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Distributed Wind Case Study: Cross Island Farms, Wellesley Island, New York

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Photo from Cross Island Farms, NREL/PIX 19918

Baker and Belding installed a 10-kW Bergey Excel wind turbine in August 2011. *Photo from Cross Island Farms, NREL/PIX 19923*

Installing a small wind turbine can sometimes be difficult due to economics, zoning issues, public perception, and other constraints. Persistence and innovation, however, can result in a successful installation.

Dani Baker and David Belding own Cross Island Farms, a 102-acre certified organic farm on Wellesley Island in northern New York. In 2009, they took their interest in renewable energy to the next level by researching the logistics of a small wind installation on their land to make their farm even more sustainable. According to Baker, they wanted to reduce air pollution as well as be able to make a living off their farm.

"Controlling costs is a big part of that," Baker said. "If we can produce all the power we need without any expenditures, then we can actually live off the profits from the farm."

Step 1: Siting and Assessment

Baker and Belding worked with two developers during this project. Initially they worked with a developer who primarily performed solar installations. Along with siting and assessment work, the company secured a U.S. Department of Agriculture (USDA) Rural Energy for America Program (REAP) grant for the project and navigated local zoning and planning boards. Siting and assessment work included erecting the anemometer tower to measure the wind resource at 60, 80, and 100 feet. The assessment was disappointing: The wind resource was nearly half of the computer projections for the site, and the project would not be economically feasible.

"It went from a project with about a 7- to 10-year payback to a project that looked like it would have an 80-year payback," Belding said.

"We were really discouraged at that point. We kept thinking, 'Isn't there another way to do this, to make it economically feasible?'"

According to Belding, in January 2011, they were referred to a more experienced contractor, Alternative Power Solutions of New York, LLC (APS). APS advised them to increase the project's height from 80 feet to 120 feet to make it economically feasible.

Step 2: Planning and Zoning Board Meeting

Belding said that the only reason the project could be installed at Cross Island Farms is because the property is located in the New York State Agricultural District.

When Baker and Belding first appeared before the zoning board, the officials said that although they were supportive of wind energy, Cross

Funding Summary

- Total cost of wind turbine, including first developer: $82,000
- Total cost of wind turbine, excluding first developer: $73,000
- Total cost of solar: $40,000
- Propane generator: $8,000; including equipment, installation, and propane: $13,000
- USDA REAP grant: $20,506 (~25% of total wind cost, including the first developer's work)
- New York State Energy & Research Development Authority: $34,919 (~50% of total wind cost; also paid 25% of the solar project)
- Baker and Belding will also apply for a federal tax credit
- Payback: Wind turbine 5 years, solar system 10 years (will depend on performance, usage, and electric rates)
- During the project planning process, Baker and Belding had to spend a portion of the total project cost or the project would no longer qualify for USDA REAP funding. At that point they still did not know what the final project would entail, so they chose to upgrade their electrical service. This upgrade was required for net metering regardless of the turbine model selected for the final project.

Warranty and Maintenance

- 10-year manufacturer's warranty for turbine and solar system
- 25-year power guarantee on solar panels

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The system at Cross Island includes a 10-kW Bergey Excel wind turbine, a 5.52-kW SunPower solar array, and a 17-kW propane generator. *Photo from Cross Island Farms, NREL/PIX 19921*

Island Farms is located in a district that would not allow the installation. Baker and Belding's initial consultants had "done their homework," according to Belding. Cross Island Farms lies within a New York State Ag District, and so the board agreed that Baker and Belding could install the turbine.

Because the project height was amended, APS had to appear before the zoning board of appeals. The board of appeals approved the change, and the project moved forward.

Step 3: Construction

The final project at Cross Island Farms consists of:

- One 10-kilowatt (kW) Bergey Excel wind turbine
- 5.52-kW SunPower solar array
- 17-kW propane generator.

Construction progressed as follows:

- July 2011: The installers broke ground, dug the foundation, and poured concrete. The concrete cured for 30 days.
- August 2011: The turbine was installed and tied to the grid by the middle of the month.
- September 28, 2011: The solar array and generator were installed.

System Performance

The initial results of the 10-kW turbine and the solar array have been encouraging. During the turbine's first month online, the farm's energy bill was reduced by half. With the wind and solar combination, Baker and Belding had to pay a $16 standard demand charge required by the local utility to connect to the grid. The combined system generated an excess of 265 kilowatt-hours of electricity in its first month of operation. When excess power is produced by the combined system, it is rolled over into the next month. If the system under-produces, the accumulated excess is used to make up the difference. At the end of each year, measured from the date that the system was connected to the grid, Cross Island is reimbursed by their local utility for any excess power produced.

Lessons Learned

- Choose a developer who has a track record with the technology that you want to use.
- Examine your motives, which will help you plan your project. Do you want to save on energy costs or make a statement by promoting social and environmental sustainability?
- According to Belding, after they were committed to the project, they discovered that grid-connected systems shut down if the grid goes down because of the way the inverters work. "We thought that if the grid goes down, we'd still have our wind and our solar, and that was not the case," he said. They integrated a 17-kW propane generator into the system because the farm has some critical energy needs: freezers and refrigerators for meat and produce, pumps for water, and chargers for electric fences. "We couldn't afford to be without electricity for any extended period of time," Belding said. "It would pose an extreme economic hardship, and if our animals got loose it would cause some pretty bad public relations issues with our neighbors on the island."

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