸ Why is it important to address the risk of dropped objects in the wind industry?

The risk posed to the wind industry by DOs covers four main areas: personnel safety, equipment integrity, finances, and reputation. The safety risks involved in such incidences are clear: Objects falling from height endanger lives — they can seriously injure personnel working directly below and could cause fatality.

In terms of the financial risk, it is difficult to accurately assess the cost to businesses of individual incidences of DO. Little formal research has been completed on this topic and, as with reputational risk, it is not in the interest of the companies involved to divulge such information.

It is clear, however, that injuries to personnel cost the company financially through working days lost, and falling objects risk damaging equipment. This could lead not only to the cost of replacing the damaged assets, but also a need to temporarily suspend some operations at the wind farm, which would, in turn, have a significant financial impact. Furthermore, there are potential financial compensation implications and the legal consequences that go hand-in-hand with them.

While all of the major reported DO events that have occurred to date in offshore wind have related to heavy lifting, without risk mitigation action being taken now by offshore wind companies, it is only a matter of time before a significant DO incident occurs in the industry.



The Dropsafe Barrier installed at a power generation facility in Asia. (Courtesy: Dropsafe)

► What unseen long-term costs do businesses face when it comes to the procurement of health and safety equipment?

Cost remains an important consideration for buyers of HSE systems. This means that it can be easy for HSE decision makers to seek a short-term fix for a long-term challenge by adopting the product with the lowest upfront cost.

While this approach may reduce immediate capital expenditure, it can have a knock-on effect on long-term operational costs. It is important, therefore, not to look at the initial equipment purchase and installation costs in isolation, but to consider the cumulative costs of using the DO-prevention product over a given period.

Installation is a key constituent of the total lifetime cost of using a barrier, particularly if the system is set to be removed or reinstalled. Understanding this cost should be a critical part of procurement decision making.

Knowing how long a barrier system can withstand the elements, particularly in offshore applications, is also essential to understanding the impact of long-term maintenance costs on HSE budgets. The duration of manufacturer warranties is an indication of how long the product can be safely used.

It is also important to take into account missed revenues incurred as a result of turbine downtime. In sectors such as wind energy, where availability is a core metric, the cost of downtime may far outweigh equipment, installation, and maintenance costs.

The problem is that, while there is slow progress toward standardization of DO prevention mechanisms across industries, HSE decision makers often lack a clear benchmark for assessing the quality and lifetime cost of the available options. It can be difficult to answer the question: ‘How much should I be spending on DO mitigation?’

More transparency is needed to support informed procurement and empower HSE decision makers to adopt innovative and cost-effective solutions that not only ‘do the job,’ but deliver long-term value.

► What are the potential dangers when businesses only focus on short-term solutions?

DOs are not the only on-site risk at offshore wind projects. Given their finite budgets, HSE decision makers in offshore wind must choose solutions that are proven to demonstrate long-term cost efficiency.

Lessons can be learned from the offshore oil & gas sector, where compromises have historically been made in DO prevention. Lower-quality, “quick-fix” solutions have sometimes been adopted that either do not stand up to the offshore environment or do not constitute a robust defense against DOs – or both.

It is important that, in offshore wind, the lifetime costs of DO mitigation solutions are made transparent so long-term HSE decisions can be made, and the risks involved with adopting low quality solutions are avoided.

► How is Dropsafe addressing this challenge?

Dropsafe’s latest whitepaper “Slipping Through the Cracks” was developed in response to the lack of transparency in long-term health and safety equipment costs. The whitepaper looks in depth at one particular DO prevention technology – the barrier.

In “Slipping Through the Cracks,” Dropsafe provides an honest assessment of how the Dropsafe Barrier stacks up against the other most commonly used solutions in the market. This is done by looking at upfront cost, quality, and long-term maintenance requirements. In doing so, we aim not to show “you can’t put a price on safety,” but rather that cost shouldn’t be a barrier to an effective DO mitigation strategy.

Dropsafe also continues to work with developers and operators in the wind-energy industry to develop the most advanced technology and quality manufacturing processes without sacrificing value and cost efficiency.

► **How do leading barrier solutions in the market stack up against each other in terms of upfront cost, quality, and long-term maintenance requirements?**

The most commonly adopted barriers used in offshore applications worldwide include, at one end of the spectrum, low-grade flexible mesh netting, and at the other, advanced polymer barrier systems such as the Dropsafe Barrier. Bolted metal fencing and expanded metal barriers are also widely used.

It was found that more advanced systems such as the Dropsafe Barrier, while they may have higher upfront material costs, have substantially lower installation costs due to ease of attachment. While many other products on the market will require partial or full replacement during a five-year period, products guaranteed under warranty to last for the full five years without replacement ultimately have the lowest maintenance and reinstallation costs. This therefore makes them more cost-effective than lower-grade solutions.

► **Is there a move to standardize safety measures? If so,**

will that be enough, or will more regulations be needed?

To date there remains a lack of standardization when it comes to recommended DO prevention technology, and an absence of clear-cut regulation. Across multiple sectors, this has put the emphasis on leading wind-energy firms and their HSE decision makers to “self-regulate” with their use of DO prevention systems.

Organizations, including Drops.org and the American Bureau of Shipping (ABS), are making moves toward standardization of key technologies such as safety nets and barriers via schemes such as the ABS DOPPP+ program. The ABS DOPPP+ certification scheme verifies the manufacturing quality of the product and enables users to demonstrate a commitment to upholding the highest safety standards.

DO regulations are likely to come into effect in wind power in the near future as the risk is increasingly realized, but in the meantime, firms shouldn't take the back seat and wait for legislation to guide HSE decision making. Wind-power companies have the opportunity to take a leadership stance and position themselves as health and safety market leaders. This can be achieved by proactively implementing a robust DO prevention strategy instead of waiting for standardization to be introduced. ✈

MORE INFO ► www.dropsafe.com



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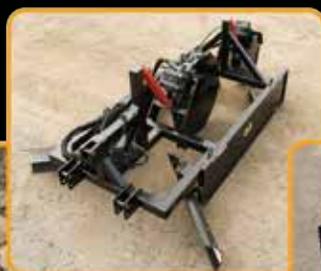
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Kawailoa Wind is installing NRG Systems' Bat Deterrent System on its 30 turbines. (Courtesy: NRG Systems)

INNOVATION

NRG Systems sells Bat Deterrent System to Hawaii wind farm

NRG Systems, Inc. has announced the first commercial sale of its Bat Deterrent System to Kawailoa Wind, Hawaii's largest wind farm. Located on the island of Oahu, Kawailoa Wind will outfit each of its 30 turbines with a Bat Deterrent System. The adoption of NRG's pioneering technology is part of Kawailoa Wind's ongoing efforts to help conserve the Hawaiian hoary bat, which has been on the United States' list of endangered species since 1970.

"DESRI has a history of adopting innovative technologies and ideas to

mitigate the impacts of renewable energy development," said Bryan Martin, chief executive officer of D. E. Shaw Renewable Investments (DESRI), which owns and operates Kawailoa Wind. "We are excited to partner with NRG Systems at Kawailoa Wind as part of those efforts."

Bat fatalities have been documented in association with wind-farm operations in Hawaii — an occurrence that has been seen at wind farms across the globe. Because of this, conservation of these animals has become one of the most pressing issues facing the renewable energy industry today.

"Wind energy is crucial to providing renewable energy in Hawaii," said Brita Woeck, environmental compliance officer for Kawailoa Wind. "Kawailoa Wind is invested in finding solutions so that clean energy generation and

bat conservation can co-exist."

Kawailoa Wind is curtailing, or turning off turbines in low wind speeds at night, when bats are most active, to minimize Hawaiian hoary bat fatalities. NRG's Bat Deterrent Systems are expected to be used in addition to curtailment.

MORE INFO nrgsystems.com

INNOVATION

Vaisala expands weather radar offering to include X-band

Vaisala, a global leader in weather, environmental, and industrial measurement, recently announced the develop-

ment of an advanced X-band Weather Radar. The smaller size and lower cost of an X-band radar will make it an ideal instrument to enhance the weather detection capabilities of a specific location. In difficult terrain, it fills the gaps to reliably detect snow, rain, and other weather activity. Adding X-band radars to an existing network will also improve the accuracy of precipitation measurement, providing better data for flood warnings or hydro-electric power plants, for example. In airport environments, the radar allows for detection of wind shear, wake vortices, convective weather, even birds.

The new X-band Weather Radar provides accurate measurements for a limited area, filling in a gap in a national radar network or delivering precise information for an airport. Severe weather in mountainous areas and gaps under sparse weather radar networks will be visible when X-band radars are added to the radar networks. Airport safety and efficiency will be improved with accurate detection and nowcasting of hazardous conditions.

“X-band radar will enhance a weather detection arsenal, making it even more reliable and accurate,” said Pekka Utela, director of Weather Radars for Vaisala. “By developing a smaller system allowing simple site selection, as well as providing maximum weather detection sensitivity with automatic and continuous calibration, the new X-band radar will answer the challenges decision-makers face in severe weather situations.”

The intelligence the X-band radar collects will provide significantly improved situational awareness. When integrated with other measurement systems, such as Vaisala C-band Weather Radar or wind Lidar, users will get the most comprehensive, real-time data available. At airports, accurate wind shear detection, complemented by Lidars, helps optimize take-off and landing sequences, as well as enhancing the safety of flight operations.

MORE INFO vaisala.com/weather-radars

INNOVATION

Acciona installs photovoltaic modules on turbine tower

The Energy Division of Acciona has developed a pioneering solution in the field of hybridization between wind and photovoltaic power. It consists of covering a wind-turbine tower with flexible organic panels to produce energy for the internal electricity consumption of the turbine.

The innovative project will allow the study of the performance of the organic panels — an emerging photovoltaic technology — and their application to improve wind-turbine efficiency.

The system has been installed in one of the turbines of the Breña Wind Farm in Albacete, Spain, which Acciona owns and operates. The turbine is an AW77/1500 of Nordex-Acciona Windpower technology, mounted on an 80-meter-high steel tower (hub height).

Installed on the tower are 120 solar panels facing southeast-southwest to capture the maximum of the sun's rays throughout the day. They are distributed at eight different heights, occupying around 50 meters of the tower's surface area. The photovoltaic modules, with an overall capacity of

9.36 kilowatts peak (kWp), are of Heliatek technology (HeliaSol 308-5986 model). They are only 1 millimeter thick, and each one has a surface area of 5,986 x 308 mm.

In contrast to the conventional technology used in the manufacture of photovoltaic models based on silicon, these organic panels use carbon as raw material and are characterized by their structural flexibility, which makes them adaptable to different surfaces. Other key features are lower maintenance costs, less energy consumption during manufacture, easier logistics, and the complete recycling of the materials used, although their efficiency is still below that of silicon modules.

“The hybridization project in Breña means the optimization of the use of space for renewable energy production, and it will enable us to test the efficiency of organic photovoltaics, a technology that we believe has one of the best improvement curves in terms of technological efficiency,” said Belén Linares, energy innovation director at Acciona. “That is why we have decided to pilot it.”

The immediate application of the Breña project is to produce part of the energy that the internal systems of the wind turbine need. When the turbine is running, some of the energy generated is used to power the auxiliary systems. In shutdown mode, certain



An X-band Weather Radar antenna. (Courtesy: Vaisala)



The system has been installed in one of the turbines of the Breña Wind Farm in Albacete, Spain. (Courtesy: Acciona)

systems need to continue functioning so they are fed from the grid, which means that the wind turbine is registering a net consumption of energy.

MORE INFO www.acciona.com

► INNOVATION

Operators need to invest in disruptive tech, says Onyx Insight

Micro Electro-Mechanical Systems (MEMS) have radically changed the return on investment model for turbine condition monitoring in the United States, helping wind-farm owners make significant OPEX savings. By cutting the cost of condition monitoring systems (CMS), low-cost MEMS sensors have helped wind-farm owners to improve operational planning, cut unscheduled maintenance, and make OPEX savings of up to 8 percent each year, according to ONYX InSight.

First introduced by ONYX InSight in the wind-energy industry, MEMS sensors are used in CMS hardware to measure and report on vibration, temperature, and oil condition in the drive train. With billions of MEMS sensors manufactured every year for use in equipment from mobile phones and pacemakers to automo-

otive and aviation safety systems, the technology is low cost and highly reliable. MEMS equipped CMS have transformed the return on investment for turbine monitoring, particularly for owners of smaller or older models. Lowering the cost of CMS hardware has allowed owners to refine repair and maintenance strategies to realize greater OPEX savings. The latest CMS hardware collects a wide range of wind-turbine performance metrics, allowing wind-farm operators to identify and confirm faults much earlier and to act preventatively to save money on repairs and site visits. The low-cost technology can benefit older and smaller turbine models significantly.

MORE INFO www.onyxinsight.com

► MANUFACTURING

Siemens Gamesa reaches 1 GW for EDF Renewables in the U.S.

Siemens Gamesa Renewable Energy has been awarded another order by EDF Renewables to supply 30 SG 4.5-145 and 36 SG 2.7-129 wind turbines for the 232 MW Milligan wind project, in Milligan County, Nebraska. This project marks 1 GW of SG 4.5-145 wind turbines sold world-wide and reinforc-

es Siemens Gamesa's solid position in one of the largest wind power markets in the world.

The contract also includes a service and maintenance agreement for Siemens Gamesa's premium maintenance program, offering the best in scale and flexibility to maximize energy asset returns. Project completion is expected for the end of 2020.

"EDF Renewables is a very strong partner for us, and we are glad to be working with them on a number of projects like Milligan and the recently announced Coyote and Oso Grande wind projects," said José Antonio Miranda, CEO of Onshore Americas at Siemens Gamesa Renewable Energy. "This order again is evidence of our customer's confidence in Siemens Gamesa and our leading technology."

The SG 4.5-145 offers a flexible power rating from 4.2 MW to 4.8 MW depending on site conditions and has a rotor diameter of 145 meters. It is optimized for medium wind onshore locations to maximize energy production with low noise emission levels.

MORE INFO www.siemensgamesa.com

► MANUFACTURING

Vestas introduces the V138-3.0 MW to reduce LCOE

Following the launch of the EnVentus platform in January, including the V162-5.6 MW and V150-5.6 MW turbines, Vestas recently introduced the V138-3.0 MW turbine at AWEA WIND-POWER in Houston, Texas. Based on the scalable EnVentus platform architecture, the V138-3.0 MW's 138-meter rotor provides a large rotor-size-to-generator-rating ratio, strengthening Vestas' portfolio of turbines through superior park level energy production, higher certainty in performance, and reduced leveled cost of energy.

The V138-3.0 MW is globally applicable but purposely designed to maximize performance under mar-

ket specific constraint conditions. By combining the V138-3.0 MW turbine's 138-meter rotor with an 83-meter tower, the new turbine offers the industry's largest swept area under 152.4 meters (500 feet), a relevant height constraint in the United States. At the same time, the turbine's leading sound power levels makes it highly suitable for low wind sites in sound sensitive markets such as France.

"The V138-3.0 MW underlines Vestas' ability to continuously innovate and lead the industry in developing customizable and sustainable energy solutions that meet our customers' needs," said Chris Brown, president of Vestas' sales and service division in the United States and Canada. "This turbine is a perfect match for the North American market where higher certainty in Annual Energy Production at park level will become increasingly important for our customers to secure project financing and ensure profitability in a post-PTC market."

With the introduction of the V138-3.0 MW, EnVentus now covers a wide spectrum of turbine generator ratings and rotor sizes, underlining the scalability of EnVentus' platform architecture. Prototype installation is expected by the second half of 2020, while serial production is scheduled for the first half of 2021.

MORE INFO www.vestas.com

MANUFACTURING

Siemens Gamesa to supply offshore project in Taiwan

Following its selection as preferred supplier in May 2018, Siemens Gamesa Renewable Energy has received the firm order by wpd offshore to supply the 640 MW Yunlin offshore wind power plant in Taiwan. Located approximately six kilometers from shore in the Taiwan Strait, the plant will feature 80 SG 8.0-167 DD offshore wind turbines. This first firm order in

Asia Pacific (APAC) for the SG 8.0-167 DD also includes a 15-year long-term service agreement. Construction is expected to start in 2019, with turbine installation beginning in 2020.

As announced in October 2018, the project will feature localized towers in 2021, via CS Wind and Chin Fong Machine Industrial's partnership in Taichung harbor. It thereby satisfies official localization requirements on turbine components.

The SG 8.0-167 DD wind turbine has a rated capacity of 8.0 MW, and a rotor with a 167-meter diameter. It has a swept area of 21,900 square meters and uses the SGRE B81 blade, which measure 81.4 meters.

MORE INFO www.siemensgamesa.com

MAINTENANCE

Shell launches 10-year warranty gearbox oil to U.S. market

Shell Lubricants unveiled a new synthetic gearbox oil for wind turbines in the U.S. market at AWEA WINDPOWER 2019 in Houston, Texas.

With a 10-year warranty, Shell Omala S5 Wind can help to extend operational uptime and reduce unplanned breakdown by offering enhanced protection.

"70 percent of U.S. power businesses don't realize that effective lubrication can lead to shorter periods of equipment downtime, having negative ramifications on the bottom-line," said Warren Cates, senior research scientist at Shell. "Improving this aspect of equipment maintenance can make a significant impact on profitability. Shell's range of wind turbine gearbox lubricants are designed specifically for exceptional oil life under various extreme conditions, as is demanded by America's varied climate."

Gearbox operations and management can be particularly demanding, often in remote locations and challenging weather conditions. They must



Gearbox operations and management can be particularly demanding, often in remote locations and challenging weather conditions. (Courtesy: Shell Lubricants)

withstand extremes of hot and/or cold climates, water, dust, and fluctuating wind speeds. These severe conditions and varying loads can cause damage to the gearboxes, including micro-pitting. If a gearbox failure occurs, it can cause significant equipment downtime, leading to monetary loss. With more than 56,600 wind turbines now active across 41 states, with a combined capacity of 97,223 MW, operational efficiency has never been of more importance in the U.S.

MORE INFO www.shell.us

MAINTENANCE

Crawler cranes use tandem lifts to remove blades from turbine

On behalf of Enercon, Belgian crane service provider Aertssen removed the 72-metric-ton, 58-meter-long rotor blades from an Enercon E-126 wind turbine at a height of approximately 136 meters for maintenance. However, what may sound like a routine job was actually a tricky challenge, and it was only the team's extensive experience and two CC 3800 lattice boom crawler cranes that enabled them to successfully carry out the corresponding lifts.

"Before anything else, we had to decide which crane to use for the job," said Aertssen Project Manager Peter Bertels.

There were two options available: either a large crane that would be able to take care of the lifts by itself or two, more compact, cranes that would tackle the lift in tandem. Ultimately, the team decided on using its two CC 3800 cranes, as they were more cost-effective, would be powerful enough when used together, and had the required reliability and precision characteristics for the lifts. However, it was first necessary to make sure that the ground bearing capacities at the work site in Estinnes would be sufficient for the two crawler cranes, as they had originally been calculated back when the wind turbine had first been erected, for the use of a single crane only.

A total of 52 truck runs across a distance of about 130 kilometers were needed in order to get the two cranes from the Aertssen branch in Stabroek to the work site. Once there, a five-member Aertssen team set up the cranes within a week. The team started by setting up the first crane, which was placed a bit farther away from the wind turbine, on the corresponding access road, and then proceeded to set up the second one, which was closer to the tower. For the configuration, the team decided on the main boom variant with a 141-meter LSL and 12-meter LF4 arrangement with an offset of 20 degrees. The Superlift mast had a length of 36 meters, and the crane was set up with 165 metric tons of counterweight and 50 metric tons of Superlift counterweight.

Once all these steps were completed, the two cranes and the Aertssen team were ready for the technically ambitious lifts: The 72-metric-ton rotor blades not only had to be taken from a height of 136 meters and safely lowered to the ground, but they also had to remain perfectly balanced while being lowered. To achieve this, the operator of the CC 3800 that was closer to the tower first guided a sling, which was hanging from a spreader beam with four-part reeving, around the tip of the rotor blade. The operator of the other crane then repeated this same procedure. When “lassoing” the rotor blades with the slings, the two



The 72-metric-ton, 58-meter-long rotor blades from an Enercon E-126 wind turbine at a height of approximately 136 meters are removed for maintenance. (Courtesy: Aertssen)

crane operators depended on the instructions of Enercon employees who were also on-site for the job.

“The reason is that even though we’d installed cameras on the spreader beams, our crane operators were operating remotely, and were therefore unable to determine whether the slings were at the right height,” Bertels said. “It was kind of like lassoing a tiny animal.”

Once the two slings had “lassoed” the rotor blade, the cranes swung them to the intended rigging points, at which point it was time for the tricky part of the job: First off, the cranes needed to rotate parallel to each other in order to get the blade out of the rotor. Once this happened, crane 1 had a gross load of 46 metric tons on its hook, while crane 2 had a load of 36 metric tons. After this, the operators were able to set down the blade at a radius of about 22 meters. However, the blade had to be kept in a perfectly horizontal position at all times in order to prevent it from sliding off the slings, which is why digital spirit levels with wireless transmission capabilities were installed on the blades in advance to let the operators know, at all times, that the blades were level.

It was only necessary to make two

brief corrections throughout all three lifts, which totaled a distance of about 400 meters. One week later, after the required maintenance was complete, the rotor blades were reinstalled on the wind turbine.

MORE INFO www.aertssen.com

MAINTENANCE

Airway Services announces ISO 9001:2016 Certificate

Airway Services recently announced the successful completion of its International Organization for Standardization (ISO) 9001:2015 audit for its corporate office in San Angelo, Texas. The audit’s objective is to set international requirements for quality management systems.

The audit was performed by QAS International (QAS) on April 23, 2019, and Airway Services passed the most recent version of the audit. The internationally recognized ISO 9001 standard is applicable to any manufacturing or service industry.

The newest version of the ISO 9001 certification contains key updates including an emphasis on risk-based thinking to enhance the application of the process approach, improved applicability for services and increased leadership requirements.

MORE INFO www.airwayservicesinc.com

CONSTRUCTION

Chartwell Marine wins design contract for hybrid catamaran

Chartwell Marine, a pioneer in next-generation vessel design, has been selected to design and specify build for a U.S. hybrid vessel. The 65-foot catamaran has been designed to meet EPA Tier 4 emission standards

and will set a benchmark for vessel operators and boat builders in the U.S. and further afield.

Driven by the emergence of new industries such as offshore wind, the diversity and scope of workboat operations off the U.S. East Coast is increasing rapidly. Simultaneously, offshore wind vessel operators, public institutions, and port authorities must begin to adapt to increasingly stringent emissions regulations. As these stakeholders in the U.S. maritime market look to reduce their carbon footprints, vessel design and hybridization is becoming an increasing area of focus.

In order to provide operators with these next generation hybrid craft, however, there are a number of design challenges to overcome, requiring specialist naval architecture and design expertise.

Chartwell Marine and its partners won this design project following a competitive tender launched by a leading New England institution. The firm was selected on the basis of its industry-leading track record in developing high-performance catamarans and hull forms for the offshore wind sector, and low emission, hybrid architecture.

These design considerations will be made possible by an advanced new catamaran hull form that has been optimized via Computational Flow Dynamics (CFD) modeling, enabling maximum maneuverability and stability resulting in a smoother and safer ride.

MORE INFO www.chartwellmarine.com

CONSTRUCTION

Top safety technologies to watch out for

Safety training is critical in the construction industry because it's a high-risk workplace with hazardous work. Dangerous situations are part of the everyday working environment. The constant challenge for construction companies is to create and deliver ef-



Chartwell Marine will design a 65-foot catamaran that meets EPA Tier 4 emission standards. (Courtesy: Chartwell Marine)

fective safety training.

“The traditional way of handling safety training tends to be boring and doesn’t take into account the natural learning style of construction workers,” said Abby Ferri, vice president, national construction practice, Hays Companies, a Minneapolis, Minnesota-based risk management, insurance and employee benefits adviser. “It is more effective to provide hands-on training, and if this can’t be done in the immediate workplace, the training should be done in some sort of a simulation of the workplace or at least do meaningful activities that bring the workplace into the classroom.”

Ferri, who has been involved in construction safety for more than 16 years, has found that, rather than building a PowerPoint presentation for a particular topic, it is more effective to determine the learning objectives for the particular training, identify learning activities that can be facilitated with the students (workers), and then guide them through the training.

“It is important that the training be interactive, because this helps to keep everyone involved,” she said.

The trainer needs to digest what is being shared, understand the group that is taking the training, and, if necessary, adjust the learning activities to make it applicable, she said.

Ferri is conducting an “in the field” Safety Tech Trek at ICUEE, October 1-3, 2019, in Louisville, Kentucky.

These are some of the top construction safety technologies to keep an eye on:

► **Wearables and Embedded Technology:** This technology involves attaching various types of mobile electronics and embedded sensors to the body and personal protective equipment for a wide range of purposes.

► **IoT (Internet of Things):** By combining the real-time data generated by wearables, embedded technology, and GPS tracking with the IoT, Big Data can be used to monitor and measure a wide variety of safety performance metrics within the construction industry.

► **Enterprise Solutions:** These are designed to integrate multiple facets of jobsite safety through the interchange of information from “connected” workers and a “connected” jobsite.

► **Collision Avoidance Systems:** Technologies will continue to evolve to further improve blind-spot coverage, proximity detection alerts, detecting the presence of workers, collision avoidance systems, and systems that monitor equipment operators and keep a record of their performance.

► **Microlearning:** This involves breaking down information into compact, focused learning segments — usually three to five minutes long — that are designed to meet a specific learning outcome. The training, which can be viewed on a smartphone or tablet in the field, is easier to process, and knowledge retention is increased.

► **Apps:** Mobile applications are making it easier to get safety training to workers, plus they help safety managers be more productive. ↵

MORE INFO www.aem.org



CROSSWINDS

THE FUTURE OF WIND

BUILDING NEW TOWERS – ONE PIECE AT A TIME

One advantage of the Hybrid Tower design is the ability to produce the tower segments on site. (Courtesy: Max Bögl Wind AG)

Max Bögl Wind AG has developed a Hybrid Tower technology that meets the growing need for taller hub heights while addressing challenges surrounding transportation issues and more.

By **KENNETH CARTER** ▸ Wind Systems editor

As the demand for taller wind turbines increases, the challenge of transporting steel structures pushing 200 meters to their final destination increases along with it.

But what if a turbine tower could be put together on site like a bunch of giant Lego blocks?

Not only would that solve the transportation problem, but it could result in other money-saving measures such as job creation and lower material cost.

That “what if” scenario is a reality in Germany, where Max Bögl Wind AG has been implementing its Hybrid Tower technology to the tune of 300 towers a year since building its first prototype in 2010. Since then, Max Bögl has produced and assembled more than 1,850 towers supplying more than 4,800 MW of installed power.

The company’s next step is to demonstrate how the tower-building technique is a perfect fit for the wind industry in the U.S.

PRECISION-MADE PREFABRICATED CONCRETE

Max Bögl’s technology consists of prefabricated, CNC-milled concrete elements with standard steel tube sections. The modular designed towers can reach hub heights up to 190 meters, according to Christoph Bosch, head of sales at Max Bögl.

The construction method stacks rings made up of three segments of prefabricated concrete. Once those rings reach the necessary height, a transitional steel piece that will support the turbine is positioned on top of the concrete structure.

“The CNC milling of the concrete elements allows us to have a really high exactness of 0.1 millimeters between the gaps,” he said. “This exactness allows us to stack the rings on top of each other with a dry vertical and horizontal joint.”

The steel transition piece sits on top of the concrete tower, supplying pressure to the whole system, according to Bosch. It combines the lower concrete elements with the steel tip.

“The concrete elements fit together by the friction between the elements; that’s it,” he said. “There’s no grouting or anything between them.”

Max Bögl is experienced in using concrete for different products and prefabricates its products (like the hybrid tow-

er) in a serial production, according to Bosch.

HUB HEIGHT DEMANDS

The Hybrid Tower technology was created to meet the German wind energy sector’s demand for higher hub heights, he said.

“It was difficult to reach hub heights like that with steel towers, so we thought that a combination of concrete elements would be the best way to get higher hub heights in a very economical way,” Bosch said. “We had a lot of experience in prefabrication of the concrete elements with the CNC grinding technology. It was an opportunity for us because we could support the OEMs and reach those kinds of hub heights.”



Max Bögl built the world’s highest onshore turbine in Gaildorf, Germany, with a 178-meter hub height. The turbines are part of Max Bögl’s Water Battery storage project. (Courtesy: Max Bögl Wind AG)

The average hub height in Germany now sits at 140 meters, but a lot of towers are being built with a hub height of 160 meters or more, according to Bosch.

When hub heights get that high, field tower limitations start to materialize, and transportation starts to become a bigger challenge.

“The concrete tower is prefabricated in segments so we can use standard trucks to transport the elements to the wind park very easily and combine them to one ring,” Bosch said. “We then stack the rings (like a Lego system)

▼ An advantage to the Hybrid Tower design is the ability to produce the tower segments on site. This has the added benefit of taking care of transportation challenges, but it also can increase local job creation. ▼



The concrete tower is prefabricated in segments that can be transported to a wind-farm site by standard trucks. (Courtesy: Max Bögl Wind AG)

on top of each other directly on site.”

THE ECONOMICS OF CONCRETE

Since the costs of constructing a wind farm are often calculated years before a turbine’s blades actually start spinning, being able to factor in an accurate bottom line is a necessity. With the price of steel often fluctuating, using concrete for most of the turbine towers starts to make a lot of sense, according to Bosch.

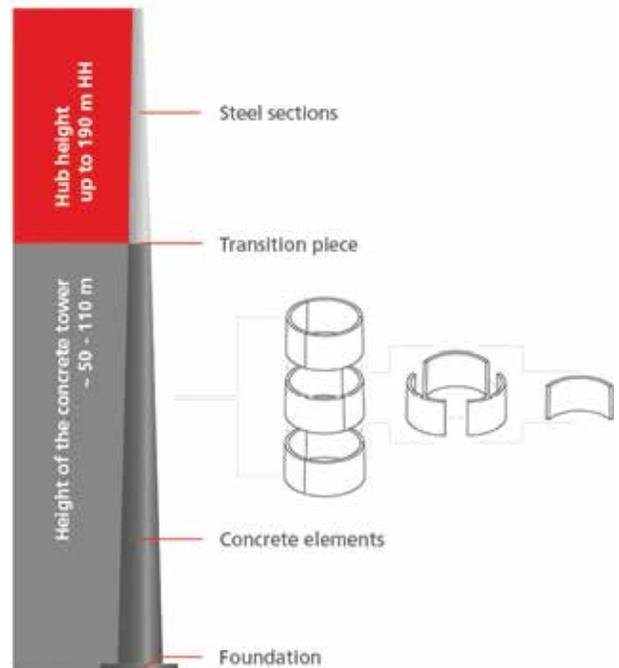
“If you’re going to quote something today, we can hold the same pricing structure in two, three, or four years because it’s only prefabricated concrete elements,” he said. “This makes it more economical. You need a huge amount of steel if you go with a steel tower structure up to high hub heights.”

Another advantage to the Hybrid Tower design is the ability to produce the tower segments on site, according to Bosch. This has the added benefit of taking care of transportation challenges, but it also can increase local job creation.

“You use local workers to do the production,” he said. “We had a project last year in Thailand, for example, with our mobile fabrication where about 80 percent of the workers were coming from Thailand directly. There was just a small task force team there, and the rest was local. Furthermore, we used local resources for the concrete.”

SOLVING A TRANSPORTATION CHALLENGE

If fabrication on or near site isn’t available, the Hybrid Tower



The construction method stacks rings made up of three segments of prefabricated concrete. Once those rings reach the necessary height, a transitional steel piece that will support the turbine is positioned on top of the concrete structure. (Courtesy: Max Bögl Wind AG)

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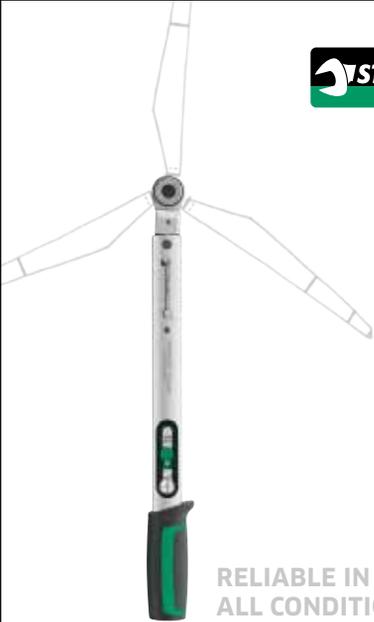
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**DRONE INSPECTION
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The ability to produce tower segments on site can tackle transportation challenges and aid in local job creation. (Courtesy: Max Bögl Wind AG)

construction still has a major advantage over traditional steel towers, according to Bosch.

“We do not need any heavy-load trucks,” he said. “The only heavy load trucks are from the OEM for field sections or the rotor blades. For us, it doesn’t matter. We are using standard trucks.”

Max Bögl is in negotiations now with U.S. developers on several projects where on-site mold applications will be used for more than 30 turbines. But the on-site technology will also be advantageous for smaller projects as well, according to Bosch.

“If the project is smaller, then we look for solutions to set up the mobile fabrication between two or three projects to create a volume for a bigger output,” he said.

ENTERING THE U.S. MARKET

With U.S. developers now seeking higher hub heights like the ones Germany has been constructing for years, Bosch said he sees the U.S. as a continuing market for Max Bögl’s innovative tower construction.

“We want to be in the U.S. with our own U.S. identity because we see the U.S. as a long-term business market

for us,” he said.

And Bosch eyes the end of the PTC as a perfect opportunity that will help hybrid tower technology to continue its transition into the U.S. wind market.

“Everybody is looking for the time period after the PTC,” he said. “We have had several discussions with OEMs and also with developers to identify projects for next year where we can set up our hybrid tower structure in the U.S.”

That and other developments are helping Max Bögl make inroads into the U.S. wind market, making wind energy viable in areas of the country that aren’t considered possible today.

Where wind energy is viable and profitable in the middle of the U.S. in states such as Texas and Oklahoma, it will need a hub height boost in order to be sustainable in areas such as the eastern side of the U.S.

“You have to go higher with your wind farm,” Bosch said.

With Max Bögl’s Hybrid Tower technology, it would appear wind energy in the U.S. will continue to reach for new heights. ↙

MORE INFO www.mbrenewables.com



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