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INDUSTRY AT LARGE

DURING THIS WINTER'S COLD SNAPS, WIND ENERGY HELPS KEEP LIGHTS ON AND ENERGY BILLS LOW

While the record cold across much of the U.S. in January and February was a top news story, what received less coverage was the role wind energy played in protecting consumers from price increases and reliability problems affecting other energy sources. Electricity supplies across the Eastern U.S. were tight as electricity demand skyrocketed at the same time many conventional power plants stopped producing due to mechanical failures from the cold and natural gas shortages.

Fortunately, wind energy provided large amounts of extremely valuable electricity as the cold successively challenged each grid operator:

- As the cold and high winds first rolled into U.S. on January 6, the Midwest grid operator saw very high wind energy output of around 8,000 MW, enough to supply 6 million average homes under typical conditions.
- Later that morning, the Nebraska Public Power District was able to meet record winter electricity demand with more than 300 MW of wind output, which provided about 13 percent of its total electricity demand. In a press release touting wind energy contribution, the utility explained that "Nebraskans benefit from NPPD's diverse portfolio of generating resources. Using a combination of fuels means we deliver electricity using the lowest cost resources while maintaining high reliability for our customers." The utility also noted that "NPPD did not operate its natural gas generation because the fuel costs were up more than 300 percent over typical prices."
- In Texas, the more than 2,000 MW of wind output that morning was the critical difference keeping heaters running as the grid operator struggled with numerous outages at conventional power plants. More than 13,000 MW of conventional power plants were down for maintenance, while another 2,000 MW of conventional power plants experienced unplanned outages, forcing the grid operator to resort to emergency procedures. In a similar incident two years ago, wind energy earned accolades from the grid operator for helping to keep the lights on as dozens of conventional power plants failed in another cold snap.
- By that evening, the cold air had reached the East Coast. The grid operator for the Mid-Atlantic and Great Lakes states, PJM, saw very high wind energy output when it needed it most. Wind output was above 3,000 MW when the grid operator faced extreme challenges due to the unexpected failure of numerous conventional power plants.
- The New York grid operator issued a press release highlighting the major contributions it received from wind energy and the difficulties it encountered due to failures of other energy sources that evening.



By Michael Goggin
American Wind Energy Association

- New England consumers also saw major savings as the region's wind plants ran at nearly full output, helping to mitigate the impact of extremely high electricity and natural gas prices.

Two weeks later, wind energy again provided large amounts of extremely valuable energy as another cold snap roiled the Eastern U.S. During the periods of peak demand on January 22-23, the PJM grid operator received between 3,000-4,000 MW of wind energy output. Wind played a critical role in diversifying the energy mix, protecting consumers from electricity and natural gas prices that skyrocketed to 10-50 times normal levels.

Finally, in early February, wind energy once again demonstrated its value, this time in California. Specifically, wind energy provided the California grid operator

with around 2,000 MW of output at the time of peak demand on the evening of February 6, and wind energy output remained high at around 2,500 MW for most of the rest of that evening. This came at a critical time for the operator, which issued a statewide “Flex Alert” because “A shortage of natural gas triggered by extreme cold weather in much of the United States and Canada is impacting fuel supplies to Southern CA power plants and reducing electricity generation.”

Because it has no fuel cost, wind energy plays a critical role in protecting consumers from fuel price

volatility. Through four separate mechanisms, wind energy keeps electricity and natural gas prices in check by:

- Directly offsetting the use of expensive energy
- Driving prices down for all consumers in the electricity market
- Driving natural gas prices

down for all consumers in the gas market

- Hedging against energy price volatility

While wind energy provides these benefits during everyday grid operations, they are more pronounced during shortages like the extreme cold events seen in January and February. ↘



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WARRANTY WORRIES IN THE U.S. WIND MAINTENANCE MARKET

As an increasing number of turbine warranties expire, seamless collaboration among operators and insurers is crucial to long-term decision making and reliability

By Chris Cioni and Dan Cass
GCube Insurance Services, Inc.

The scale of the shift from original equipment manufacturer (OEM) agreements to independent maintenance contracts and its impact on the market is not to be underestimated. According to IHS Energy research, U.S. operations and maintenance (O&M) spending is forecasted to double to close to \$6 billion by 2025 as a result of the number of turbines coming out of warranty. Worldwide, we estimate that around 30 to 35 percent of the market has made the shift, or is considering shifting to independent maintenance contracts.

The fate of the Production Tax Credit has driven owner/operators to search for alternative ways to reduce costs wherever possible—and there’s no pretending that cost isn’t the major factor driving this industry development.

With average yearly maintenance costs of over \$50,000 per turbine, operators will naturally look for ways to bring this figure down; however, once warranties expire, this exercise becomes increasingly complex.

During the OEM’s standard warranty period, which is often non-negotiable, an operator will have a limited idea of the true operational experience of a wind farm, since not all day-to-day issues are shared by the OEM and the data history accumulated by the operator is not all encompassing.

When it comes to negotiating a follow-on O&M contract with the OEM, the operator is presented



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with a 'menu' of options ranging from basic programs to comprehensive offerings. These packages come at a significant price; hence an inevitable shift towards independent contracts.

Some OEMs have differentiated their offering by providing Energy Yield Guarantees (EYG) or Annual Energy Production Guarantees (AEP), which cover the production of a wind farm, rather than its availability. These offer owner/operators the opportunity to make savings on personnel costs, since the bulk of maintenance work will be performed by the OEM for a price that guarantees a specified production output no matter what.

By comparison, independent O&M providers will offer a similar menu of incrementally priced offerings to the OEM, in conjunction with an availability guarantee, for a lower cost than the OEM can offer. Since the independent contractor is bound to this availability



guarantee, it must continue to provide a robust and efficient program in order to meet targets. Owner/operators opting for independent contracts will thereby benefit from upfront cost savings while maintaining availability objectives.

Both of these routes have their benefits for an owner/operator, however, in our view, the biggest difference and greatest advantage is the EYG offered by some OEMs. While independent contractors can guarantee a particular percentage of

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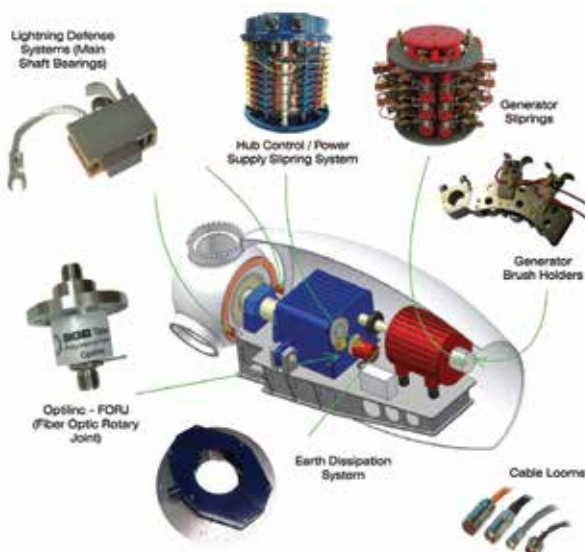
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Relative experience is another area where the maintenance offerings of OEMs and independents can be differentiated. Manufacturers will naturally claim to know

everything there is to know about their machines and will assert that they are in the ideal position to service these. This is a valid point—the OEM will possess the most comprehensive database available and will be up-to-date with a number of trends and

issues that might not make it into the public domain.

Independent contractors, by contrast, will stress the value of lessons learned across the sector, having worked with a variety of manufacturers and equipment. They will be able to share these lessons openly with the client to ensure that projects continue to be managed effectively going forward.

Crucially, from an insurance perspective, both OEMs and independent contractors have a vested interest in keeping turbines working properly and minimizing down time. The best way to ensure this will always be to have a proactive maintenance program in place, ideally making effective use of condition based monitoring.

Naturally, however, any switch in maintenance practices is a source of potential concern for insurers and underwriters. An insurer will always feel most comfortable while the original manufacturer warranty is still in effect, and, once this has expired, will be in need of a certain level of reassurance in order to resolve uncertainty and maintain that level of comfort.

As such, when negotiating follow-on O&M contracts outside of the warranty period, there are several areas that operator/owners should consider to ensure that the relationship with their insurer remains positively engaged.

Firstly, the nature of any new contract and service level agreement should be carefully considered. Given the 'menu' of choices offered by independent contractors and OEMs alike, it's important that an owner/operator knows whether a site will be receiving a bare bones offering or a full wrap, comprehensive O&M service.

Secondly, if an independent service contract is being considered, operators should take care to determine the reputation of the company set to undertake maintenance work on their site. While the reputation of the OEM will have

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been a factor in the original equipment choice, owners will have to consider the experience and scope of operations of any third party contractor to ensure that they are the best fit for the asset involved.

Finally, underwriters are keen to see that an operator can display a commitment to best practice across the board where maintenance is concerned. In addition to a robust and suitable maintenance program, operators should be able to demonstrate that a supply of spare parts is available should a problem arise, that sufficient numbers of experienced technicians are on hand to conduct maintenance work and that strong contingency plans are in place.

Providing all of the above is enacted, insurers will work to develop an insurance program for a site that reflects the best practice of its owner/operator.

However, with a climate of uncertainty surrounding the future of O&M in the sector, the willingness of operator/owners to share information in a timely fashion is increasingly becoming

the key requirement for keeping insurers happy and on board.

Having paid more claims in the renewable energy insurance market than any other provider; one of the biggest challenges we regularly face is convincing clients to share information as soon as possible. Although we understand clients' concern that information will be used against them in an attempt to up their rates, we look at our relationship with the client as a partnership.

Crucial to this partnership is an open dialogue, affording us the opportunity to exchange ideas and strategies for more effective risk mitigation and loss control. It is vital that we receive information early so that we have time to act in a timely and effective manner.

Furthermore, the need to act early will be an ongoing theme as the market matures in the coming years. As wind farms grow older, wear and tear and equipment degradation is only set to increase. We need to see proactiv-

ity across the maintenance market. Regardless of who is responsible for maintaining this aging equipment, more real time analytics and condition-based monitoring will ultimately be required in order to minimize downtime and repair costs.

So in the end, it is not only about making a considered choice for a post-warranty maintenance program and demonstrating a wider commitment to best practice that owners and operators can maintain a strong relationship with their insurer; it is also about ensuring that an honest, open partnership is established alongside a commitment to proactive, preventative maintenance and associated technologies. ✎



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VESTAS ADDS ANOTHER 450 U.S. JOBS

Driven mostly by North American demand, OEM's total workforce addition at four Colorado factories to top 850

Two blade factories have already filled about 400 positions and Vestas expects to add at least 450 more production workers in 2014.

One of the best years for wind-turbine orders for Vestas has led to significant hiring at its four Colorado factories. The company's blade factory in Windsor, blade and nacelle factories in Brighton, and tower factory in Pueblo, expect to add more than 850 production workers this year after Vestas secured orders in 2013 for nearly 900 turbines.

Working with Elwood Staffing, Vestas this year already has filled about 400 positions at its Colorado blade and nacelle factories and has received more than 3,200 applications overall. About 450 additional factory positions are expected to be filled this year. Candidates can apply at ElwoodWind-

Jobs.com.

"We are going to be extremely busy making blades, nacelles and towers this year through at least 2015," said Chris Brown, president of Vestas' sales and service division in the United States and Canada. "We have excellent turbines like the V110-2.0 MW and V100-2.0 MW that are very competitive in the U.S. market—and they're made right here in Colorado. Some of the world's largest utilities and energy developers are buying them because they are confident in the proven technology, quality, and durability of our products."

The positions are considered temporary with the opportunity to be hired as regular Vestas employees. Since late 2013, Vestas has already converted more than 60 people to regular employees at the Brighton blade factory.

HEADLINES

Senvion eclipses 10 GW installed capacity milestone

Senvion SE, a wholly owned subsidiary of the Suzlon Group, installed more than 1.4 GW of capacity in 2013 followed by a strong installation start in 2014—thereby breaking the mark of 10 GW of capacity worldwide. This capacity is enough to supply 20 million people—or the entire population of Australia—with electricity for one year.

Senvion installed the largest share of this total volume in Europe, where a total of 7.5 GW is installed here alone—on land and in the water. In its domestic market of Germany, the wind turbine manufacturer installed a total capacity of 2.8 GW by the end of 2013. The subsidiaries in France (1.5 GW) and Great

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Britain (1.1 GW) likewise make a major contribution to breaking the 10 GW mark. In North America, Senvion is active with a total of 1.8 GW of installed capacity. Asian countries contribute 375 MW to the group's capacity while the subsidiary in Australia contributes 196 MW.

A total of 10 gigawatts of installed capacity on four continents in more than 10 countries documents impressively that we have the right products for the global market—from our tallest turbine measuring 200 meters in height for low-wind locations in inland areas to powerful offshore machines,” said Andreas Nauen, CEO of Senvion SE. “It was only recently that we founded a subsidiary in Austria. Turkey, India and Japan are other interesting markets we have our sights on.”

Employees hired directly by Vestas receive a comprehensive benefits plan that includes health care, generous vacation and sick time, as well as a 401(k) with an employer match.

“Our world-class Colorado factories help us compete in the U.S. market,” Brown said. “Since we opened our first factory six years ago, it’s allowed us to conduct business in American dollars, build a domestic supply chain, and reduce transportation costs.”

Based on orders received in 2013, Vestas has the potential for an additional 2.6 GW of turbine sales in the United States and Canada. In addition to fulfilling regional orders, Vestas also is exporting blades, towers and nacelles from Colorado to projects in Mexico, Brazil, and Uruguay.

In 2011 and 2012, a downturn in the U.S. wind industry proved challenging for Vestas and other renewable-energy companies. Today, Vestas is completely debt-free, earned a profit in 2013 and expects strong earnings in 2014.

Vestas employs more than 1,450 people in Colorado with the large majority working at the manufacturing facilities. In 2013, Vestas hired more than 300 people at its tower factory in Pueblo to meet customer demand.

The tower factory plans to hire 80 more people in the next few months and is expected to reach full capacity utilization in 2014. Vestas also employs people in service and maintenance at two wind farms, as well as at a tools warehouse in Denver. By the end of 2014, Vestas expects to have more than 2,000 workers in the state.

Across the United States, the wind industry has more than 550 factories in 44 states. Turbine components produced domestically and installed in the U.S. have grown from about 25 percent in 2005 to more than 70 percent in 2013, according to the American Wind Energy Association.

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GE ANNOUNCES ITS NEXT-GENERATION “BRILLIANT” WIND TURBINE

2.75-120 features flexible storage, delivers 5 percent more AEP than its predecessor

GE recently announced its 2.75-120 wind turbine—a smarter, more powerful turbine—at the European Wind Energy Association’s annual event. Part of GE’s brilliant wind platform, the 2.75-120 provides 5 percent more annual energy production than GE’s 2.5-120 model and is available with various tower technologies, ranging between 85-139 meters, and optional energy storage.

“As we accelerate our platform’s growth in Europe, we will continue to invest in technology such as the 2.75-120’s flexible tower and other energy storage options, making GE’s wind turbines more customizable for developers and operators,” said Cliff Harris, general manager of GE’s renewable energy business in Europe.

The 2.75-120 is available on a steel, hybrid or space frame tower, helping to tailor the turbine for unique site conditions and bring wind power to new places across the continent. The range of tower height spans 85-139 meters tall.

Short-term or long-term energy storage is available with the 2.75-120, making wind power more predict-

able, flexible and fast responding through battery software applications. Short-term storage is integrated at the turbine level and long-term storage is centralized for the wind farm. These options further customize GE’s offering based on-site or operator needs.

The 2.75-120 follows the success of its predecessor, the 2.5-120, announced in February 2013. Forty-four are being supplied to eight new German wind farms. The 2.75-120 is part of GE’s brilliant wind turbine platform and utilizes the power of the Industrial Internet to analyze tens of thousands of data points every second, driving higher output, improving services productivity and creating new revenue streams for customers.

The 2.75-120 wind turbine is part of the company’s commitment to technology solutions that save money and reduce environmental impact for customers. In February, GE renewed that commitment in announcing it would invest \$10 billion additional in research and development by 2020. Part of that investment will go toward reducing the cost and increasing the output of its turbines to lower wind power generation costs.



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VESTAS RECLAIMS TOP SPOT FOR GLOBAL WIND TURBINE INSTALLATIONS

Danish wind turbine manufacturer Vestas Wind Systems has regained its position as the world-leading turbine installer, reaching first place in the top five companies in terms of total capacity installed, according to research and consulting firm GlobalData's unique wind turbine installation figures for 2013.

The company's latest research shows that Vestas has knocked GE Power & Water out of this position from 2012. This comes following Vestas' high number of wind turbine installations in the US, which is a major market for the company.

Both GE Power & Water and Gamesa Corporacion Tecnologica slipped completely from the top five original equipment manufacturers in 2013, falling from first and fifth position, respectively. In 2013, GE Power & Water installed 980.2 MW of wind turbines, a drop of more than 80 percent compared to its 2012 installed capacity.

German turbine manufacturer Enercon has made the top five list as the second largest turbine supplier in 2013, climbing up from its fourth position in 2012. Germany, Canada, and Turkey proved major markets for Enercon in 2013, where the company installed total capacities of 1,484.8 MW, 582.5 MW, and 237.1 MW, respectively.

While Chinese OEMs were absent from the top five in 2012, Chinese wind turbine supplier Xinjiang Goldwind Science & Technology (Goldwind) has blown its way into third place in 2013, advancing from its seventh position in 2012. GlobalData states that this is due to the company's increasing domestic installations in China.

Meanwhile, German OEM Siemens slipped to fourth position in the rankings, as Goldwind overtook the company to claim its position from 2012. Siemens' drop follows its decline in U.S., UK, and Romanian wind turbine installations.

Like Goldwind, Suzlon Group was another new entrant in the top five and ranked as the fifth largest OEM for 2013, advancing from its sixth position in 2012. This is attributed to the company's large-scale installations in Canada, Germany, and Poland during 2013, according to GlobalData.

GE TARGETS NEW HEIGHTS WITH SPACE FRAME TURBINE TOWER DESIGN

GE's renewable energy business announced the introduction of its new space frame tower for multi-megawatt wind turbines at the European Wind Energy Association's annual conference in Barcelona, Spain.

The five-legged enclosed lattice tower enables towers up to 139 meters to be built more cost-effectively in never before accessible locations, using a logistics-friendly model of standard shipping methods and on-site assembly.

"The space frame tower helps our customers go taller in new locations, further enabling the growth of wind energy," said Cliff Harris, general manager of GE's renewable energy business in Europe. "This next innovation in wind turbine technology is a stepping stone towards towers taller than 150 meters in Europe. GE will continue to drive innovation and advanced technology for the wind industry in the coming years."

The space frame tower is being introduced with GE's new 2.75-120 wind turbine and was demonstrated in a full-scale turbine at GE's prototype site in Tehachapi, Calif.

The lattice tower is assembled at wind farm locations and then wrapped in an architectural fabric to provide familiar solid structural aesthetics. The tower improves serviceability with increased space down-tower, maintenance-free bolting system, and efficient installation and dismantling.

The space frame tower features a wide base supported by five legs that provide more room at the base of the tower than a traditional tubular tower. The additional down-tower space allows for storage within the turbine for ease in maintenance, site organization and balance of plant.

Parts manufacturing can be automated with the space frame tower to optimize quality control of the structure. The fabric casing is durable, weather resistant, and does not need to be replaced during turbine life.



Courtesy: GE Power and Water