

PG&E NATIONAL ENERGY GROUP'S MADISON WINDPOWER LLC

Taking Green Power for a Serious Spin

PROJECT SNAPSHOT

THE PROJECT

Madison Windpower wind generation project in central New York state.

TECHNOLOGY

Seven 1.65-megawatt Vestas v66 wind turbines

CO₂ EMISSION REDUCTIONS

About 12,100 tons annually

INVESTMENT

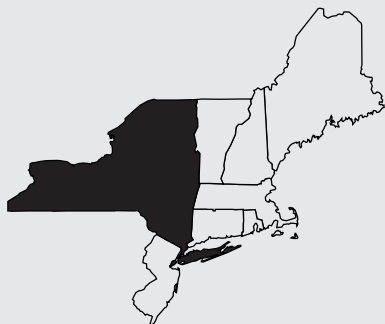
\$15 million

LESSONS LEARNED

- Stakeholder involvement in the development process is vital.
- Renewable energy marketing can be more effective if green power is marketed as two distinct products: real-time energy, and the associated benefits (e.g., avoided pollution).
- More experience is needed in the field of "attribute marketing".

FUNDING SOURCES

PG&E National Energy Group and New York State Energy Research and Development Authority



INTRODUCTION

Our fossil fuel-fired electricity system presents a significant challenge to greenhouse gas reduction. One important strategy is to develop new sources of green power – that is, electricity generated without polluting the air. The search for viable sources of renewable electricity took a major forward stride in September 2000 when officials cut the ribbon at the largest wind-powered electricity plant in the eastern U.S. Located in Madison, New York, the seven-turbine facility was developed by Madison Windpower LLC, a subsidiary of the PG&E National Energy Group. It is one of the first "merchant" wind farms in the eastern U.S. Instead of being financed through a long-term power-purchase contract with a specific electric utility, the Madison windfarm sells its output in New York's competitive wholesale electricity market. The project will serve as a pilot to assess the value of renewable energy in such markets nationwide.

At present, windpower supplies only 0.01-0.02 percent of U.S. electricity demand – the result of difficulty in finding suitable sites, and historically high construction costs. But recent advances in windpower technology have cut production costs significantly. It is fast becoming one of the most competitive renewable sources on the market.

THE PROJECT

A wind turbine is the modern counterpart of the traditional windmill. The Madison Windpower project, located on farmland near Colgate University, between Utica and Syracuse, New York, consists of seven large Vestas American Wind Technology v66 wind turbines. Each is rated at 1.65 megawatts (MW), for a total project capacity of 11.55 MW.¹ The turbine towers are 220 feet tall, with the tips of the blades reaching 328 feet. Total project cost – including development, permitting and construction – is estimated at \$15 million. The New York State Energy Research and Development Authority (NYSERDA) awarded the proj-

ect a \$2 million research and development contract from its New York Energy SmartSM program. The program is funded by the "system benefits charge," a small surcharge to users of the state's electricity transmission and distribution systems that helps stimulate investment in renewable resources and energy conservation. The facility began commercial operation in October 2000.

Energy produced by Madison Windpower is delivered to the New York State power grid. Marketed as environmentally friendly electricity, it is sold at a premium price for eventual resale to consumers. To keep track of something that is inherently hard to monitor (generating electricity into the grid is a little like pouring water into a lake), Madison Windpower has developed an accounting system that separates the electricity actually produced at the windfarm from its environmental benefits. For each megawatt-hour (MWh) generated, the company issues a Pure WindSM certificate. It sells the certificates – each of which verifies that 1 MWh of green power has been produced – to retail suppliers and end users, while it sells the electricity itself into wholesale energy markets. By separating the electricity from its environmental attributes, Madison Windpower can earn a premium for its investment in renewable technology without facing the potentially impossible task of tracking the sale of its electricity through complex wholesale markets. By matching up their Pure WindSM certificates with the electricity they purchase, customers in effect pay a premium for a specific quantity of renewable energy. Regulators throughout the Northeast currently are developing similar systems of transferable "renewable credits."

The first company to step up to the plate and buy Pure WindSM certificates has been Kinko's, the national chain of business service centers. Kinko's is using the certificates to offset up to 50 percent of the energy-related pollution

stemming from the operation of its New York stores. (The Kinko's case study provides additional detail.) Although certificate sales have been slower than expected so far, that is because retail competition in electricity markets is only just beginning, notes Muir Davis, PG&E National Energy Group's Director of Strategy and New Initiatives. The wind certificate program is a novel concept, and retail suppliers have been hesitant to get out in front by marketing the certificates early. Nonetheless, Green Mountain Energy Company, the national green energy retail supplier, recently offered a renewable product in Connecticut containing 5.5% Pure WindSM. To speed things up, Madison Windpower also is targeting end users who seek to promote environmental responsibility – users like Kinko's and the Natural Resources Defense Council, a national environmental advocacy group. Although, as noted, the certificates and the energy are sold separately (“unbundled”), retailers can purchase both energy and certificates from Madison Windpower. Or they can buy the energy from another supplier.² Pure WindSM certificates currently sell for \$40 each and are available at www.purewind.net.

THE RESULTS

The Pure WindSM certificates represent one MWh of green electricity, and that electricity avoids 1,000 pounds of CO₂, five pounds of SO₂, and two pounds of NO_x³ all at a premium of just four cents per kWh. (As a point of comparison, the average retail electricity rate in New York was just over \$0.13 per kWh in 1999.) When winds are between eight and 20 mph, the entire Madison Windpower facility generates enough electricity to serve 10,000 homes. If the windfarm did not exist, New York's fossil fuel-fired generating system each year would emit another 12,078 tons of CO₂, 65 tons of SO₂ and 19 tons of NO_x to make up the difference. Put another way, the windfarm's green electricity represents an energy use reduction of some 61 barrels

of oil per day or the removal of about 1,698 typical cars from the road. The project also provides economic benefits to the local community. These include lease payments to the farmland owners, voluntary contributions to the town (the facility is tax-exempt), creation of new jobs and educational opportunities.

LESSONS LEARNED

The company may have experienced some higher-than-expected development costs due in part to up-front analysis of potential environmental and community concerns such as avian, noise and aesthetic impacts. Bird mortality from collisions with wind turbine blades have historically caused serious concern. But the avian assessment of the Madison windfarm concluded that the site is not the habitat of any endangered or threatened species, nor does it encompass any significant breeding areas or migration corridors. Davis, of PG&E's National Energy Group, is of the view that the time and energy the company spent early on to assess environmental impacts and address citizens' concerns about potential visual and noise issues helped to build significant community support.

Working in newly deregulated electricity industries like those in California and the Northeast has been more of a challenge than expected. Customers as well as retail suppliers remain on what appears to be a long learning curve with regard to competitive electricity markets. In particular, the concept of separating the sale of electricity from its environmental benefits is new. A number of stakeholder groups across the country have been working to refine programs that offer tradable renewable energy credits, and to tell potential customers about the concept. Until credit programs are developed, PG&E National Energy Group's Madison Windpower LLC and other companies are expected to meet with some sales resistance. But, to the PG&E National Energy Group, that makes trail-blazing efforts like the Madison Windpower LLC all the more valuable.

FUTURE COMMITMENTS

The PG&E National Energy Group designed Madison Windpower to test the profitability of renewable energy in today's competitive power markets. Given that renewable energy is a valuable part of its generation portfolio, the company has announced a second windpower project – the acquisition of Mountain View Power, a 44.4-MW facility in California. Mountain View Power is scheduled to enter commercial operation in spring, 2001. When up and running, it too will generate Pure WindSM certificates.

COMPANY PROFILE

PG&E National Energy Group owns or has management interests in 30 operating electric generation facilities, with an additional 10,000 MW of new ones under development. The company's holdings include a number of very clean natural gas-fired power plants and several higher-emitting plants that burn coal. Recently, the National Energy Group has been negotiating with environmental groups and state energy regulators to cut emission reductions at several coal-fired plants in Massachusetts. The company has made a voluntary corporate commitment to reduce greenhouse gas emissions. Although it has not identified a specific reduction target, in 1999 it reported reductions equivalent to 0.3 million tons of CO₂ through projects that include fuel-switching, landfill gas generation, fly-ash reuse and forestry. PG&E National Energy Group also is participating in an emissions reduction pilot program coordinated by the Northeast States for Coordinated Air Use Management (NESCAUM). Finally, it is taking part in EPA's Natural Gas Star Program, is a member of the Clean Energy Group and is a participant in the Pew Center on Global Climate Change. The Madison Windpower project is the corporation's first wind-powered electric generating facility.

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For more information on buying green power, see: www.green-e.org

¹ One megawatt of wind generating capacity provides enough generation capacity to serve the needs of about 825 average residential homes a year, assuming a wind plant capacity factor of 34% and average residential home use of 3600 kWhs a year.

² To avoid double-counting, Madison's Windpower's energy (as opposed to the certificate) cannot be sold at a premium as "green power."

³ All emission reductions cited here are calculated based on New England regional marginal emission rates, provided by ISO New England. See Appendix A for a discussion of these calculations.

CLEAN AIR-COOL PLANET CASE STUDY RATING

This case study reduces CO₂ emissions equivalent to the following:

Avoiding the consumption of 61 barrels of oil per day. (1 barrel = 5 barrels of oil)



OR Taking 1,698 vehicles off the road per year. (1 car = 100 vehicles)



Assumptions: 1,093 lbs of CO₂ per barrel of oil. Vehicles are average passenger cars (approximately 20 lbs CO₂ per gallon of gasoline - 22.5 miles per gallon, averaging 16,000 miles per year)