Expanding The Owner-Operator’s Toolkit

The value of operational power curve testing using ground-based LiDAR.

Illinois
An update on the state’s RPS saga.

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Kelly Creek
EDF Renewable Energy’s latest wind farm nears commercial operations.

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THE WAY FORWARD

S128

The S128 wind turbine is Suzlon’s newest and largest rotor diameter helping drive down the cost of energy. The S128 features a rotor diameter of 128 meters and a swept area of more than 12,860 square meters generating one of the highest-yielding IEC Class II (3.0 MW) and III (2.6 MW) medium speed full converter wind turbines in their 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. For the way forward contact us today at 773-328-5077 ext. 201 or ext. 203.
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On the cover: The Viger-Denonville community wind farm, which is jointly owned by Innergex and the regional county municipality of Riviere-du Loup, comprises 12 wind turbines with an installed capacity of 24.6 MW. Photo courtesy of Joan Sullivan
Ladies and gentlemen, we are gathered here today to pay our respects to Ontario’s utility-scale wind industry, which has passed away from unnatural causes (a lack of government support).

Those of you knew who knew Ontario will recall it was a place of great passion for renewable energy. In just a short time, Ontario grew to become Canada’s leading wind province. And with the passage of its Green Energy and Green Economy Act of 2009 – which introduced North America’s first feed-in tariff – the province became a leader on the global stage. Those were good times. Soon after the act’s unveiling, global energy players, such as Samsung Renewable Energy and turbine manufacturer REpower Systems (now Senvion), as well as U.S. developers, such as Invenergy and Pattern Energy Group, set up shop north of the border. And Ontario was also an early pioneer of climate change. In 2014, the place rid itself of coal-fired generation.

Alas, these lofty attributes were not enough to save Ontario from itself – a place where the discourse around energy quickly elevated into a political football. Cries of political corruption from the Dalton McGuinty government unraveled the inroads made by renewable energy. For example, from the sudden moratorium on offshore wind and the confiscation of assets and intellectual property, to the scandal involving the relocation, and subsequent cancellation, of the gas plants, there was one debacle after another. Some wind developers did themselves no favors, as the heavy-handed tactics of some angered municipalities in southern Ontario, ruining it for all.

Sure, existing wind projects were unaffected by the September ruling, and small-scale renewable energy projects that plug in behind-the-meter will continue to proliferate. However, the modern utility-scale wind industry as we knew it may take some time to come around again, if ever. Rest in peace. You will be missed.

[Editor’s Note: On Sept. 27, the government of Ontario abruptly suspended its large-scale renewable procurement mechanism, halting more than 1,000 MW of wind, solar, hydroelectricity, bioenergy and energy from waste products. For more on the decision – and how it impacts the industry – check out Viewpoint, on page 34.]
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The New York State Energy Research and Development Authority (NYSERDA) has issued the eagerly anticipated Blueprint for the NYS Offshore Wind Master Plan to encourage and support wind power as a clean, reliable and cost-effective energy source for New York.

According to NYSERDA, this plan outlines the key studies and policies that will be developed to drive the growth of the wind industry and serves as an acknowledgment of both the enormous potential that offshore wind power presents and the significant commitment that New York is making to effectively launch the industry.

The association notes that this commitment will not only provide abundant, zero-emission power, but also create jobs and spur new investment in the Empire State.

“The new Offshore Wind Blueprint lays out a policy framework that will support the successful deployment of offshore wind power for New York,” said Liz Gordon, director of the New York Offshore Wind Alliance (NYOWA). “Offshore wind power is crucial to achieving the state’s 50 percent renewables by 2030 requirement, and the Offshore Wind Master Plan studies outlined by this Blueprint will be an important component of achieving this objective, which will require a large-scale, long-term commitment by New York.”

New York’s recently adopted Clean Energy Standard (CES) Order tasked NYSERDA with developing an Offshore Wind Master Plan that recommends appropriate mechanisms and best solutions for maximizing the potential for offshore wind in New York.

Ensuring large-scale market demand and a mechanism to realize it is the NYOWA’s top priority. The Blueprint specifically commits to the identification of off-take options that will maximize the benefit to ratepayers and the quantification of offshore wind power solicited through the CES.

UL Acquires AWS Truepower

Global safety science company UL says it has acquired AWS Truepower, an energy engineering services and advisory firm, in an effort to expand its global renewable energy portfolio. According to AWS Truepower, this addition will strengthen its full lifecycle solutions for both the wind and solar energy sectors.

AWS Truepower is an Albany, N.Y.-based company providing renewable energy services through five business units covering project advisory, performance engineering, due diligence, information services and grid solutions. Its service portfolio complements UL’s current renewable energy offering focused on testing, inspection and certification, as well as performance verification of solar, wind, batteries and energy storage systems.

According to AWS, the acquisition supports UL’s global expansion strategy, as many countries are pushing for energy independence, energy security and environmental sustainability. AWS Truepower’s services are crucial in meeting the growing demand for energy assessments of new projects coming online and ongoing support.

“There is strong alignment between the two brands. UL and AWS Truepower have a shared mission and complementary...
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businesses,” said Jeffrey Smidt, vice president and general manager for UL energy and power technologies. “As the market for renewable energy increases and demands a full lifecycle service offering for renewable energy projects, the combined portfolios enable us to capture additional business globally.”

AWS Truepower’s employees will join UL and remain with the company. For the time being, AWS Truepower will continue operating under its current brand name.

Apex Adds Novus Assets

Apex Clean Energy has acquired the Novus IV wind energy project, located in Hansford County and Sherman County, Texas, from Guymon, Okla.-based Novus Windpower LLC.

Located in the north Texas Panhandle, the wind project has the potential to bring 360 MW of wind energy into the Southwest Power Pool market. The company notes that construction could begin as early as 2017.

“Novus IV is an excellent project in a strategic location,” said Mark Goodwin, president of Apex. “The Texas and Oklahoma Panhandle region has some of the best wind in the country, and we are pleased to be partnering with Novus Windpower to bring this project through construction and into operations.”

Apex Clean Energy builds, owns and operates utility-scale wind and solar power facilities. Last year, Apex was the market leader in the U.S., with 1,042 MW of new wind capacity installations – enough clean energy to supply the population of a city the size of Boston or San Francisco each year for the life of the facilities.

NJRCEV Buys Medicine Bow

NJR Clean Energy Ventures (NJRCEV), the unregulated distributed power subsidiary of New Jersey Resources (NJR), has acquired the 6.3 MW Medicine Bow Wind Farm, its fifth onshore wind project.

Located in Carbon County, Wyo., approximately 80 miles outside of Cheyenne, the project consists of nine fully operational Vestas turbines. According to NJRCEV, the energy produced is sold to the Platte River Power Authority, where it is distributed to municipal utilities in Estes Park, Fort Collins, Longmont and Loveland, Colo.

“Our investment in onshore wind represents a long-term growth opportunity for our company and our shareowners,” said Laurence M. Downes, chairman and CEO of NJR. “With the acquisition of the Medicine Bow Wind Farm, onshore wind now accounts for more than half of our distributed power capacity and underscores NJR Clean Energy Ventures’ continuing efforts to strengthen and diversify our portfolio, as well as our commitment to make clean energy – and its benefits – more accessible.”

Medicine Bow, utilizing a program of audits, upgrades and technology improvements, underwent an overhaul by Gamesa that extended the service life of the wind farm’s turbines. Based on the nature of the work, the project qualifies for federal production tax credits (PTCs), which are based on kilowatt-hour output. All PTCs generated by the wind farm will be retained by NJR, the company notes.

In addition, NJRCEV also placed into service the Montana-based Two Dot Wind Farm in June 2014; the Carroll Area Wind Farm, located in Iowa, in February 2015; and the Alexander Wind Farm, in Rush County, Kan., in December 2015. The Ringer Hill Wind Farm, located in Somerset County, Pa., is currently under construction. When complete, NJRCEV’s onshore wind portfolio will total more than 126 MW, capable of producing enough energy to power over 29,000 homes per year.

NJRCEV invests in, owns and operates
distributed power projects that generate clean energy and provide low-carbon energy solutions. To date, NJRCEV’s approach has focused on commercial and residential solar project development in New Jersey and onshore wind projects in the U.S.

**PUC Greenlights Xcel’s Rush Creek**

The Colorado Public Utilities Commission (PUC) has approved a broadly supported settlement that will allow Xcel Energy to develop, own and operate the 600 MW Rush Creek Wind Project.

The PUC, a division of the Department of Regulatory Agencies, voted to approve the agreement (without modification) reached between Xcel and more than a dozen other parties.

In approving the settlement, the PUC found that the project satisfied the reasonable cost standard in state law that allows utility ownership of up to 25% of the total new renewable energy resources acquired after March 27, 2007.

The proposed wind project, to be located on Colorado’s eastern plains, would comprise two wind generation sites and a 90-mile, high-voltage transmission line to tie into Xcel’s electric system. In total, the project would include 300 Vestas V110-2.0 MW turbines on approximately 116,000 acres in Elbert, Lincoln, Kit Carson and Cheyenne counties. Construction and commercial operations are expected to begin in 2017 and late 2018, respectively.

The agreement caps the cost of the project at $1.096 billion. In addition, it provides for a sharing of cost-savings between customers and Xcel if capital costs are less than the capped amount.

Moreover, the agreement allows Xcel to pursue an earlier construction schedule for the proposed Pawnee-Daniels Park Transmission project in order to take advantage of federal tax credits and accommodate the Rush Creek project interconnection, says the PUC.

“I’m very pleased that almost 20 parties could join together and support a comprehensive settlement that significantly increases renewable energy in the state, will be a driver of economic development in rural Colorado, and helps sustain the renewable energy supply chain that has matured in Colorado,” said Joshua Epel, chairman of the PUC. “I am especially pleased that a high-voltage transmission line that provides access to energy resource zones is part of the settlement.”

In addition to PUC staff, the Office of Consumer Counsel and the Colorado Energy Office, signatories to the settlement included environmental organizations, cooperative electric associations, municipalities, large energy consumers, trade and union groups, and independent power producers.
**Deepwater Opens Mass. Office**

In an effort to spur its planned offshore wind project off the Massachusetts coast, Deepwater Wind is opening a new development office in downtown New Bedford, Mass.

The opening of the new office comes as Providence, R.I.-headquartered Deepwater Wind accelerates pre-development work on its Deepwater ONE project. The utility-scale offshore wind farm is planned for federal waters roughly midway between Martha’s Vineyard in Massachusetts and Montauk, N.Y.

The company’s Massachusetts development team, led by Matthew Morrissey, vice president, will be based at 555 Pleasant St. in the historic Standard-Times Building.

“New Bedford will be the hub for Massachusetts’ new offshore wind industry, and we can’t think of a better place to base our operations than right here,” Morrissey stated.

**SunEdison Yieldcos Mull ‘Strategic Alternatives’**

Both of bankrupt renewables company SunEdison’s yieldcos, TerraForm Power and TerraForm Global, are considering mergers or sales of their entire businesses. Although the yieldcos were not part of their sponsor’s Chapter 11 bankruptcy filing, SunEdison’s financial woes have weighed heavily on the subsidiaries’ operations.

“Our board and management team have been working to preserve and protect stockholder value, and after careful review, we have decided that exploring all possible alternatives to maximize that value is in the best interests of all our stockholders,” said Peter Blackmore, interim CEO of both yieldcos. In two separate press releases, he added that each sister company has a “diverse portfolio of assets and record of strong operating performance,” thus offering “a unique opportunity for a broad range of potential acquirers and investors.”

In addition to selling all of the yieldcos’ equity interests, the companies would also consider transactions involving new sponsors, which could buy out SunEdison’s existing sponsorship deals. Furthermore, the yieldcos are taking steps to operate as independent operating companies without sponsors, “if that should become necessary in the short or long term,” according to Blackmore.

Because SunEdison is operating under Chapter 11 bankruptcy protection, many decisions made by SunEdison — such as how to vote its shares in the yieldcos to approve potential mergers or acquisitions — may require the approval of the U.S. Bankruptcy Court for the Southern District of New York.

Blackmore stated, “We have been working closely with SunEdison on disposition alternatives so far and regard a collaborative exploration of strategic alternatives to be in the best interests” of all parties involved. The yieldcos are also working with SunEdison to consensually resolve intercompany claims, but Jack Stark, the chairman of the corporate governance and conflicts committee, said, “[W]e stand ready to enforce our rights in litigation if necessary.”

**Canadian Mining Firms Look To Renewables**

Canada’s new carbon pricing proposal is pushing mining leaders to consider renewable energy options as a way of further reducing greenhouse-gas emissions and stabilizing energy costs, according to Ottawa, Ontario-based Energy and Mines.

“Carbon pricing in Canada is having an impact on the energy choices of mines,” said Adrienne Baker, director of Energy and Mines. “With carbon becoming a commercial liability, mines are evaluating renewables for remote sites and integrating alternative energy into feasibility studies for new operations as a way of limiting carbon exposure.”

According to Energy and Mines, among the Canadian mining companies leading on carbon reduction and renewables integration are Barrick Gold, IAMGOLD, AurCrest Gold, Goldcorp and TMAC Resources.

The company says these entities are investing in renewables and/or mine electrification to significantly reduce their carbon exposure, stabilize energy costs and boost social license to operate.

“The projects these mines are doing and the approaches they are taking to energy are models for the entire sector to mitigate carbon risk and address energy challenges,” added Baker.

Internationally, COP21 targets and emerging carbon policies in key mining jurisdictions, including Chile, Argentina and South Africa, are also pushing mining leaders to integrate carbon exposure into their energy choices, notes Energy and Mines.
New Milestone Paves Way For Paris Agreement

The European Union has formally joined the Paris Agreement, which has now surpassed an emissions threshold needed to make the climate deal official.

With the European Union's voting to join the U.S., China, India and other nations in ratifying the agreement, nations representing more than 55% of the world's global warming pollution have now signed on – crossing the minimum threshold for the agreement to enter force, according to Environment America.

The Sierra Club says the agreement crossed a 55-country threshold in September at a United Nations event and will now enter force in 30 days, just ahead of the upcoming climate negotiations in Marrakech, Morocco.

At last year's United Nations (UN) Climate Change Conference in Paris, more than 190 countries came together to adopt the Paris Agreement, what the White House called “the most ambitious climate change agreement in history.” Specifically, the agreement sets a goal of keeping a global warming increase well below 2°C and pursues efforts to limit the increase in temperatures to 1.5°C. On Earth Day earlier this year, leaders from roughly 170 countries met in New York City to formally sign the deal.

“Signed, sealed, and delivered. After years of tireless dedication and work toward an international climate deal, the Paris Agreement has finally jumped off the page and into reality,” said Michael Brune, executive director of the Sierra Club, in a statement.

“This step forward means that the Paris Agreement will enter into force this year, and that’s not a moment too soon. In Paris, fossil fuels received their expiration date, and today’s announcement marks a global turning point that unites the world to finally take action to tackle the climate crisis while unquestionably putting us on a path toward a modern clean energy economy,” he continued.

On Oct. 4, UN Secretary-General Ban Ki-moon went to Strasbourg, France, to urge the European Parliament to sign on to the deal.

“In the name of humanity and for the sake of future generations, I encourage you to support the speedy ratification of the Paris Agreement,” he said. “At a time of record heat, let us take historic action. At a moment of divisions on many other challenges, let us show we are united on the biggest one of all.

“This is our chance to set us on course towards a safer, more sustainable and more just future for all on a healthy planet. Let us seize the moment and be true to the values and aims of our organizations.”

In total, 74 countries have joined or committed to join the Paris Agreement by the end of 2016 – accounting for 60.34% of global emissions, according to the Sierra Club.

Countries that have announced their commitment to joining the agreement by the end of the year include Australia, Cambodia, Canada, Costa Rica, Cote d’Ivoire, Kazakhstan and the Republic of Korea.

The Sierra Club notes that once the agreement enters into force, it will take at least four years for any one country to officially leave.

Anna Aurilio, global warming solutions program director for Environment America, added in a statement, “Here in the United States, we must redouble our efforts to reduce – and eventually eliminate – global warming pollution. President Obama has already put America on track to slash emissions from vehicles and power plants, but we can and must do much more.

“We have the tools to shift away from dirty and dangerous fossil fuels towards a 100 percent renewable energy future powered by solar, wind and energy efficiency. Tapping this immense potential, President Obama should establish a goal for the United States to achieve net-zero carbon pollution by 2050. Setting this ambitious goal will not only seal the president’s legacy as an historic world leader, but also guide our nation to avert climate disaster in the coming decades,” Aurilio said.

The countries that have joined the Paris Agreement to date are Albania, Antigua and Barbuda, Argentina, Bangladesh, Barbados, Belarus, Belize, Brazil, Brunei, Cameroon, China, Cook Islands, Dominica, the European Union, Federated States of Micronesia, Fiji, Ghana, Grenada, Guinea, Guyana, Honduras, Iceland, India, Kiribati, Laos, Madagascar,
Governors To Obama: Let’s Talk About Wind

In a letter to President Barack Obama, a bipartisan group of 20 governors has taken action to expedite the siting of new wind farms, both onshore and offshore, in the U.S.

According to the American Wind Energy Association (AWEA), the Governors’ Wind & Solar Energy Coalition, representing 20 states, has led for a decade on policies to increase wind energy around the country.

With long-term tax policy now in place, thanks to Congress’ passing a multiyear extension of the production tax credit last December, other issues stand in the way of adding to U.S. wind energy infrastructure and fully tapping the country’s abundant wind resources, explains AWEA.

Recently, the coalition sent a letter to Obama from Iowa’s Terry Branstad, chair of the group and governor of a state that gets over 31% of its electricity from wind, and Rhode Island’s Gina Raimondo, vice chair of the group and governor of the state with the first U.S. offshore wind farm.

“[W]e agree that wind and solar energy development address many of our states’ and the nation’s important needs, such as job creation, economic development, reliable and low-cost energy, and cost-effective emission reduction,” the letter stated.

Specifically, the governors asked the administration to consider the following:

- Having the Coast Guard keep working on its Atlantic Coast Port Access Route Study with the Bureau of Ocean Energy Management (BOEM) and the states because “it is not clear that the approaches detailed … properly balance the multiple uses of the ocean”;
- Further streamlining the offshore wind energy permitting process so that BOEM and outside agencies set and meet “reasonable deadlines”;
- Ensuring that the U.S. Fish and Wildlife Service does not broaden legal liability under the Migratory Bird Treaty Act without a workable general permit process for the private sector;
- Making additional changes to a proposed eagle permit rule “to ensure the final rule is workable while continuing to protect eagles”; and
- Addressing concerns that a competitive leasing proposal said to be coming from the Bureau of Land Management could hamper wind and solar development on public lands.

Tom Kiernan, AWEA’s CEO, thanked the governors for their support and offered the following statement:

“Wind farms are some of the greatest infrastructure projects this country has ever built, but there’s a lot more to be done if wind energy is to meet its promise. These governors are leading. They’re attuned to economic development needs and deployment challenges in their states, and they’re looking to the federal agencies to help rather than hinder.”

Plan To Tax Wyoming Wind Is Defeated

A proposed $2 tax increase on wind power in Wyoming was reportedly shut down by the state’s joint revenue committee.

According to coverage from the Wyoming Business Report, Congressman Mike Madden, who serves as chairman of the committee, had proposed bringing wind taxes from $1/MWh to $3/MWh.

However, having gotten no support at an October meeting, the proposal was killed.

The article adds that the increase in taxes would have gone toward funding schools in the state.

Following the committee’s vote, Juan Carlos Carpio Delfino, Wyoming-based Viridis Eolia Corp.’s CEO, reportedly stated, “At the end of the day, sanity prevailed, and now developers are free to continue the arduous task of converting wind to electrons for the benefit of Carbon County and the state.”

Viridis is developing the 840 MW Little Medicine Bow wind farm in Carbon County, which will also be home to the Power Co. of Wyoming’s Chokecherry and Sierra Madre Wind Energy Project, which will total a whopping 3 GW of capacity.

What Can Energy Storage Do For The Bay State?

Massachusetts’ Baker-Polito administration has released a new report, “State of Charge,” detailing the value of deploying energy storage in Massachusetts and a road map of policy recommendations for growing the energy storage market and industry in the state.

The report finds that the addition of energy storage to the state’s energy portfolio could realize hundreds of millions of dollars in cost savings for Massachusetts ratepayers, shave the impacts of peak demand on the state’s energy infrastructure, and reduce carbon emissions by better integrating renewable resources into Massachusetts’ energy infrastructure. The study was commissioned as part of the administration’s $10 million Energy Storage Initiative.

“Massachusetts has a proud history of being on the forefront of technological and renewable energy innovation, and this report clearly shows the enormous potential energy storage has for the state,” said Gov. Charlie Baker, R-Mass. “As demand for renewable energy sources increases, this administration is committed to ensuring that the commonwealth maintains reliability and energy affordability, as demonstrated by the recent bipartisan comprehensive energy legislation.”

Massachusetts ratepayers, shave the impacts of peak demand on the state’s energy infrastructure, and reduce carbon emissions by better integrating renewable resources into Massachusetts’ energy infrastructure. The study was commissioned as part of the administration’s $10 million Energy Storage Initiative.

“Massachusetts has a proud history of being on the forefront of technological and renewable energy innovation, and this report clearly shows the enormous potential energy storage has for the state,” said Gov. Charlie Baker, R-Mass. “As demand for renewable energy sources increases, this administration is committed to ensuring that the commonwealth maintains reliability and energy affordability, as demonstrated by the recent bipartisan comprehensive energy legislation.”
As part of a broader energy law signed in August, the state has authorized an energy storage procurement goal for Massachusetts, given that the Department of Energy Resources (DOER) deems such a target prudent by year’s end. The DOER is now beginning a stakeholder engagement process to inform the decision-making process ahead of the Dec. 30 deadline set forth in the legislation, as well as to solicit feedback on the new report.

As the Baker-Polito administration explains, advanced energy storage technologies include batteries, flywheels, and thermal and compressed air technologies that allow utilities and electricity customers to store and discharge energy as needed instead of purchasing or generating more expensive energy during times of high demand.

In order to increase storage deployment and maximize ratepayer benefits, the report recommends policy changes for the state to adopt, including encouraging regional coordination around energy storage, amending the Alternative Portfolio Standard to include all types of advanced energy storage, encouraging expanded use of energy storage in existing energy-efficiency programs, considering energy storage as a utility grid modernization asset, pairing storage with renewables in future long-term clean energy procurements, and considering standards and code development for energy storage.

The report also highlights programmatic opportunities, including rebate programs for customer-sited energy storage, solar-plus-storage initiatives, the continued funding of clean energy resiliency initiatives focused on energy storage for critical facilities, and continuing the Massachusetts Clean Energy Center (MassCEC) investment and technology development programs to support energy storage companies in the state.

The administration says that these recommendations, if adopted, have the potential to yield 600 MW of advanced energy storage technologies on the Massachusetts grid by 2025. Furthermore, these recommendations are anticipated to provide over $800 million in cost savings to ratepayers and cut approximately 350,000 metric tons of greenhouse-gas emissions over a 10-year time span, which is equal to taking over 73,000 cars off the road.

Following the release of the study, the DOER and MassCEC will use the findings to implement a grant program for energy storage demonstration projects over a range of application scales. This grant program, to be launched later this year, will use the remaining funds available from the $10 million Baker initially budgeted for the Energy Storage Initiative. Funds generated through the grant program will build upon the results of the use cases in “State of Charge” to further explore the potential benefits of storage.
At long last, some see progress in fixing a long-standing hurdle limiting renewable energy in the state.

By Kevin Borgia

With a huge electric load, an ambitious renewable portfolio standard (RPS) goal, a strong wind resource and transmission access, Illinois should be experiencing continuous clean energy growth. But a complex electric market and a renewable energy standard with technical flaws have hindered development in the state for the past five years. Now, thanks to persistent advocacy by the industry, environmentalists and others, it appears more likely than ever that Illinois will fix the law and see growth resume.

Of course, we’ve been here before: Illinois is the wind industry’s “boy who cried wolf.” These pages have proclaimed several times that victory was near, only to see defeat snatched from the jaws of victory. But an alignment of various forces and diligent negotiations with other stakeholders indicate that resolution may be possible later this year or in early 2017.

Battle of the bills

Environmentalists and the renewables sector have fought to fix the state’s broken RPS law since at least 2011. The effort saw new enthusiasm when the Illinois Clean Jobs Bill was introduced in early 2015, quickly gaining broad, bipartisan support for its proposals to fix the RPS, expand energy-efficiency opportunities and reduce carbon pollution.

The so-called Clean Jobs Bill is one of three major energy bills that have competed for legislators’ attention in the past two years. A proposal backed by utility giant Exelon would provide hundreds of millions in ratepayers’ dollars to save their struggling nuclear plants, while sister company ComEd supported a bill that would restructure the state’s power market in ways attractive to the utility. Statehouse observers assumed portions of all three bills would eventually be combined into an omnibus energy package, as it is unlikely that either proposal could pass on its own.

All of the parties lobbied hard for their respective bills, but the General Assembly largely ignored their calls for action. A vicious partisan battle between Gov. Bruce Rauner, R-Ill., and House Speaker Mike Madigan, a Democrat, left Illinois without a budget for nearly a year, with devastating consequences to the state’s economy and social safety net. With bigger battles to fight, both parties decided not to address a complex energy bill in either the 2015 or the 2016 legislative sessions.

But discussions between Exelon and the Clean Jobs Coalition were productive during the summer and fall months, and both parties were expressing very cautious optimism that legislative
Legislative
action on a comprehensive bill could happen soon.

**Law of unintended consequences**

To understand Illinois' broken RPS, it is important to understand the state's complex power markets. Illinois is a fully deregulated state – meaning individuals and businesses can buy power from the incumbent utility or purchase it from one of nearly 80 alternative retail electric suppliers (ARES) licensed to operate in the state.

The Illinois Power Agency (IPA) acts as a broker for utility power supply contracts and ensures that the required percentage of renewables is incorporated into utility portfolios.

Both utilities and ARES are subject to the RPS mandates: 10% by 2015 and 25% by 2025. (Municipal and cooperative utilities are exempt.) Theoretically, the RPS should be creating hundreds of megawatts of demand each year, but the so-called “municipal aggregation” law that passed in 2010 threw the system into disarray.

Under municipal aggregation, entire cities, towns and counties can vote to leave the incumbent utility and seek another supplier. Cities can even require ARES to bid on the contract to provide renewable power, although this usually means purchasing cheap renewable energy credits (RECs) via one-year contracts.

Since the legislation’s passage, municipal aggregation has surged in popularity, with more than 450 communities choosing a competitive supplier. In the first three years of municipal aggregation, Illinois utilities lost 60%-90% of their load. Many of those communities have since switched back to the incumbent utility, but the risk of future shifting is always present. With an uncertain customer base, utilities and ARES primarily sign wholesale power supply contracts of less than three years, lest they face stranded costs if customers shift to another supplier.

Complicating the problem is the convoluted system by which the RPS is administered. Under the current law, utilities and ARES comply with the RPS in different ways, all of which revolve around one-year RECs.

It is common knowledge in the wind industry that lenders don’t like to finance a renewable energy project if it lacks a power purchase agreement (PPA) or another long-term off-take arrangement. But with both utilities and ARES operating on a short-term basis, PPAs are impossible to find in Illinois’ power market today.

Worse still, hundreds of millions of dollars intended for procurement of long-term renewable resources that are held in a state account have been “swept” by lawmakers and the governor, who are hoping to address the state’s gaping budget hole and $100 billion pension funding crisis. Due to this convoluted system, the business climate for renewable energy developers is far from friendly. Fortunately, there is a solution.

**Wires charge**

The best way to solve the problem is to scrap the entire system and move to a single compliance mechanism. Currently, the cost of compliance is embedded on the generation side of ratepayers’ electric bills. The proposed RPS fix aims to solve the problem by switching the compliance charge to the transmission portion of the bill. The Clean Jobs Bill would implement such a non-bypassable wires charge that would be paid by both utilities and ARES equally. This creates a pool of funds that the IPA could direct toward a portfolio of short- and long-term REC contracts.

The incumbent utility would be the counterparty to the contract, and the state would never actually hold the funds, preventing sweeps. All cost caps would remain in place, so consumers and businesses would not pay more than allowed under current law.
Additionally, retail competition and municipal aggregation would continue unabated.

Under this system, the Illinois RPS would foster thousands of megawatts of new wind and solar constructed over the coming decade.

Uncertain but optimistic

As lawmakers head back to Springfield for the short veto session in November, they face a host of heavy decisions. Although Statehouse Democrats and the Republican governor reached agreement on a six-month budget back in June, that spending plan expires at the end of December. If basic state services are going to continue into the new year, lawmakers will need to put aside their partisan dispute and compromise on a budget. Also looming is the possibility of an income tax increase to help fill the massive budget gap.

With just six days scheduled for the veto session, those major issues will dominate the agenda. Even if the Clean Jobs Coalition and Exelon reach agreement on a broad energy bill, lawmakers and other stakeholders will certainly be critical of aspects of the agreement and oppose the bill or seek changes. A short window and a packed agenda don’t bode well for the complex energy bill. If no action happens in November, advocates are eyeing the short lame duck session in January.

Exelon plans to shut down the Clinton nuclear plant by mid-2017 if the state doesn’t pass a bill providing the ratepayer subsidy. It’s likely that the company will begin that process if it doesn’t see a bill by the lame duck session. The potential of losing the plant’s jobs and local economic impact places pressure on lawmakers to act in the near term. Whether they respond is an open question.

In any case, renewable energy companies and their allies in the Clean Jobs Coalition will continue advocating for their priorities. If renewables advocates are successful, the proposed change would finally help developers finance and build new projects – helping shift Illinois’ economy from fossil fuels to clean energy. After all, that was the point of the RPS law in the first place.

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Progress Made In Maine, But More Hills To Climb

Maine hosts almost 1,000 MW of land-based wind power that is operating or scheduled to come online by year-end. The majority of projects have been permitted since 2008, when the legislature approved and then-governor John Baldacci signed into law an Act to Implement Recommendations of the Governor’s Task Force on Wind Power Development, P.L. 2007, ch. 661 (the “Wind Energy Act”). The Wind Energy Act established aggressive goals for wind development in Maine and, in order to reach those goals, modified the review process to encourage the siting of wind power in areas where it is most compatible with existing patterns of development and resource values. The goals for wind power in Maine include at least 2,000 MW of installed capacity by 2015, which did not occur; at least 3,000 MW of installed capacity by 2020 (including 300 MW or more from facilities located in coastal waters); and at least 8,000 MW of installed capacity by 2030 (including 5,000 MW from facilities in coastal waters).

One of the key tools for bringing about wind energy development and its attendant environmental, energy and economic benefits was to identify specific areas for development and enact measures to encourage developers to site projects in those areas. Known as the expedited permitting area, it includes all of the organized areas of the state, as well as portions of the unorganized areas of the state. (Approximately half of Maine, just over 10 million acres, is unorganized, with no local form of government and very sparse population.) Since passage of the Wind Energy Act, 13 grid-scale projects have been permitted, with an installed capacity of more than 700 MW. The projects – ranging in size from a small, three-turbine project on the island of Vinalhaven, to the Bingham Wind project, a 56-turbine, 185 MW project located in western Maine – are all located in the expedited permitting area. Not all projects, however, have been successful. One project was proposed but failed to obtain state approval on the basis of scenic impacts, a second project was proposed but subsequently withdrawn following concerns expressed by the state wildlife agency about impacts to songbirds, and a third has been filed but is now on hold.

Maine is experiencing continued interest in wind development, particularly as the demand for clean energy in New England grows. The Tri-State Clean Energy request for proposals (RFP), in which Massachusetts, Connecticut and Rhode Island are soliciting offers for clean energy and transmission to deliver clean energy, has generated significant development interest in Maine. More than 2,000 MW of new land-based wind power projects in Maine have been submitted in response to the Tri-State Clean Energy RFP, and there are additional projects under development. Once the results of that RFP are announced, the pace of development in Maine is expected to pick up.

Challenges ahead

Although there are many opportunities in Maine, significant challenges remain.

First, the rural areas in the state where projects are proposed are generally distant from load centers, and therefore, transmission availability and constraints remain a key challenge. The Tri-State Clean Energy RFP bids include a number of transmission projects, and expansion of the transmission system in Maine will be key to future development. The lengthy and expensive interconnection process at ISO-New England also presents an ongoing challenge to development in New England.

Second, there is ideological opposition to wind power, which has created regulatory uncertainty in recent years. The current governor, Paul LePage, R-Maine, does not support...
the industry, which has an effect, albeit difficult to quantify, on agency decision-making.

Third, state wildlife agencies have voiced increased concerns over mortality of birds and bats. Although post-construction mortality data demonstrates that avian mortality at Maine projects is low, the state’s wildlife agency has objected to projects that are located in an area identified as the coastal plain and where passage rates of passerines are thought to be higher than in other areas of the state. This is an issue that will have to be studied and worked out as projects located in that area move through the permitting process. The precipitous decline in the Myotis bat species due to white nose syndrome and the subsequent listing of several species on Maine’s threatened or endangered species list present additional permitting challenges. Maine currently has among the most conservative curtailment recommendations in the country – 6 m/s from a half hour before sunset to a half hour after sunrise from April 20 to Oct. 15.

Ideological opposition and permitting challenges are offset, however, by the public support for wind power that exists in the region. The economic benefits of wind development are significant. One report, “Economic Impacts of Wind Energy Construction and Operations in Maine 2006-2018,” by the Maine Center for Business and Economic Research in December 2014, contends that total spending in Maine on wind projects could reach $1.28 billion by 2018. This amount does not include taxes, however, which are significant, or community benefit payments, which are required as part of the permitting process in an amount no less than $4,000 per turbine per year. Much of the economic spending occurs in rural areas that have few economic opportunities, and the support for wind power by these communities and the many industries that have benefited from wind development is key to the industry’s success. The forest products industry is a major stakeholder in Maine and has been supportive of wind power, which is a compatible land use and provides an alternative revenue stream at a time when value from traditional forestry activities is declining.

Now that Maine has a number of operating projects, there is also less fear of the unknown. For example, outdoor recreation is important in the state, and many feared that visibility of turbines would have a significant adverse impact on outdoor recreational activities. ATV and snowmobile groups have seen the benefits of wind projects and have been supportive of the industry. Additionally, a post-construction intercept survey, conducted in October 2012 by Kleinschmidt for First Wind, of persons recreating on Baskahegan Lake demonstrated that visibility of the turbines was not adversely impacting that user group’s experience. Specifically, 93% of the respondents stated that the Stetson project (which included 55 turbines) had either no effect or a positive effect on their recreational experience on Baskahegan Lake, and 81% stated that the turbines had either no effect or a positive effect on scenic quality.

Maine’s Wind Energy Act was passed to encourage wind development in the state, and to date, it has succeeded in doing so. Although the aggressive goals for development have not been reached, there is continued opportunity and support for the industry. As the demand for clean renewable energy in New England grows, Maine should benefit from additional development.

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Why LiDAR-Based Operational Power Curve Testing Matters

Technology can now corroborate individual turbine performance with greater certainty.

By Evan G. Osler & Guillaume Coubard-Millet
Understanding the performance of individual wind turbines at any modern wind farm is critical. The characterization of turbine efficiency is a necessary first step in detecting underperformance, evaluating turbine upgrades, refinancing or reselling a project, identifying degradation in performance over time, and, increasingly for wind farm owners, trying to decide whether to invest in contractual power performance testing within the first year of plant operations per the International Electrotechnical Commission’s (IEC) 61400-12-1:2005 standard.

It is well known that the IEC-12-1:2005 methodology requires the use of a hub height meteorological mast to measure the wind conditions upwind of the turbine(s) being tested. In the spirit of this current standard, wind farm owners in North America are increasingly performing operational (non-contractual) power curve tests using ground-based Doppler LiDAR alone. Indeed, certain Doppler LiDAR models provide a very similar input to hub height IEC masts for assessing wind turbine performance in simple terrain sites, mimicking the role of the mast but with a much higher degree of flexibility and at a much lower cost. Resultant uncertainties on power performance are slightly higher, but not significantly so, and the results of such a test give wind plant owners very similar benefits in understanding whether turbine performance meets, underwhelms or exceeds expectations and, just as importantly, whether far more costly and time-intensive actions such as formal IEC 61400-12-1 testing under the current standard will pay off.

Many readers are probably also aware that an update to IEC-12-1 is likely to be ratified and enacted in 2017 and that this update will incorporate the concept of rotor equivalent wind speed (REWS) as an alternative to hub height wind speed as input to the turbine power curve calculation. REWS is best derived with measurements across the vertical surface of the turbine rotor, and as a result, the IEC power performance test standard will, for the first time, allow the use of remote sensors as a complement to short (< hub height) met towers for contractual power curve tests. Data from the remote sensor will be used as input for the REWS calculation, while the short met tower serves as an on-site verification device for the remote sensor itself.

Economics, practicality and uncertainty

A Doppler LiDAR-based operational power curve test is one of many such methods available to wind farm operators currently. Each available method strikes a unique balance in terms of economics, practicality and resulting annual energy production (AEP) uncertainty. We focus here specifically on ground-based wind measurement methods, which mimic the current IEC standard in terms of mast placement upwind of the turbine(s) being tested, acknowledging that a variety of different nacelle or hub-mounted instrumentation options are also being used as wind speed inputs to operational power curve tests. In general, we find that a ground-mounted remote sensor located upwind of the turbine is still the most comfortable alternative to conventional met masts for wind farm owners and investors in the U.S.
height will vary based on shear conditions far more than what the LiDAR has been shown to experience. In the case of the Doppler LiDAR, the uncertainty is driven more so by its verification to an already uncertain reference (a calibrated cup anemometer) than by any flaw in its measurement performance, such as shear-based sensitivity.

AEP uncertainties typical of mast-, Doppler LiDAR- and SoDAR-based power curve tests are illustrated in a relative sense, along with cost, in Figure 2. Based on its favorable nexus of cost, practicality and accuracy, a LiDAR-measured power curve will typically offer significantly more confidence on which to make actionable and defensible business decisions when compared with a nacelle anemometer or SoDAR-based test and still at a small cost compared with an IEC met mast.

A real-world example

A Doppler LiDAR was utilized for an operational power curve test in late 2014 at a utility-scale wind farm in the midwestern U.S. The wind farm owner’s objective in this case was to rapidly and economically assess the performance of a targeted turbine installed just a few months prior, both to confirm suspected underperformance and to determine whether to invest in more expensive, contractual testing as a basis for

**Figure 2:** Cost and uncertainty comparisons of various methods for measuring the wind speed as part of an operational power curve test in simple terrain.

Ground-based measurement methods, such as those from an industry-standard SoDAR or Doppler LiDAR, will typically differ in price by a factor of 2 to 2.5 x when considering average monthly rental fees for each device, with both methods falling well below the cost of a hub height met tower, especially with the assumption of short (e.g., three-month) test campaign durations. A purchased remote sensor can be cost-amortized relatively rapidly when considering the low cost of relocations compared with repeated hub height met tower installation and decommissioning.

Preexisting nacelle anemometry is the low-cost wind speed input method for power curve testing, as well as the most practical one, but it suffers significantly from measurement uncertainty to the point where it cannot be utilized with any confidence for absolute evaluations of the turbine's efficiency unless calibrated on-site by a reliable reference instrument. The remote sensor option is less practical in general than a nacelle anemometer would be by virtue of the need to install the device separately at a unique location upwind of the turbine(s) being evaluated, but it is far more practical than a met tower installation, given the typical lack of permit or soil disturbance required, as well as a far quicker and simpler installation and decommissioning process generally.

In considering various ground-based remote sensor options, it is important to note that industry-standard SoDARs measure with a significantly higher degree of uncertainty than industry-leading Doppler LiDARs due to their sensitivity to changes in wind shear. A study by independent consultancy Deutsche Wind Guard estimated the total hub height wind speed uncertainty from a typical SoDAR at greater than 5.0% versus 2.5% for the Doppler LiDAR (Figure 1). The SoDAR’s high sensitivity to shear implies that the accuracy at a given
warranty claims and possible liquidated damages payments from the turbine original equipment manufacturer.

The turbine was tested because initial SCADA data analysis indicated an overestimation of the calculated energy produced based on the nacelle anemometer power curve when compared with the real energy produced (calculated > real production). This specific LiDAR was chosen to serve as the reference wind measurement device for the test due to its ease of installation, proven accuracy and wide industry acceptance. These data were combined with turbine SCADA data and ground-level atmospheric measurements to provide an accurate and meaningful understanding of the turbine’s performance relative to its reference power curve.

The turbine under evaluation was located on the outer edge of the wind farm and frequently experienced unwaked winds as a result. The LiDAR was placed 2.5 rotor diameters upwind of the turbine in a prevailing wind direction, beyond the turbine induction zone. Prior to its deployment, the LiDAR was tested and validated at company headquarters against a calibrated reference LiDAR.

Following the data collection period, a series of straightforward filtering steps to both LiDAR data and turbine SCADA data were applied by the wind farm owner’s internal performance analysts, and final calculation of turbine power curve was performed.

The wind farm owner concluded that the wind turbine significantly underperformed its reference power curve.

A secondary result showed, not unexpectedly, that the performance deviated between unstable daytime conditions (low shear, high turbulence intensity in a convective boundary layer) and stable nighttime conditions (high shear, low turbulence intensity in a nocturnal boundary layer) (Figure 3 and Figure 4). Following this internal test, the wind farm owner was able to confidently proceed with a formal IEC power curve test while the LiDAR was moved to another location to analyze additional wind turbines. Background experience and industry research coupled with on-site measurements with high data availability and low scatter provided a high level of confidence on which to make this important business decision.

**Figure 3:** Comparison of binned power curves (daytime and nighttime) with reference power curve. Error bars represent the statistical uncertainty on the power (one standard deviation).

**Figure 4:** Normalized turbulence intensity at hub height, shear index and temperature variation by hour of day (local time).

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There’s nothing particularly noteworthy about EDF Renewable Energy’s 184 MW Kelly Creek wind farm — unless you happen to be a fan of well-executed projects. Indeed, the flat and wide-open spaces that characterize Illinois farmland — as well as access to a robust transmission network within PJM Interconnection — made building here virtually risk-free.

At press time, each of the wind farm’s 92 Vestas V100 turbines (perched on 80-meter towers) has been erected, assembled and energized, notes Jon Baker, EDF Renewable Energy’s development manager. The wind farm, located in Kankakee and Iroquois Counties, Ill., will interconnect to the grid at the Kensington Avenue substation.

The wind farm is being built at a time when several projects are sitting idle due to the state of Illinois’ well-documented struggles with its renewable portfolio standard (RPS). Given the loopholes in the state’s existing RPS, it was unlikely that a traditional utility would step forward and sign a power purchase agreement (PPA) for the energy produced by the project. (For more on Illinois and its RPS struggles, see “Advocates Eye Upcoming Legislative Session To Fix RPS Bill,” on page 14.)

Therefore, the electricity generated by the Kelly Creek wind farm will be sold on the open market within PJM Interconnection. That the wind farm is progressing without a PPA does not faze the developer.

“The PJM market is very liquid,” Baker says. “It is a vibrant market of buyers and sellers.”

Backstory

The history behind the Kelly Creek wind farm is not particularly unusual. The project was originally known as the K4 wind farm and was developed by Cincinnati-based Vision Energy LLC, which designed the project, put together the land agreements and obtained permits from the counties. Oakland, Calif.-based Orion Energy Group later partnered with Vision Energy to continue late-stage development activities, which ultimately culminated in the sale to EDF in July 2014.

Perhaps the most notable aspect of the project — which also added considerably to the project’s timeline — was its proximity to a radar facility in Joliet, Ill., which tracks aircraft. In 2009, the Department of Defense (DOD) and Federal Aviation Administration (FAA) objected to the proposed turbine layout, fearing the wind turbines would interfere with radar. The incident was one of many at the time that involved wind turbines and radar. The concern was that operators would be unable to distinguish between a moving wind turbine and a potential threat. By 2013, the DOD lifted its objection and the FAA issued a determination of no hazard.

Ryan McGraw, Orion Energy Group’s president, credits Vision Energy’s early leadership, particularly in assembling a group of powerful and influential landowners who continued to support
the project in times of economic and regulatory uncertainty.

“Without the landowner group – who supported the project in their local communities – I’m not sure this project would have been built,” McGraw says.

“After the sale, EDF Renewable Energy planned to build two separate projects,” notes David Sawyer, EDF’s program manager, adding that both projects maintained separate queue positions within PJM’s transmission network.

In September 2015, EDF completed the 175 MW Pilot Hill wind farm, which is powered by both Vestas and GE turbine technology. As was the case with Kelly Creek, signed PPAs with traditional utility buyers were non-existent. However, Microsoft Corp. has agreed to purchase 100% of the project’s output to help power its Chicago-area data center.

Generally speaking, the inability to sign power agreements has hindered most wind development activity in the state. Therefore, some wind projects have sat idle for many years as project momentum ebbs and flows. And that can be a problem, especially for community relations, Baker says.

Because the project has languished for long periods of time, Baker and Sawyer credit the landowners for continuing to support the project.

“This is a project that changed hands,” Baker says, adding that any time a project goes from one developer to another, the project owner needs to keep updating and communicating the value proposition. And in the case of Kelly Creek (and Pilot Hill), that project meant the promise of local jobs used for construction.

For example, both wind farms used labor from Local 150 Operators Union, Local 444 Iron Workers Union and some operating engineers from Local 841.

EDF also benefited, Baker notes, as the developer says the quality of its work has been instrumental in ensuring a successful project.

“We learned a lot from their work on Pilot Hill,” he explains. “The most important thing to keep in mind is that this is Illinois farmland. And we paid attention to certain local considerations, such as making sure there was no soil erosion or that drainage tiles were not damaged.”

Both wind farms will also inject a much-needed revenue stream into the local communities.

Because wind farms are designed to last 25 years or longer, it is not uncommon for communities to expect more than $30 million in property taxes and tens of millions more in landowner payments over the life of the projects. Therefore, the taxes generated by the wind farm will also go a long way, as well.

Based on current tax rates for the local counties hosting the projects and the current method used to calculate property taxes on wind turbines within Illinois, EDF Renewable Energy estimates that the Pilot Hill and Kelly Creek projects will each contribute more than $2 million annually in local property taxes for the first several years.
A crane hoists the rotor that will power Senvion's 3.2 MW machine for Innergex's 150 MW Mesgi'g Ugju's'n community wind farm in Quebec.

Photo courtesy of Joan Sullivan
Will You Have Your Crane When You Need It?

The five-year extension of the production tax credit ensures that there’s going to be some serious wind construction occurring over the next five years. Just the same, the expected flurry of demand could spell difficulty for wind developers – and their supply-chain partners – in procuring the main erection and hydraulic cranes needed for wind farm construction.

Procuring a crane can be tricky – not to mention expensive – even in normal business cycles. And the period the U.S. wind industry is about to enter will be like wind power on steroids.

According to the American Wind Energy Association, more than 15.2 GW of wind capacity was reported as under construction or in advanced stages of development during the first quarter, with more than 3.5 GW of total new announcements. And digging into the numbers a little deeper reveals that project developers reported more than 10,100 MW of construction activity across 81 projects in 25 states, including more than 2,000 MW of new construction announcements.

The anticipated demand over the next few years requires that wind developers place their orders now for crane procurement.

By Mark Del Franco

The expected demand is not unfamiliar to wind developers. During previous demand periods, such as in 2012, developers pulled out all the stops necessary to ensure projects were energized and grid-connected by the end of the year to qualify for that year’s expiring tax credit. Although the tax credit is again in play, there are some factors working against developers.

First, the tax credit’s extension is longer than in previous iterations – meaning the build cycle for wind farm construction will be longer. And elongated time frames mean more construction, which exacerbates demand.

Second, a boom in civil engineering projects means there’s also competition for the heavy-duty machinery coming from outside the wind industry. For example, several petrochemical plants being built along the Gulf of Mexico have tied up the same main erection cranes, such as the Manitowoc 16000 and 18000 and Demag CC 2800, used to hoist towers and nacelles and attach rotors.

Then there’s the turbine technology itself. Wind turbine towers have continued to grow taller as the nacelles have become heavier. As such, these components call for highly specialized machines, explains Dave Schwalm, executive vice president at construction services provider JPW Riggers.

“The current crop of wind technology requires cranes up to and over 1,000-ton capacity in both thecrawler and hydraulic configurations. Unfortunately, there’s simply not a lot of availability with these machines,” he says, citing the Manitowoc 21000 crawler crane and Liebherr’s LR 11000, a crawler crane that debuted in 2013.

“Everything always gets bigger – and in the wind industry, it’s no different,” notes Jim Strobush, product manager of crawler cranes for Liebherr USA. What used to be requests for 80- to 100-meter towers has now increased to 120 to 140 meters, he says.

Generally speaking, although some deep-pocketed developers own their cranes, most wind developers rely on their construction service providers to procure the cranes. Therefore, during these critical times, it’s imperative that wind developers choose their suppliers accordingly, confirms Steve Klatt, crane manager at Mortenson Construction. This sounds like a no-brainer, but Klatt says working with a contractor that has established relationships with crane suppliers and manufacturers will keep your wind project on track if and when problems occur. In addition, he says, the major crane original equipment manufacturers, such as Manitowoc and Liebherr, are in close contact with the major construction service providers. “Those conversations [about cranes] are already happening.”

With the demand for cranes likely, it’s never too early to begin planning. Here are a few tips to ensure you have your crane when you need it.

**Place your future orders yesterday.** Thinking about a 2018 wind project? Better get that order in now, notes Liebherr’s Strobush. “From a manufacturer’s point of view, the more visibility we have on our production schedule, the better,” he says, adding that it could help the wind developer’s supplier, too. “If we begin to see a lot of activity in one area or one region, we could ramp up production of crane units.”

**Say no to “over-craning.”** Review your projects so that you understand two things: turbine size and the crane needed to erect the turbine chosen for the project. The theory, says Klatt, is that when you go to rent or lease the proper crane, you procure only what you need. Otherwise, you run the risk of what’s referred to as “over-craning” and spending more money as a result.

**Don’t think outside the box.** During previous crane crunches, some intrepid wind developers headed outside the country, recalls Schwalm. However, at $250,000 and above, going to Canada or Mexico is often a last-resort strategy, as such options are not inexpensive and add time to the schedule.

**Consider group maintenance.** “Customers have been doing group maintenance when possible,” according to Schwalm. “The owners don’t like a turbine to be down, so normally, when a turbine is down, they are hot to change it or have it repaired – sometimes they can wait for a few to be done at the same time, which does save them money.”
Due to a number of factors, there is a growing interest in time-varying energy calculations. Traditionally, most wind farm energy production calculations use some sort of annually averaged wind distribution. Typically, the measured wind distribution will be fitted to a Weibull curve to reduce the computational requirements of handling large amounts of data. This means that the wind distribution represents an average year. It also means that time-varying changes in parameters such as air density, turbulence, shear and veer during the year – and within each day – are not taken into account. They are simply represented by annually averaged values.

An alternative method is to use a representative time series of wind and other climatic data consisting of 10-minute averages for an entire year or a long-term time series, such as a recent 20-year series with a time resolution of one hour. In this way, the energy calculations are based on each time step. Power curves can be adjusted every 10 minutes or hourly for changes in air density, turbulence, wind shear and veer. Wake decay constants, an important parameter in the wake loss modeling, can be adjusted based on changes in turbulence for each time step and, thereby, model the wake loss more accurately.

Improving efficiency and reliability

The time-varying calculation method is very helpful in identifying operating issues that are responsible for production losses so that efficiency and reliability can be improved. Making these time-based adjustments to the power curve and the wake decay constants allows for a much more precise matchup and correlation of concurrent calculated and measured energy production. This leads to a more precise determination of energy losses that can be evaluated by mean wind speed, temperature, turbulence, etc. Thus, the problem areas can be identified and quantified and actions can be taken to improve the operation.

Because of the ever-increasing number of wind farms being built, the likelihood of having a nearby operating wind farm is increasing. This presents an opportunity to fine-tune and calibrate the wind model for pre-construction wind and energy assessments.

In addition to improving efficiency and reliability, using the time-varying method in a performance check also helps to isolate and identify any remaining modeling errors (e.g., elevation or roughness modeling) that may be responsible for differences between predicted and actual energy production. The end result is that the refined wind model will be more accurate for predicting pre-construction energy production for a new wind farm that will be located nearby, as well as have a better understanding of how the local terrain influences the wind flow. This provides valuable feedback on how to fine-tune the model to reproduce the actual production as accurately as possible.

Once the performance check and the associated model refinements are completed using a time series of wind data that is concurrent with the operating wind farm’s production data, the wind flow model can be updated to use a time series that represents the long-term average year, or simply calculate based on recent 20-year hourly meso-scale model data that are calibrated to reproduce the nearby wind farm for the period with concurrent data. Using the long-term representative time series in conjunction with the time-varying calculation method has been shown to reduce the uncertainty of the yield estimate from a range of 10% to 15% to a range of 5% to 10%. This is primarily due to the increased accuracy that is achieved by fine-tuning the wind flow model in the performance checking exercise when testing the model calculations against real operational data.
In some cases, the Weibull-fitted distribution curve will be poorly fitted to the actual measured wind distribution. In this case, because the Weibull fitting is typically energy-weighted, it will fit better at the higher wind speeds and not so well at the lower wind speeds. This can be a real problem for lower-wind-speed sites. Studies indicate that there can easily be a 20% difference between energy yield predictions using a poorly fitted Weibull distribution versus using the time-varying energy calculation method.

Valuing the wind energy in the financial model (pro forma) is becoming more complicated as the value of the wind energy becomes tied to the time of generation. As the electrical grid becomes more congested with renewable energy generation, it becomes increasingly important to understand the relationship between the time that the energy is produced and the time that the energy is needed. The value of the energy is closely tied to this relationship. Wind energy that is generated in the middle of the night will have little value if the utility's load profile indicates that customer demand for power at that time is at a minimum. Conversely, wind energy that is generated in the middle of the afternoon in July will likely have a much higher value due to air conditioning requirements. Time-varying energy calculations are essential to predict the value of the wind power generation in a market where prices are often no longer fixed but vary by time of day and time of year.

**Looking ahead**

Turbine manufacturers are constantly working to improve the efficiency and reliability of their turbines. Many of these improvements involve control strategies – for example, using variable or multiple power curves to vary the power output for different climatic conditions or for different curtailment reasons. These variations are difficult to capture and model in the energy calculations using the annual-average wind distribution method but are easily handled with the new time-varying calculation structure.

The Weibull-fitted wind distribution has been around for a long time and has served the wind industry well. One can argue that many of these time-varying elements will cancel each other out over the course of the year and that the annual average will be correct with regard to the annual energy yield estimate. Although this may still be true in most cases, the changing energy market and renewable energy’s value within the overall energy mix have made it increasingly important to understand the time-of-generation value of the energy and impact on the grid with regard to congestion and curtailment.

In addition, precisely matching time-specific wind speeds with time-specific generation becomes more necessary as additional megawatts of generation come online, as this information is critical to making sure that the wind farms are being operated in the most cost-efficient and reliable manner possible.

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Beothuk Taps Canadian Offshore Partner

On behalf of Copenhagen Infrastructure II, Copenhagen Infrastructure Partners (CIP) has entered into a partnership with Newfoundland-based developer Beothuk Energy to develop the 180 MW St. Georges Bay wind farm, to be located off the coast of Newfoundland.

Until a power purchase agreement (PPA) has been secured, Beothuk Energy will continue to lead the development of the project. Once a PPA has been obtained, CIP will lead the project to financial close, as well as through the construction phase, in cooperation with Beothuk Energy.

Beothuk says it has secured approvals and significantly advanced the development of the project – to be Canada’s first offshore wind farm – since 2011.

The announcement is part of a larger agreement between Beothuk and CIP in which CIP will develop, own and operate wind farms in Atlantic Canada.

Beothuk says it is advancing projects totaling up to 1,000 MW in Newfoundland, Nova Scotia, New Brunswick and Prince Edward Island. According to the developer, the St. Georges Bay project will supply clean energy to more than 150,000 households, as well as create more than 500 jobs during construction.

Jacob Capital Management Inc., managed by Sasha Jacob, acted as the financial advisor to Beothuk Energy and is the exclusive financial advisor to Beothuk and the Beothuk projects. Norton Rose Fulbright is acting as Beothuk’s legal counsel.

“We are looking forward to participating in developing the St. Georges Bay project together with Beothuk,” said Christina Grumstrup Sørensen, senior partner at CIP. “We see significant potential for offshore wind in Atlantic Canada due to strong winds, shallow water and an existing industry with experience in working in an offshore environment since many years.”

Enel Lands $500 Million Financing Package For Cimarron Bend

Enel Green Power North America Inc. (EGPNA), acting through its subsidiary Cimarron Bend Wind Holdings LLC, has signed a tax equity agreement worth approximately $500 million with three investors – Bank of America Merrill Lynch, J.P. Morgan and MetLife – for the 400 MW Cimarron Bend wind project in Kansas.

Under the agreement, the investors will contribute the above amount to the wind farm’s owner, Cimarron Bend Wind Holdings, in exchange for 100% of Class B membership interests in the project.

According to EGPNA, this interest will allow the three investors to obtain, at certain conditions provided by U.S. tax laws, a percentage of the fiscal benefits that will be attributed to the project. In turn, EGPNA, through Cimarron Bend Wind Holdings, will retain 100% ownership of the Class A interests and, therefore, management control of the project.

The funding commitment came into effect at signing. Funds will be released in two phases: The first installment will be released midway through the entire project construction, and the second installment will be released upon completion of the project. The tax equity partnership will be supported by a parent company guarantee from Enel SpA.

The Cimarron Bend wind farm, whose construction started in April, is expected to begin operations in 2017. The project will require an investment of approximately $610 million, says EGPNA.
## NAW’s 2017 Lineup!

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For more information, contact Mark Del Franco at: mdelfranco@nawindpower.com  
(800) 325-6745, ext. 283 • www.nawindpower.com
Cimarron Bend Wind Holdings, which owns the project through special purpose vehicles, is fully owned by Enel Kansas, a 100% subsidiary of EGPNA. Cimarron Bend Wind Holdings has taken over the project assets from Cimarron Bend Wind Project LLC.

Cimarron Bend is supported by two 200 MW power purchase agreements: one with Google and the other with the Kansas City Board of Public Utilities. Cimarron Bend is the first of Enel Group’s North American wind farms to sell a portion of the power produced to a corporate off-taker.

**Wind Represented In Mexico Energy Auction**

Wind energy developers celebrated after Mexico’s second long-term electricity auction.

Cubico Sustainable Investments, a global renewable energy company with an installed gross capacity of approximately 2 GW, says it has won power purchase agreements in Mexico’s second long-term electricity auction for the 250 MW Mezquite wind project and the 290 MW Solem solar photovoltaic (PV) project, representing a total investment of approximately $700 million.

According to Cubico, it will raise financing for $500 million and will invest, along with its minority partners, $200 million in equity to start the construction of these projects early next year and have them operational between 2018 and 2019.

The company says the 250 MW Mezquite wind project is located in the state of Nuevo Leon, in the northeast of Mexico, and forms part of an 800 MW portfolio of wind projects under development acquired by Cubico from Banco Santander in 2015.

Secondly, the 290 MW Solem solar PV project is located in the state of Aguascalientes, in central Mexico, and is owned by Cubico and its partner Alten Energias Renovables, an independent power producer focused on PV technology in southern Europe, Africa and Latin America.

“This is the beginning of a new era for Cubico in Mexico that sets solid foundations to move forward with our growth plan and long-term investment strategy in the country,” said Osvaldo Rancé, head of Mexico for Cubico.

In other Mexico auction results, EDF EN Mexico, a subsidiary of the EDF Energies Nouvelles Group, has won a contract for the 252 MW Gunaa Sicaru wind project.

The project is located in the Isthmus of Tehuantepec region in Oaxaca. The wind farm, covering an area of approximately 4,400 hectares of leased land, will comprise Gamesa turbines. Transmission capacity for the project has been secured through the Federal Electricity Commission’s Oaxaca Second Open Season.

EDF also won the 90 MW Bluemex Power solar project, located in Guaymas, Sonora.

“We are pleased to take this important step in our expansion plan for the Mexican renewable energy market and to be an active player in the framework of Mexico’s Energy Reform,” commented Gerardo Pérez Guerra, vice president and country manager of EDF EN Mexico. “The diligent work of the EDF EN North American team has allowed the EDF Energies Nouvelles Group to achieve continued success in this increasingly competitive market.”

Present in Mexico for 15 years, EDF EN Mexico installed its first wind project in 2009 and has put into service a total wind capacity of 391 MW.

**Transmission Line Moves Forward**

Vermont Green Line Devco LLC (VGLD) and the Town of New Haven, Vt., have reached an agreement on a proposed high-voltage, direct-current (HVDC) transmission line linking wind and hydropower from New York State with New Haven.

According to an agreement document, the New Haven Select Board decided at an Oct. 4 meeting that the 400 MW HVDC project would “benefit the town and its residents by providing needed revenue.” The decision was made following a “favorable resident survey,” the town says.

In turn, the Town of New Haven says it is in its “interests to support VGLD’s Petition for a Certificate of Public Good to the Vermont Public Service Board,” which now must authorize the “construction and operation of the project.”

The proposed Vermont Green Line is a 60-mile transmission project linking wind and hydropower resources north and west of Beekmantown, N.Y., with New Haven via an underground cable, which would be buried along public roadways and submerged beneath the waters of Lake Champlain in Vermont.

The project is being developed by National Grid and Wakefield, Mass.-based Anbaric. According to the agreement, VGLD will make an annual payment of $1.4 million to the town (which will increase by 1% each year through the 40th year of commercial operations).

**Amazon Wind Farm Texas Secures Sponsor Equity**

Lincoln Clean Energy (LCE) – a portfolio company of infrastructure investment manager I Squared Capital – has committed 100% of the sponsor equity for the Amazon Wind Farm Texas, a 253 MW facility in Scurry County, Texas.

The facility will use 110 GE turbines.
to generate more than 1 million MWh of power annually, says LCE. Amazon will purchase 90% of the output over a long-term contract.

The $360 million project will receive construction financing from MUFG as coordinating lead arranger and Bank of America Merrill Lynch as mandated lead arranger. Bank of America Merrill Lynch and GE Energy Financial Services will invest in long-term tax equity for the project. BayernLB will provide letter of credit facilities after construction completion.

“We look forward to starting construction at Amazon Wind Farm Texas, as well as working with I Squared Capital on a pipeline of more than 1,000 MW of advanced-stage development projects across Texas and the Midwest,” commented Declan Flanagan, founder and CEO of LCE.

The project is expected to be completed in October 2017.

Tenaska Snags Projects Under Development

Independent power producer Tenaska has acquired a 470 MW wind portfolio under development in Minnesota and North Dakota.

The acquisition from Minneapolis-based PRC Wind comprises three mid-stage projects: 270 MW in Minnesota and 200 MW in North Dakota. All projects will interconnect to the Midcontinent Independent System Operator regional transmission system, and one of the projects will be able to interconnect with the Southwest Power Pool.

“These wind projects are located in regions with both good wind resources and a growing need for renewables,” noted Joel Link, Tenaska’s vice president of development.

PRC Wind will provide support services to Tenaska through the completion of local development activities. Tenaska will assume overall development responsibility, as well as financing, construction and operations. Tenaska also plans to use its inventory of safe-harbor wind turbines to achieve full production tax credit qualification.

Tenaska, based in Omaha, Neb., says it has developed approximately 10,000 MW of natural gas-fueled and renewable power projects.

E.ON To Manage Four Projects

Novatus Energy has selected E.ON Energy Services to manage four wind farms across three states: two in Texas, one in Maine and one in Washington.

Under the terms of the five-year agreement, E.ON will provide complete asset management, site supervision and balance-of-plant management.

The projects, totaling 700 MW, include the South Plains II and Route 66 projects in Texas, the Oakfield project in Maine, and the Palouse project in Washington.

With the Novatus Energy agreement, E.ON now manages, owns and/or operates wind farms in seven states and in nearly every major independent system operator territory. E.ON also provides operations and maintenance services in Europe.

Firm Inks Deal On Construction Financing

Falvez Energy has closed construction financing on the Falvez Astra Wind Project in Texas — the company’s first utility-scale wind project — from GE Energy Financial Services.

Additionally, GE Energy Financial Services and BNP Paribas SA will each provide 50% of the long-term tax equity for the project.

The 163 MW project is located in the Texas Panhandle in Randall, Castro and Deaf Smith Counties (approximately 30 miles south of Amarillo). The project property comprises roughly 11,000 acres of land historically used for ranchland and agricultural purposes. The area is considered to be in the western part of the Competitive Renewable Energy Zone in Texas.

The energy from the 68 GE 2.4-107 wind turbines will be transmitted through a new 14-mile, 345 kV transmission line to the Sharyland Utilities Windmill Substation and via the Electric Reliability Council of Texas.

The day-to-day operations and maintenance of the project will also be provided by GE under a 10-year, full-service agreement.
Ontario's recent decision to suspend the second round of its Large Renewable Procurement (LRP II) process is a missed opportunity for a province that has become a leader in investing in an increasingly clean and modern electricity system. LRP II had been seeking 600 MW of new wind energy. The suspension of LRP II does not affect any existing wind power developments under contract with Ontario's Independent Electricity System Operator, according to the province's minister of energy.

The decision to pause further procurement under LRP II was precipitated by the recently released Ontario Planning Outlook (OPO). The Canadian Wind Energy Association believes that the OPO understates the need for new electricity generation, given the important role electrification will play in meeting the province’s climate change targets and moving to a low-carbon economy. Ontario also plans to refurbish 10 nuclear reactors, and wind energy should be an important clean energy backstop for system reliability.

Investments in wind energy have positioned Ontario well, as Canada is now putting a price on carbon and taking the first steps to transition to a low-carbon economy. Ontario leads Canada in installed wind energy, with 4,361 MW of capacity, meeting about 5% of electricity demand. Continuing to invest in wind energy is essential to enable Ontario to meet its climate goals while remaining globally competitive.

In 2014, Ontario was first in North America to eliminate coal-fired electricity generation, while also making significant investments in its electricity infrastructure. Investments in new natural gas and renewable generation, refurbishment of nuclear facilities, and new transmission have resulted in higher electricity prices, as new facilities are more expensive than existing ones for which capital costs have been paid. New renewable generation has also created thousands of new highly skilled jobs, delivered local economic benefits and virtually eliminated smog warnings throughout Ontario. Continued growth in emission-free wind energy will be critical to meeting Ontario's energy and climate policy goals.

Achieving a low-carbon economy will require deep electrification. Success on this front requires Ontario’s electricity grid to be powered by non-emitting, affordable electricity sources such as wind that can be used to power other sectors that have traditionally used fossil fuels, such as vehicles, transit, heating of buildings and many industrial processes.

These clean energy sources must be economic, and in this regard, wind energy has many competitive advantages. It is a technology, not a fuel, which means there is no commodity price risk, such as exists for natural gas. Being non-emitting, wind energy also avoids carbon price risks. Without commodity or carbon price risks, wind energy is more likely to enjoy long-term price stability.

The costs for wind energy have fallen by 61% over the past six years, making it cost-competitive with other energy sources, as evidenced by the wind energy projects in Ontario’s LRP I, with costs as low as C$0.065/kWh. Plus, costs are projected to continue falling (41% by 2040, according to Bloomberg) as economies of scale and efficiencies are realized through the massive global expansion underway.

Ontario’s current energy plan reflects an understanding that there is a need, and a will, to cost-effectively and reliably integrate more clean, renewable energy into the electricity grid. The investments already made in wind energy are aligned with a global movement toward renewable energy, and Ontario is now broadly recognized as a Canadian leader for its strong domestic renewable energy sector. This capacity gives Ontario and Canada a competitive edge in a burgeoning global market. The International Energy Agency estimates that $36 trillion will need to be invested in the energy sector over the coming years as all jurisdictions seek to avoid the threat of serious climate disruption.

If Ontario is to cost-effectively transition to a low-carbon economy that meets its climate goals, it will be necessary to maintain or increase the pace at which it shifts to clean, renewable energy.

The industry is committed to working with the Ontario government as it updates its long-term energy plan. We will use that forum to demonstrate that the province must procure new wind energy to meet future growth in electricity demand and to provide its citizens with long-term price certainty at a more competitive rate than alternatives.

Brandy Giannetta is Ontario regional director at the Canadian Wind Energy Association. She can be reached at brandygiannetta.can-wea.com.
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