CEFN

Clean Energy Funds Network

Investing in markets for clean energy.

CEFN Case Study #1:
Madison Windpower Project

Promoting Clean Energy -- Case Study Series

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Clean Energy Group

PREFACE

The Clean Energy Funds Network Case Study Series

This is the first in a series of case studies from the Clean Energy Funds Network, a project of the Clean Energy Group (CEG). CEG is a non-profit organization that advocates for innovative ways to commercialize clean energy technologies. This case study was written by CEG Consultant Michael Stoddard.

CEFN's mission is to study and support the work of more than 20 public funds established in states across the U.S. to promote markets for renewable and clean energy. These state funds, which will total more than $2 billion over the next ten years, are relatively new entities; some like California and Rhode Island were established in 1997, while many others are just getting underway. Visit our web page for more information about the funds and CEFN at www.cleanenergyfunds.org.

The CEFN project plans to issue a series of case studies about these funds and projects they have financed. These studies are intended to encourage rigorous analysis and evaluation: what works, what does not work and why? Each case study will describe project details (location, size, equipment and energy resources of the project, role of the parties), project economics (costs, revenues, and financing), and other key features of the project. We will review why certain choices were made, and what questions need to be asked the next time a similar project is considered.

To assure the accuracy of our reporting on these projects, we share drafts of our studies with the persons quoted or relied upon in the narratives prior to publication.

We hope these reports from the field prove useful to other state funders, to advocates and others working to develop functioning clean energy markets. Based on our experience, this kind of detailed information is not easy to obtain from available sources. We hope these studies become a source of investment quality information for other public and private funders.

We welcome reactions from our readers in the hopes of improving future studies. We also welcome project ideas for future case studies. To contact us, please call 802.223.2554 or send email to webmaster@cleanenergyfunds.org.

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INTRODUCTION

The 11.5 megawatt Madison Windpower Project in Madison County, New York, started generating power in September 2000, becoming the largest wind farm east of the Mississippi and the first merchant wind facility in New York. It is now owned and self-financed by PG&E Corporation and managed by its subsidiary, the recently formed National Energy Group.

The total installed cost of the facility is confidential. National Energy Group officially lists the total installed cost of the project at $15 million, but other credible reports place the cost somewhere between $16 million and $18 million, before receiving any public financing.[1] This translates to a per kilowatt cost of somewhere between $1,300-$1,565.

The New York State Energy Research and Development Authority (NYSERDA) awarded the project $2 million from its New York Energy $mart (NYE$) program. NYE$ derives its funds from a systems benefit charge assessed on every New York electricity customer's monthly bill. In addition to the NYE$ subsidy, the project receives the market clearing price of power sold into the local power grid, revenues from the sale of Pure Wind certificates, the federal production tax credit for wind and a property tax exemption, and favorable tax depreciation.

CEFN chose to do a case study of the Madison Windpower Project for a variety of reasons. Madison is the first operational merchant wind project in the northeast. The project was financed on the owner's balance sheet (i.e., self-financed) and its revenue stream includes the innovative development of a market for the environmental attributes of the wind power. The project poses interesting questions about what it takes to develop a commercially viable wind facility in the Northeast, and whether the Madison project will indeed be profitable.

Our primary interest in studying Madison is to better understand the financial aspects of the project development and what lessons it holds for future wind development in the region. Madison is also the first wind facility in the east to receive support from one of the state clean energy funds. Our secondary interest for the case study was to record the process that led to the decision by the New York fund to help finance to this particular project.

I. PROJECT DESCRIPTION

The Madison Windpower project is located in Madison County, New York about 45 miles southeast of Syracuse. It was completed during the summer of 2000 and began operating in September 2000. The facility, which sits on a 120-acre ridge of land that is still used for farming, was a turnkey construction project originally developed by Atlantic Renewable Energy Corp. and built by Vestas American Wind Technology.

The site, at an elevation of 1,700 feet, is identified as a “Class IV” wind power site. The developer documented this with two years on-site data collection. The site experiences wind speeds of between eight and 20 miles per hour -- with a mean wind speed in the range of 16-17 miles per hour -- at 50 meters above ground.

The project uses seven Vestas V-66 1.65-MW tubular-style turbines. The V-66 is a pitch regulated wind turbine with OptiSlip and OptiTip technologies to maximize the wind resource. The towers are about 220 feet high and each of the three blades is 108 feet long, reaching 328 feet high (just longer than a football field) at their peak. At present, the V-66 is the largest turbine operating in the U.S.

[1] New York Times, p. 1, Sunday, November 25, 2000 stated that the project cost $16 million, but it is unclear if that figure includes the $2 million NYSERDA award.

Total nameplate capacity of the seven turbines is 11.55 MW. According to the owner, the wind farm is expected to generate about 24,000 MWh annually, from which we deduce that the capacity factor of the project is between 23-24 percent.

In mid-1998, Atlantic Renewable started developing the merchant energy wind project in New York and formed Madison Windpower LLC. The company chose Madison, NY, believing that the facility could be permitted and built relatively quickly due to the site's environmental fit, lack of landowner resistance, decent wind resource, proximity to the utility grid and public road access.[2]

Shortly after being awarded public funding from NYE$, Atlantic Renewable brought U.S. Generating Company in as a late stage development partner with an option to buy the project. U.S. Generating later became PG&E Generating, a subsidiary of PG&E Corporation. In 1999, PG&E Generating elected to purchase Atlantic Renewable's rights to the project and took over the process of developing and permitting the project. Since then, the project has come under the management of the newly formed PG&E National Energy Group. Vestas has stayed on under a contract to operate and maintain the facility for the first five years.

A major motivation for PG&E Corp. to buy the Madison project was its desire to expand renewable, environmentally-preferable generation in the Northeast. "Madison Windpower's commercial operation is a milestone for us," said Chris Iribe, PG&E National Energy Group president and chief operating officer. "Aside from offering critical additional capacity to the New York State power market, we're pioneering a new approach to linking customers to new, renewable energy facilities."[3]
The Company notes that without the generation from the emission-free Madison facility, the average New York State power plants would annually emit 12,000 tons of carbon dioxide, 65 tons of sulfur dioxide, and 19 tons of nitrogen oxide.

[2] The developer states that it selected the site using guidelines developed by the National Wind Coordinating Committee and the European Wind Energy Association.

[3] National Energy Group press release, Sept. 15, 2000, http://204.253.35.76/pressroom.html. PG&E Corporation Chairman, CEO, and President Robert D. Glynn, Jr. said of the parent company's motivation, " PG&E Corporation is proud to be promoting this innovative program and this project that will advance the market for environmentally preferred generation." Company Press Release, April 14, 2000, http://www.gen.pge.com/news/041400madison.htm.

Summary Economics

General		
	Capacity	11.5 MW
	Capacity Factor	23%-24%
	Annual Generation	24,000,000 kWh
Costs		
	Capital equip., installed	+/- $11.5 million
	Interconnection & Substation	$1.15 - $1.725 million
	Developers Costs	Not Available
	Land	$14,000 - 28,000/year
	Community Property Tax Replacement	$60,000
	Operating and Maintenance	Not Available
	Financing	0
	TOTAL INSTALLED COST	$15 - 18 million
Revenues		
	Bulk Power (spot market)	2.0 - 5.1 cents/kWh
	"Green" Market for Pure Wind*	0 - 4.0 "
	Fed. Tax Credit (i.e., after tax)	1.5 "
	TOTAL cents/kWh	3.5 - 10.6 "
	TOTAL $/year	$840,000 - $2.54 million
	NYE$ Funding	$2 million

* Best case scenario assumes PG&E Corp. sells all of the green premium available at 4 cents/kWh.

II. PROJECT ECONOMICS

A. Costs

The exact costs of the project are not public. National Energy Group officially lists the total installed cost of the project at $15 million, but other credible reports place the cost somewhere between $16 million and $18 million.[4] These figures translate to an installed cost somewhere in the range of $1,300-$1,565 per kW. The total installed cost includes capital equipment and installation, development costs, and costs to access the land on which the site is located. It does not include annual operation and maintenance costs.

Capital Equipment and Installation

Atlantic Renewable held a competitive bid for the supply and installation of the turbines that was won by Vestas. While terms of the sale are not public, Rebecca Blackburn, a sales representative at Vestas American Wind Tech, Inc., stated that installed capital costs for the V66 are about $1,000/kW. Rolled into the installed rate are the turbine -- shipped from Denmark -- the tower, controller, and cables as well as the services of building the tower foundations, transporting the equipment to the site, erecting the tower, and making the facility operational. As a point of reference, assuming a rate of $1,000/kW the capital equipment and installation component of the 11.5 MW Madison project would have cost in the neighborhood of $11.5 million.

According to Theo de Wolff, a principal at developer Atlantic Renewable Energy Corp., an unexpected addition to the capital costs came from the fluctuations in international currency exchange rates. De Wolff said that the effective purchase price for the turbines rose 20% when the U.S. dollar fell against the Danish currency from the time the contract was signed to the moment when payment was made.

[4] New York Times, p. 1, Sunday, November 25, 2000 stated that the project cost $16 million.

Other capital and installation costs that typically are not incurred by the installer (and therefore are additional to the $1,000/kW installed cost of the turbines) include building or upgrading any roads needed to get the towers and turbines into place, building a local substation and the interconnection to the grid, and trenching to run power lines from the base of individual towers to the substation.

As to the interconnection component of these other installation costs, de Wolff states that the industry average is $25-$50/kW. However, because Madison Windpower incurred the full cost of building a 20 Mva substation, interconnection cost for the project reached somewhere in the range of $100-150/kW (i.e., $1.15 million - $1.725 million).

By way of comparison, wind developer John Zimmerman of Mountain Energy notes that the electrical interconnection, including a transmission line, at the 6 MW facility in Vermont cost approximately $2.5 million dollars.

An additional installation cost at Madison Windpower was incurred to upgrade the local roads leading to the site because the towers and turbines for the V-66 are so long and heavy.

Developer Costs

In addition to the capital and installation costs, the Madison project included costs to develop the project. Atlantic Renewable undertook all the early aspects of the project development, including site selection, conclusion of wind leases, wind resource evaluation (collecting two years of data), local permitting, legal work, meteorological tower installation, surveying, bird and wildlife evaluations, town board relations, preliminary design and engineering, and the preliminary utility interconnect.

Later stage development costs were borne by PG&E Corp. Activities at this stage included ushering the permitting process through the state agencies, finalizing arrangements with the local communities and the utility, and pursuing markets for the project's output.

Development costs were a bit higher than initially expected. The main reason for this, as discussed further below, is that the process of siting and permitting proceeded more slowly than projected. A minor additional expense were two payments of $30,000 that PG&E Corp. agreed to pay both Madison and local schools in lieu of taxes (the wind facility is tax-exempt under a state law aimed at promoting renewable energy resources).

Land rights

The Madison developer agreed to pay between $2,000-$4,000 per turbine per year to property owners for the right to develop the wind farm on their land. The leases are for 25 years with an option to extend. Most of the owners receive payment in the form of rent (or royalties) paid quarterly.

Operation and Maintenance

The annual operation and maintenance (O&M) costs for the Madison project are not publicly available. Experts suggest that for large commercial wind facilities in regions with a well developed service infrastructure for wind power (more commonly found in the midwest and western U.S.) these costs generally run from 0.5 – 1.0 cents per kWH. Atlantic Renewable's de Wolff observed that smaller projects in the east, particularly in areas lacking a good service infrastructure for wind, are likely to have O&M costs ranging from 1.0 - 2.0 cents/kWh.

But according to Vermont wind expert John Zimmerman, there is an existing example of O&M costs of less than a penny per kWh in modest-sized, east-coast wind facility. Zimmerman states that at the Searsburg, Vermont facility, O&M is approximately

0.875 cents/kWh for an annual output of roughly 14,000,000 kWh.

Using a middle-of-the-road approximation of 1.0 cent/kWh for Madison Windpower, we estimate that the total annual O&M cost is around $240,000. Madison's future O&M costs could potentially be helped by the fact that several other wind farms are being installed nearby.

B. Revenues

Bulk Power Market

The wind farm sells electricity into the Northeast power grid through the New York State Electric & Gas Transmission System and the New York Independent System Operator. In recent years, market prices for power delivered to the grid have averaged about $20/MWh. Keeping in mind that market prices in the autumn of 2000 were unusually high, it is informative to note that the average real time price for power at the New York Independent System Operator was $51.01/MWh (or 5.1 cents per kWh) during the month of September (the project's first month of operation).[5] At the lower market price, the project should return about $480,000 each year for the 24,000 MWh it sells at wholesale. Were the market price to remain closer to the $51/MWh level of late 2000, then the wholesale revenues would be around $1,224,000 each year.

"Green" Market

PG&E's National Energy Group also gets revenue by selling "Pure Wind" certificates to consumers for $40/MWh (equal to 4 cents/kWh). The Pure Wind certificates correspond to the environmental attributes associated with equivalent amounts of wind-generated electricity delivered to the New York power pool. In deciding to buy the wind farm, PG&E Corp. anticipated that it could sell some portion of the favorable characteristics of the wind power to companies and institutions that are willing to pay more for electricity generated without pollution, according to Christopher R. Sauer, then a senior vice president of PG&E Generating (now part of National Energy Group).[6]

Shortly before the Madison project came online, Kinko's Inc., a chain of copy stores, announced it would buy up to 4,500 MWh Pure Wind certificates each year in a multi-year deal. This amount, which corresponds to 50% of the Kinko's annual power consumption for its New York stores, is intended as a ceiling but does not guarantee that Kinko's will buy the full amount.

Kinko's price for its Pure Wind certificates was less than 4 cents/kWh because of its sizeable purchase (although the exact price is not public). Similar deals are available to be worked out with large customers.

Assuming Kinko's ultimately purchases Pure Wind certificates to match the full 50% of its total consumption, National Energy Group will still have at least 19,500 MWh of Pure Wind certificates to sell on the open market each year. Of the balance, National Energy Group realizes that not every last one will be bought. Though admittedly it is a new product and marketing efforts are just getting underway, Muir Davis, Director of Strategy and New Initiatives at National Energy Group, said that fewer than 100 had been sold over the Internet through year end (2000).

According to Jean Hopkins, Senior Policy Associate for External Relations at National Energy Group, before deciding to invest in the project company executives considered three scenarios for returns on the Pure Wind certificates. Under the best-case scenario, the total return from a "green" premium

[5] For updated market price information, see www.nyiso.com/services/documents/mthly-reports/.

[6] More information about how to use and purchase Pure Wind certificates is available at www.purewind.net.

averaged $40 for every megawatt hour generated. Under the middle-case scenario, the return averaged $20/MWh. Under the worst-case scenario, the return averaged $0/MWh. Assuming total annual generation of 24,000 MWh, these scenarios produce a return from the Pure Wind certificates $960,000, $480,000 and $0, respectively.

Federal Production Tax Credit

The Madison project is eligible to receive the full benefit of the federal wind production tax credit (PTC). Application of this incentive provides an inflation-adjusted credit of 1.5 cents per kWh for power generated from qualifying wind facilities.[7] The credit lasts for the first ten years of the life of the facility.

Using National Energy Group's projection that the Madison facility generates 24,000,000 kWh in an average year, the project should receive approximately $360,000 per year after taxes from the federal PTC for the next ten years, increased by the rate inflation each year.

State Wind Energy Tax Exemption

While not technically a form of revenue, we note that New York State law offers a property tax exemption for the value of wind (and solar) installations.[8] The Madison project sought and received permission for this cost savings, although as mentioned above, PG&E Corp. ultimately offered to pay two local communities $30,000 each to help offset the lost taxes.

C. Financing

Private Financing

Setting this project apart from other "project financed" wind projects, PG&E Corp. financed Madison Windpower "on its balance sheet," which is to say it used no external financing. This is unusual because most wind projects use institutional financing to help cover the high, up-front costs.

The potential terms for borrowing money for Madison were not attractive. One reason is that the project is relatively small. According to National Energy Group's Hopkins, "These days, most of PG&E Corp.'s new generation projects are around 1,000 MW, but the Madison project is only one hundredth that size." Hopkins said that lenders asked PG&E Corp. to consider bundling two or three renewable projects together to increase the size of the financial package and secure better terms, but that Madison was the only renewable project they were interested in at the time.

The second reason for unfavorable financing terms was that the project lacked the prerequisites for demonstrating long-term economic viability: (a) long-term customer commitments for the output, or (b) an established market that can support a "green" premium for wind power.

Typically, lenders demand some demonstration that the project is economically sustainable. In the traditional regulated electric utility business, this demonstration was easily achieved by showing a power purchase agreement (PPA) that guarantees a buyer for some or all of the generation output over an extended period of time (e.g., 15-20 years). Even today, most large wind projects (such as several in Texas and California) have secured financing based on long-term contracts for the project's output. However, in the deregulated markets (at least in the East), most power marketers are currently unwilling to make

[7] H.R. 1180 - Title V, Sec. 507: Extension and Modification of Credit for Producing Electricity from Certain Renewable Resources, amending section 45(c) of the Internal Revenue Code of 1986, was signed into law in December, 1999.
[8] §487, New York State Real Property Tax Law

such long commitments partly because they cannot predict what consumers will want 20 years in the future and partly because they are not sure they will still be in business 20 (or even 2) years from now. Obviously, this is a concern of the lenders as well.

Alternatively, developers can demonstrate creditworthiness if they have access to markets that, through some combination of the wholesale price and any premium gained from sale of wind's environmental ("green") characteristics, will generate enough revenue to make the project profitable.

Absent long-term commitment for the output and uncertain markets for the energy and the "green" value, lenders considering the Madison project demanded tougher terms. According to Hopkins, PG&E Corp. typically aims to buy or develop generation projects that will deliver a return on investment (ROI) of between 15% to 20%. By the company's calculations, the expense of the terms proposed by outside lenders was so high that the target ROI could never have been achieved, so PG&E Corp. decided to finance the project internally.

Public Financial Support

In addition to the federal tax production credit and the property tax exemption discussed above, the Madison project also received financial help from the New York state incentive program to promote renewable energy.

Atlantic Renewable was well along in developing the project when, in late 1998, NYSERDA released its request for wind generation proposals in Program Opportunity Notice (PON) No. 437-98. NYSERDA's goal for this first round of funding for wind was to share the risks with early market participants of overcoming market barriers to installing wind capacity in New York. As described by NYSERDA, these early market barriers included the following features:[9]

- Higher cost of wind power. (Wind energy will likely cost more than the market rate for wholesale electricity.)
- New York State market for premium-priced green power is not yet developed.
- Lack of infrastructure in an immature industry.
- Intermittent nature of wind could make it difficult to sell under New York Independent System Operator rules.
- Transmission constraints from wind sites to markets.
- Expensive to find and characterize suitable wind sites.
- High perceived risk by investors and developers of wind technologies.

Under the initial PON, entitled the New York Wind Power Plant Development Program, NYSERDA sought to use the public benefit funds to help install one or two long-term wind power plants that were at least 2MW in size. While NYSERDA screened candidates for their technical and financial capability, the main criteria for awarding funds was to maximize installed capacity and energy.[10] New York wanted the most bang for its buck.

NYSERDA devoted $6 million to the program, which was divided into three phases: (1) site selection and characterization, and turbine selection; (2) wind power plant development and installation; and, (3) operating the wind plant for more than a three-year period.

According to the PON, NYSERDA was prepared to make three Phase 1 awards up to $100,000. It could also skip the first phase and make a single award if the winning

[9] NYSERDA, "Building a Wind Energy Industry in New York State," p. 2
[10] PON 437-98, p. 1

bidder had already completed that phase. This is what happened with the Madison project.

The PON had six core requirements:

1. The minimum wind power plant size was 2MW, with greater consideration being given to larger plants.
2. At least 25% of the total funding requested from NYSERDA should be based on wind power plant performance.
3. "Teaming arrangements" were encouraged when necessary. For example, teams could include commercial firms, government organizations and universities. NYSERDA asked that the teams include members with experience in developing and operating wind power plants.
4. Cost sharing among team members.
5. The developers had to show that they had the financial resources to do the proposed work, the appropriate technical expertise, access to adequate facilities or the ability to get them, and a solid performance record.
6. The wind power plant had to be installed in New York State, although the power could be sold anywhere.

NYSERDA also required that developers submit a proposal with 13 key elements:

1. A project abstract;
2. Project description, including sections environmental issues, land acquisition and electrical interconnection;
3. Project economics, which included marketing plans, basic cash flow analysis and financing sources;
4. A description of the proposing team;
5. A decommissioning plan describing what would happen to the facility if it closed;
6. The name of a program evaluator to provide "unbiased, technically credible expert advice to NYSERDA";
7. A "statement of work," which would serve as the contract between NYSREDA and the developer;
8. A schedule;
9. A cost-share summary outlining the project's funding sources;
10. A proposed payment plan, which included financial incentives for developing the project on schedule and performance incentives once the facility was operating;
11. Contract pricing proposal forms;
12. The project expenditure timeline; and,
13. Letters of commitment signed by a person authorized to contractually obligate the organizations involved in the project.

NYSERDA's PON drew 12 proposals in 1999. Most but not all had done enough homework to skip the Phase 1 funding. Using internal staff and five outside technical consultants from the National Renewable Energy Lab, an environmental organization, a wind company, the New York independent system operator and the New York State Public Service Commission, NYSERDA selected two projects for funding. One of these was the Madison facility, which was awarded $2 million.

In order to take full advantage of the federal production tax credit of 1.5 cents/kWh, Atlantic Renewable and NYSERDA restructured the terms of the state's initial award, changing it from an outright grant to a series of performance-based payments. As Atlantic Renewable's de Wolff explained, guaranteed grants can reduce the level of federal production tax credits. These credits are a key factor in making wind projects economical. By simply changing the NYSERDA award to a contingent incentive program, the developer/owner is able to

accept the state support without jeopardizing the amount of the federal tax credit.

III. DISCUSSION

A. Costs

Industry experts suggest that a resource such as Madison should aim for an installed cost of between $1,100 and $1,300 per kW. Madison's all-in cost is higher than this range.

Exchange Rates, Limited Selection of Turbines, and a New Substation Drove Up Capital Costs

One reason costs at the Madison project were relatively high is that, as mentioned above, the exchange rate turned unfavorable before final payment on the Danish turbines was made. This added an unexpected 20 percent to the purchase price.

A second reason, which has been true for all wind projects over the last 20 years, is that the Madison developers had limited choices in turbines at the time the project was built. The Vestas V-66, which is the largest turbine operating anywhere in the U.S., is most efficient (has the highest capacity factor) in areas where the wind resource is most vigorous. But it is less efficient at sites where the wind is not as energetic, such as Madison. In the view of the developers, the V-66 was the best option available at the time.

Since the Madison installation, not only have manufacturer costs dropped for all turbines including the V-66, but models offering a range of turbine to generator size ratios have also hit the market. For example, the Nordex 1.3 MW WTG and the Enron 1.5 MW models are being considered by Atlantic Renewable at a similar, nearby location because they are likely to achieve a better capacity factor (i.e., generate electricity more of the time) given the nature of the wind resource in upstate New York.

As discussed in the Project Economics section above, installing a substation for this project was more expensive than it might be in a different setting partially because the project carried the full financial burden of the substation instead of being able to share it with other projects.

Finally, as a general observation, the shortage of in-state subcontractors familiar with the necessary construction and installation techniques meant that out-of-state, higher-cost subcontractors were needed to complete the job.

Some Development Costs Were Inflated Because The Process Was New to All Parties

On one hand, the Madison site was relatively easy to develop because, compared to other sites in the Northeast, it had little or no detrimental impact on the local community or environment. Indeed, finding a site that local residents will accept is more than half the battle in this region. According to observers and media reports, the local farming community was happy to see additional revenues from the wind business. Madison also offered a decent wind resource, and it had reasonable access to roads and the power grid.
On the other hand, the development costs of the Madison project were higher than they might be for subsequent projects in New York due to the expense of going "first" in a number of matters. For example, developer de Wolff noted that his company had to compile all the wind survey data from scratch, whereas the state has since begun a wind survey that will make publicly available much of the data needed for subsequent projects. He also observed that, as the first merchant wind plant in the state, the project proponents experienced some delays that added cost to the project. These delays came in the form of a permitting process that had to explain the environmental impacts of the project to communities and state agencies that had no previous experience with wind projects.

Similarly, the interconnection arrangements posed novel issues for the local utility that required constant explanation and negotiation. Bill Moore, a principal at Atlantic Renewable, said that while all the issues were relatively straightforward and "solvable," the local utility wanted assurances about voltage and frequency fluctuations and how intermittent resources like wind impact the local supply grid.

Incidentally, these explanations and negotiations added time and cost to the process, but according to Moore were a minor inconvenience compared to the ongoing fight to get favorable dispatch rules approved with the New York's transmission authorities (e.g., NY ISO) who control the grid into which Madison sells its energy. Moore says that the viability of future wind projects in the Northeast will be determined in part by rules from the ISOs that do not penalize intermittent resources for imbalances and their inability to guarantee scheduling of output ahead of time. While New York ISO rules currently exempt the first 50 MW of wind capacity from such penalties, future development in the region is not assured of such treatment and faces a serious cost disadvantage unless the exemption is extended to all wind generators.

B. Revenues

A discussion of any merchant wind plant's revenues must start with an analysis of the underlying market into which the plant will sell its output. Developers of the Madison project acknowledged that $2 million financial support from the New York Energy $mart program provided a boost to the project. But they also observed that this support is not enough by itself to make a project viable in a deregulated market.

Administrative price setting has led to sluggish retail markets, especially for "green" markets

Atlantic Energy's Bill Moore noted that if the retail electricity markets do not foster competition, for example because default power supply (also called "Standard Offer" or "Provider of Last Resort") is administratively priced too low, this will drive power marketers away and stunt the motivation for customers to switch from the standard offer supplier to a new competitive supplier. This has been the experience to date for most of the markets in the Northeast to date. Among the marketers who have sat out the early stages of the Northeast restructured markets are those who would offer and promote environmentally preferable or "green" power. The absence of these marketers hampers the development of a growing and sustainable customer class that is willing to pay a premium for clean energy such as wind.

PG&E National Energy Group's Hopkins observed that to be economically viable, future wind projects in the deregulated Northeast need access to a vibrant retail market that will reward wind energy for its environmental characteristics or else they need to bring installed costs down such that they can compete in the wholesale markets. Jeff Peterson, Project Manager at NYSERDA, echoed this point, observing that, "The real challenge [for wind] is to build the market demand to a point where the financial community is confident that the power can be sold at the necessary price."

Compensation for wind power's environmental attributes could be limited if market (and marketing) rules impinge on the trading of credits

Unless spot market prices go even higher than they are now and stay that way for years to come, the Madison project will not make a profit relying on the commodity price alone. Consequently, a major focus has turned to selling the Pure Wind certificates to generate as much revenue as possible from the project's environmental attributes.

Whether and how the restructuring rules allow retailers to market and trade their wind power is a serious factor impacting the viability of wind projects in deregulated markets. In the case of Madison, National Energy Group is selling the right for customers to claim the clean characteristics of wind generation for four cents per kWh. This is roughly the same price being paid for the energy (electrons) that the project is selling into the spot market. If a state's rules on marketing, disclosure and/or record-keeping make it harder or even impossible to capture some of this "green" premium through the marketplace, wind projects will have a much harder time recouping their costs.

Renewable Portfolio Standard Rules May Impact Demand for Pure Wind Certificates

Some states have mandated that power suppliers include a certain minimum percentage of renewable energy content in their overall supply mix. The mandate is called a renewable portfolio standard (RPS), which, depending on the level of the minimum (e.g., 1% renewable content, 5% renewable content, etc.) and the details of the implementation rules, can add significant demand for renewable energy.

Clearly, these RPS mandates have the potential to push up market demand for renewables, which in turn helps the bottom line of a project like Madison. One question that impacts the commercial success of the Madison facility is whether the Pure Wind certificates, by themselves, can be used to satisfy RPS requirements in states adjacent to New York (New York does not have an RPS, but initially Connecticut, Massachusetts, Maine, New Jersey and Pennsylvania have established RPS mandates.) For example, statutes in both Connecticut and New Jersey indicate that RPS mandates may be satisfied by participating in a "trading program" if it is approved by the relevant state authorities.[11] But in other states, the rules are either incomplete or unclear as to whether trading of certificates is allowed or can be suitably administered.

C. Financing and Incentives

PG&E Corp.'s willingness to self-finance the Madison facility allowed the project to be fully developed without long term PPAs. This means the generator, PG&E Corp.'s National Energy Group, has assumed all the risk.

According to de Wolff, PG&E Corp.'s self-financing played a critical role in the project. "It was important to bring in PG&E Corp., a company with tremendous creditability and a solid track record," de Wolff said. Additionally, given the fact that this was a merchant plant without any long-term customer commitments for the output, it would have been difficult to secure financing elsewhere, regardless of the terms.

Because self-financing of such expensive projects is not commonplace for renewable energy projects, and that the revenue stream from the Pure Wind certificates is new and untested, it is unclear whether this installation of a large, central generation wind facility in the northeast offers a financial model ideally suited for replication.

With regard to the state's financial incentives program, both NYSERDA's Peterson and de Wolff at Atlantic Energy stressed the value of applying due diligence techniques when deciding which proposals should receive state funding.

The developer of the Madison project observed that state clean energy funds are well served by instituting a rigorous application process for developers seeking

[11] Connecticut Public Act No. 98-28, Section 25(a); New Jersey Pub. Law 1999, Ch. 23, Section 38d.2.

funding. As discussed above, NYSERDA required applicants to demonstrate that the basic elements of the project development were in place and a pro forma cash flow so it could determine the seriousness of the applicant and the feasibility of the project.

De Wolff stated that NYSERDA took the proper approach in reviewing proposals by focusing on a project's quality, not quantity. He suggested that this is a more sound process than adopting a straight low-bid approach. De Wolff advised other state funds to approach the process like a banker performing due diligence by requiring a showing of:

1. proof that the developer has rights (e.g., leases) to the site;
2. evidence that there is a suitable wind resource at the site;
3. evidence that grid interconnection is feasible and economical;
4. a reasonable likelihood of receiving the necessary permits;
5. evidence that the output can be sold (or at least a credible plan to market the output);
6. financial capability (to secure financing to move the project forward); and,
7. technical capability.

Project developers also need to focus on their marketing plans, de Wolff said, noting that a well-researched marketing plan can help make up for a lack of committed power purchasing agreements.

IV. Questions For Future Consideration

This case study provides considerable information describing the technical and financial aspects of the Madison Windpower project, and offers a discussion of what we see as the more salient points about the process and the economics. Time will tell what more there is to be learned about whether the project can turn a profit and whether similar projects will be developed in the Northeast.

We will also have to save for another day the analysis of a few other questions that came to mind as we prepared this case study, such as:

- Can future wind projects in the Northeast achieve lower costs?
- Do the economics and rules of local retail electricity markets encourage marketing of, and customer demand for, "green" power?
- If a wind project is not self-financed, what kinds of security will a lender accept in lieu of long-term power purchase agreements?
- Is there a role that state funds (like NYSERDA's NYE$) can play in financially securing the project in addition to the performance-based funding?

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