

## ADAPTING A USED WIND POWER SYSTEM TO SUPPLEMENT OUR FARM'S ELECTRICITY SUPPLY

Jack Lazor, Butterworks Farm, Westfield

Jack owns an extremely windy farm in Westfield. He originally wanted to install a grist mill, but discovered that they don't work well in icy conditions. Inspired by an article on wind power from The New Farm (<http://www.NewFarm.org>), he went to Middlebury consultant Tom Halnon and the Department of Public Service to put together a wind project for his farm. He now has operational wind power. The timeline that Jack shared in his talk presents both the basic steps of making a wind project happen and some mistakes that other farmers might avoid.

First, Jack assessed his options. The optimum wind would be a consistent supply at 15-20 mph. Gusts that move too fast (> 45 mph) shut down the generator and, as Jack later discovered, setting blades too aggressively to catch moderate winds can also cause system problems. NRG Systems in Hinesburg will do wind measurements (although Jack chose to trust that he had enough wind). Jack also was able to use his connection to the grid (see Ken Smith for wind power without a grid connection). He received net metering permission from the Public Service Board (Rule on Net Metering: <http://www.state.vt.us/psb/rules/5100amendedruletext.pdf>). Net metering means that a farmer can send electricity to the grid if he is generating beyond his demand at that time, then pull electricity back off the grid when he generates below his demand. Jack also relies on electricity from the grid to start his induction generator.

To purchase his wind tower, Jack found Wind Land (<http://www.windland.com>), a company in Idaho that reconditions old wind towers then ships them to new owners. He purchased his system for only \$32,000. From the beginning, this system encountered problems. After building an extensively reinforced 4' deep by 21' square concrete base for his new 10,000 pound wind tower, he discovered its feet did not align properly. He hired a welder to fix the problem. Next he discovered that the blades were cracked. Wind Land sent a specialist to fix the blades.

Wind Land finished repairing the blades about the same time that Jack's field 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 this achievement did not mean that he had power. The control board that Wind

Land installed was fried and inoperable. Jack switched to a new company— Energy Maintenance Systems (EMS) in South Dakota.

EMS immediately made adjustments to the Wind Land equipment as well as sending new equipment. Their first recommendation was to replace the Wind Land generator. Because Butterworks Farm receives single phase instead of three-phase power, generators require 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. 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 from EMS eliminated that problem.

After many months of problems, and cost shares from the Department of Public Service, Jack's bargain wind tower cost \$102,000 triple the original estimates. It runs a 35 kW generator; a 65 kW generator would have worked with the same size tower if he had access to 3-phase power instead of only single phase. With the smaller generator, Jack draws 60% of his electricity from the wind (he has a high electricity demand because of his yogurt-making operation). Once he solved the original start-up problems, few additional problems have occurred. Only very minor problems, such as icing on the wind vane, have occurred after the prolonged installation phase.

Other wind projects have experienced much fewer initial challenges than the Butterworks Farm experience. Jack hopes that telling those considering a project about what problems to avoid can make the process smoother in the future.