Not Now. Not Ever.

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Where Are The PPAs?

Where are all of the wind power purchase agreements (PPAs)? Despite all of the bluster surrounding the five-year extension of the production tax credit (PTC), activity out there seems thin. Is it just me, or do you also suspect that off-take agreements for wind are far less plentiful this year than in years past?

No doubt, there have been some notable off-take agreements — some with recognizable, blue-chip corporations, and some with traditional, regulated utilities — but nothing approaching what was expected shortly after the PTC was extended last year.

According to Keith Martin, partner at law firm Chadbourne & Parke, many factors could be responsible for the decline. In a macroeconomic sense, he notes that low gas prices continue to be an obstacle for wind developers.

Nonetheless, off-take agreements with non-utility buyers — once a fast-growing segment — suffered a sharp decline this year.

Last year, PPAs by non-utility buyers, such as Facebook and Walmart, fell 33% from the previous year to 2,194 MW compared with 3,260 MW in 2015, according to data from Renewable Energy Choice. The totals were far more disappointing when you consider that estimates at the start of 2016 had the non-utility segment at 4,000 MW.

“What happened was that by midyear, there was a growing sense among corporate buyers that wholesale electricity prices are falling,” Martin explains. “[Corporate buyers] had less interest in locking in prices under long-term contracts.”

As for PPAs signed by traditional utilities, he says, most of the activity is in states with renewable portfolio standards. However, many utilities have already signed PPAs to meet their near-term requirements.

“There are pockets of need,” Martin explains, “but they tend to be small contracts.”

This begs the question, is there light at the end of the tunnel? Does the U.S. wind market gradually turn to merchant power — that is, wind projects designed specifically to serve spot electricity markets? That seems unlikely, as merchant power has never gained much traction in the U.S. Certainly, the concept has merit (in smaller markets, for example, energy trades at a higher rate), but absent a national renewable electricity standard or carbon legislation, merchant wind projects seem a ways off.

The wind industry needs to come to grips with how its development pipelines sync up with off-take market projections. So, look past the damning headlines that detail how former wind-friendly states are reversing course (I’m looking at you, Oklahoma); the off-take agreement — and how to obtain one — is the only story that matters now. WP

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IRS Boosts Wind PTC’s Value

On April 11, the Internal Revenue Service (IRS) announced an inflation adjustment increase in the production tax credit (PTC) for power sold in 2017 that is generated by wind, closed-loop biomass and geothermal projects to 2.4 cents/kWh from the prior 2.3 cents/kWh.

Such inflation adjustments are welcome news when announced, and they slightly goose the economics of the pertinent projects.

The PTC is available for a qualified project’s first 10 years of its power sales. Therefore, the adjustment applies to qualified 2017 power sales from new projects and also to 2017 power sales from projects placed in service during the prior 10 years.

Unfortunately, for owners of open-loop biomass, small irrigation power, landfill gas, trash, qualified hydropower, and marine and hydrokinetic facilities, the PTC for energy sold from those projects after application of a rounding convention remains at 1.2 cents/kWh.

For a wind project that “starts construction” in 2017 and manages to have energy sales in 2017, the PTC under the extension/phase-out enacted by Congress in December 2015 would be only 80% of the 2.4 cents/kWh (i.e., 1.92 cents/kWh).

However, the developers of most wind projects that will be placed in service in the near term have taken steps to meet the IRS’ guidance as to what was required to “start construction” prior to 2017 in order to qualify for the full PTC (100% or 2.4 cents/kWh, with this inflation adjustment).

Geothermal, biomass (open and closed loop), landfill gas, trash, small irrigation power, qualified hydropower, and marine and hydrokinetic facilities were excluded from the 2015 extension/phase-out. Therefore, in order to qualify for any tax credits, those projects must have started construction prior to the end of 2016. The exclusion was reportedly inadvertent, and in 2016, there were efforts to enact legislation to place such projects on comparable footing with respect to the extension/phase-out of wind projects, but there was insufficient bipartisan support in Congress for such legislation to pass.

In 2017, consideration of such statutory nuances has been off the table, given the legislative agenda of the administration and the majority leaders of each chamber of Congress.

The 30% investment tax credit for solar does not have a comparable inflation adjustment, as it is computed using the project’s tax basis rather than its energy sales.

- David K. Burton

David K. Burton is a partner at law firm Mayer Brown. He can be reached at dburton@mayerbrown.com.

Duke Energy Plans Renewables Growth

Duke Energy has launched a $13 billion, 10-year initiative to modernize North Carolina’s electric system. Among the goals of the “Power/Forward Carolinas” project is expanding renewable energy in the state.

According to Duke Energy, other plans include hardening the system against storms and outages, making it safer and more resilient against cyber-attacks and physical threats, and generating jobs and stimulating economic growth. The initiative will also give 7 million people in North Carolina more information to manage their energy use, the company says.

“Safely powering the lives of hard-working families and maintaining the vitality of our communities are our most important responsibilities,” says David Fountain, Duke Energy’s North Carolina president. “When we improve our energy infrastructure, we not only improve power quality and reliability for everyone, but we help grow our economy and create opportunities.”
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According to Duke Energy, which touts the sixth-largest grid in the U.S., its 10-year modernization plan will result in the following:

- Additional bill-lowering tools designed to help customers reduce their energy costs;
- An average of 13,900 jobs each year;
- $10.4 billion in salaries and wages;
- Almost $800 million in state taxes and $550 million in local taxes; and
- A total economic output of $21.5 billion over the 10 years.

“We must embrace a forward-thinking approach to building a smarter energy future for North Carolina,” Fountain adds. “We have been working hard to generate cleaner, smarter electricity, and now we must invest to make the system that delivers that energy even smarter.”

The Fortune 125 company’s renewables unit operates a growing renewable energy portfolio across the country, including the 200 MW Frontier Windpower Project in Oklahoma. Last October, Duke Energy Carolinas issued a request for proposals for 750,000 MWh of renewable energy located in its service territory.

Ohio Board Delays Icebreaker Certification

The Ohio Power Siting Board “kicked back” Lake Erie Energy Development Corp.’s (LEEDCo) certification request for construction of the $120 million, 20.7 MW Icebreaker offshore wind project, according to Cleveland.com.

As reported, LEEDCo officials say the decision is only a “bump in the road,” as they are already planning to file updated documents that they expect will be approved, giving the green light to North America’s first freshwater offshore wind project.

In order to achieve certification, the report explains, LEEDCo needs to submit two memoranda of understanding to the Ohio Department of Natural Resources for studying the proposed wind farm’s environmental impact, specifically on animals.

The report cites a letter from siting board Chairman Asim Haque to LEEDCo President Lorry Wagner, stating that the application does not have enough information to “comply with Ohio law.”

Icebreaker Windpower Inc. formally filed applications with the siting board for the Icebreaker wind farm in February.

Utility Plans Massive Renewables Investment

Rocky Mountain Power has laid out a 20-year, $3.5 billion initiative that includes adding more wind and solar and making existing wind turbines more efficient. In addition, the plan incorporates building a segment of a transmission line to facilitate the wind expansion.

The integrated resource plan (IRP), filed with utility regulators, is used as a road map to help Rocky Mountain Power provide reliable electric service to customers at lower costs, the company says. Part of PacifiCorp, Salt Lake City-based Rocky Mountain Power provides electric service to approximately 1.1 million customers in Idaho, Utah and Wyoming.

The 2017 IRP includes upgrading more than 900 MW of existing wind projects with larger blades and newer technology in order to generate 20% more energy in a wider range of wind conditions, as well as capture federal production tax credits, the company says.

Further, the plan calls for beginning construction on a segment of the 500 kV Gateway West transmission line, located between Medicine Bow, Wyo., and the Jim Bridger power plant in the southwestern part of the state. According to Rocky Mountain Power, the 140-mile line would enable additional wind generation, improve efficiency and relieve transmission congestion.

Under the plan, the company would also facilitate the construction of up to 1.1 GW of new wind projects — primarily in Wyoming — by the end of 2020. Likewise, these would also capture federal tax credits for customers.

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In addition, up to another 859 MW of new wind would be built between 2028 and 2036: 85 MW in Wyoming and 774 MW in Idaho.

On the solar side, the plan calls for building up to 1.04 GW of new solar between 2028 and 2036. Approximately 77% of the solar would be built in Utah, and 23% would be built in states served by Pacific Power.

Continuing a “cost-conscious transition that adds more energy diversity,” says Rocky Mountain Power, the plan also incorporates the company’s environmental compliance obligations for its coal plants. Energy efficiency will also continue to play a key role in the company’s long-term plans.

“This plan provides more diversity in the energy we use, which helps us keep electricity prices low for customers and improves the economies of our states,” says Cindy A. Crane, Rocky Mountain Power’s president and CEO. “The proposal is also a major investment that will produce more jobs, provide a stronger tax base and build transmission lines that will deliver reliable energy more efficiently for years to come.”

Wyoming Gov. Matt Mead adds, “This ambitious plan – a nearly $3 billion investment in Wyoming – diversifies Wyoming’s economy, expands markets, presents workforce training opportunities, adds jobs and strengthens the tax base in local communities. I look forward to working closely with Rocky Mountain Power. I see great potential for Wyoming workers and ratepayers as this plan is implemented.”

Unearthing Dinosaur Footprints At Meikle Site

When Pattern Development began construction on its 184.6 MW Meikle Wind power project, the largest of its kind in British Columbia, one very observant excavator operator made an unexpected discovery – dinosaur tracks.

What he had uncovered, in fact, were natural casts of a large, quadrupedal ankylosaur in 97 million-year-old rocks of the Dunvegan Formation.

According to Richard McCrea, curator of the Peace Region Palaeontology Research Centre, several dinosaur-track-bearing slabs were found in the Meikle project site, just north of Tumbler Ridge, during the road and platform excavations in 2015.

McCrea says that although this track type is not uncommon in western Canada, it is considered very rare globally. Specifically, he explains that the tracks were significant due to their depth and the number of visible digit impressions. Four-toed ankylosaur tracks had previously been found in Canada, but these new tracks outlined only three.

This find, then, added to the lesser-known representative...
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population of three-toed ankylosaur tracks.

Michael Thompson, Pattern Development’s project manager, explains that the province of British Columbia does not have any specific legislation for fossil protection, so the developer immediately contacted an independent environmental monitor, and the site was cordoned off so as to protect the tracks.

“After the initial shock of the find, the team followed the on-site ‘chance encounter’ protocol developed for cultural finds,” he says. “The discovery was quickly assessed by the local paleontologist and identified as a valuable footprint track of an ankylosaurus.”

Construction work in the area was placed temporarily on hold – only for a couple of days, Thompson notes – so that the rock, which weighed over a ton, could be safely transported and donated to the Peace Region Palaeontology Research Centre.

All in all, Thompson says half a dozen sets of tracks – the majority being similar ankylosaurus finds – were uncovered in the area over the course of Meikle Wind’s construction process.

As the local paleontologist, McCrea says he personally made several site visits during construction and that he was pleased with how Pattern Development handled the rather unusual situation.

“From time to time, I would get called out to the site to identify and assess any finds that were made, usually by one of the supervisors. If the finds were of interest, the company would make arrangements to transport the slabs to our museum.

“I was very impressed by everyone’s attitude and commitment to do the right thing,” he adds. “I have a great respect for all the people I encountered from the Meikle Wind project.”

Although the findings may have been surprising to some, the wind project’s general location had already proven itself to be a hotbed for paleontological discoveries.

According to McCrea, these ankylosaurus tracks are just the latest in a series of similar findings in the Tumbler Ridge area, including the bones of other dinosaurs, marine reptiles and fish – and notably, the most complete thalattosaur skeleton ever found in North America.

Having responsibly handled the archaeological discoveries, Pattern Development says the Meikle Wind project has been up and running since Jan. 31, expanding the province’s total installed wind capacity by 37% to reach 673.6 MW.

– Lauren Tyler

Gamesa, Siemens Finalize Merger

With the registration of the combined company in the Mercantile Registry of Biscay in Spain, the big merger between Gamesa and Siemens Wind Power has been completed.

According to the companies, the registration was the last step required to close the transaction, which the European Commission granted anti-trust approvals for in March.

At the start of last year, Gamesa confirmed via regulatory filing that it was in negotiations with Siemens. In June, the companies signed binding agreements to combine their respective businesses.

Now, the combined wind power giant has a presence in 90 countries and an installed base of 75 GW. It also boasts a EUR 21 billion backlog, pro forma revenues of EUR 11 billion, and EUR 1.1 billion of adjusted earnings before interest and taxes in the fiscal year ended December 2016.

The legal domicile and global headquarters of the merged company, as well as its onshore wind offices, will be located in Spain, where it is also trading on the stock market. The offshore headquarters will be located in Hamburg, Germany, and Vêle, Denmark.

Gamesa is absorbing Siemens’ wind power assets in exchange for newly issued shares in Gamesa. Siemens owns 59% of the share capital of the merged company, 8% is held by Iberdrola, and the rest are free-floating shares. In addition, EUR 1.005 billion (EUR 3.601 per share) will be distributed as dividends to Gamesa shareholders.

The first board of directors meeting of the combined company took place on April 4, when the first decisions regarding the composition of the board, committees and top management were expected.

“With the new wind power company, we’ve created a global market leader in the area of renewable energies,” says Joe Kaeser, president and CEO of Siemens, in a press release.
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President Donald Trump issued an executive order on “energy independence,” which focuses on dismantling the Clean Power Plan (CPP) – what Trump vowed to do before he was even elected president.

The Obama administration’s climate change initiative – which has already been met with its share of opposition and lawsuits – calls for reducing carbon emissions from the U.S. power sector 32% below 2005 levels by 2030. To do so, the plan calls for, among other initiatives, phasing out coal plants with clean energy sources such as wind and solar power.

Scott Pruitt, the newly appointed administrator of the U.S. Environmental Protection Agency (EPA) – who was part of a multistate lawsuit against the EPA, itself, in an effort to block the CPP back in 2015 – notes in a press release that “job growth and a healthy environment aren’t at odds” under the new order, which calls for Pruitt to “review” the CPP.

According to a White House press release, the order tells the EPA to “suspend, revise, or rescind four actions related to the Clean Power Plan that would stifle the American energy industry.” Citing the National Mining Association, for example, the White House says the CPP would decrease coal production by 242 million tons.

Further, as explained in a release from the EPA, the order “directs agencies responsible for regulating domestic energy production to submit plans to the White House, which will identify, and propose measures to revise or rescind, regulatory barriers that impede progress towards energy independence.”

“Moreover, the order rescinds several Obama executive orders and policies related to climate change. It also directs the administrator of the Environmental Protection Agency and the secretary of the Interior to review, and if necessary, revise or rescind, several regulations that may place unnecessary, costly burdens on coal-fired electric utilities, coal miners, and oil and gas producers.”

In an interview on ABC’s “This Week with George Stephanopoulos,” Pruitt said, “We need a pro-growth and pro-environment approach for how we do regulations in this country. For too long, we have accepted a narrative that if you’re pro-growth [and] pro-jobs, you’re anti-environment. That’s not where we have been as a country. We have made tremendous progress on our environment; we can be both pro-jobs and pro-environment. The executive order will address the past administration’s effort to kill jobs throughout the country through the Clean Power Plan.”

Unsurprisingly, some notable proponents of climate change action have spoken out against the executive order.

Al Gore, former vice president under the Clinton administration, is calling the order a “misguided step away from a sustainable, carbon-free future for ourselves and generations to come.” Moreover, he says the “increasing competitiveness of solar and wind” will spark the U.S.’ transition to clean energy and, in turn, the fight against climate change.

“No matter how discouraging this executive order may be,” he adds, “we must, we can and we will solve the climate crisis. No one man or group can stop the encouraging and escalating momentum we are experiencing in the fight to protect our planet.”

In a joint statement issued by New York Gov. Andrew M. Cuomo and California Gov. Jerry Brown — whose states are known for their emissions-reduction initiatives, including 50%-by-2030 renewable portfolio standards — the Democratic governors are calling Trump’s order “profoundly misguided.”

“Climate change is real and will not be wished away by rhetoric or denial,” the governors state. “We stand together with a majority of the American people in supporting bold actions to protect our communities from the dire consequences of climate change.

“Together, California and New York represent approximately 60 million people – nearly one in five Americans – and 20 percent of the nation’s gross domestic product. With or without Washington, we will work with our partners throughout the world to aggressively fight climate change and protect our future,” they add.

Even the American Bird Conservancy, which has long voiced its concerns over the threat of wind turbines to birds, is worried
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about the “further deregulation of energy development, especially of the rapidly growing wind industry.”

“Wind energy development can be done using bird-smart strategies that avoid risky locations and mitigate for impacts,” ABC’s Michael Hutchins says in a statement. “People love birds and public lands and do not want to see them squandered.”

In addition, the Sierra Club maintains that Trump’s plan “cannot stop the energy boom in Oklahoma” – which generated more than a quarter of its electricity from wind last year, according to a recent American Wind Energy Association report.

Johnson Bridgwater, director of the Sierra Club’s Oklahoma Chapter, says in a release, “The attempted rollback of the Clean Power Plan and other clean air and clean water protections will cost lives and impact our health. And no matter what Trump wants, coal is no longer profitable, nor is it good for us – and we now have much better options. Coal is declining, and here in Oklahoma, renewables like wind are booming, creating jobs and cleaning up our state.”

According to the American Council on Renewable Energy, even though the CPP would bring “long-term investment in the nation’s renewable energy infrastructure,” the thriving industry is strong enough to stand on its own, says Greg Wetstone, president and CEO of the group.

“The reality is that America’s renewable energy industry is growing rapidly because of declining costs, forward-looking state policies, and increasing demand by residential and corporate electricity consumers – a trend that is likely to continue for the foreseeable future,” he says. “Even without a regulatory mandate, renewable energy growth may be sufficient to enable the U.S. to stay on track toward the Clean Power Plan’s emissions-reduction objectives.”

Frank Maisano, partner at law firm Bracewell LLP’s policy resolution group, remains optimistic that an “effective climate change policy based more on market principles,” as opposed to “command-and-control regulations,” is plausible.

“It is possible to keep up international dialogue without the straightjacket of regulations that exceed legal authority,” he says in a statement to North American Windpower.

Maisano also adds that the order will likely “take time to unwind” – a sentiment echoed by the New York Times, which brings up the fact that in order for the EPA to repeal the CPP, the agency will be required to go through a rulemaking process, which includes an opportunity for the public to provide input.

Likewise, a White House press release, which cites a senior administrative official, says undoing the CPP will require adherence to a “notice and comment” process – which could “take some time,” even up to a few years. The official also notes that there will likely be “litigation once the final [CPP] review is undertaken.”

As for the country’s participation in the Paris Agreement, the release says this decision is “still under discussion.” Notably, the official also says there is not yet a time frame for the CPP review, but Pruitt is “ready to hit the ground running.”

- Betsy Lillian

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An increasing number of North American bat species are deemed threatened or endangered. Fortunately, clean energy and bat conservation can coexist.

By Brogan P. Morton

There are many issues that a wind developer must consider when siting a wind project, but one that has become increasingly pressing in the U.S. is the effect of turbines on local wildlife. The wind industry takes great pride in contributing to a clean energy future and will protect species across the globe from climate change, but at the local level, turbines do have an impact on wildlife, including causing the fatality of birds and bats.

The wind industry takes these consequences seriously and is continuously working toward minimizing its impact. In recent years, bats have emerged as a critical focus for the wind industry, as there are several threatened and endangered North American bat species whose territories overlap with existing and forthcoming wind development sites. Although wind turbines do cause bat fatalities, it is the horrific disease white-nose syndrome (WNS) that has caused the drastic reduction in many hibernating bat species. Mortality from WNS can differ by site and species, but some bat hibernation sites, also known as hibernacula, in the Northeastern U.S. have seen 90% to 100% mortality rates, making bat conservation a crucial issue for wind developers and operators.

WNS is caused by a white fungus (pseudogymnoascus destructans) that grows on a bat’s nose and wings, disrupting both its hydration and its hibernation cycles and ultimately leading to its death. The disease was first detected in North America in 2007 at four sites in New York state and, less than a decade later, has been confirmed in 26 states and five Canadian provinces. Hibernating bats are most affected by WNS due to the cold and humid conditions in their hibernacula, which promote the growth of the fungus. Once present, WNS can spread rapidly among hibernating bats, which retreat together.

However, even before WNS devastated the North American bat population, the wind industry was taking proactive steps to lessen its impact on wildlife by addressing the issue of bat mortality as a result of wind plants. In 2003, the Bats and Wind Energy Cooperative was formed by Bat Conservation International, the U.S. Fish and Wildlife Service (FWS), the American Wind Energy Association, and the National Renewable Energy Laboratory. The goal of this consortium is twofold: to better understand the causes of bat fatalities and to find ways to minimize them.

An important milestone in the wind industry’s efforts occurred in 2012, when the FWS produced the Land-Based Wind Energy Guidelines. The guidelines were created to “provide a structured, scientific process for addressing wildlife conservation concerns at all stages of land-based wind energy development. They also promote effective communication among wind energy developers and federal, state, and local conservation agencies and tribes.”

The guidelines use a tiered approach, with increasing levels of data collected at each tier, to better characterize the risk to species of concern, such as bats. After each tier, the developer consults with the FWS to determine next steps. These can range from abandoning a project altogether to proceeding to the next tier without further data collection – all based on the level of risk. This iterative approach allows developers to increase investment incrementally and in proportion with the level of risk surrounding the project.

Preconstruction

The first three tiers – preliminary site evaluation, site characterization and field study, and impact prediction – are addressed in the preconstruction phase. As the developer moves through the tiers, the data collection becomes more specific – from the landscape scale using publicly available information to site-specific measurements of species-of-concern presence.

For bats, this can include acoustic studies that are used to determine bat activity on-site, as well as mist-netting studies, in which a sample of bats is captured by biologists to characterize the species composition in the area. It is important to note that although adherence to the guidelines is voluntary, that does not relieve the developer of the responsibility of...
complying with laws and regulations, including the Endangered Species Act, which covers threatened and endangered bats. At the end of Tier 3, the developer can estimate the risks posed to endangered species, and if the risk of mortality is high, the developer must choose whether to abandon the project or to pursue a permit with the FWS.

Although there are over a dozen listed bat species in the U.S., the three species that are most likely to be impacted by wind plants are the Indiana bat (myotis sodalis), the northern long-eared bat (myotis septentrionalis) and the Hawaiian hoary bat (Lasiusurus cinereus semotus). The map shows the range of each of the species and its concurrence with wind energy plants in the U.S.

Permitting

Because wind plants do not intend to take bats, which is defined by the Endangered Species Act as meaning “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct,” there is a path to receive what is called an incidental take permit (ITP) from the FWS for threatened and endangered species. The ITP is meant for activities such as wind energy generation that are otherwise lawful but result in the “incidental take” of a listed wildlife species. This permitting mechanism is not unique to wind and covers all activities that may impact listed species. To receive an ITP, an applicant must show the FWS the following:

- Taking will be incidental;
- The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of the taking;
- The applicant will ensure that adequate funding for the plan will be provided;
- Taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild; and
- Other measures, as required by the secretary, will be met.

The plan the applicant creates to show the FWS these steps is called a Habitat Conservation Plan (HCP). An HCP outlines the three major efforts, known as the “mitigation hierarchy,” that will be implemented by the developer:

1. Avoidance – How will the developer avoid take of the endangered species through micro-siting of the turbines to avoid known hibernacula and create buffers from preferred habitat and known roost trees?
2. Minimization – How will the wind plant be operated to minimize, to the maximum extent practicable, the levels of bat take at the wind plant?
3. Mitigation – If unavoidable take remains after avoidance and minimization efforts have been implemented, how will the developer compensate for the loss? This is known as “compensatory mitigation” and, for bats, can include funding conservation projects such as gating, which protects important hibernacula, and purchasing conservation easements on suitable habitat.

The HCPs are reviewed by the appropriate local FWS Field Office. If the HCP is deemed sufficient to protect the species, an ITP that allows the wind plant to take a limited number of endangered species over the fixed life of the wind plant is issued.

Operation

Clearly, this entire process can be quite time- and resource-intensive. For wind developers, time is of the essence, so it is typically not feasible for the developer to wait for the issuance of the ITP to commission the wind plant. In these cases, the project is issued a Technical Assistance Letter from the FWS that allows for operation of the wind farm, under specific operational constraints, until the issuance of the ITP and implementation of the HCP. The goal is to operate in such a way that no significant impacts occur to the listed species.

For wind plants, that typically means increasing the turbines’ cut-in speed (when they start generating power) from the original equipment manufacturer standard level of 3.0 m/s-3.5 m/s to 6.9 m/s, which the FWS considers take avoidance. This level of curtailment typically applies during the fall migration (August to October) but, depending on the risk profile and location of turbines, can also be applied during the summer months. An increase in the turbine cut-in speed is an effective mortality minimization tool because bats are less active at higher wind speeds.

However, the power losses from curtailing at this level are significant and impact wind plant revenue during its first, critical years. Once the ITP is issued, a lower level of curtailment is typically implemented (4.5 m/s-5.5 m/s) to reduce, but not eliminate, the take of bats at the wind plant.

Post-construction mortality studies are conducted during the first several years of wind plant operation. These mortality studies involve human searchers, who walk transects around a number of sample turbines looking for bat and bird carcasses.

The intensity of these search efforts varies based on the level of risk of impacts to species of concern and the required prob-

Where The Bats Are

Map information: Bat hibernation areas are based on known hibernacula from best-available data for little brown, big brown, Indiana, southeastern, gray, Rafinesque’s big-eared, northern, eastern small-footed and tri-colored bats. Some hibernacula are not represented.

ability of detection required. For low-risk projects, a “roads and pads” search protocol may be used, in which only the access road to and gravel pad around the sample turbines are searched. For high-risk projects, large plots ranging from 50 meters to 80 meters around the sample turbine are cleared and searched. The search process is very labor-intensive and incurs a very significant cost to the project. The results of these searches are used to generate an estimated take level for the wind plants and are used to validate that the predictions of bat mortality and impacts on the habitat of the species of concern, both estimated in Tier 3, were correct.

Through the efforts outlined previously, the wind industry has actively reduced its impact on bats. Often, this minimization comes with a relatively small price tag, as is the case with the industry’s voluntary best management practice of feathering a turbine’s blades before the cut-in wind speed is reached. This drastically reduces the rotational rate of the blades before the turbine makes power and can reduce operating wind turbines’ impacts on bats by as much as 30% without significantly affecting generation. Unfortunately, the turbine curtailment required to reduce endangered species take risk does require a significant decrease in the amount of renewable energy generation.

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What You Need To Know About Virtual Power Purchase Agreements

Power purchase agreements are fairly well understood. But how well do you know virtual power purchase agreements?

By Jacob Susman

Large companies have been setting sustainability targets since the 1992 Earth Summit in Rio de Janeiro, but today’s headlines are the most clear we’ve seen: Corporations want more renewables in their energy mix now.

About half of the Fortune 500 companies have sustainability goals to reduce their carbon footprint, reduce their energy usage, and/or power a portion, or all, of their operations with renewable energy – a goal that has been made more viable as wind and solar costs continue to decline. What’s more, the single most important reason for corporations to bring renewable energy into their portfolios is turning out to be consumers, who are demanding sustainable products, services and practices from the companies that serve and sell to them.

Interest in renewables among market-leading corporations is positive for the industry, as the linchpin of a renewable energy project is to secure a long-term anchor tenant in the form of a power purchase agreement (PPA) with a creditworthy customer. When this customer is a corporate buyer, the agreement typically takes the form of a virtual PPA, commonly referred to as a VPPA, in which a company agrees to purchase power at a negotiated price from a wind or solar project over a predetermined number of years.

In a typical PPA, a utility would buy physical power at the site of the wind or solar plant and take title of the electrons and renewable energy credits (RECs) as delivered by the facility. A VPPA is a slight variation of a typical PPA. It involves a financial settlement whereby a corporate buyer commits to pay, for example, a wind farm’s owner a fixed price for each unit of electricity produced by the wind farm, while the developer of the wind farm takes responsibility for managing the delivery and sale of the electricity produced on the merchant market.

Under the VPPA arrangement, the buyer pays a fixed price for electricity, whereas the wind facility owner receives the floating market price. If the wind farm generates more revenue than the fixed VPPA price by selling on the market, it pays the surplus revenue to the corporation. Conversely, if the wind farm makes less money than the fixed VPPA price by selling on the market, it receives a true-up payment from the corporate buyer. Therefore, an alternate term for a VPPA is a contract for differences.
The buyer receives the RECs and other environmental attributes of the wind farm but does not typically take physical delivery of or manage the flow of electrons to the electric grid. Under this structure, the buyer remains connected to the local utility and continues to receive electricity and related services from that utility.

VPPAs add value to a corporate buyer both because they provide low-cost, fixed-price power and RECs for more than a decade and because they represent an additional renewable resource coming onto the grid. By signing long-term contracts for power, organizations provide project developers with commercial off-take certainty, which unlocks the project’s ability to commit construction capital. This is because VPPAs provide clean energy developers and their financiers with long-term revenue certainty.

For non-utility companies, the benefits of a VPPA transaction are many, including fixing long-term power prices, eliminating price volatility, avoiding emissions, satisfying customer demands for cleaner industrial processes and providing an opportunity to save money. Although many of the companies contracting for VPPAs have long participated in the wholesale power markets, the VPPA comes with a new set of considerations that must be addressed.

There are several essential considerations for a successful VPPA that are detailed as follows:

**Location.** Good wind and solar resources are rarely collocated with electric load. As such, one of the first considerations is where to locate a facility against which a VPPA can be executed. Contracting with a renewable project on the same electric grid or in the same state as one’s electric load is often a goal. For companies with widely dispersed loads, this is less of a concern. Some grid systems or independent system operators are better suited to the VPPA than others. Markets with “open access” or “nodal” markets work best because the physical power can be liquidated without owning transmission rights.

**Length of the agreement.** A typical VPPA is 15 to 20 years in length. This is often new decision-making territory for corporate buyers, as they do not customarily purchase inputs over that time horizon. However, to keep the power price at a reasonable level, a long-term agreement is required (not unlike a home mortgage).

**Long-term power price forecasts.** The value embedded
in a VPPA is usually measured against long-term power price forecasts. Price forecasting is tricky, and in recent years, deregulation and restructuring of electricity markets have been reshaping the U.S. energy markets. Nonetheless, as with any business exposed to commodity prices, having a view of the future price landscape is unavoidable. There are many consultants and advisory services that provide long-term forecasts based on market fundamentals. Nobody knows for certain where power prices are headed, but given today’s low prices for renewable power, VPPAs are often “in the money” when measured against long-term, third-party forecasts.

Performance security. Building a larger-scale renewable energy project is an expensive endeavor in which the contracting parties have long-term financial exposure to one another. Both buyers and sellers face risks associated with the credit quality of the other party. Buyers typically wish to hold some form of security to be protected against damages if the project fails or is severely delayed. In turn, sellers usually require some form of security as a backstop for a buyer’s failure to pay for the power produced. For buyers, contracting with a highly rated developer with in-house capital to finance construction and a proven track record can appease many of these concerns.

Accounting treatment. The accounting treatment of a VPPA can be a daunting issue for some market participants. However, dozens of corporate buyers have been able to structure their contracts such that consolidation and derivatives accounting are not required.

Locational basis risk. The difference between the prices of power at two differing points of sale is referred to as the locational basis risk. This issue typically emerges when the buyer wishes to “settle” its VPPA at a trading hub that could be hundreds of miles from the project location. Because the prices in these two locations do not necessarily move in tandem, a financial risk is created, i.e., the settlement price (hub price) does not equal the physical power sales price (node price). Buyers and sellers have devised a number of contract terms that allow them to share this risk while still resulting in a “financeable” project.

Additionality. Making a claim of additionality is important to many corporate renewable buyers. Additionality is defined as a determination of whether an intervention has an effect when the intervention is compared with a baseline. Additionality in the renewable energy arena refers to adding a new facility to the electric system rather than contracting for power from an existing facility. The idea is that a buyer not only is purchasing renewable power, but also is actually directly responsible for adding new sustainable generation to the grid that would not have been put in place without the VPPA (i.e., making an intervention that creates additionality).

In light of these and other hot topics in corporate purchasing, the reader may wonder, where do we go from here? Corporate buyers have comprised upwards of 50% of total renewable energy contracting in recent years. As a major source of renewable energy demand, corporate buyers deserve to have their voice heard on all of the topics mentioned previously. At the same time, however, the financing requirements and risk-reward profile of developing wind and solar facilities need to be factored in. Corporate buyers may wish to procure renewable energy at increasingly low prices while concurrently reducing risk. Nevertheless, the prices and terms of these contracts eventually hit the minimum requirements for developers and their financiers. The industry needs to cater to the needs of this critical new customer group and can do so while also striking the right risk-reward balance for all.

Jacob Susman is vice president and head of origination at EDF Renewable Energy, where he leads the company’s relationships with utility and corporate customers around the U.S. for its wind and solar portfolio. Previously, he led OwnEnergy from inception to its sale to EDF Renewable Energy in August 2015. He can be reached at jacob.susman@edf-re.com.
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California Defies Trump’s Agenda

The state remains a strong market for wind energy as its value rises. But challenges persist.

By Nancy Rader

California will remain an oasis of progress in addressing climate change despite President Donald Trump’s determination to dismantle former President Barack Obama’s climate change legacy. California’s political leaders are determined to not only resist the unraveling of Obama’s environmental policies, but also counter that reversal with stronger goals, particularly in the electric sector. The extent to which this will translate to good news for the wind industry, nevertheless, remains an open question.

California’s political leaders wasted no time asserting their resistance to Trump. Four days into the new year, state legislative leaders announced the hiring of former U.S. Attorney General Eric Holder Jr. to advise on legal strategy against the new administration on policy matters ranging from climate change to immigration.

Twenty days later, Gov. Jerry Brown delivered his State of the State address titled “California is not turning back. Not now, not ever.” Obliquely referring to the Trump administration, Brown declared, “Whatever they do in Washington,” he said, “they can’t change the facts. And these are the facts: The climate is changing, the temperatures are rising, and so are the oceans. Natural habitats everywhere are under increasing stress. The world knows this.”

Most Californians do, too. Last summer, a poll found that 68% of adults favored requiring greenhouse-gas emissions to be reduced 40% below 1990 levels by 2030 – a goal that was subsequently placed in statute by the California Legislature. A solid majority of adults (56%) were willing to help reduce global warming by paying more for electricity if it were generated by renewables. Indeed, in 2015, state senate leader Kevin de León had already lead the legislature in raising the state’s renewable portfolio standard (RPS) to 50% by 2030.

Trump’s unwinding of Obama’s Clean Power Plan (CPP), which would have curbed the emissions of existing and new coal plants and fostered demand for clean power, is a great disappointment to the wind industry nationwide. But it will have no direct impact on California’s clean energy goals in the electric sector. California is already nearly coal-free, and its policies exceeded the CPP greenhouse-gas-reduction targets.

Further, de León recently introduced a bill that would move up the 50% RPS target to 2025 and raise the RPS to 100% by 2045. Whatever the fate of that bill, the value of wind energy in California’s RPS market is rising, as the market dominance of solar energy in recent years is now significantly undercutting the value of future solar projects. But because land-use policies have curbed greenfield wind development inside California, most of that wind energy must come from outside of the state, which could prove politically and technically challenging. Even repowering California’s pioneering fleet of 1980s projects is no slam-dunk.

Indirectly, the election of Trump did change the course of events in California in one significant way: by signaling the demise of Obama’s CPP – now realized with Trump’s March Executive Order directing the U.S. Environmental Protection Agency to begin the process of rescinding the CPP, which was the major incentive of the Interior-West states to cooperate with California in its clean energy ambitions that are all but evaporated. Among other things, the CPP’s derailment undercut a key selling point of a proposal to expand the California Independent System Operator’s (CAISO) territory into parts of five Western states: that joining an electricity market would help those states integrate the wind and solar resources that would be necessary for coal-dependent states to comply with CPP goals.

Although CAISO expansion, through a merger with Pacificorp, was facing headwinds even before Trump’s election, its odds now appear to be slim. The Interior-West states are distrustful of California’s progressive policies, particularly CAISO’s emissions tracking requirements, while some California environmental groups fear that Western coal generation could find its way into California through the geographically expanded CAISO markets. Amid such concerns, fashioning a governance agreement that would not tilt policy and market control toward either side was already proving elusive. The derailment of federal climate policy has now removed any urgency felt by coal-consuming and -producing states to grapple with variable renewable resources.

California advocates of CAISO expansion argue that an expansion would facilitate the California grid operator’s ability to export...
excess solar generation that could otherwise be lost to curtailment and that it would provide access to Western wind resources of tremendous quality. But there are numerous ways to deliver California’s excess solar energy to neighboring states, should they want it, and Western wind to California without expanding CAISO’s market footprint. Trump’s campaign promise of an infrastructure spending plan may even help.

A draft list of potential infrastructure projects obtained by the press includes the TransWest Express transmission line, which would deliver Wyoming wind energy to load centers in California, Nevada, and Arizona from the related massive Wyoming Chokecherry and Sierra Madre wind projects that are, themselves, also on the list. Other proposed projects, such as the Cleanline Centennial West HVDC project, could connect New Mexico wind resources to California.

In addition to these and other proposed new transmission lines that could directly connect major wind resource areas to the CAISO grid, developers could make more efficient use of the existing transmission grid to access wind projects dispersed across the West. The freed-up transmission capacity from scheduled coal-plant retirements could enable at least 5,000 MW of wind energy additions across the Western Electric Coordinating Council (WECC) footprint that would suffer little or no congestion using firm transmission service to deliver their energy into California.

Combined with CAISO’s ability to dynamically schedule wind resources located outside of its service territory, freed-up transmission could open up the California market to wind resources across the West. Dynamic scheduling puts resources under CAISO control as if they were physically located within CAISO’s balancing area, qualifying them for the most-valuable tranche of California’s RPS requirement. Over 700 MW of New Mexico wind energy projects using dynamic scheduling and firm transmission service on existing lines have already signed power purchase agreements (PPAs) with two California utilities.

Transmission upgrades in the WECC region, such as Pacificorp’s Gateway West project, or “feeder” lines connecting wind resources to the Western grid, such as the proposed Lucky Corridor, Cleanline Western Spirit or SunZia lines, could further facilitate wind deliveries to California.

More exciting still is the potential to use “conditional firm” transmission service – service that anticipates a very limited, pre-defined amount of transmission capacity unavailability. This service could enable far more wind energy to be transmitted on the existing grid of the WECC, particularly when combined with advanced grid technologies and relatively inexpensive “feeder” lines. The path from the WECC grid to California load centers, on the California side, is also clearer, as CAISO has found that its grid has the potential to transmit an additional 23,000 MW of renewable energy capacity to load centers without transmission upgrades.

The potential to transmit wind energy on the existing Western grid with limited or no transmission upgrades was highlighted in the product of a joint initiative among California’s energy agencies – the Renewable Energy Transmission Initiative 2.0 Plenary Report. The report supported consideration of a wide range of options to access out-of-state resources alongside new transmission lines.

The politics of wind from outside of California borders, no matter how delivered, is another matter. In reaction to the proposed CAISO expansion early last year, along with its promise of access to Western wind, the leaders of the California Legislature announced several concerns about CAISO expansion. They made clear that they viewed CAISO expansion as a “serious challenge to California jobs and its economy.”

The jobs associated with California’s clean energy policies have been a major selling point for those policies. In their purchases of out-of-state power, which can be perfectly legal under the RPS statute, utilities and other power purchasers will, nevertheless, have to overcome political pressure with two main arguments: Land-use restrictions have largely closed the door on in-state greenfield wind developments, and low-cost, out-of-state wind energy will help keep achievement of the state’s policies that are more affordable for electricity consumers.

Those arguments could be difficult as long as California’s historical wind projects, spurred by the policies of Brown’s first administration in the early 1980s, remain without long-term PPAs. Projects totaling at least 500 MW are in this position, as their original 30-year PPAs have expired or soon will expire. These projects, with their early-generation turbines, face tough times, as current market demand has been low because utilities bought more energy, largely from new solar facilities, than they
needed to meet their pre-2020 RPS targets. On top of that, the utilities are increasingly losing load to cities and counties that are buying power for their jurisdictions through “community choice aggregation” programs. Community Choice Aggregators (CCAs) may, therefore, be the best bet for near-term demand, given that most are premised on exceeding California’s clean energy targets and supporting local economies.

Whether CCAs will sign the long-term contracts needed to support the revitalization and repowering of California’s pioneer projects that launched the wind industry globally is yet unclear, however. So is the ability of developers, particularly developers without a large asset base, to obtain financing with power purchasers that have little or no credit history or assets.

In the long run, there are strong arguments that substantial wind energy – on the order of 10,000 MW by 2030 under California’s current 50% RPS – will be needed to maintain affordable retail rates. Although solar photovoltaic projects have been the fastest-growing renewable resource in California in recent years, it is now widely recognized that the value of additional solar energy is plummeting and – barring plummeting storage costs – wind energy will be needed to cost-effectively balance a growing renewable energy portfolio. To wit, the scale and frequency of solar-driven energy curtailments are increasing, with CAISO already expected to curtail 8,000 MW of power (largely solar) in midday hours this spring and predicting as much as 13,000 MW of curtailed power by 2024. As the sun goes down, the three-hour ramping requirement needed to meet rising evening demand is expected to reach 13,000 MW by 2020.

Accompanying these added indirect costs of solar is a steep decline in its capacity (reliability) value, expected after the conclusion of a multiyear regulatory process of updating methodologies required under a California Wind Energy Association-initiated change in statute. Regulators are expected to reduce the monthly capacity values of solar already in the portfolio from an average of about 44% to 17% while raising the capacity value of wind from about 14% to 23%. (Maximum summer-month solar values decline from 80% to 33%, while maximum summer-month wind values rise from 33% to 47%.) The comparative values of incremental solar and wind purchases are expected to be even more stark.

The de León bill establishing the 50% RPS also required the state’s energy agencies and utilities to cost-effectively plan the state’s clean energy portfolio on a total-cost basis. Such “Integrated Resources Planning” should, if faithfully implemented, reflect the indirect costs and values of wind and solar and situate wind energy very well under California’s progressive climate change policies, despite Trump’s hostility toward them. If, instead, lawmakers pressure power purchasers to shun out-of-state wind or put a thumb on the scale of in-state resources, whether baseload renewables or solar combined with storage, wind won’t fare as well. The scale and success of wind industry engagement in California’s regulatory and political processes will influence the outcome.

Nancy Rader is executive director of the California Wind Energy Association. She can be reached at nrader@calwea.org.
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Seeking to capitalize on the repowering movement in California, a midscale turbine manufacturer has its eyes on several legacy wind sites in Tehachapi, Calif., the birthplace of U.S. wind.

Turbine supplier EWT Americas, which manufactures direct-drive wind turbines with rated capacities up to 1 MW, plans not only to install a handful of 900 kW wind turbines in sites that were originally built in the 1980s, but also to own and operate the machines.

But before the manufacturer-turned-developer can move forward with its plans, it needs the California Public Utilities Commission (CPUC) to modify eligibility requirements under California’s Renewable Market Adjusting Tariff (ReMAT) program — a key state incentive that would help improve the economics of the project.

The ReMAT program, which operates like a feed-in tariff, stipulates that renewable energy projects of less than 3 MW cannot share facilities, such as transformers. And that puts EWT’s three planned Tehachapi wind projects — each with nameplates smaller than the 3 MW threshold — in jeopardy.

**ReMAT**

ReMAT, which pays developers $89/MWh, is a standard fixed-price contract that allows the sale of electricity to California’s three large investor-owned utilities: Southern California Edison (SCE), Pacific Gas and Electric, and San Diego Gas and Electric. The program runs on a first-come, first-served basis until it is fully subscribed. To date, the program totals nearly 500 MW of capacity dedicated to renewable energy, with most of that amount awarded to solar energy. In fact, only one wind power purchase agreement was awarded to a wind developer in nearly three years.

As Jarod Bishop, EWT’s business development manager for the West Coast, explains, ReMAT projects are characterized as distribution-level projects, meaning they generate power onto the utility’s lower-voltage distribution grid. Connecting at the 12 kV level for a small project is doable. But in some areas of California, such as Tehachapi, the distribution lines are as high as 66 kV. At that level, a new transformer costs roughly $500,000 for the equipment and another $400,000 for related design, engineering and installation services.

“At that point,” Bishop notes, “the cost quickly approaches $1 million.”

Modifying ReMAT eligibility requirements, explains Bishop, would alleviate the “twisted nature” of the California grid.

“The twisted nature of interconnection capacity on the grid leaves some projects with a small amount of unfilled capacity,” Bishop explains.

EWT Americas seeks a modification from state regulators to allow development on legacy wind sites.

By Mark Del Franco
He says the utilities try to claw back allocated interconnection capacity all the time; one point in time this occurs is during the qualifying facility conversion process, when legacy contracts are updated to conform to current regulatory standards, resulting in interconnection agreements that contain new terms under the appropriate regulatory jurisdiction, shifting from state to federal regulation, for example. This process often results in a loss of allocated capacity, or partitioned capacity that is difficult to develop in today's energy market.

According to Bishop, EWT thought it had struck an agreement with SCE late last year. However, citing restrictions under ReMAT, the utility terminated the off-take agreement earlier this year.

Nancy Rader, executive director of the California Wind Energy Association, has lobbied the CPUC on behalf of wind developers such as EWT. She asserts that a favorable ruling would open the door not only for some of its projects, but also for wind development in the state as a whole. She says EWT’s 900 kW turbines are a good fit for repowering many of the small 1980s projects that, for a variety of reasons, cannot handle 2 MW to 3 MW wind turbines, citing wind shadow, military height restrictions and small parcel size.

According to Rader, repowering preserves California’s nearly 1,000 MW in legacy projects, increases their capacity factors and stabilizes the grid. The expected increase in annual energy output is 330 MW, all of which would be available to meet California’s renewable portfolio standard of 50% renewables by 2030. (For more on California wind, see the cover story, “California Defies Trump’s Anti-Environment Agenda,” on page 28.)

In a letter to the CPUC, Rader argues that a large majority of the 1980s vintage wind projects that have not been repowered are relatively small in size (under 20 MW), and all use wind turbines that are tiny in size by today’s standards.

“In many cases, particularly in Kern and Riverside counties, circumstances are such that these pioneer projects cannot be repowered with typical modern turbines that are 2 MW to 3 MW in size,” she says. “Conversely, wind turbines in the 500 kW to 1 MW range will be required to repower many of these aging facilities. These midsize turbines are also well suited to California’s distributed generation market.”

The industry is pushing for a ruling on the issue sometime this month. Proponents, such as Bishop and Rader, are hopeful that the CPUC will rule favorably, primarily because the CPUC has already lifted the restriction for renewable projects exceeding 3 MW.

“We won the same argument [before], and we simply need the CPUC to extend their ruling to the ReMAT program,” Rader says. “While the CPUC appears to be short-handed, with priority going to the integrated resource planning and other matters, we are trying hard to get their attention on this.”

Bishop agrees. “The CPUC is often bogged down with so much to do that it can’t respond quickly enough to reasonable attempts from the industry to make sensible fixes to the policy in time.”
The steady and rapid growth of renewables in the U.S. has caused many states to be well ahead of their renewable portfolio standard (RPS) targets. As a result, there is increasing interest in developing renewables as merchant assets not secured under a long-term power purchase agreement (PPA) for their energy or green attributes.

In this article, we demonstrate how renewable generators could use standard electric and gas forward contracts to manage their market risk over mid- to long-term horizons when a utility PPA is not available. The electricity forwards demonstrate how wind volume uncertainty and its correlation with spot prices influence the hedge, while the gas forwards allow more, albeit imperfect, hedging of longer-term risks. Although this article focuses on hedging methods for wind assets in the Electric Reliability Council of Texas (ERCOT) region, many of the analytical concepts also apply to solar energy, and the framework can be used in other regions, subject to adjustments for features such as capacity pricing.

Using electricity forwards

The basic hedge for a wind plant would involve selling forward contracts to receive a fixed price in exchange for a “floating” price set based on average spot price at the settlement point. The deviations in spot revenues would be offset to some degree by the changes in floating contract payments, allowing for a less volatile revenue stream.

The purpose of selling forwards is to lock in prices, but the uncertainty in the total amount and timing of wind output creates a certain amount of irreducible volume risk for wind resources. Because the variance of the wind output is correlated with market outcomes, volume risk should be taken into account when hedge ratios are being determined. Although selling too little forward leaves a long position exposed to spot prices, selling too much forward can create a short position exposed to spot price replacement, as well. An effective hedge requires estimating the hourly output pattern for 1 MW of wind and valuing it at the expected volume-weighted average spot price of electricity in those hours of production. The resulting expected revenue would then be divided by the fixed cost of a standard forward contract to find the number of contracts needed.

For example, suppose that a wind plant is expected to operate at a 50% capacity factor in a given month during just off-peak hours, and its output is randomly and uniformly distributed across all hours. This output would then get the same expected price as the off-peak forward price (assume at $25/MWh), but because it will average at 0.5 MW for each megawatt of installed capacity, you need half as many hedge contract megawatts as you have wind megawatts.

If the wind output is not uniformly distributed but is concentrated in hours with lower spot prices (say, averaging $10/MWh), then you can expect only $5/MWh over all off-peak hours, so you need just 0.2 hedge megawatts per wind megawatt. Thus, the volume hedged depends on the price pattern of likely output. Similar calculations would be done for on- and off-peak hours in each forward month. Electric hedges...
are intrinsically imperfect for wind, with residual risks arising from the following:

- Uncertainty in wind output quantity per month;
- Hourly pattern of when that wind output quantity will be realized within the month;
- Hourly pattern of spot prices; and
- Congestion risk between the location of the electric forward price settlement and the bus that wind plant is physically connected to.

In general, these volume risks cannot be eliminated, but their expected effects can be used to revise the size of the desired hedge. These factors combine into a net uncertainty surrounding the realized wind revenues versus the hedge payoff.

For instance, if the variances in wind output are negatively correlated with the realized prices of spot power (i.e., less-than-expected wind leading to higher-than-expected spot prices and vice versa), then net gains and losses will not balance out, resulting in an expected loss from the error terms. Figure 1 demonstrates this negative correlation in a plot of the ranges of wind output and spot prices in ERCOT over the past six years versus real-time location marginal pricing. It shows that wind generators historically ran at a high capacity factor of 60% when the hub prices were below $10/MWh but ran only at 20% when prices reached $50/MWh or higher. Of course, the nature of the wind-price correlation will vary over time, but this negative relationship is fairly typical.

Because of such wind-price correlation, the expected revenues collected by a wind plant could be much lower than the expected spot price multiplied by expected wind volume. As shown in Figure 2, the wind output weighted average prices for wind generators in ERCOT have been persistently below the simple average prices over the past six years, with the difference

![Figure 2: Discount Of ERCOT Wind Output Weighted Prices vs. Simple Average Prices (2011-2016)](image)

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<td>$43.1</td>
<td>$26.2</td>
<td>$24.9</td>
<td></td>
<td></td>
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<tr>
<td>2012</td>
<td>$43.7</td>
<td>$31.7</td>
<td>$38.0</td>
<td>$23.8</td>
<td>$22.4</td>
<td></td>
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</tr>
<tr>
<td>2013</td>
<td>$12.6</td>
<td>$16%</td>
<td>$10%</td>
<td>$9%</td>
<td>$10%</td>
<td></td>
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<tr>
<td>2014</td>
<td>$12.6</td>
<td>$16%</td>
<td>$10%</td>
<td>$9%</td>
<td>$10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>$28.3</td>
<td>$20.8</td>
<td>$26.8</td>
<td>$30.6</td>
<td>$20.7</td>
<td>$17.7</td>
<td>$15.4</td>
</tr>
<tr>
<td>2016</td>
<td>$24.6</td>
<td>$18.3</td>
<td>$24.2</td>
<td>$27.6</td>
<td>$18.0</td>
<td>$15.4</td>
<td>$13%</td>
</tr>
</tbody>
</table>

Source: Calculated based on data compiled by ABB Inc., Energy Velocity Suite (2016)

![Figure 3: ERCOT Historical Average Market Heat Rates](image)

Impact of price spikes (hourly HR above 20 MMBtus/MWh)
Market HR excluding price spikes (hourly HR below 20 MMBtus/MWh)

Sources: Calculated based on data compiled by ABB Inc., Energy Velocity Suite and SNL Financials (2016)
as large as 30%-40% in some months. This means that if hedge quantities were to match expected wind output, the hedge payoff would often exceed changes in spot revenues relative to expected levels. A negative adjustment for wind-price correlation resulting in smaller hedge positions per megawatt of wind would be needed to reduce the associated exposure to spot prices.

Although there is a net “discount” for wind output from simple average prices, the magnitude of this discount varies significantly from one month to another, possibly with some seasonality. Some of this variation is random, but some is probably recurring and predictable, which ought to be taken into account as a part of hedging decisions.

Electric prices often spike due to a combination of extremely high demand and limited supply, during which wind resources tend to run less (e.g., very hot, still days). Such price spikes could magnify the effects of wind-price correlation and should be considered when hedge ratios are being determined. Although price spikes are uncertain, electric forwards typically include a “premium” to account for the effects of price spikes during occasional scarcity events.

For example, as of February, on-peak futures at ERCOT North Hub for August traded at approximately $65/MWh, which is $40/MWh above the marginal cost of generators likely to set prices at $25/MWh under normal conditions. If a wind plant is estimated to run at 40% capacity factor on average but only 10% in scarcity hours, it would collect only one-fifth of the scarcity premium (or $10/MWh) on average, resulting in expected spot revenues of $35/MWh (equal to $25/MWh in normal hours, plus $10/MWh for scarcity premium). In this case, effective hedging would be to sell forwards in the amount of $35 ÷ $65 = 0.538 of the expected average wind output, which translates to approximately 0.215 hedge megawatts per wind megawatt.

As mentioned earlier, the wind-price correlation is largely driven by aggregate wind output in a system. Individual wind plants may have different output patterns compared with aggregate wind, which means that for effective hedging, it is important to understand the correlation of wind output at specific facilities with the aggregate output.

**Using natural gas swaps**

Electric forwards are only liquid one to two years out, and therefore, they do not readily support long-term hedging. Gas contracts are often available and liquid for longer delivery periods (especially at Henry Hub), so they can serve as potential hedging instruments over longer horizons.

However, instead of swapping real-time spot value of wind output for an electric forward, market revenues are used to buy spot gas scaled by expected market heat rate (HR) to settle against a fixed gas forward purchase. The on-peak versus off-peak distinction in the hedging contract is lost, as gas is not differentiated by time of delivery.

The risk factors listed for electric hedging also apply here, but there are several additional hedge design elements and uncertainties to consider:

- Expected correlation of gas and electric forward prices over time;
- Uncertainty or drift in the expected long-run market implied HRs (the ratio of electric to gas prices), which cannot be observed far forward due to limited trading of electric contracts, so they will have to be forecasted; and
- Gas basis risk between settlement location of gas contracts and delivered gas for plants setting prices at wind production node.

In ERCOT, during 2011-2016, the monthly average market HRs fluctuated considerably within a range of 6-32 MMBtus/MWh. As shown in Figure 3, the bigger changes in market HR were largely driven by price spikes when there was scarcity in the system. When such price spikes are excluded, the average market HR across the remaining hours follows a relatively steady and seasonal pattern, ranging from 7 MMBtus/MWh in winter to 8-9 MMBtus/MWh in summer.

If market HRs were known and fixed in future periods, it would be simple to substitute gas contracts for electric forwards to achieve equivalent hedging with either one: In the example described previously in which the wind plant expects to have a 40% capacity factor and $35/MWh spot revenues during on-peak hours in August (below the $65/MWh forward price due to negative wind-price correlation), the effective hedging strategy would be 0.215 hedge megawatts per wind megawatt. As of February, the gas forwards for August traded at approximately $3.4/MMBtu, which implies an expected on-peak HR of 19.1 MMBtus/MWh, including anticipated effects of scarcity prices. Then the equivalent hedging strategy using gas swaps would be $0.215 × 19.1 = 4.1 hedge MMBtus per wind megawatt. Under this strategy, expected spot revenues would match fixed charges associated with gas swap contracts.

However, market HRs are variable over short and long time frames, creating conversion risk for using gas swaps as a surrogate. Figure 4 summarizes some of the ways in which they can vary that must be anticipated. If/when market HRs change, there will be a corresponding increase or decrease in the quantity of gas contracts needed to replicate an electric hedge.

Hedging decisions should also consider that errors in forecasted HR may be correlated with unexpected changes in gas prices. In coal-heavy regions, very low gas prices (as experienced in 2012) can push gas plants into being infra-marginal and cause coal plants to set prices more often. This would result in the market HR being higher because electric prices would not decrease as much as gas prices. In regions with considerable amounts of oil-fired plants, unexpected gas price spikes can cause a lower market HR because electricity prices do not rise as much as gas prices in extreme conditions (e.g., during the Polar

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**Figure 4: Examples Of Market Drivers That Could Systematically Change Market Heat Rates**

<table>
<thead>
<tr>
<th>Market Driver</th>
<th>Likely Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased penetration of renewables</td>
<td>(-) Lower HR</td>
</tr>
<tr>
<td>Addition of new efficient gas generation</td>
<td>(-) Lower HR</td>
</tr>
<tr>
<td>Coal plants retirements</td>
<td>(+) Higher HR</td>
</tr>
<tr>
<td>Load growth</td>
<td>(+) Higher HR</td>
</tr>
<tr>
<td>CO₂ price</td>
<td>(+) Higher HR</td>
</tr>
<tr>
<td>Outage of large baseload plant</td>
<td>(+) Higher HR</td>
</tr>
</tbody>
</table>

Source: The Brattle Group
Vortex in 2014). Such examples illustrate that gas prices and market HRs could be negatively correlated at certain price levels, which may affect the optimal hedging strategy for wind plants.

Price differences between gas at the contract hub and marginal gas resources setting electric prices at the wind production site may create an additional “basis” risk that needs to be considered as a part of the hedging strategy.

One of the attractive features of renewables is that they are an engineering hedge against carbon pricing, but getting credit for this in hedges requires being able to anticipate the effects of possible policies such as carbon pricing. The interaction of CO2 penalties or constraints with power prices, though regionally distinct in marginal sensitivity, is fairly well understood, so it is useful to think about what carbon constraints might do to wind hedging practices when/where implemented. It is important to recognize that short- and long-run effects of CO2 prices on markets can be quite different.

Initially, CO2 prices can be positively correlated with gas prices, especially in coal-heavy regions, because higher gas prices would increase CO2 prices needed for coal to gas switching.

However, over a longer horizon, this relationship can change and perhaps even reverse, as higher gas prices raise electricity prices and accelerate future renewables entry, which may reduce CO2 and electricity prices.

Overall, the relationship between gas and CO2 prices can alter appropriate hedge ratios for wind plants using gas contracts. Generally, the more valuable the future carbon avoidance when CO2 prices are also positively correlated with gas, the larger the gas forward position will have to be (because the price of gas, itself, will not reflect that carbon benefit). Such changes can be usefully anticipated via power system analysis tools and then covered with conventional or more complex hedges (e.g., gas options contingent on future market events).

Conclusions

Increasing amounts of renewables, especially wind, are being developed, often in excess of states’ RPS targets and increasingly without PPAs. Such merchant projects are exposed to significant market risk, as they need to absorb price fluctuations and anticipate how their own production outputs may or may not vary favorably in relation to market tightness. This risk can create a barrier for initial financing and perhaps impact the economic feasibility of projects. In response, customized, bilateral hedging arrangements are gaining popularity, but they could be offered at prices with heavy discounts that reduce the value of projects from a developer’s perspective.

Although these examples have focused on a single wind plant in ERCOT, the concepts are applicable to rebalancing the hedges in a more diversified portfolio with some new, unhedged wind. And the principles would also apply to other markets and even other renewables, such as solar plants. 

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Salka LLC, a San Diego-based renewable energy company, has signed a purchase and sale agreement for the Summit Wind Project, a 55 MW wind farm under development in the east San Francisco Bay area.

The agreement was signed with Castlelake LP, a global private investment firm, on behalf of the funds it manages. The project will repower a former Altamont Pass wind farm by replacing 569 100 kW turbines with 27 more modern turbines. The wind farm will be located 35 miles outside of Oakland and 45 miles outside of San Francisco.

"Repowering the Altamont Pass wind farm will have a profound impact on the Alameda County economy," says Jiddu Tapia, CEO of Salka. "Not only will the redevelopment process create local jobs, but the energy produced at the site will provide an affordable, dependable way for the east San Francisco Bay area to meet its expanding power needs for generations to come."

The Summit repowering project received its conditional use permit in January 2016 and broke ground in December 2016. Completion and operation are planned for late 2017 or early 2018.

Repowering the wind farm will create approximately 100 jobs and produce enough clean energy, on average, to power about 29,000 homes per year, says Salka, which notes that the project is the company’s first wind farm sale.

The transaction is expected to close this summer. Salka will continue to manage the development and construction of

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the project until it achieves commercial operations – at which point funds managed by Castlelake will own and operate the wind farm.

### E.ON Tapped For Texas Wind Farm Services

E.ON Energy Services has been contracted to provide services for Copenhagen Infrastructure Partners’ (CIP) 196.7 MW Bearkat I wind farm, located in Glasscock County, Texas. E.ON will provide on-site construction management and project management services for the Vestas-powered wind farm, which is currently under construction. E.ON will also provide on-site supervision and management of a number of other services, including balance-of-plant monitoring.

Building the facility is Black & McDonald, an engineering, procurement and construction contractor. Construction is expected to be complete by the end of the year.

“Bearkat I is our second wind project under construction in the U.S., and it is great to have experienced players like E.ON to work with,” says Christian Skakkebæk, senior partner at CIP. Patrick Woodson, chairman of E.ON in North America, adds, “We are offering help throughout the value chain – from energy management, asset management, construction management and full operational support. This sector continues to grow, as a multitude of international investors, financial players and midsize developers alike are entering the U.S. market.”

### Firm Employs Renewables To Power Operations

North American produce company Taylor Farms is now using a combination of wind, solar and cogeneration energy systems to power the majority of its Gonzales, Calif., facility’s operations.

Combined, the systems generate 4.25 MW of energy on-site, which will be used to run the 192,000-square-foot vegetable processing plant. At times, the three systems will generate enough power to operate 100% of operations, but on average, they will offset energy usage by more than 90%, says the family-owned company, which has a total of 12 production and distribution sites in North America.

The wind turbine, installed in November 2014, is a 1 MW GE machine. Since its installation, it has produced an annual energy offset of 16%, the company notes. The 1 MW solar array, consisting of 3,578 panels, was installed in July 2016 and has an annual energy offset of 10%.
The natural-gas-powered cogeneration system, the latest addition to the Gonzales facility, was recently installed and is expected to produce an annual energy offset of 62%.

“This is a fantastic achievement for not only Taylor Farms’ Gonzales manufacturing plant, but the industry as a whole,” comments Karen Ross, secretary of California’s Department of Food and Agriculture. “The innovation, leadership and dedication Taylor Farms is delivering to their community in regards to alternative energy should lead as an example for all.”

Attending the ribbon-cutting ceremony for the company’s energy ecosystem was Maria Orozco, mayor of Gonzales, as well as representatives from REC Solar, Foundation Wind Power and Concentric Power.

NextEra, Westar Tout $650M Wind Investment

State and local leaders and landowners joined executives from NextEra Energy Resources and Westar Energy to celebrate the commissioning of the Kingman and Ninnescah Wind Energy Centers in Kansas, which created hundreds of construction jobs and millions of dollars in economic benefits for the region.

“Wind energy is good for Kansas, and it’s good for our economy,” says Kansas Gov. Sam Brownback, addressing landowners and guests at the commissioning ceremony. “When these blades are turning in the wind, it’s just like the combines harvesting wheat from our land – we are creating value from our natural resources to the benefit of our people, and I’d like to see more projects like these.”

“These projects represent a more than $650 million investment in Kansas,” says Armando Pimentel, president and CEO of NextEra. “We are very pleased to bring these wind energy centers online to help serve the state and boost the local economy.”

As reported, an affiliate of NextEra owns and operates the Kingman and Ninnescah projects.

The Kingman and Ninnescah Wind Energy Centers feature more than 240 GE wind turbines designed to pivot to capture the prevailing wind and convert it to renewable electricity. Together, they have a generating capacity of 400 MW, capable of powering more than 100,000 homes. The energy serves customers of Westar and its wholesale partners Midwest Energy and the cities of McPherson, Chanute, Iola, Fredonia and Sabetha through energy management service agreements.

“These projects modernize and diversify Kansas’ energy supply and provide low-cost, clean energy to our customers,” says Mark Ruelle, president and CEO of Westar. “We are also pleased to make this renewable energy available to several of our wholesale customers who now have an opportunity to share in this tremendous investment in our state.”

The projects have created a significant economic boost for Kingman and Pratt Counties, creating approximately 500 jobs during the construction phase in 2016 and approximately 35 full-time jobs once the projects became operational in December. The projects will provide more than $40 million in guaranteed payments to the county governments over their projected 30-year operational life and nearly $100 million in payments to local landowners. From labor and materials to housing, health care and construction, a wide variety of local businesses have benefited from the influx of economic activity.

“Kansas, and Kingman and Pratt Counties in particular, is fortunate to have some of the best wind in the nation,” says Rep. Jack Thimesh of Spivey. “These projects are evidence of what we can do when we build strong partnerships to develop this resource, create good jobs and long-term benefits for our communities.”

Facebook Powers Ninth Data Center With Wind

Facebook has chosen to build its next data center in Papillion, Neb., and has pledged that the new facility will be supplied by 100% wind energy from Omaha Public Power District (OPPD).

As reported, the Nebraska facility will be Facebook’s ninth data center overall and sixth in the U.S., providing the infrastructure needed to help support the 1.86 billion people on Facebook monthly. Company officials expect the 970,000-square-foot Papillion campus to be online as early as 2020.

The Papillion site will serve as Facebook’s first location in Nebraska.

“Partnerships like this, with the state, local communities and utilities like OPPD, cannot be overstated when it comes to economic impact for our region,” says OPPD CEO Tim Burke. “By collaborating with one another and looking for solutions that serve the best interests of our entire community, we create tremendous value. For example, OPPD was able to offer an innovative rate solution that would provide flexibility in how companies reach their renewable energy goals. It’s an example of how we work to meet the needs of large customers – particularly those who seek more renewable energy.”

According to the announcement, construction of new wind farms in Nebraska will allow the company to power the facility solely through wind-generated electricity.

“We’re thrilled to have found a home in Nebraska and to embark on this exciting partnership,” says Tom Furlong, vice president of infrastructure at Facebook. “Everything here has been as advertised – from a committed set of community partners and strong pool of talent to the opportunity to power our facility with 100 percent renewable energy. The Cornhusker State is a great place to do business.”
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Wind Deflates Trump’s Executive Order

On March 28, President Trump signed an executive order aimed at promoting energy independence and economic growth. At its core, the order targets “regulatory burdens that unnecessarily encumber energy production, constrain economic growth and prevent job creation.”

Media coverage of the order focused on the dismantling of the Clean Power Plan and its alleged impact on the U.S. coal industry and coal jobs. It’s hard not to take this view when President Trump, surrounded by coal miners at the signing of the order, said that he made a promise to coal miners that “we will put our miners back to work.”

Most experts agree the order will not achieve Trump’s stated promise of bringing back coal jobs, including Robert Murray, CEO of Murray Energy Corp., one of the largest independent operators of coal mines in the country. Murray told Fox Business, “You can’t bring the coal industry back to where it was.” Bloomberg also interviewed him on his outlook for the industry, and when asked about job growth after the order, he admitted that he has “no immediate plans to re-open mines or hire miners after the order is signed.”

Other parts of the order are aimed at repealing “job-killing” restrictions on oil and gas production, including easing limits on fracking on federal lands and methane emissions. As noted by Platts, these “rules were already being undone through court cases and by actions still moving through Congress. Obama-era regulations were always seen as having a marginal impact on oil and gas production, as evidenced by the dramatic increase in supply, which occurred during Obama’s second White House term.”

With nearly 50,000 utility-scale wind turbines producing power for over 20 million homes across the U.S., wind energy has become the fastest-growing form of clean energy in the country, and the Department of Energy (DOE) predicts wind power capacity will rise to nearly 160 GW by 2030. Wind power and other renewables have been firmly established as the future of American energy, and momentum in the industry shows few signs of waning.

According to The Wall Street Journal, several major utilities across the country have pledged to “continue long-term investments to generate more power from gas, wind and solar” in spite of the recent regulatory efforts designed to revitalize coal.

The latest Bloomberg New Energy Finance report from The Business Council for Sustainable Energy found that power from renewables now comprises almost a quarter of all energy generation in the U.S. The U.S. saw a 12% increase in renewable power generation from 2015 to 2016, and the International Energy Agency expects worldwide growth to increase, as well, even raising its previous growth forecasts this past October.

The strength of the renewables industry has rewarded U.S. customers, who saw their electric bills drop almost 4% in the last five years, while the growth of renewables has also proved extremely beneficial for ongoing innovation in the field; market forces will continue to advance cleaner energy supply and efficiency technologies.

The growth of the renewables industry is also good news for our economy. According to the U.S. Bureau of Labor Statistics, the fastest-growing job in the U.S. is wind technician, on track to grow by 108% over the next decade. And, according to a DOE report, a total of more than 100,000 American workers now manufacture, construct and maintain the U.S. wind turbine fleet. The expansion of American wind power is poised to create 248,000 new jobs and generate $85 billion in economic activity over the next four years, according to the American Wind Energy Association, citing a new report from Navigant Consulting.

With members of the coal industry skeptical about an uptick in coal-related jobs and no anticipated incremental increase in oil and gas production, the free market will be the real driver behind energy independence, with renewable energy continuing to serve as the engine for new energy production, economic growth and job creation.

David Halligan is CEO at Goldwind Americas. He can be reached at dhalligan@goldwindamericas.com.

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