

## ***CASE STUDY***

### **Jack and Anne Lazor, Butterworks Farm, Westfield, Vermont**

#### ***Installing a Used Wind System to Produce On-Farm Electricity***

The Lazor's dairy farm is located in a very windy site in Northern Vermont, close to the Canadian border, at an elevation of 1,350 feet. The farm was the first organic dairy in Vermont, and is well-known for their high quality yogurt.

The Lazors milk 40 to 45 cows, and for the most part have a traditional farm electrical system, except for one scroll-type compressor that uses about half to a third of the power that a traditional compressor uses. They would have more of these units but they are expensive. The yogurt plant requires quite a bit of power, and, in combination with the dairy, the total farm electricity usage is about 6,000 kW per month.

Jack was inspired to pursue wind power for generating electricity by an article he read a few years ago in *New Farm* magazine. He worked with a private wind power consultant and the Vermont Department of Public Service to put together a wind project for his farm.

While the project ended well, there were some mistakes made along the way. The main one was purchasing a used wind system from a company that was not reputable and did not provide competent technical support.

Before starting the project, Jack received net-metering permission from the Vermont Public Service Board. Net metering means that a farm can send electricity to the grid when they are generating more than their demand, then pull electricity back off the grid when generating below their demand. Net metering makes most on-farm electricity projects more attractive to pursue. See the Vermont rule on net metering at: <http://www.state.vt.us/psb/rules/5100amendedrulettext.pdf>

Jack also wanted to assess the wind potential of his site before buying a wind system. He bought the necessary meteorological tower, but due to weather and ground conditions, was not able to install it promptly. So, based on their observations over 30 years of living at the site, the Lazors decided to go ahead without wind data. "It blows like hell up here" says Jack.

In fact, sometimes it blows too hard. The optimum conditions for generating power with his system would be consistent winds of 15 to 20 mph. Occasionally the wind is too strong, and if there are sustained gusts over 45 mph, and the generator shuts down. This only happens a couple of times a year. And, as Jack discovered, setting the blades too aggressively to catch moderate winds can also cause system problems.

To purchase his wind tower, Jack found a company on-line that reconditions old wind towers then ships them to new owners. He purchased a model V-15 Vestas system that

was made in the mid-1980's, for only \$32,000. He still budgeted twice that amount for the project, to cover installation and modifications.



From the beginning, this system encountered problems. After building a reinforced 4' deep by 21' square concrete base for his new 10,000 pound wind tower, he discovered that the tower's feet did not align properly with the footings he had been instructed to build. He hired a welder to fix the problem.

Next he discovered that the blades were cracked. By the time a specialist from the company that sold him the system had finished repairing the blades, Jack's field had turned to mud. He had to drag a crane through the mud to install the blades. At this point he had a fully assembled wind tower, but it didn't generate any power. The control board that came with the used system was inoperable. Jack switched to a new company – Energy Maintenance Systems (EMS) in South Dakota – to help him solve the problem, and they provided excellent service.

EMS immediately made adjustments to the used equipment and installed some new equipment. Their first recommendation was to replace the generator. Because Butterworks Farm receives single phase instead of three-phase power, the generator required rewiring along with modifications to prevent vibration problems.

EMS also replaced the wind turbine's blades because one from the original set weighed more than the others, preventing them from rotating properly. At first, the new blades were set at an overly aggressive angle so that when winds gusted over 20 mph, the 200 amp breaker blew. A new controller was installed to eliminate that problem.



After many months of fixing problems, Jack's bargain wind tower cost \$102,000, or about triple the original purchase price. Thanks to cost-sharing programs available from the Vermont Department of Public Service in support of wind power projects, it cost Jack about half that amount out-of-pocket.

The system runs a 35 kW generator, producing 3,000-3,500 kW per month, or about 50% to 60% of the farm's electricity during the winter months, and about 10% to 20% during summer months. The farm has a high electricity demand because of the commercial yogurt-making operation. If they only had the dairy, Jack believes his wind system would be meeting all the farm's electricity needs. At current performance and current electricity price of 13.7 cents per kW hour, the projected payback period for the Lazor's portion of expenses (not including Jack's time) on this project is 7 to 8 years.

The farm only has access to a single-phase power line from the utility. If there was access to three-phase power instead, a 65 kW generator would have worked with the same size

tower and blades, nearly doubling the energy production. This may be a common constraint to wind power in rural areas.

Since the original installation and start-up problems were addressed, few additional problems have occurred. There have been some minor issues, such as icing of the external instrumentation. When freezing rain accumulates on the wind vane or the anemometer, the system may shut down, but there is a manual over-ride to deal with this. It is also possible to have heated instrumentation to prevent the problem.

Jack says “I wouldn’t recommend against farmers buying a used wind system, but make sure that the people you buy it from are reputable, and be prepared to rebuild some of the components. Beside this Vestas unit, there’s really no medium size windmill available for farm-scale applications using single-phase power. Most of the available single-phase systems are small, about 10 kW. In general, it seems like in between residential scale and large scale wind farms there are not a lot of equipment options.”

For more information about the basics of wind power systems for farmers and ranchers, see: [http://www.nrel.gov/learning/fr\\_wind.html](http://www.nrel.gov/learning/fr_wind.html).

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