Lone Star Threats

As wind development hums along, there are signs of Texas-sized trouble on the horizon.

page 24

Repower vs. Repair
What to consider when you’re considering.

page 14

Bolts, Anchors & Tensioning
Think all bolts are created equally? Think again.

page 22
In today’s fast paced and ever changing world, stay ahead of the pack. The newest addition to Suzlon’s product portfolio is the S128 – 2.6 MW turbine for low to mid range wind speeds helping drive down the cost of energy. A swept area of more than 13,000 square meters results in one of the highest-yielding IEC Class III wind turbines in its class. Suzlon has more than 2,700 MW of installed capacity throughout the United States and Canada, with a team of over 200 trained Operations, Maintenance and Service technicians providing industry leading service in North America | Wind turbine manufacturer with an installed capacity of over 15 GW | Operations in 17 countries across 6 continents | R&D facilities in Denmark, Germany, India and the Netherlands. To drive down cost and generate more power contact us today at 773-328-5077 ext. 201 or ext. 203.
14 Seven Considerations When Deciding To Repower (Or Repair)
To repower or repair? The decision requires an in-depth analysis of costs and benefits.

18 Is Repowering Worth It?
Developers need to consider all of the consequences, both intended and otherwise.

22 What You Should Know About Tower Anchors
If you think all bolts are created equally, think again.

24 Is The Sun Setting On Texas Wind?
Several factors have the potential to reshape the state’s attitude toward wind energy.

Project Profile
28 Bearkat 1 Steams To Commercial Operation
The first phase of the wind farm is expected to produce power by the end of this year.
Aging fleet of U.S. wind turbines will force owners and operators to begin grappling with the thorny dilemma of deciding to repower the machines or simply repair them.

According to Navigant Consulting, there are 6,696 wind turbines in the U.S. that have exceeded 20 years of operation—or about 12% of the domestic fleet. And right behind that legacy fleet are another 12,903 wind turbines (24%) that have been in operation between 10 and 20 years. Taken together, that’s a whopping 36% of the total U.S. installed base that falls into these categories.

Lately, some owners have even opted for a partial repowering of a turbine. Experts say that this option can be particularly beneficial for wind turbines that are nearing 10 years of operation. Therefore, with so many options available, how can owners and operators decide which strategy is best?

Each option has its strong points. Repowering means that owners can take advantage of taller hub heights and increased rotor diameters to ensure more energy output. Then again, new analytical techniques have enhanced the ability for owners and operators to identify optimized approaches to running older wind farms. Therefore, some owners and operators may choose to repair the wind turbines as needed.

Luckily, two feature articles in this month’s issue may help to dispel the myths and provide an operating path forward.

**Several determiners factor into the equation.**

The first article, “Seven Considerations When Deciding To Repower (Or Repair),” written by AWS TruePower, provides a laundry list for readers to consider. For example, did you know that partially repowered projects may requalify for the production tax credit (PTC)? I didn’t. Or how about that repowering may impact your power purchase agreement? The article states, “Contracts may not have been structured to deal with repowering or may have ambiguities in the language that need clarification.”

The second article, “Is Repowering Worth It?” on page 18, is written by law firm Mayer Brown. The lawyers navigate the thorny issues surrounding the tax law and how repowering may impact PTC eligibility.

No matter which option is selected, you can be certain more owners and operators will be wrestling with this issue in the coming years.
THE BEST OPTION IS HAVING ONE

Castrol® is the only lubricant supplier that offers fit for purpose technology options. We utilize multiple product-based solutions that can align with your O&M strategy and deliver continuity within your fleet. Our expert engineering services can provide insights to help you obtain the maximum value from your lubricants and your turbines.

Ask us what options Castrol has for you.

Learn more at Castrol.com/windenergy or 1-877-641-1600
New & Noteworthy

Dominion, DONG Partner On Offshore Wind

Through a new agreement and strategic partnership with DONG Energy, Dominion Energy Virginia is moving forward on an offshore wind project in a federal lease area off the coast of Virginia Beach, Va. Dominion has signed a deal with DONG Energy to build two 6 MW turbines for the newly named Coastal Virginia Offshore Wind project, of which Dominion Energy remains the sole owner.

DONG Energy expects to immediately begin engineering and development work in order to support the targeted installation by the end of 2020. The timing for construction depends on many factors, such as weather and protected species migration patterns, notes Dominion.

This phase-one development will be built approximately 27 miles off the coast of Virginia Beach on a 2,135-acre site leased by the Virginia Department of Mines, Minerals and Energy. Dominion says it will provide critical operational, weather and environmental experience needed for large-scale development in the adjacent 112,800-acre site leased by Dominion Energy from the Bureau of Ocean Energy Management (BOEM). Full deployment could generate up to 2 GW of energy – enough to power half a million homes.

The two companies have signed a memorandum of understanding giving DONG Energy exclusive rights to discuss a strategic partnership with Dominion Energy about developing the commercial site (based on the successful deployment of the initial test turbines). DONG Energy, which is based in Denmark and has North American headquarters in Boston, owns 22 offshore wind farms in Europe and Asia.

The project continues what previously was called the Virginia Offshore Wind Technology Assessment Project. Dominion Energy began work on the project in 2011 as part of a U.S. Department of Energy grant to develop and test new wind technologies that could lower costs and withstand hurricanes. During that time, key achievements were made to advance the project, including the Approval of the Research Activities Plan by BOEM and environmental studies, which included avian and bat surveys, as well as assessments of ocean currents, archeological conditions and whale migration patterns.

“Virginia is now positioned to be a leader in developing more renewable energy, thanks to the commonwealth’s committed leadership and DONG’s unrivaled expertise in building offshore wind farms,” comments Thomas F. Farrell II, Dominion Energy’s chairman, president and CEO. “While we have faced many technological challenges and even more doubters as we advanced this project, we have been steadfast in our commitment to our customers and the communities we serve.”

According to the energy company, the project would be only the second offshore wind project in the nation and the first owned by an electric utility company.

“Today marks the first step in what I expect to be the deployment of hundreds of wind turbines off Virginia’s coast that will further diversify our energy production portfolio, create thousands of jobs and reduce carbon emissions in the commonwealth,” says Gov. Terry McAuliffe, D-Va. “Hampton Roads has the ideal port assets and talented workforce to attract and house the offshore wind business supply chain to support not only Virginia’s commercial wind area, but also wind farms under development in Massachusetts, New York and Maryland. Today’s announcement advances our efforts to build a new Virginia economy that is cleaner, stronger and more diverse.”
Better Bolting For Windpower

A radical change in AC powered, torque multipliers; includes unsurpassed quality, durability, accuracy, and service

EvoTorque

Versatile, accurate and easy-to-use

• Operating ranges from 100 lb-ft to 4500 lb-ft (135-6101 N-m)
• Measures in Torque, Torque and Angle, and Torque Audit mode for pre-tightened bolts
• Versions for 110 VAC or 230 VAC
• Lightweight at only 23lbs. (10.4kg)
• Factory calibrated and certified to ± 3% accuracy regardless of fluctuating voltages
• USB and Bluetooth® 4.0 data transfer (also called Bluetooth® Smart)
• 3,000 readings in internal memory, time and date stamped
• Includes PC software ‘EvoLog’ for data management and tool configuration
• From factory to field; for fabrication, installation, verification and maintenance

Norbar Torque Tools, Inc.
440.953.1175 PH
440.953.9336 FX
inquiry@norbar.us
norbar.com
Rocky Mountain Power Advances Major Wind, Transmission Plans

Salt Lake City-based Rocky Mountain Power is asking regulators in three states to approve an initial plan to significantly expand the amount of wind power serving its customers by 2020.

Regulatory filings in Wyoming, Utah and Idaho seek to advance the company’s Energy Vision 2020 initiative. The plan would do as follows:

- Upgrade or repower the company’s existing wind fleet with longer blades and newer technology;
- Add approximately 1.1 GW of new wind; and
- Build a new 140-mile Gateway West transmission segment.

Most of the new investments would be in Wyoming, notes Rocky Mountain Power, which is a division of PacifiCorp and part of Berkshire Hathaway Energy.

“We are very excited to begin the stakeholder review process for these projects that will significantly increase the renewable energy that serves all our customers,” comments Cindy A. Crane, Rocky Mountain Power’s president and CEO. “These investments will provide significant long-term benefits to our customers and bring substantial economic benefits to rural communities where the facilities will be located.”

The company first announced the wind and transmission investments in April as part of its broader long-term energy plan. Additional filings and regulatory approvals will be needed for the projects to be built and serve customers by 2020 as planned, the company says.

The Energy Vision 2020 projects were chosen by Rocky Mountain Power as the most cost-effective option to meet customers’ energy needs over the next 20 years. By moving to complete the projects by 2020, the company says it will be able to use federal production tax credits to provide a net cost-savings to customers over the life of the projects.

Further, Rocky Mountain Power also expects the projects to do as follows:

- Create 1,100-1,600 construction jobs in Wyoming;
- Add approximately $120 million in tax revenue from construction; and
- Bring significant post-construction annual tax revenues, starting at approximately $11 million in 2021 and growing to $14 million annually by 2024.

Cheers: Beer Maker Brews Up Renewables

After making a commitment to secure 100% of its purchased electricity from renewables by 2025, the world’s largest beer company is now in the process of bringing 220 MW of wind capacity to Mexico.

Anheuser-Busch (AB) InBev, which produces hundreds of brands of beer, including Budweiser, Corona, Stella Artois and Beck’s, signed a 15-year power purchase agreement (PPA) with Iberdrola for 490 GWh of wind power each year – providing enough energy to fully power all of its production sites in Mexico, including its largest brewery in Zacatecas.

As part of the agreement, which was signed on March 28 in Mexico, Iberdrola agreed to build and install 220 MW of wind energy capacity onshore in the state of Puebla.

Tony Milikin, chief procurement and sustainability officer at AB InBev, says the new wind project is called PIER (Parque Industrial de Energia Renovable), noting it’s an extension of an existing PIER wind farm owned by Iberdrola. Gamesa has been contracted to manufacture the turbines, with delivery expected in early 2018.

The beverage company expects the wind facility to begin producing energy in the first half of 2019, and according to Iberdrola Mexico’s spokesperson, construction has already begun.

With this first agreement, AB InBev is following through on its commitment to 100% renewables, noting both economic and environmental benefits.

“On the business side, renewable electricity through PPAs is actually cheaper than grid-sourced electricity in several markets,” Milikin says. “And further, PPAs help us reduce our risk from volatility in energy prices by locking in a fixed price of electricity in each agreement.

“But this decision was about more than that. As a company, we believe that climate change has
profound implications for our business and for the communities where we live and work, and it’s a huge area of concern for our consumers.

“I have said before that my generation – the baby boomers – see resources as infinite,” he continues. “As a generation, we seem to think that there will always be clean water or new sources of coal or gas. But the people coming up behind us, and especially the millennials, get that this isn’t the case. They know that these resources are finite, and we need to protect them and find new, cleaner and more renewable sources of electricity.”

This 100% goal is a noteworthy shift, considering AB InBev currently sources only about 7% of its purchased electricity from renewables. The company expects that by 2025, between 75% and 85% of its electricity will be secured through direct PPAs, like the one signed with Iberdrola, while the remaining 15% to 25% will come from on-site technologies.

And considering the company’s global operations require a whopping 6 TWh of electricity each year, AB InBev claims this plan – once enacted – will make it the largest direct corporate purchaser of renewable electricity in the consumer goods industry.

In conjunction with its renewable pledge, the company also announced that it officially joined the ranks of RE100, led by The Climate Group, along with CDP.

Launched in 2014, RE100 is a collaborative group of businesses that have committed 100% to renewable electricity and actively work to increase the adoption of renewables. These businesses include some of the biggest names in the game, including Apple, Bank of America, Coca-Cola, Ebay, Google, General Motors, IKEA, Johnson & Johnson, Microsoft, Nestle, P&G, Starbucks, TD Bank, Tesco, Walmart, Wells Fargo, and many more.

Acknowledging the rising demand for renewables from corporate customers, Milikin adds, “Businesses must start planning for a future that doesn’t totally depend on those [traditional] sources. Renewable electricity sources – like solar and, of course, wind power – are where the leading companies are heading.”

AB InBev says it chose to launch its efforts in Mexico because it already had a trusted partner in the area – Iberdrola – and because the country could serve as a case study for other developing emerging markets.

“When it came to building the contract, [Iberdrola] came to the table with a strong business point of view, and they were flexible in discussing the terms and conditions,” Milikin says. “In the end, they were the best choice for this agreement.”

The PPA will add more than 5% in additional renewable energy capacity to the current installed wind capacity in Mexico, based on existing, estimated 2015 installed wind and solar capacity from the International Renewable Energy Agency, helping the country reach its renewable generation target of 35% by 2024.
Emphasizing that the PIER project is only its first endeavor, AB InBev says it’s currently working to secure similar agreements in other markets, including Argentina, Brazil, India and South Africa.

“By using Mexico as our launch platform, we want to show that these kinds of PPAs are workable in developing countries,” Milikin says. “We want to send a signal to businesses that switching directly to renewable electricity can create positive social and environmental benefits while also delivering local cost savings.”

AB InBev hopes to be able to announce additional projects in the coming months and, more long term, over the next few years.

“I think we have an obligation to leave this Earth better than we found it,” Milikin says. “And with this commitment, we are doing what we can to make that happen.”

Lauren Tyler

Regulators Green-Light Xcel’s Wind Expansion

The Minnesota Public Utilities Commission (PUC) approved Xcel Energy’s plan for a huge wind energy expansion in the Upper Midwest.

Seven new wind farms are slated to be built in Iowa, Minnesota, North Dakota and South Dakota and will be operational by the end of 2020. The projects will provide enough energy to power more than 800,000 homes and increase Xcel Energy’s regional wind output by approximately 70%. The North Dakota Public Service Commission will review the plan later this year.

“We’re investing in low-cost wind energy to provide the benefits of clean, affordable energy directly to our customers,” says Chris Clark, president of Xcel Energy-Minnesota. “These projects deliver on our plan to keep energy costs low while also reducing carbon emissions by more than 60 percent in the coming decades.”

The facilities are as follows:
- Freeborn Wind Energy, a 200 MW project in Freeborn County, Minn., and Worth and Mitchell counties, Iowa;
- Foxtail Wind, a 150 MW project in Dickey County, N.D.;
- Blazing Star 1, a 200 MW project in Lincoln County, Minn.;
- Blazing Star 2, a 200 MW project in Lincoln County, Minn.;
- Crowned Ridge Wind Project, a 600 MW project in Codington County, S.D.;
- Lake Benton Wind Project, a 100 MW project in Pipestone County, Minn.; and
- Clean Energy 1, a 100 MW project in Morton and Mercer counties, N.D.

All projects are expected to be completed by the end of 2020, thus qualifying them for production tax credits, notes Xcel Energy.

The company says local landowners and governments will receive millions in lease payments and property taxes over the life of the projects. In addition, up to 1,500 construction jobs are expected to be created.

County Banks Millions From Production Taxes

Representatives from the wind industry and Xcel Energy recently presented a ceremonial check to Tim Gabrielson, chairman of the Mower County, Minn., board of commissioners, for $2,373,932 in wind energy production tax revenue for 2016. According to Wind on the Wires, the check represents the largest wind energy production tax payment made to any one county in Minnesota. Moreover, it’s a 26.5% increase over last year’s payment.

Statewide, revenue from the wind energy production tax exceeds $12 million, and more than one-quarter of the counties in the state benefit from this source of revenue, says Wind on the Wires, a St. Paul, Minn.-based nonprofit organization that works to advance renewable energy in the Midwest.

“More wind energy is produced in our county than anywhere else in the state, and that has been a good thing for Mower County,” said Gabrielson. “Not only does this economic development benefit local landowners and businesses who have partnered in the wind projects – our entire community benefits from the production tax revenue received by our county. This last year, the county board committed $400,000 of the county portion of revenue from the wind energy production tax toward improving roads and bridges. We’ve used the remainder as a tax relief for citizens.”

“Minnesota is truly a leader in renewable energy in the Midwest, and Mower County is reaping the benefits of that leadership,” said State Sen. Dan Sparks. “The county has received over $14.8 million in wind energy production tax payments since 2007. That revenue helps our entire community because it helps keep the lid on property taxes, helps pay for road improvements and supports community projects. We need to continue supporting wind energy development in Minnesota.”

According to Wind on the Wires, the wind industry has invested $6.8 billion into Minnesota’s economy. With 3,499 MW of installed capacity, wind power now provides 17.7% of Minnesota’s electricity. In addition, another 906 MW of wind is under construction or is in advanced stages of development in Minnesota.

“Wind energy is a true success story for Minnesota, providing investment, revenue and jobs across the state,” added Chris Kunkle, regional policy manager for Wind on the Wires. “The cost of wind energy has declined 66 percent over the past seven years, and utilities like Xcel Energy are passing those savings along to customers.”

“This year, for the first time, the revenue from the wind energy production tax exceeds $12 million. Cumulatively, over the past 10 years, the wind industry has paid more than $78 million in production taxes. More than one-quarter of the counties in the state benefit from this revenue source, predominantly in greater Minnesota, where the jobs and economic development are needed most,” Kunkle said.
Xcel Energy will own 1,150 MW of the new wind energy; the remaining 400 MW will be sold to the company under long-term power purchase agreements.

“We are pleased to see the Minnesota Public Utilities Commission give Xcel Energy the green light on their proposed acquisition of over 1,500 MW of clean, cost-effective wind energy,” says Beth Soholt, executive director of Wind on the Wires, a nonprofit that advocates for renewable energy in the Midwest. “[The] unanimous vote by the PUC demonstrates not only that wind energy is a smart investment for ratepayers, but also that these projects will provide significant economic benefits throughout our region.”

Block Island Project Not To Blame For Whale Death

In response to the whale carcass recently discovered on a beach in Jamestown, R.I., and the suggestion by local newspapers that the death of the creature may have been caused by the Block Island Wind Farm, the state’s Coastal Resources Management Council (CRMC) is claiming there is no scientific evidence to prove the theory.

The government office cites information from the U.S. Bureau of Ocean Energy Management (BOEM), which says there has been no scientific evidence collected to date of any whales being injured or stranded due to offshore wind activities.

Moreover, observed data collected shows that operational offshore wind turbines generate sounds that are relatively low (approximately 134 decibels at the Block Island site); in comparison, rainstorms range from 100 to 120 decibels, and fishing vessels create sounds from 150 to 190 decibels, the CRMC says.

The council also claims that baleen whales do not use sonar to navigate or feed and are classified as low-frequency (10 to 31 kHz) vocalizers; they generally produce grunts, moans and pulse trains to communicate. The operational underwater noise measured at the Block Island Wind Farm can possibly be heard by whales over short distances but is likely not heard beyond a few hundred meters from the foundation, according to the CRMC.

The council also cites scientific literature based on data collected in the U.K. stating that “underwater noise from operation[al] wind facilities is not considered significant.”

According to the CRMC, BOEM reportedly plans to continue to monitor and assess potential impacts related to the construction and operation of wind farms on marine life, specifically whales, through the Environmental Studies Program and data collected from lessees and state and federal partners.

Fagen, Inc. has everything you need to complete your wind farm:

- Experience building across the nation with a variety of wind turbine manufacturers.
- Skilled crews with recent wind experience.
- A fleet of main pick and support cranes.

Call us today and ask what we can build for you!
Invenergy Completes Construction Financing

Invenergy Renewables LLC has arranged construction financing for its 300 MW Santa Rita Wind Energy Center, under construction in Reagan, Irion and Crockett counties in Texas.

Morgan Stanley & Co. LLC and its affiliates acted as sole lead arranger, administrative agent and lender for the construction financing. Blattner Energy Inc. is the project’s contractor for civil/mechanical scope and the transmission line, while RES System 3 is the contractor for the electrical substation.

Comprising 120 GE 2.5 MW wind turbines, Santa Rita Wind is located approximately 70 miles west of San Angelo. Commercial operation is expected to commence in the first quarter of next year.

According to Invenergy, the project will produce enough electricity to power approximately 122,000 homes, as well as create more than 300 construction jobs and up to 15 full-time, permanent jobs. Further, the project will generate over $100 million in local economic development in its first 20 years of operation through tax payments, lease payments to participating landowners, and wages and benefits for employees.

“We’re pleased to have reached financial close for our Santa Rita project, which is Invenergy’s largest wind project to date,” states Jim Murphy, president and chief operating officer at Invenergy.

RES To Build Its First N.Y. Wind Farm

Through a third-party bidding process, Renewable Energy Systems (RES) has been awarded the balance-of-plant construction contract for the Copenhagen Wind Project, located in Jefferson and Lewis counties in upstate New York.

A notice to proceed was given on May 24, and construction will begin on the 80 MW project in August. The wind farm, owned and developed by EDF Renewable Energy, is expected to be completed in November 2018.

The Copenhagen Wind Project will comprise 40 Vestas V110 2.0 MW turbines. RES will also construct an approximately nine-mile, 115 kV transmission line, terminating at a newly constructed substation located along an existing National Grid-owned transmission line.

“Copenhagen will be RES’ first wind project constructed in the state of New York, and we are pleased to be contributing to the economic benefits this project will provide to the community,” says Jason Zingerman, vice president of construction for RES in the Americas. “This project is another step forward towards our goal of a low-carbon future for all and adds to our proud track record of working alongside EDF Renewable Energy.”

During peak construction, Copenhagen will support 120 jobs, notes RES. The project will also offset 177,000 metric tons of CO2 emissions annually.

Greenbacker Scoops Up Fossil Gulch Wind Park

Through a wholly owned subsidiary, Greenbacker Renewable Energy Co. LLC has purchased Fossil Gulch Wind Park, a 10.5 MW wind farm in Hagerman, Idaho.

Greenbacker bought the project for approximately $6.175
Appalachian Power Seeks Two Invenergy Projects

In concurrent filings made with the Virginia State Corporation Commission and the Public Service Commission of West Virginia, Appalachian Power is requesting regulatory approvals to acquire two wind facilities under development in Ohio and West Virginia.

Both under development by Invenergy LLC, the 175 MW Hardin Wind Facility will be located in Hardin County, Ohio, and the 50 MW Beech Ridge II Wind Facility will be situated in Greenbrier County, W. Va.

“We are continuing our transition to an energy company of the future and further diversifying our power generation portfolio. These acquisitions move us in that direction,” states Chris Beam, Appalachian Power’s president and chief operating officer. “Direct ownership and operation of these facilities will give our employees new experiences in the planning, production and delivery of power from diverse generating assets as Appalachian continues to add renewable resources in the years ahead.”

A unit of American Electric Power, Appalachian has 1 million customers in Virginia, West Virginia and Tennessee (as AEP Appalachian Power). Appalachian currently has a total of 375 MW of wind generation and an additional 120 MW coming online in 2018 (from the Bluff Point Wind Farm in Indiana). With approval of these two additional wind facilities, Appalachian will have more than 1 GW of wind and hydro generation – enough to power over 230,000 homes.

Regulators will establish case schedules for the filings, the utility notes.

Ellershouse Wind Farm Grows In Nova Scotia

Phase two has been launched for the Ellershouse Wind Farm, the first wind development in Nova Scotia to be funded and built independently of the local power authority or any provincial government incentive program.

The launch of phase two is being celebrated by Bullfrog Power, East Coast Credit Union, developer Minas Energy and Alternative Resource Energy Authority (AREA), which is the facility owner and operator. AREA, a partnership between the towns of Antigonish, Berwick and Mahone Bay in Nova Scotia, was created by the towns to reduce energy costs, expand green mandates and develop new revenue streams for the municipalities.

The second phase adds three turbines to the original four-turbine wind farm in West Hants, located near Ellershouse. The seven Enercon E-92 wind turbines have a total capacity of 16.1 MW, which is enough to power 4,900 Nova Scotian homes, says Bullfrog Power. All three of the towns’ electric utilities, as well as the Riverport Electric Light Commission, purchase part of their energy requirements from the Ellershouse Wind Farm. In addition, Bullfrog Power sources the green power produced by the facility for its Maritime customers, such as East Coast Credit Union.

“Bullfrog Power launched in the Maritimes in 2009 to mobilize and create further demand for renewable energy in the region. The launch of the second phase of the Ellershouse Wind Farm is proof of the impact that our customers, like East Coast Credit Union, are having in growing the...
Repower vs. Repair

Seven Considerations When Deciding To Repower (Or Repair)

Thanks to an aging U.S. turbine fleet, the dilemma will only become more commonplace.

By Jeremy Tchou, Gill Howard Larsen & Emil Moroz

Repowering is not a new idea, with first efforts in the U.S. occurring in the late 1990s with the San Gorgonio Westwinds repower in California.

Since then, several projects located in California have undergone similar repowering efforts. More recently, projects outside California are getting more attention and include the potential repowering of the Mendota project, owned by Leeward Energy, or the repowering efforts being undertaken by NextEra.

With more than 84,000 MW of wind power in the U.S., representing nearly 6% of total U.S. electrical generation in 2016, repowering wind projects will continue to be an important topic in future years.

The decision between repowering a project versus continuing to operate is dictated by the type and age of the project under consideration. There are two main reasons for repowering projects: end of the turbine’s life or, typically, end of tax credits.

End of life – These projects are nearing end of design life, using outdated or sub-megawatt technology, not receiving support from original equipment manufacturers (OEMs), or having difficulty obtaining spare parts. They are typically greater than 20 years old, but this can also apply to cases prior to 20 years when the turbine technology no longer had the support of the OEM.

End of production tax credit (PTC) – These projects are still operating without significant issues but no longer receive PTC benefits. By nature of the credit, these projects are near to or have surpassed 10 years of operations. These projects could still continue to operate successfully without the PTC, but requalifying for PTC benefits is financially beneficial.

There are two main repowering approaches:

Full repower – This would constitute the construction of a new or almost new project in place of an older project operating in the same area.

Partial repower – This would include the replacement of certain main components (such as the rotor or gearbox) while keeping other components for reuse (such as the foundation or tower).

Typically, end-of-life repowering requires a full repower to take advantage of the new turbine technology. A 2 MW to 3 MW generator and an 80+-meter rotor are not compatible with older towers and foundations that operated in the sub-megawatt range.

A partial repower is a new phenomenon that has become economically attractive for end-of-PTC repowering in which the original project has only operated for about 10 years. The electrical collection system, foundations, towers, nacelles, bed plates and yaw gear may still be in good condition, of suitable design and able to be reused during the repowering process.

Both partial and full repowering will play an important part in the U.S. wind industry in the future. Both offer an opportunity to improve overall project performance through the use of more modern technology that has benefited from the many lessons learned in the past 10 years. According to the American Wind Energy Association, nearly 4,000 MW of wind power is...
more than 15 years old and could be suitable for full repowering. Projects between eight to 12 years of age (i.e., expiration of the PTC) account for around 26,000 MW and may be suitable for partial repowering for PTC requalification.

Repowering, whether full or partial, can require as much work and preparation as a regular greenfield project. Although certain aspects, such as land leases or permits, can be leveraged or reused from the original project, all items must undergo a thorough review to ensure they are still applicable for the repower. It is important to consider the specific details of a particular project before deciding whether to repower or continue operating the original equipment.

Key considerations

When determining whether to repower or repair, consider the following key items in your analysis:

**Project contracts.** Current project contracts may require updating for a repowering. These include off-take agreements, the interconnection agreement, permits, land leases and other project-specific agreements. Contracts that have specified costs or revenues based on the size of a project or generation quantity should be revisited to determine potential impacts or limitations. Contracts may not have been structured to deal with repowering or may have ambiguities in the language that need clarification.

For example, if an off-take agreement is for 50% of the project output but was based on a specific project turbine or a specific project size, further clarification should be obtained on how a new rotor diameter, larger generator or higher capacity factor would be accommodated. Historically, prices for power purchase agreements have decreased over time, so any renegotiation could include a different pricing structure for all or some of the output. Interconnection agreements are also crucial capacity-based contracts that will need to be reviewed. Interconnection capacity limits may restrict project output, and restudies may be necessary to update the agreement.

**Permitting.** If repowering is selected, it is crucial to understand the requirements and overall effort needed to complete the repower. Most repowering will require some updates to permits, as larger rotors will mean a taller turbine tip height and new Federal Aviation Administration permits. Required setbacks, permit terms for operations, and risk to sensitive areas or species must be considered, not only for project operations, but also for the construction phase. Owners should
Economic benefit. The economic benefit of repowering should be compared with the option of maintaining the original project. A recent NREL report noted that full repowering is generally not financially beneficial until a project reaches 20+ years of operations. However, a partial repowering can be financially attractive as a project reaches the end of PTCs in year 10.

Other reasons for repowering may include limited or no support from the OEM (i.e., due to bankruptcy or discontinued turbines) and difficulty obtaining spare parts. BP is investigating partial repowering of its Clipper turbines, reusing the foundations and towers but installing new nacelles and rotors from another OEM.

Infrastructure. While a full repower tends to mean mostly new infrastructure, before embarking on a partial repower, the reused equipment needs to be studied for suitability for the new operating conditions. Foundations, towers, reused turbine components and the electrical system all need adequate reviews to ensure they can accommodate the new components, additional electrical output and higher loads. It is important to review as-built conditions and operating history, which can be input into these analyses for greater certainty.

For example, the suitability of a reused foundation may be improved based on the known as-built strengths of the foundation instead of the foundation-design-specified strengths. Any reused components should be inspected to make sure the assumed state of the equipment represents actual operating conditions.

It is important to ensure that the completed turbine, whether fully or partially repowered, has been reviewed by a certification agency. For partial repowers, which include a combination of old and new components and a known period of operations, standard certifications seen for new-build turbines do not apply, and a new certificate is recommended. An OEM will also provide a turbine loads assessment for the repowered setup, which could require curtailments as part of the requirements for site suitability.

As part of the decision process, an owner must consider long-term requirements to successfully operate the project if repowering is not performed. This is particularly important for projects with older technologies, with technologies that have fewer globally deployed turbines, with turbines that are no longer supported by the OEM, or with turbines for which the OEM no longer exists. As an example, if a turbine is no longer supported by an OEM, the owner would need to secure the proper supply chain for repairs.

Operating costs. Although historical project operating expense (OPEX) costs would be well known, future costs may change based on the details of the repowered site. New equipment would be under warranty for several years, which should reduce OPEX expenditures during those years. Other benefits of repowering can include lower-than-typical development costs, improved operations due to new or retrofitted technology, higher energy output or smaller project footprint, and lower overall long-term operating costs.

However, the reused equipment in a partial repowering could require increased inspections or remediation measures over the remaining life of the project. The reused equipment may not be covered under any new warranties, so operators must be aware of any performance risk of reused equipment and take this into account when estimating future operating costs.

These considerations should be compared with cost expectations for running the original project. Continuing to operate a project can have several benefits: The owner is already familiar with the site operations and current issues and has a good
idea of operating performance, overall generation amounts, and operations and maintenance expenses. Undertaking a repower requires readjusting overall project expectations, which leads to a period of operating uncertainty until a repowered plant matures.

Decommissioning costs. Replaced components must be resold, recycled or disposed of, and the site must be returned to a condition that complies with permitting requirements. Consider including disposal or deconstruction requirements as part of the contractual terms of any turbine supply agreement or engineering, procurement and construction contract in order to more easily quantify decommissioning costs.

Revenue. When deciding between repowering or repairing, increased energy production is another reason to consider repowering. Per-turbine output will typically be larger due to bigger rotors. Improved reliability can also be expected, which can increase project output, such as in the example of replacing a Clipper turbine with another manufacturer. Repowering may also allow for requalification of PTCs, which can boost overall project revenue.

Another analysis that should be completed when deciding between repowering or repairing is determining turbine useful life. By better understanding the expected life of the original project and when atypical or critical repairs may be needed, an owner can make a more informed decision as to the value of operating versus repowering. Although most turbines have a design life of 20 years, it is expected that with proper maintenance, most projects can operate for more than 20 years, continuing to provide project revenue for additional years beyond the design life, subject to site-specific conditions and the ability to operate safely.

Construction and start-up. An owner must also be aware of issues that can surface during a repowering. In a partial repowering, reused equipment will be part of the repowering. Proper checks on critical reused items must be performed prior to repowering to prevent delays during construction and to avoid costly rework.

As with any new project, it is expected that start-up issues will occur and that a new break-in period will be required. A project owner must take this into consideration or be caught off guard by lower initial performance and higher operating costs. Making sure that any construction or equipment contracts include proper testing and sign-off milestones, with adequate warranty terms, will help alleviate these issues.

Temporary reduction in turbine availability and energy output is expected during construction, and this must be taken into consideration, especially if an off-take agreement has availability or generation guarantees.

Although no single solution will be adequate for all projects, the option to repower allows for greater flexibility, which will benefit the industry in the long term.

Jeremy Tchou is director of North American due diligence services at AWS Truepower. He can be reached at jtchou@awstruepower.com. Gill Howard Larsen is global director of due diligence services at AWS Truepower. She can be reached at ghoward@awstruepower.com. Emil Moroz is senior turbine engineer at AWS Truepower. He can be reached at emoroz@awstruepower.com.
Repowering is an opportunity for a developer to requalify an existing wind project for the renewable electricity production tax credit (PTC) for wind projects under Section 45 of the Internal Revenue Code of 1986 based on new placed-in-service and begun-construction dates while retaining some of the existing project assets.

With a number of aging projects that have exhausted or nearly exhausted their PTCs and that are located on sites with a proven wind resource, the industry stands to greatly benefit from this opportunity. However, repowering introduces a number of practical considerations that could be traps for the unwary.

The PTC is an income tax credit equal to $0.024/kWh (for 2017) of electricity produced by a taxpayer from a qualified facility during the 10-year period beginning on the date the facility is originally placed in service.

The PTC had expired as of Jan. 1, 2015, but with the passing of the Consolidated Appropriations Act of 2016 at the end of 2015, Congress revived the PTC and extended it to wind facilities beginning construction before Jan. 1, 2020.

However, although Congress gave with the extension, it took, as well. Unlike previous extensions of the PTC, this extension included a phaseout, pursuant to which the amount of the PTC is reduced by 20% for facilities that begin construction during 2017, 40% for facilities that begin construction during 2018, and 60% for facilities that begin construction during 2019.

Congress likewise extended the investment tax credit in lieu of the PTC for wind projects under Section 48(a)(5) of the tax law, subject to a similar phaseout.

Although the PTC has been extended numerous times since its introduction into the tax law in 1992, this is the first time in its 25-year history that it has been subject to a phaseout.

The phaseout, together with a general climate of uncertainty surrounding tax reform, is driving developers of wind farms and their investors to seek creative ways of qualifying for PTCs.

One such qualification method is the repowering of existing wind farms. A good example of this trend, as reported by North American Windpower, is NextEra Energy Resources’ recently celebrated groundbreaking of the Golden Hills North Wind Energy Center, a completely repowered project, which calls for the removal of 283 30-year-old wind turbines and the replacement of them at the same site with 20 2.3 MW GE turbines.

Placed in service
As noted previously, the PTC is available only during the 10-year period beginning on the date a facility (meaning the
Developers should consider several practical issues before choosing this increasingly popular option.

By Jeffrey Davis, Robert Goldberg & Isaac Maron

The physical work test is a qualitative rather than quantitative test that focuses on the nature of the work performed, not the amount or cost. Accordingly, under a literal reading, beginning work on any activity that constitutes physical work of a significant nature is sufficient for establishing the beginning-of-construction date.

Under the 5% safe harbor, construction of a facility begins when physical work of a significant nature begins. The physical work may include both on-site and off-site work and may be performed by either the taxpayer or a third party pursuant to a binding written contract.

The physical work must be on tangible property used as an integral part of the activity performed by the facility, including property integral to the production of electricity (such as a custom-designed step-up transformer or roads for equipment to operate and maintain the facility), but not property for electrical transmission. The IRS guidance makes it clear that the physical work test is a qualitative rather than quantitative test that focuses on the nature of the work performed, not the amount or cost.

Under the 5% safe harbor, construction of a facility is considered as having begun in the year in which a taxpayer pays or incurs, depending on his method of tax accounting, at least 5% of the total cost of the facility, including all costs properly included in the depreciable basis of the facility and excluding the cost of land and any property not integral to the facility.

Generally, the costs of property or services are not treated as incurred by a taxpayer for tax purposes (and, thus, do not count toward the 5% safe harbor) until the goods or services are provided to the taxpayer.

However, under a limited exception known as the “3½-month rule,” a taxpayer is permitted to treat property or services as provided to him when the taxpayer makes payment to the person providing the property or services, if the taxpayer reasonably expects the person to provide the property or services within 3½ months after the date of payment.

Generally, multiple facilities that are operated as part of a single project, as determined by the relevant facts and circumstances, are treated as a single facility for purposes of the physical work test and 5% safe harbor. Therefore, starting physical work (or paying or incurring costs) with respect to a single turbine may be sufficient to establish the beginning of construction for the entire project.

Historically, in the waning days of a year in which the PTC was set to expire (or more recently, at the end of 2016, before the phase-down of the PTC was set to be triggered), developers would typically qualify a project via the physical work test by beginning physical work on turbine foundations, roads for operations and maintenance, or a discrete piece of equipment, such as a custom step-up transformer. Alternatively, developers would qualify a project via the 5% safe harbor by incurring costs for turbines or other equipment, often under the 3½-month rule. Tax equity investors, in particular, often prefer the objectivity of the 5% safe harbor over the more subjective physical work test.

As with the so-called “beginning of construction” requirement, the tax law provides no guidance on the meaning of “placed-in-service.”

Treasury regulations broadly provide that property is placed in service during the taxable year that it is placed in a condition or state of readiness and availability for a specifically assigned function. In applying this standard, the wind industry generally relies upon five factors that the IRS has identified as factors in determining that property has been placed in service. These factors include whether all necessary licenses and permits to operate the facility have been approved, the facility has been synchronized, all critical testing of the facility has been completed, the taxpayer has taken control of the facility from the contractor building the facility, and daily operation of the facility has begun.

Placed in service, again

However, satisfaction of the five-factor placed-in-service test is not a bell that can’t be unrung. The IRS guidance expressly allows a previously placed-in-service project to be retrofitted or repowered to qualify for the PTC. Under the IRS guidance, a wind turbine may qualify as originally placed in service even though it contains some used property, provided that the fair market value of the used property is not more than 20% of the wind turbine’s total value (i.e., the cost of the new property plus the value of the used property) – the 80/20 rule.

North American Windpower • August 2017 • 19
For purposes of the 80/20 rule, the cost of new property includes all costs properly included in the depreciable basis of the new property. Further, the 80/20 rule is applied to each individual wind turbine (including associated towers and supporting pads), not the project as a whole. Thus, only those individual wind turbines that satisfy the 80/20 rule would requalify for PTCs.

With respect to the corresponding redetermination of the begun-construction date for the newly placed-in-service repowered project, the IRS guidance provides that the 5% safe harbor is applied only with respect to the cost of new property that is used to repower the existing facility. Such costs include only expenditures paid or incurred that relate to the new construction, such as the legal fees incurred in negotiating a new turbine supply agreement or an allocation of salaries of employees who worked on the repowering.

As discussed, the beginning-of-construction determination is generally a single determination for the entire project (provided that the individual turbines are operated as part of a single project). Thus, costs incurred with respect to a single repowered turbine could count toward satisfying the 5% safe harbor with respect to all repowered wind turbines in the project. Likewise, physical work performed to repower a single wind turbine could be sufficient to establish the beginning of construction of all repowered wind turbines in the project.

For example, assume that a project consists of 10 wind turbines (that operate as a single project), each with a fair market value of $100. In 2017, the developer projects it will cost $800 to repower the project and incurs costs of $40 to upgrade a single wind turbine. By the end of 2021, the developer has installed new components at a cost of $80 at each of the 10 wind turbines. The value of the original equipment retained in each turbine is $20. Thus, the value of each turbine is $100 when the repowering is complete, and the turbines are placed in service in 2021.

Because the fair market value of the remaining original equipment of each wind turbine ($20) is not more than 20% of the wind turbine’s total value of $100 (the cost of the new components, $80, plus the value of the remaining original components, $20), each wind turbine will satisfy the 80/20 rule and will be treated as placed in service in 2021. Further, the project will be treated as having begun construction in 2017, the year in which the developer incurred the cost of $40 (5% of $800).

As this example illustrates, a critical issue in satisfying the 80/20 rule and requalifying a repowered project is the valuation of the old property that remains incorporated in the repowered wind turbines.

Valuation

Because the 80/20 rule is concerned with the relative value of used equipment, it introduces a number of valuation wrinkles.

Generally, a taxpayer’s cost is respected as the fair market value of the property for tax purposes. Thus, if a developer were to purchase an operating project from an unrelated third party and repower the existing wind turbines, the portion of the purchase price allocable to the used equipment would be the presumptive fair market value of such equipment.

However, in many instances, a developer may be interested in repowering a project that it already owns. In this case, there would be no purchase price to serve as a proxy for fair market value.

As an alternative to actual cost, the replacement method may be used to determine the value of the old components based on the cost to the developer to replace them. Although this approach may work as a conceptual matter, the resulting value may need to be adjusted for wear, tear and obsolescence to reflect the fair market value of the old components.

Another alternative would be to use the income method, which values a project based on its projected income. The income approach is a widely used method for valuing a project in its entirety or even individual turbines; however, it would be difficult to use this method to allocate value to specific components of a single turbine.

In addition to issues of methodology, there are a number of specific valuation questions that are implicated. For example, assuming the existing project is eligible for PTCs (i.e., the existing project is still within the 10-year PTC period), is it appropriate to take into account the value of the PTCs that the old project would have generated in valuing the old components?

Should a portion of the value of existing shared equipment or equipment other than the actual turbine (e.g., a step-up transformer, SCADA equipment or transmission lines) be included in the value of the old components? With respect to the latter question, considering that the IRS guidance is clear that the 80/20 rule is applied per facility (which is the turbine together with the associated tower and supporting pad), it may not be necessary to take into account the value of equipment that is not part of the turbine; however, to be conservative, it may be prudent to include an allocable portion of the value of such equipment.

In short, the valuation of an existing project for purposes of the 80/20 rule involves a number of new wrinkles. Thus, developers are advised to work closely with an appraiser to develop a defensible method and approach that will satisfy not only the IRS, but also risk-averse financing parties (including lenders and tax equity investors). Further, as a practical matter, a developer initially will evaluate satisfaction of the 80/20 rule when it first makes the decision to undertake a repowering. Thus, the new spend should be calculated conservatively, taking into account best-case scenarios for spend to ensure that the new spend will, in any case, be at least four times the value of used property. The analysis will need to be finalized once the repowering is complete in order to demonstrate that the 80/20 rule has been satisfied.

Economic benefit

Another consideration is the application of the somewhat nebulous economic substance doctrine to repowering. Simply put, the economic substance doctrine looks at both the objective and the subjective non-tax reasons for a transaction. Although the tax law does not define the term transaction, the IRS has stated that for these purposes, the term transaction generally includes all of the factual elements relevant to the expected tax
treatment of any investment, entity, plan or arrangement and any or all of the steps that are carried out as part of a plan.

This broad definition could arguably apply to repowering a project such that it would be eligible to obtain PTCs (particularly if the repowering is in connection with a tax equity investment). Accordingly, if the only purpose of the repowering is to generate PTCs, the IRS may argue that the repowering should be ignored.

The conservative approach would be for developers to demonstrate a non-tax business purpose for the repowering, such as increased power output that, in turn, results in more revenue from power and renewable energy certificates. This could be the result of a higher nameplate capacity (e.g., bigger turbines), increased efficiency (e.g., newer technology), or an increased capacity factor.

Other non-tax business purposes could include an extended useful life, a new or extended warranty, or lower operations and maintenance costs. In measuring the costs and benefits of repowering, the costs of disposing old equipment should also be considered. If the pure economic case for repowering is not clear, it may make sense to expand the scope of the appraisal to include a comparative analysis of the projected cashflows or net income from the existing project with those from the repowered project.

**Non-tax considerations**

Beyond the tax and economic analysis, a developer will need to give consideration to a number of practical development issues, such as whether project permits and contractual arrangements for the repowered facility will need to be newly obtained or negotiated or whether the permits, leases and other project contracts for the existing facility can instead be modified or extended.

This will depend on the terms of the permits and contracts, which will need to be carefully reviewed to consider what is and is not permissible. A complete replacement of older turbines with the larger turbines of current vintage may also mean that the meteorological data for the existing project is not sufficient for the contemplated repowered project, as the existing data may have been taken at lower altitudes or is not sufficient to support efficient micrositing for the new turbines. Therefore, obtaining new wind data may be one of the first hurdles to a potential repowering.

The valuation and economic substance issues are far from insurmountable, but they do introduce some additional risk that may not be present in the typical PTC-qualification analysis. It is unlikely that the IRS will issue letter rulings on these valuation and economic substance issues, so developers and investors likely will be turning to counsel for comfort before moving too far down the road on an aggressive repowering qualification strategy.

Jeffrey Davis and Robert Goldberg are partners and Isaac Maron is an associate at law firm Mayer Brown. They can be reached at jeffrey.davis@mayerbrown.com, rgoldberg@mayerbrown.com and imaron@mayerbrown.com, respectively.
With increased demand for greater output from wind energy projects, the industry is increasingly looking to maximize output from each wind turbine. Over the years, wind power has become competitive with traditional forms of non-renewable energy because advancements in generator technology allow larger and heavier generators to produce a higher-megawatt output than ever before. These newer, advanced turbines are also carried on towers with higher hub heights to capture higher wind speeds. With this comes the requirement for tower anchor bolts to carry higher tensile load capacities.

Design and installation

To safely carry larger turbines at higher hub heights, careful consideration must be given to the foundation design and system components. A proper geotechnical evaluation of the soils must occur after all of the structural loads carrying the tower and nacelle components are evaluated. With this information, the foundation designer is able to determine the width and depth of the concrete foundation.

A vital component to the foundation system is the tower anchor bolt. These anchor bolts are responsible for keeping the tower and nacelle in equilibrium. The anchor bolts are installed during the foundation forming process in a large ring pattern with a matching inner and outer circle of anchor bolts symmetrically around the foundation.

Typically, between 140 and 200 anchor bolts are in each foundation design. A thick steel embedment ring containing holes for the tower anchor bolts is placed near the bottom of the foundation pour, and a template ring – ostensibly, a thinner steel ring with matching holes – is placed at the top of the foundation pour. Each anchor bolt is fitted with PVC sleeves running between the steel rings so they are flush against each ring surface in order to keep the anchor bolts de-bonded during the foundation pouring operation.

A heavy pattern hex nut and washer are underneath the embedment ring and similarly placed on the tower base plate. (Prior to placing the tower base plate, the temporary template ring is removed after the concrete pour.) It should also be noted the tower base section is shimmed into position above the top of the pedestal foundation pour, and the voided area between is filled with a high-strength epoxy grout to complete the grout pad.

Once the grout pad is cured, all of the tower anchor bolts are pre-tensioned to a load specified by the foundation designer and locked off by torquing the top hex nuts to remove the stretch created. The pre-tensioning process is typically achieved by using small-diameter, compact, high-psi capacity calibrated tensioners. This elastic stretch created by tensioning under load is permanently transferred to the anchor bolt by torquing the nut prior to removing pressure from the tensioning jack.

After pre-tensioning the tower anchor bolts in a predetermined selected pattern across the foundation, the ring pattern of the anchor bolts is placed into compression. Therefore, the equilibrium is maintained as varying load cycles are continuously placed on the foundation. Designers specify an anchor bolt lock-off pre-tensioning load to be at a level where the maximum external design load that is placed on the foundation is never reached.

Pre-tensioning prevents the anchor bolts from stretching and relaxing, which can lead to long-term fatigue, and also mitigates spalling or cracking of the concrete from tensile stresses.

What You Should Know

How much do you understand about the roughly 200 bolts that set each foundation design?

By John A. White

With increased demand for greater output from wind energy projects, the industry is increasingly looking to maximize output from each wind turbine. Over the years, wind power has become competitive with traditional forms of non-renewable energy because advancements in generator technology allow larger and heavier generators to produce a higher-megawatt output than ever before. These newer, advanced turbines are also carried on towers with higher hub heights to capture higher wind speeds. With this comes the requirement for tower anchor bolts to carry higher tensile load capacities.

Design and installation

To safely carry larger turbines at higher hub heights, careful consideration must be given to the foundation design and system components. A proper geotechnical evaluation of the soils must occur after all of the structural loads carrying the tower and nacelle components are evaluated. With this information, the foundation designer is able to determine the width and depth of the concrete foundation.

A vital component to the foundation system is the tower anchor bolt. These anchor bolts are responsible for keeping the tower and nacelle in equilibrium. The anchor bolts are installed during the foundation forming process in a large ring pattern with a matching inner and outer circle of anchor bolts symmetrically around the foundation.

Typically, between 140 and 200 anchor bolts are in each foundation design. A thick steel embedment ring containing holes for the tower anchor bolts is placed near the bottom of the foundation pour, and a template ring – ostensibly, a thinner steel ring with matching holes – is placed at the top of the foundation pour. Each anchor bolt is fitted with PVC sleeves running between the steel rings so they are flush against each ring surface in order to keep the anchor bolts de-bonded during the foundation pouring operation.

A heavy pattern hex nut and washer are underneath the embedment ring and similarly placed on the tower base plate. (Prior to placing the tower base plate, the temporary template ring is removed after the concrete pour.) It should also be noted the tower base section is shimmed into position above the top of the pedestal foundation pour, and the voided area between is filled with a high-strength epoxy grout to complete the grout pad.

Once the grout pad is cured, all of the tower anchor bolts are pre-tensioned to a load specified by the foundation designer and locked off by torquing the top hex nuts to remove the stretch created. The pre-tensioning process is typically achieved by using small-diameter, compact, high-psi capacity calibrated tensioners. This elastic stretch created by tensioning under load is permanently transferred to the anchor bolt by torquing the nut prior to removing pressure from the tensioning jack.

After pre-tensioning the tower anchor bolts in a predetermined selected pattern across the foundation, the ring pattern of the anchor bolts is placed into compression. Therefore, the equilibrium is maintained as varying load cycles are continuously placed on the foundation. Designers specify an anchor bolt lock-off pre-tensioning load to be at a level where the maximum external design load that is placed on the foundation is never reached.

Pre-tensioning prevents the anchor bolts from stretching and relaxing, which can lead to long-term fatigue, and also mitigates spalling or cracking of the concrete from tensile stresses.
The normal practice is for the foundation designer to specify a lock-off load that takes into consideration in-service design loads and, in addition, losses such as natural relaxation loss in the steel (generally averages 2% max) and slight creep losses in the foundation itself under load. Creep refers to the slight movement over time to the concrete – and, to a lesser extent, the steel tower base as a result of being under the pre-tension load. Movement resulting from the so-called creep results in a loss of direct pre-tension load.

Anchor bolt properties/quality control

Tower anchor bolts contain a rugged, course-thread pitch – a popular option because it is more forgiving to dings and residue lodged between the threads than the finer thread anchor bolts. In most cases, the diameters specified are 1-1/4” and 1-3/8”. The grade 75 and grade 90 anchor bolts are produced from a hot roll melt at the mill and do not contain secondary mill processing. This makes them a very economical choice.

Long-term assurances that the tower anchor bolts are going to maintain their pre-tensioned load are vitally important to the integrity of the wind turbine and to the foundation itself. One of the leading causes of foundation problems is load loss of the tower anchor bolts. When the pre-tensioned lock-off load is diminished, tower anchor bolts are subjected to stretching and relaxing. This action causes the grout pad and concrete to crack or spall.

Corrosion inside the protective bolt cap covers housing the hex nut, washer and tip of the anchor bolt protruding above the tower base plate is sometimes extensive enough to cause loss of material section, resulting in load loss. As the thickness of the nut and washer is diminished due to corrosion, it has the same effect as de-tensioning the nut. For this reason, it is important that only a quality protective bolt cap cover be specified that has a gasket seal and that grease be applied for corrosion resistance to the nut, washer and protruding anchor bolt prior to installing the bolt cap covers.

Bolt cap covers are usually required to be removed and inspected inside for signs of corrosion. During this time, load verification testing is conducted and recorded to ensure no load loss has occurred. If load loss is detected, the anchor bolts are locked off at the designed pre-tensioned level. This testing is usually done on a 100% basis after six months to a year and then on a randomly selected basis if no problems are detected.

Another quality control measure typically seen is the requirement of mill heat qualifications of tower anchor bolts. Certified mill test reports are always required for each heat of steel used for the anchor bolts supplied. Found on the mill certs are physical properties and chemistry elements, with proportions making up each heat.

In most cases, full section tensile load tests to support the mill certifications are required to be conducted for each heat of anchor bolt material. This testing ensures the yield and ultimate tensile strengths meet the minimums as specified by the foundation designer.

Rock and soil

In the right geotechnical conditions, grout-bonded ground anchors consisting of fully course-threaded, large-diameter, high-strength bars or helical earth anchors can be used as an alternate design to traditional deep excavated spread footings. The result is a foundation system requiring less excavation and more of a savings in the amount of poured concrete and steel reinforcing than is normally found in a traditional spread footing design. In a ground-anchored foundation, the number of tower anchor bolts is the same as in a traditional design, but the length of each anchor bolt is considerably decreased because the foundation is not as deep. This type of design is particularly effective in hard rock conditions, in which excavating for a traditional spread footing foundation would be challenging.

John A. White is vice president of Williams Form Engineering. He can be reached at jwhite@williamsform.com.
Is The Sun Setting On Texas Wind?

Can the state maintain its No. 1 position in the U.S. wind industry?

By Skip Rankin & Maximillian Wolf

With approximately 25% of the nation’s installed wind power capacity, Texas is the leading state for wind-generated electricity. There are nearly 12,000 operating turbines with an overall installed capacity of 21,000 MW, and new projects currently under way do not give rise to any serious concerns about the continued growth of this renewable energy sector in Texas, at least in the short term. While the indicators point to the continued development of the Texas wind industry, there are some potential threats on the horizon that should be taken into account.

Current state of affairs

Despite being better known as the oil and gas state, Texas provides ideal conditions for wind energy projects: Strong winds blow along the southern coast, as well as in the northern and western parts of the state; population density is low outside the urban areas, thus avoiding conflicts with residential concerns; and unlike solar projects using photovoltaic panels, wind energy projects do not interfere with the agricultural use of land, nor do they adversely impact the large Texas cattle farming sector.

These favorable conditions were enhanced by a local governmental framework that encouraged the industry. For example, the Texas legislature recognized early on that renewable energy generated in rural areas needed transmission lines to service the big cities in central and east Texas.

As a result, the Electric Reliability Council of Texas oversaw the linkage of a network of transmission lines between areas identified as Competitive Renewable Energy Zones and urban areas such as Austin and Dallas/Fort Worth. These additional transmission lines alleviated much of the congestion in transmitting electricity across the state caused by the large number of projects installed in the western part of the state.

Meanwhile, the renewable energy certificate (REC) system, which was first tracked domestically in Texas in 2001, helped to create incentives for investing in wind power projects. Texas’ renewable portfolio standard (RPS) is also credited with the wind industry’s impressive progress in the Lone Star State. Installed capacity has more than doubled since 2010 and is expected to increase by nearly an additional 25% in the near future, as projects with a capacity of approximately 5,000 MW are under construction.

Harpingers of change?

Although the Texas wind energy market shows no visible signs of deceleration, the current political environment is not evolving in favor of wind power. The federal administration’s recent announcement of the withdrawal of the U.S. from the Paris Agreement sent shock waves through the renewable energy industry. It remains questionable whether the decision will have any direct effect on investments, but clearly, there will be diminished federal support for the industry for several years. The Texas state government has, up until now, endorsed an approach that does not play fossil fuels and wind power off against each other, but it remains to be seen whether such policy will continue in the future.

What needs to be taken seriously are indicators that the federal administration may consider cutting subsidies. A study requested by Secretary of Energy (and former Texas governor) Rick Perry in mid-June on the negative effects of subsidies at least suggests that the renewal of the production tax credit (PTC) and similar measures are not to be taken for granted. Although technological advances and other operating improvements have made wind power more and more competitive, such developments have led to the argument that cutting subsidies is only helping to advance the competitiveness of the industry, thus allowing lawmakers to vote to cut subsidies without necessarily having to revoke formal support for renewable energy.

Though the public may be more aware of the trends at the federal level, the political environment at the state level is also not free of some troubling trends. The 2015 attempt by the Texas legislature to repeal the state’s RPS has not been forgotten. Although the bill ultimately was not passed into law, the battle over regulatory measures designed to increase the percentage of renewable energy may still be fought. A restrained attitude toward renewables on the federal level might embolden lawmakers on the state level to reexamine their efforts to eliminate the RPS, although Texas has, for many years, been ahead of the schedule set out in its RPS. While regulations may shape the development of the renewable energy industry elsewhere, the industry in Texas has proven to be more dynamic and a decisive factor as to whether investments in wind power continue to be attractive and could be the fate of the PTC rather than the RPS.
Another recent obstacle for wind power projects arose from a bill enacted by the Texas legislature in the first half of June making wind turbines within a 25-mile radius of certain military bases ineligible for certain property tax abatements. The law cuts back on the reduction of property taxes first introduced by the 2001 Texas Economic Development Act to attract investors to the state.

Due to the large number of U.S. military installations located in Texas, the affected territory adds up to a considerable loss of “tax advantaged” development area. One reason for the legislation, as expressed by lawmakers, is to ensure aviation security, especially to guard against the adverse impact on the reliability of radar systems caused by the rotating blades on the wind turbines. Concerns could also arise from the fact that a wind project located near a military base and owned by foreign investors could become a “front” for espionage, although such concerns were not publicly voiced during the legislative process. It remains unclear whether the bill was passed solely on security considerations or general concerns about the development of wind power.

Furthermore, wind projects located along the state’s southern coastline lie within the path of migratory birds leading from North to Central and South America. Concerns are likely to increase with the development of offshore wind projects in the Gulf. Recently, operating projects have taken measures to protect birds by using radar technology that shuts off turbines as soon as the birds are approaching. For instance, Pattern Energy Group operates a 283 MW radar-equipped, wildlife-friendly onshore wind park along the Texas southern coast.

Opportunities

Even though these obstacles should not be taken lightly, no negative effect on investment activity is readily ascertainable. Several major projects are planned or already under construction. Goldwind Americas, a 100% subsidiary of Chinese wind turbine manufacturer Goldwind, recently invested $250 million in the 160 MW Rattlesnake Wind Project, demonstrating that Texas remains a major investment location for wind energy projects, even for investors from outside the U.S. The U.S. Army started its largest renewable energy project in Texas, consisting of a 50 MW wind farm in north Texas that will, in combination with a solar project, meet approximately half of Fort Hood’s demand for electricity. At the same time, companies located in Texas keep going green: 7-Eleven announced that it will power all of its Texas stores with wind power generated in the state commencing in June 2018. General Motors announced that approximately 50% of its electricity needs for its SUV plant in Arlington, Texas, is derived from wind power, and it aims to increase the share to 100% by the end of 2018. General Mills recently signed a 15-year power purchase agreement for 100 MW of wind power capacity to be produced by a wind project in Concho County, Texas.

These ongoing developments demonstrate that Texas not only is the undisputed leader in wind power, but also is well positioned to keep its lead. While no
VPPAs Fuel Texas Wind Market

One of the most dynamic developments for the continued growth of the wind energy sector in Texas is the advent of virtual power purchase agreements (VPPAs). So-called VPPAs have become attractive for many major corporate entities in the U.S. that are seeking to achieve sustainability goals to meet the demands of constituents and customers.

The so-called contract-for-differences, which is the most popular version of the VPPA, provides a developer in Texas with a stable revenue source based on the “fixed” price per megawatt-hour of electricity produced by the wind project.

Here’s how it works: Although the electricity is not consumed by the corporate off-taker (it is sold into the local market as a merchant project), the corporate off-taker does receive the upside if the electricity is sold at a price above the fixed price but also assumes the “downside” in the event the electricity is sold at a price below the fixed price.

While there are times when the project may be in the red as far as the financial obligations of the corporate off-taker, most contract-for-differences return a positive result over time, and the corporate off-taker receives the RECs and may negotiate for additional environmental attributes generated by the wind projects, all of which may be used to offset the corporate off-taker’s carbon footprint created by its day-to-day operations. One reason Texas has become a popular state for projects utilizing VPPAs is the deregulated electricity market and the liquidity of the market so that these projects are able to deliver electrical power at fair market rates.

The transmission authorities are supportive of these projects, and some of the largest wind projects developed over the past 24 months have come to rely more and more on corporate off-takers paying fixed prices generally more favorable than currently available from utilities. Some recent examples of VPPAs supporting wind projects located in Texas include agreements entered into with General Mills, Philips Electronics, 3M and Owens Corning, to name just a few.
Deep in the heart of West Texas oil and gas country, construction crews are feverishly working to complete the 197.6 MW Bearkat 1 Renewable Energy Project.

The wind farm, located among the oil and gas rigs dotting the West Texas landscape between Midland and Odessa, is among the initial U.S. wind farms owned by Danish investor Copenhagen Infrastructure Partners (CIP). The firm acquired Bearkat 1 as part of a nearly 1 GW wind portfolio from Texas-based developer Tri Global Energy in 2016.

Construction activities at the wind farm have gone according to plan, reports Mark Winstead, U.S. renewables division manager at Black & McDonald, the wind farm's engineering, procurement and construction (EPC) services provider. At press time, Winstead said that the foundations were being poured, the access roads were nearing completion, and construction on the wind farm's substation had commenced. Nonetheless, extreme temperatures forced the EPC services provider to modify some construction activities in order to keep the project on schedule.

"Lately, we've had several days of 100-degree temperatures, which forced us to change up the normal processes," said Winstead. "We might start at night or very early in the morning to avoid working in the heat."

High temperatures also require Black & McDonald to keep foundations cool.

"We are running chillers and continually watering the aggregate," he noted. "We're also running a higher-strength mix to expedite curing so we can get [foundations] backfilled sooner. That helps protect the curing concrete from excessive surface temperatures."

Bearkat 1 will be powered by 66 Vestas V126-3.45 MW wind turbines, which are slated to arrive next month.

For his part, Winstead looks forward to the arrival of the Vestas V126-3.45 MW turbines. Because the Vestas V126 machines only operate in Texas, Michigan and Oklahoma, they pose something of a curiosity.

"They're taller, bigger and heavier," Winstead said. Nonetheless, the same lifting requirements apply to the newer rotors as Vestas' legacy machines.

"The newer V126s require three to four days just to prep each nacelle," he said. "So, we've added additional prep crews that will also turn into mechanical completion crews..."
later, which will allow us to get energization earlier in the schedule.”

**Site characteristics**

The site has prime wind resources (in the low- to mid-8 m/s range) and easy access to transmission, including a relatively new substation owned by Wind Energy Transmission Texas (WETT), a joint venture between Brookfield Asset Management and the Public Sector Pension Investment Board.

The WETT-Bearkat substation was built to facilitate new generation supporting the load centers of Dallas and Houston as part of Texas’ massive Competitive Renewable Energy Zones project, noted Tom Carbone, a director at Tri Global Energy, which originally developed the site in 2012. As the wind turbines share the site with oil rigs, the multi-megawatt Vestas machines will come in handy, he notes.

“This particular site location has a significant amount of oil and gas activity,” he explained. “Therefore, the site benefits from having more power per tower.”

Carbone said Bearkat 1 also benefits from having a “unidirectional” wind resource.

“The wind at Bearkat is very narrow in its directionality and largely comes from a specific [direction] from the south/southwest,” he said. “The turbines are programmed to hunt for the best wind and will likely take a majority of time facing into [that] wind direction.”

Such a unique phenomenon works in the developer’s favor. As a result, Carbone noted, “It allowed us to bring the turbines closer together in an east/west orientation while also reducing the [length] of the collector system.”

**About CIP**

Bearkat is among CIP’s initial land-based wind projects in the U.S.; therefore, company representatives are keeping a watchful eye on how wind farm construction is performed in the U.S. and specifically in Texas.

CIP, which was founded in 2012, focuses on long-term investments in energy and infrastructure assets, primarily in Western and Northern Europe, as well as in North America, noted Christian T. Skakkebaek, senior partner. Its management team includes former DONG Energy executives and has an extensive background in development, structuring and construction. Its diversified holdings and management’s long-term view enable CIP to participate in projects at an early stage of the project lifecycle, take long-term ownership positions, and participate in bridging the financing needs of projects that are not suitable for capital markets or bank financing.

Just the same, the investor is still a relative neophyte when it comes to North America, which is why CIP partners with more experienced local developers, such as Tri Global Energy, during a project’s early development stages.

As Bearkat’s construction takes shape, its new owners are keeping a watchful eye.

“[CIP is] asking why certain things are done and when,” said Black & McDonald’s Winstead. “They are very interested in construction activities because they plan on developing multiple projects throughout North America.”

The other wind projects in the Tri Global acquisition include Bearkat 2 (162.15 MW), Blue Cloud 1 (150 MW) and Blue Cloud 2 (200 MW). CIP has an option to acquire the 288 MW Changing Winds Energy Project and has supported funding of interconnection studies and other project development tasks, Tri Global noted.

CIP is also working to complete the 155.4 MW Fluvanna wind farm, located in Scurry County, Texas – a joint investment with Terna Energy S.A. Skakkebaek said the Fluvanna wind farm will reach commercial operation a few months before Bearkat.

Nonetheless, Bearkat 1 marks CIP’s first U.S. land-based wind project for which it is the sole equity sponsor. And all eyes are on Bearkat. Just ask Winstead: “Getting the first wind farm done right is imperative.”

**Photo courtesy of Tri Global Energy**

The white cylindrical flanges will be bolted to the tower section before the turbine components arrive.
Ohio House Drops Setback Compromise

Not long after Ohio Senate lawmakers advanced a compromise measure on the state’s harsh wind setback rule, the Ohio House of Representatives has insisted upon removing it from the state’s proposed biennial budget, the American Wind Energy Association (AWEA) has revealed.

Adopted in 2014 with no public debate, Ohio’s current wind turbine setbacks are among the country’s most restrictive and have essentially functioned as a ban on wind development and the economic benefits that come along with it, AWEA explains.

“It’s hard to understand why the Ohio House, under the leadership of Speaker Rosenberger, would stand in the way of $4.2 billion of economic development,” states Andrew Gohn, eastern region policy director for AWEA. “House lawmakers turned their backs on Ohio’s businesses and rural communities with this decision. They turned away economic growth by ignoring the business community’s plea to make Ohio attractive for companies wishing to power their facilities with renewable energy. And they ignored the needs of the state’s rural communities, who would have seen enormous investment if setbacks had been fixed.”

According to AWEA, besides bringing new resources into rural communities that could improve schools and fix roads, new wind development would have also attracted new business into Ohio. The business community rallied behind the setback fix, which also received vocal support from the Ohio Chamber of Commerce, Columbus Partnership, the Columbus and Toledo Chambers of Commerce, Amazon, and several other Fortune 500 companies, AWEA points out.

By including a fix in its proposed budget, the Ohio Senate prioritized attracting billions of dollars in investment and recognized that the onerous setbacks have pushed wind development into neighboring states, the group says.

“We appreciate the strong leadership shown by Senator Cliff Hite, Senate President Larry Obhof and the Senate leadership team who championed this vital regulatory reform,” adds Gohn. “With their support in continuing the fight, as well as support from Governor Kasich, we’re confident that common sense will soon prevail and that Ohio will grow more prosperous by unlocking the vast potential of wind power.”

Wind Moratorium Awaits Fate In North Carolina

A North Carolina bill seeking a moratorium on new wind farm permits through 2018 due to military concerns is awaiting a final decision from Democratic Gov. Roy Cooper.

According to the American Wind Energy Association (AWEA), a last-minute amendment to H.589, a wide-ranging energy bill, will stop North Carolina from harvesting more homegrown wind power.

If passed, neither the Department of Environmental Quality nor the Coastal Resources Commission would be able to issue a permit for a new wind project or wind project expansion until Dec. 31, 2018. The bill says the moratorium would “allow the General Assembly ample time to study the extent and scope of military operations in the state … and to consider the impact of future wind energy facilities and energy infrastructure on military operations, training and readiness.”

Notably, AWEA points out that there is already an existing Department of Defense process to evaluate and, if necessary, block wind farms. That process was strengthened in the FY17 National Defense Authorization Act.

“We’re calling on Governor Cooper to veto this bill due to the unnecessary, anti-business regulation slipped in at the final
moment. If the bill stands, it will cast a shadow on North Carolina, a state currently on the leading edge of wind energy development in the Southeast,” states Andrew Gohn, eastern region policy director for AWEA. “North Carolina had just made a big step forward completing its first major wind energy project, one of the very first in the Southeast, bringing jobs and millions in private investment with it. Other North Carolina wind projects are close behind, but this moratorium will send their investment to other states who welcome economic growth.”

North Carolina recently became the 41st state to host a utility-scale wind project. Though wind development is just getting started in North Carolina, the industry already employs close to 2,000 Americans in the state, including at 26 active factories, according to AWEA.

“Over 53,000 wind turbines are in operation in 40 other U.S. states – some in close proximity to military bases – with no issues reported, no base missions harmed and national security protected,” continues Gohn. “The current Department of Defense wind project review process works. As a result, no wind project has ever been built over the objection of the Department of Defense.”

He adds, “The wind industry supports American service-men and servicewomen at home and abroad. In fact, the wind industry employs veterans at a rate 50 percent higher than the national average. Unfortunately, passing laws like this one hurts, rather than helps, our national security and energy independence.”

Another City Makes 100% Renewables Commitment

The Edmonds, Wash., City Council has approved a resolution establishing a community-wide goal of transitioning to 100% renewable energy by 2025. According to the Sierra Club, Edmonds represents the first city or town in Washington state to commit to 100% renewable energy and the 37th city in the U.S. to make such a commitment.

The Sierra Club says Edmonds receives power from the Snohomish Public Utility District, which gets most of its power from Bonneville Power Administration’s hydro-heavy mix. In 2015, approximately 10% of that energy came from nuclear sources, with a small amount of coal and natural gas (less than 2%) likely included, adds the Sierra Club.

Edmonds Councilman Mike Nelson, who amended the resolution to make the 100% clean energy commitment, says, “The majority of harmful greenhouse-gas emissions come from cities, but it doesn’t have to be this way. Whether you are a small city, like Edmonds, or a large city, the infrastructure is in place to shift to clean, renewable energy. We hope every city in our state joins us and flips the switch to renewable energy.”

Victoria Leistman, associate organizer for the Sierra Club, comments, “With the federal government working against our clean energy future, leadership on climate action is going to have to come from cities and states.”

Edmonds’ 100% renewables commitment comes just days after the U.S. Conference of Mayors approved a resolution that establishes support from the nation’s mayors for the goal of moving to 100% clean and renewable energy in cities nationwide.
amount of renewable energy generated in Nova Scotia,” comments Ron Seftel, CEO of Bullfrog Power.

The Ellershouse Wind Farm is the latest wind project supported by Bullfrog Power. Thanks to the support of Bullfrog Power’s customers, the organization has been involved in the commissioning of wind farms across Canada, including some of Ontario’s first wind turbines.

“The financial support of Bullfrog Power was important in ensuring the ongoing success of this project. By launching the second phase of the Ellershouse Wind Farm, we are demonstrating real progress in developing new, cleaner forms of power for Nova Scotians,” adds David Devenne, mayor of Mahone Bay and AREA vice chair.

**Alterra Expands Loan For Texas Project**

Vancouver, British Columbia-based Alterra Power Corp. has expanded its loan facility with affiliates of AMP Capital Investors Ltd. The net proceeds, totaling approximately $20.6 million, will be used as part of Alterra’s sponsor equity contribution for the Flat Top wind project in central Texas.

The expanded facility will be secured by and supported by cashflows from Alterra’s projected 51% ownership stake in the Flat Top project, in addition to security and cashflow support the facility currently receives from Alterra’s interests in the Toba Montrose, Jimmie Creek and Dokie projects.

The loan expansion will fund the project in conjunction with the completion of the Flat Top project financing. Alterra also expects to sell down a 49% interest in the project to a sponsor-partner.

The 200 MW Flat Top project is contracted to sell the majority of its power under a 13-year power hedge with an affiliate of Citi. The project previously contracted with affiliates of Vestas-American Wind Technology Inc. for turbine supply and maintenance and Blattner Energy Inc. for construction services. The project is expected to achieve commercial operations in the first half of 2018.

**EDF RE Inks Minn. Utility PPA**

EDF Renewable Energy (EDF RE), the North American subsidiary of EDF Energies Nouvelles, has signed a long-term power purchase agreement (PPA) with the Southern Minnesota Municipal Power Agency for the 100 MW Stoneray wind farm.

The project is located in Pipestone and Murray counties in southwest Minnesota. Comprising 50 turbines, the wind farm is expected to start construction at the beginning of 2018 and be commissioned in winter 2018-2019. At the wind farm’s full capacity, the expected generated electricity will be enough to meet the annual energy consumption of up to 47,000 average Minnesota homes, says EDF RE.

EDF RE anticipates creating 150-plus construction jobs and 10 long-term, full-time positions from the project.

According to the company, the U.S. represents a major market for the EDF Group, which aims to double its renewable energy capacity by 2030.

**Serial Buyer Pattern Strikes Again**

Wind Quarry LLC says it has executed a purchase and sale agreement with Pattern Renewables 2 LP (Pattern Development) for Wind Quarry’s 103 MW Willow Creek Project in Butte County, S.D.

The project, located on approximately 20,000 acres of private ranch land, interconnects to the Western Area Power Administration’s 115 kV transmission line and, once operational, will generate enough energy to power 40,000 homes.

The company says all major construction permits are now complete.

“We are thrilled to acquire our first wind project in South Dakota and look forward to working with Wind Quarry and the local community to develop the Willow Creek Project, creating jobs, economic spending and a new source of energy in Butte County,” comments Mike Garland, CEO of Pattern Development.

**Utility, Transalta Add To N.B. Nameplate**

NB Power and a subsidiary of TransAlta Renewables Inc. have reached an agreement to add 17.25 MW of wind generating capacity at the Kent Hills site in New Brunswick.

The Kent Hills project currently accounts for 150 MW of nameplate wind generating capacity and consists of two separate projects.

Now, the additional capacity will make up Kent Hills 3. Subject to regulatory approvals and the completion of successful engagement with First Nations and other stakeholders, Kent Hills 3 is expected to begin operations in late 2018, according to NB Power and TransAlta.

Kent Hills 3 will supply additional generation and make up for lower-than-anticipated energy production at the existing Kent Hills wind farm. The energy from Kent Hills 3 will be sold to NB Power at competitive market rates.

CANADA’S STRONG, STABLE AND SUPPORTIVE WIND ENERGY MARKET OFFERS EXCITING NEW OPPORTUNITIES

Canada is home to the eighth largest wind generating fleet in the world and is led by a supportive government that is dedicated to addressing climate change.

CANADA IS A GLOBAL LEADER
Wind energy has been the largest source of new electricity generation in Canada for the past decade and Canada now has close to 12,000 MW of installed wind energy capacity.

90% CARBON FREE BY 2030
The Federal Government is aiming for 90% of Canada’s electricity to be carbon free by 2030.

7,000 MW NEW WIND ENERGY
Existing provincial energy strategies are targeting the installation of as much as 7,000 MW of new wind energy capacity by 2030 with procurement for 600 MW already underway. Additional energy strategy/policy announcements are expected this year.

$450 MILLION O&M BY 2020
Wind farm operations and maintenance market revenue opportunity is estimated to be $450 million by 2020.

JOIN US at the Canadian Wind Energy Association’s (CanWEA) Annual Conference and Exhibition to exhibit your products and services and learn more about our wind energy market.
windenergyevent.ca/whycanada
The Free Market Shall Lead The Way

Throughout the past several years, the U.S. wind industry has undergone a stunning metamorphosis from fringe technology to real player on the grid. In the past five years alone, wind capacity in the U.S. grew from 25,000 MW to over 80,000 MW in 2016, vaulting wind energy past hydropower as the nation’s most abundant renewable energy resource by capacity. Given that only 10 years ago, 16,000 MW was installed in the U.S. and with merely 2,000 MW installed in 2000, the scale-up of the wind industry is nothing short of remarkable and perhaps unprecedented. This growth has not been driven by government mandate; ironically, perhaps, it has been driven by the free market and by demand. Our industry’s growth has been derived from customers who are constantly seeking cost-efficient answers to power generation and utilities seeking a solution to volatility in fossil fuel markets. More and more utilities are choosing wind solutions for power generation at a staggering pace.

According to a report released by the International Energy Agency, investment in global renewable energy capacity totaled $297 billion in 2016 – solidly the largest share of global energy investment, with $13.8 billion of that investment going to wind energy. It was also the first time that investment in renewables outpaced fossil fuel investment. In fact, renewable energy and power grids accounted for about 80% of all investment in electricity, according to the report.

While investment in renewables fell by 3% last year, capacity rose by 50%, with output expected to rise by 35% thanks to falling prices and improvements in technology and deployment. Efficiency, technological improvements and superior service are all major drivers of wind’s surge. As turbines become bigger and produce more power with fewer materials and production cost, costs are driven down even further. And that’s a fairly important point, given wind will continue to face stiff competition from coal and gas after the production tax credit (PTC) expires.

Although some in the industry fear that an expiring PTC will harm wind’s continued expansion, I am encouraged by the explosion of investment by utilities and banks that have recognized wind’s perhaps insurmountable cost advantages. Given the sheer volume of investment and the kinds of investors becoming involved – many of them relatively new to wind and renewables in general – signs point to continued strength of wind even after the sunset of the PTC.

Most importantly, the growth of the wind industry has been good news for our planet, as CO2 emissions from the electric power sector declined by nearly 5% in 2016, thanks to a significant drop in deployment of coal power generation and increased generation from natural gas and renewable sources. Overall, data provided by the U.S. Energy Information Administration indicates about a 5% decline in the carbon intensity of the power sector, matching a 5% decline the year prior. Overall, since 2005, electric utilities have reduced carbon emissions by an astounding 25%. Coinciding with that fact is that our population has grown in that time, which usually results in increased power usage and carbon emissions, which means we’re also using power more efficiently. We haven’t seen this kind of decline in decades.

Our growth is also good news for the economy. There are more than 100,000 Americans now manufacturing turbines, building and maintaining projects, and supplying parts and services. According to the American Wind Energy Association and Navigant Consulting, that number is expected to balloon to nearly 250,000 over the next four years, with almost $100 million in ancillary economic activity. In fact, according to the U.S. Bureau of Labor Statistics, the fastest-growing job in the U.S. is wind technician.

How can wind continue this momentum to keep costs down?

If wind is to continue to compete with coal and gas in a post-PTC world, we must not only work to expand research and development programs to include larger and more powerful turbines, but also expand through improvements on established control systems that improve availability and minimize faults.

Energy markets have taken notice of wind’s revolution, as have special interests. There are already efforts under way to cut into wind’s progress, and policies are being considered to provide subsidies to coal in Ohio, Wyoming and Pennsylvania. At the end of the day, we still have the upper hand, but we need to keep getting smarter and improving on what is already a natural cost advantage over our competitors. Expanded efforts in innovation and efficiencies will continue to drive that cost down and help wind compete for decades to come.

Colin Mahoney is founder and president of Mahoney Communications Group, a strategic communications firm focused on renewable energy. He can be reached at colin@mahoneycommunications.com.
2017 SUMMER & FALL EVENTS

WIND RESOURCE & PROJECT ENERGY ASSESSMENT CONFERENCE
September 27 - 29 | Snowbird, Utah, USA

OFFSHORE WINDPOWER CONFERENCE & EXHIBITION
October 24 - 25 | New York, New York, USA

WIND ENERGY FINANCE & INVESTMENT CONFERENCE
October 25 - 26 | New York, New York, USA

WIND ENERGY FALL SYMPOSIUM CONFERENCE
November 7 - 9 | Albuquerque, New Mexico, USA

www.aWEA.org
AMSOIL’s reputation for producing the highest quality lubricants sets us apart from others in the market. With cutting-edge research and technology, our process guarantees a cleanliness code of 16/14/11 or better on every main gearbox, pitch, yaw and hydraulic lubricant we produce.

AMSOIL products are perfected in the lab and proven in the field. An approved lubricant for factory and service by today’s top manufacturers is why owners, operators and manufacturers continue to move up to AMSOIL. Don’t risk your assets with unnecessary filtering or additive treatments. Let the AMSOIL team show you how to maximize the return on your investments.