THE WILDCARDS OF WIND FINANCE

The anarchistic development of markets for renewable energy credits in the United States means there is little consensus on where they are headed, but in one form or other every sale of wind power includes a bonus for the environmental value represented by its associated credits

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Renewable energy credits (RECs) are among the least understood aspects of the American wind market. They are complex moving parts—regional wild cards of varying value with a wide variety of customers. They can be sold to customers voluntarily buying green electricity or they count towards mandated green energy targets in compliance markets. For the most part, REC income plays only a marginal role in wind plant economics compared with wind's federal production tax credit (PTC), but it can be enough to make or break a project.

RECs, just like the physical electricity they represent, are recorded in megawatt hours (MWh) of production and each one is given a serial number and stored in a database. They can be bundled with the electricity and sold as part of a package deal or unbundled and sold alone for their environmental value. Typical prices for RECs lie in a rough range of $5-8/MWh, though in states where power retailers are falling short of their renewables mandates RECs can reach $50/MWh. Prices are generally decided deal by deal and by their nature are confidential.

"The REC is the representation of the differential price between standard energy and renewable energy," says Brent Alderfer, president of Community Energy, the Pennsylvania-based marketing and development arm of Spanish renewable energy giant Iberdrola. "Each project has a different price, depending on size, siting difficulty, area energy prices, wind resource, equipment prices in the year the project is built and construction delays," Alderfer says. "All of that is reflected in the final differential between energy and REC price, project by project."

Brent Alderfer: *Prices are set by the RPS markets*

TWO MARKETS

In voluntary markets for RECs, companies, utilities, consumers and other entities often buy them through a broker or third-party REC marketer. Every manner of voluntary REC sale is occurring, from private customers opting to pay more for green power, to companies offsetting their carbon footprints. People can even walk into a Whole Foods grocery store in America and buy a $50 card representing the RECs from a wind project to assuage the guilt that goes hand in hand with their consumptive lifestyle.

Partly because of heavier marketing, the voluntary market gets more media and public attention, but the compliance market generally plays a bigger role in the American wind industry. Here, RECs have become entrenched as a reliable method for keeping track, MWh by MWh, of the degree of compliance with green energy mandates now operating in 25 US states and the District of Columbia. As the cheapest renewable, wind provides the bulk of this power. RECs enable compliance with green energy laws. "It's the bookkeeping system of who paid for the wind energy and who delivered it," Alderfer says. "In some states, if a utility has not met its mandate with actual electricity, it can buy RECs unbundled from the underlying power to get it into compliance."

According to the Union of Concerned Scientists (UCS), the combined green energy laws across the US call for the addition of roughly 3500 MW every year through 2020. "Assuming that the states achieve their targets, by 2020 there's support out there among the 25 states and DC for more than 55,000 MW of new renewable energy," says UCS's Jeff Deyette. "And for the most part, if you look across the states, I'd say utilities are really trying to comply."

Generating green value: *Iberdrola's Gamesa turbines at Locust Ridge, Pennsylvania, selling bundled power and green credits to PPL, the state's power and light company*

BLURRING THE LINES

Where taking the pulse of the REC markets gets complicated is that lines not only blur between voluntary markets and compliance markets, but also between states. In

states without a renewable energy standard or renewables portfolio standard (RPS) law setting a green power mandate, some wind projects get built by taking advantage of compliance markets in nearby states. Electricity retailers in Iowa have a green mandate to comply with, but wind power in the state also supplies the Wisconsin compliance market. And in states with no compliance market but good wind resources, projects can sell voluntary RECs into neighbouring compliance states where most of the RECs are funnelled into meeting mandates.

"The best resources are getting built," Deyette says. "That's why it's difficult to look at all the wind development that's occurring in states with RPSs as evidence that RPSs are working. I think there's some truth to that but, at the same time, it's not an accurate picture of which projects are being driven by state RPSs and which projects are being driven by the PTC, or economics, or by the voluntary green power market."

In America's flat windy heartland, state green energy laws are scarce and largely viewed as unnecessary because wind development is ramping up anyway. Oklahoma Gas & Electric (OGE) has no state mandate, but its common border with Texas has meant steady REC prices in spite of a Texas RPS that can only be satisfied through in-state generation. "You can sell into Texas, you just can't sell to someone that's trying to meet an RPS requirement," says OGE's Chris Greenwell. "But that's not to say there's not significant value for my RECs. And many of the buyers might be from Texas."

Oklahoma RECs sell at around $6/MWh, which is not much different from the best prices in Texas, Greenwell says, adding that while state mandates can drive new wind development, they can also create wildly fluctuating markets of gluts and shortages, whereas the non-RPS states tend to hold steady. "In Texas there's always a glut of building and then all of a sudden there are too many RECs on the market," Greenwell says. "And so then the price goes lower and people are trying to dump their RECs. In Oklahoma there's not an RPS where everybody's building like crazy and all of a sudden you've got too many on the market."

Greenwell says that OGE, with about 3% wind in its current generation mix, might reach as much as 10% in two or three years without a green power mandate. The utility sells its RECs either on the open voluntary market or to its own electricity customers who opt for a higher percentage of wind through the kind of sign-up programs that are increasingly popular across the country. Greenwell says selling to both markets "gives us tons of options and we love it." OGE buys power and the associated RECs from two wind plants from Invenergy and a third from FPL Energy.

COMPLEMENTARY MARKETS

According to the National Renewable Energy Laboratory (NREL), 12 million MWh of green power was sold into the US voluntary market in 2006 with 62% coming from wind, while annual sales growth rates averaged 46% since 2003. US Environmental Protection Agency figures from January show Intel Corporation and PepsiCo, both with more than a billion kWh of annual voluntary green power purchases, topping a growing list of organisations that includes Fortune 500 companies, universities and all levels of government. Where green power mandates ramp up in increments over time, voluntary markets are creating a strong secondary outlet as a stopgap between target dates.

Energised by mandate: *To get built, Horizon's 300 MW Maple Ridge plant needed green credit customers. They did not appear until New York state passed its RPS law*

"The two markets play off each other nicely," says NREL's Karlynn Cory. "If you think you're going to come online a little ahead of when the RPS gets enacted, the voluntary market is a great way to get some additional value out of your RECs. You want to build your project so that as a utility needs that additional power, you can sell it to them at a higher price than what you can get in the voluntary market. But in the meantime you have the voluntary market so that you can at least get some value for your RECs."

While compliance markets, where they exist, set the bar for REC pricing, Alderfer argues that a REC is a REC—whether compliance or voluntary. Like Greenwell, he points to Texas, where a voluntary market runs alongside the compliance market. "Now they've built a lot of megawatts with both and to say that compliance RECs are better than voluntary RECs is just like saying one dollar is different than another dollar," argues Alderfer.

While regional markets are developing for electricity trade, REC markets are still largely defined state-by-state, says Ryan Wiser of Lawrence Berkeley National Laboratory. "There are state-specific markets. And if you

just looked at the amount of renewables capacity coming online over the last several years, if you looked at the amount of money that's being made by those projects, I think you would pretty much have to conclude that the compliance market dominates the voluntary market," he says. New England, encompassing six states united in one electricity market, is the only area approaching a multi-state regional market. Most states there have RPS laws but poor wind resources and slow development of renewable energy projects has led to a supply and demand crunch forcing high prices for RECs.

"There's not a compliance market within Kansas and there's not a compliance market within most of the neighbouring states," Wiser says. As a result, wind project developers in the region have no RPS market to serve. "They'll go to the highest valued market that they can access, which in their case is the voluntary market. But in a place like New England, where you have compliance RECs selling for a sizable premium, RECs in the voluntary market will trade at approximately the same level as the compliance market. Otherwise there will be no sales."

There are also differences in the way RECs are priced between regulated and deregulated markets. In Illinois, utilities call the shots because they are the only buyers in the regulated marketplace. Power purchase agreements (PPAs) between project developers and utilities are negotiated before projects are built and bundled REC prices are factored into the contract. "In that sort of situation you're typically going to have one long term contract with one buyer," says Anna Giovinetto of wind developer Noble Environmental Power.

SPOT MARKETS

In deregulated markets, such as New England or Texas, the structure of RPS programs typically results in spot markets for RECs, where multiple buyers and sellers swap RECs in long term and short term agreements. A buyer or seller may initiate sales. "In most cases, discussions about the REC off-take will occur before the project is online,"

DEVELOPING TRACK AND TRADE

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Renewable energy credits (RECs) first appeared on the scene in America in the last decade when they were traded in wholesale deals between Californian utilities as part of early efforts to burnish their green credentials. What was likely the first retail REC trade in America, however, took place in the fall of 2000 between the Bonneville Environmental Foundation (BEF), a non-profit group based in Portland, Oregon, and the federal government's Environmental Protection Agency (EPA), says BEF's Rob Harmon.

That this first deal was between the EPA and a non-profit was the best way for RECs to leave the starting gate, says Harmon. "I think if any for-profit player had tried to do it, particularly in the days of Enron, it would have been much more difficult to get any traction for the concept."

The REC market was originally hampered by consumer doubts and misconceptions that included rumours of double counted RECs as imaginary attachments bringing ill-gotten dollars to existing wind farms undeserving of more money. "Before there was a tracking system where every REC got a serial number, all of this stuff was done with metre readings and paperwork that people signed under threat of perjury," Harmon says. "So a tracking system was set up where every megawatt hour generated at a renewable energy facility is given a unique serial number and it's put into a bank, just like a dollar bill."

Eight web-based regional tracking systems now exist in North America to validate both RECS sold to customers who are voluntarily buying green power and RECs used to prove compliance with state laws mandating minimum levels of renewable energy production. The tracking agencies serve most areas that harbour significant wind development and more are on the way. One of the largest, The Western Region Electricity Generation Information System (WREGIS), is based in Salt Lake City, Utah, and covers all or part of 14 states and two Canadian provinces. It began operating last summer.

Rob Harmon: *They go in the bank like dollars*

"All we do right now is verify renewable generation," says WREGIS' Connie White. "Our web site gives information about who's participating, but volume is considered confidential information because people who really understand this market could look at it and guess who's trading what and what their capacity factor is."

Generators open an account and their REC trades are reported much like a monthly bank statement. Efforts are under way to co-ordinate all eight agencies, which would allow easier integration between the systems to help states import and export across state and grid borders. "We're looking to see if we have compatible standards and if we can have interfaces between the systems," White says. "We want to help the marketplace get bigger and more vigorous."

Smaller purchases in the voluntary market, however, may not be substantial enough to warrant tracking through a WREGIS account. And that's where a non-profit like Green-e, a San Francisco-based company that audits consumer transactions, comes in. Green-e's certified REC sales reached nearly 8.8 million MWh in 2006. "Green-e ensures that we're selling only as much as we're buying and that all the stuff we're buying meets their standards," says Harmon. "Of course, that's much easier to do if it's all going through WREGIS to begin with. Because then you know exactly where that REC was created and you know exactly whose hands it passed through."

Projects that are too small, or wind project developers that do not understand the REC process, might decide not to bother joining a tracking system. "But I don't think you're really going to see much of that," Harmon says. "I think the wind energy industry is very evolved and very sophisticated. It's absolutely in the wind energy industry's best interests—and they know this—to participate in the system because it adds a tremendous amount of credibility to the whole thing."

Giovinetto says. "Even a well-capitalised developer needs to show the bank that they have a viable sales plan for the RECs, or financing is going to be tough if not impossible. So developers will talk to a marketer or a retail energy supplier in advance."

PLAYING THE MARKET

Another issue involves managing risk when selling RECs. Texas pops up again as an example, if for no other reason than the sheer amount of activity—more than 1600 MW of new wind plant last year alone in a state where the RPS must be fulfilled by in-state generation. Merchant wind projects, in which long term PPAs are shunned in favour of higher (though riskier) returns in the wholesale market, have been more popular here than any other state. RECs can be treated in a similar way.

The number of Texas projects selling unbundled RECs is growing as merchant projects come online, says Wiser. In the recent past, wind-produced electricity had been selling for prices under $0.03/kWh on ten to 30 year PPAs, making wind competitive with natural gas in Texas. The RECs were then typically sold in short term increments unbundled from the power, or in some cases played less of a financial role. With the merchant approach, prices for wind power have improved.

"Those projects and their owners look at the wholesale electricity market in Texas and realise that over the last four years that if they just sold their wind electricity into the wholesale market they would earn well in excess of four cents per kilowatt hour," Wiser says. "The electricity pricing in the Texas wholesale market can be so attractive that they might say RECs are just gravy and not absolutely central to the investment process."

The bottom line, says Alderfer, is that RECs monetise the value of wind energy beyond just the electricity. "Every wind farm has an energy price and a premium price. And I'd say you'd be hard-pressed to find one that says, oh no, the energy's fine. We don't have any premium. We sell it just like coal."

COMPLEX BOTTOM LINE

But Kevin Doran, senior research fellow at the University of Colorado's Center for Energy and Environmental Security, offers a cautionary note by saying that the correlation between renewable energy mandates, RECs and the amount of wind going in the ground is strongest where the PTC and great wind corridors combine. "My bottom line is that it's all very complex and the people who give very pat answers on one side or the other are really not looking at the nuances of the situation," Doran says. "If you're in the business of RECs, then it's in your interest to say that RECs are a good thing. Why would you want to do otherwise? It just makes good business sense. And in some cases it's helped by the fact that RECs can be a good thing—but not always."

For Rob Harmon from the Bonneville Environmental Foundation, which pioneered one of the first retail REC trades in America (box), monetary recognition of environmental value is an integral part of wind power pricing. Even at fairly low prices of $3 or $4 per REC, added up over the life of a 20-year project they can amount to between 7-10% of the entire capital cost of the project. "Last time I looked, seven to ten percent was about the profit margin on most of these projects," says Harmon.

CONSIDERING A NATIONAL GREEN POWER MARKET

If wind power is to be driven by demand for renewable energy credits instead of demand for tax credits, serious thought must first be applied to how such a market is to work in practice and how it will dovetail with a carbon credit market

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A growing groundswell of opinion in the US wind power business is beginning to consider whether replacement of the industry's fickle production tax credit (PTC) with a national market for trade in renewable energy credits (RECs) is an idea whose time has come. With the PTC once again due to expire at the end of a year, the advantages of a predictable long term market, with power retailers across the country required to demonstrate through the acquisition of RECs that a growing proportion of their sales comes from renewable sources of energy, are becoming increasingly more apparent.

To replace the support provided by the PTC, however, REC prices would have to rise significantly. Today, they typically hover around $5-8, with each REC representing one megawatt hour of power (previous story). Brent Alderfer from Community Energy, the US subsidiary of Spain's Iberdrola, sets the bar at $16 for RECs to compensate for loss of the PTC. Iberdrola is the world's largest wind power operator by far.

Disruption of the current REC market, however, could be substantial, warns Rob Harmon of the Bonneville Environmental Foundation, a pioneer in RECs trade. Currently there are two distinct categories of customer for RECs: those voluntarily buying green power and those required to buy credits to prove compliance with state laws mandating specific volumes of renewables in the supply mix. "If the PTC goes away and REC prices double, you will see a substantial reduction in the number of megawatt hours purchased in the voluntary market," Harmon says. "In the compliance market, what will happen is the price of projects will go up very significantly." As a result, the cost of complying with state mandates, colloquially referred to as renewables portfolio standard (RPS) laws, will go up significantly, he warns.

Harmon sees two possible outcomes. "One is that the

Puzzle: *If national REC trade is to replace a PTC driven market, the regulatory pieces need fitting together with care*

price of electricity will go up for people, which means you haven't really gained anything—your taxes might be a little lower but your electricity rates are higher," he says. "Or the utilities will fight back and say prices of projects are too high and therefore we won't comply with the RPS. And that will undermine renewable development."

For power retailers not complying with state mandates, penalties vary by state, but $50/MWh is typical. Some might decide that paying a penalty is the easier option, while several states have price ceilings that postpone the mandate should the cost of compliance start running too high.

FOR BETTER OR WORSE

"The devil is in the details of how a national RPS is structured," says Karlynn Cory of National Renewable Energy Laboratory. "If you have a national RPS, do you just say that the whole nation has to come into compliance? Or do you allocate it on a regional basis, saying this is what the Southeast has to meet and this is what the Northeast has to meet?" Cory believes that a national RPS could lead to a national REC market as opposed to the fragmented markets that exist today.

But it may just lead to confusion, says Ryan Wiser of Lawrence Berkeley National Laboratory. "The value of RECs already is wildly different from one market to the next. So it depends on what a national RPS is layering on top of. Is the national RPS in addition to state RPSs? Or are we talking about two separate instruments altogether?"

Wiser suggests that as demand for wind power rises, its costs will rise as developers move to less attractive resource areas that require increasing miles of transmission. "I think it's safe to say that greater competition for renewable electricity—whether through national RPS, expanded state RPSs or otherwise—would put at least some upward pressure on REC prices," Wiser says. "I'm not certain that's going to be a very strong economic pressure. But there is going to be some pressure."

CARBON TRADE TOO

Meantime, the outlook for federal carbon cap-and-trade legislation is reasonably promising. All three candidates for the US presidency favour some kind of system. But experts agree that a fight is brewing over who would gain the benefits—the renewable energy faction for taking fossil fuels off the system, or the fossil fuel generators for emitting less carbon.

"Those interactions are still quite a muddle," says Wiser. "The broader renewables community doesn't yet agree on what the appropriate interactions are. But it comes down to whether any available emissions allowances that go to the generator must flow with the renewable certificate and be retired with the REC, or whether they can be sold separately."

While such problems must be sorted out before any value is attached, Harmon points to the RPS in Washington state, where all environmental benefits of renewable energy are bundled with the REC. "Does the owner of the REC get to make claims that they reduced CO2 emissions? In Washington state law, the answer to that question is yes," Harmon says. "But there are many other places where they're struggling with that."