# Site It Right!

## AN INTERVIEW WITH WIND ENERGY CONSULTANT & INSTALLER DAVID BLECKER

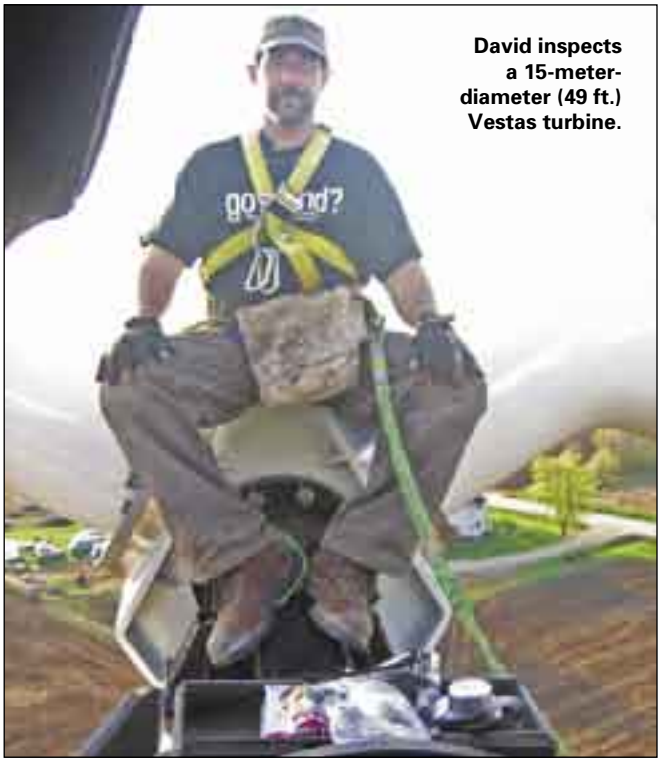
**Interview by Ian Woofenden**



**Determining the height of your wind generator tower and where to locate it are important factors when designing a wind-energy system.**

David Blecker is an electrical engineer by training and a wind geek by passion. He started working on renewable energy (RE) policy in 1990, which indirectly led to putting up his first "met" (meteorological) tower in Alaska seven years later. Since then, he's started a renewable energy business that has installed hundreds of kilowatts (KW) of wind and solar capacity, including the first Proven WT6000 wind turbine in the United States, and remanufactured 65 KW and 90 KW Vestas turbines.

David teaches wind system installation workshops for the Midwest Renewable Energy Association and has been on their board of directors since 1996. He's a member of the North American Board of Certified Energy Practitioners' small-wind installer certification committee and is also heavily involved in the world of RE policy. I asked David to share his insights into wind-electric system siting with *Home Power* readers, and he kindly obliged.



**David inspects a 15-meter-diameter (49 ft.) Vestas turbine.**

**What do you say when a customer first contacts you about using wind energy?**

I take the person through an informal interview process on the phone. I do this for two reasons. One is to begin winnowing the range of available wind system options. Customers are often overwhelmed by turbine, tower, and

balance of system (BOS) options. With a few critical pieces of information, I can narrow the design choices to an understandable few, and begin to specify a system budget for the customer. The questions help me understand how much energy the customers use, when they use it, how much it costs them, who the local utility is, and what the site is like.

The second reason for the interview is to gently align the customer's expectations with the laws of physics. Many people, understandably, come to me with little knowledge of wind turbines and energy. The phone call serves as a quick seminar on KW versus KWH, the costs of different wind turbines, and an explanation of how much energy they can produce. Even if they don't buy a system, my goal is to help people understand wind energy a little bit better.

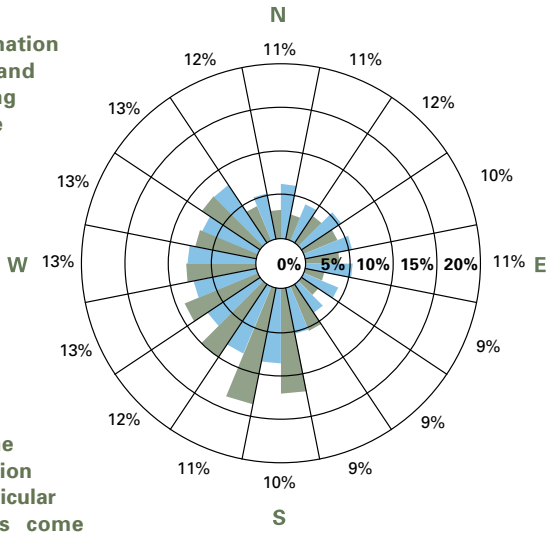
**What are the various methods of evaluating a site for home-scale wind energy?**

From the office, I first look at state wind and topographic maps. If the site is near a long-term wind-speed monitoring site or an airport, I'll look at that data too. If the site looks promising and if the conversation from the interview is positive, I'll make a site visit. It's still always surprising how different a site looks and feels when my boots are on the ground.

Many folks think the purpose of the site inspection is to figure out how a wind system can work at the customer's location. I take the opposite view. I want to know the reasons it *won't* work. The highest value I offer to prospective customers and the wind industry is to keep good turbines from being installed in bad locations.

## Interpreting a Wind Rose

**A wind rose gives information about the wind speed and frequency of wind blowing from various directions. The length of each "spoke" around the circle is related to the frequency of time that the wind blows from a particular direction. Each concentric circle represents a different frequency, from zero at the center to increasing frequencies at the outer circles. You can analyze a wind rose to determine the prevailing wind direction and frequency. In this particular example, prevailing winds come from the south-southwest.**




**Survey Dates:** 12/4/2003 – 12/4/2005 (10-minute intervals)
**Location:** Elkhorn, Wisconsin
**Elevation:** 1,027 ft.
**Height:** 164 ft.
**Outer percentages represent average time intervals when wind speed exceeds 10 mph**

**This tree's branches show the phenomenon of flagging—growth deformities caused by strong winds.**

**An anemometer (right) and a wind vane (left) measure wind speed and direction.**

**The size range of residential-scale wind turbines—a microturbine (in hand) next to a 31-foot-diameter turbine suitable for a large home or ranch.**

**How do you decide whether it's worth the expense and time of installing a recording anemometer or datalogger to determine the wind resource at a given site?**

For small wind systems (100 KW and smaller), there is no good reason to do site-specific monitoring. Even a short (30 m; 98 ft.) met tower installation can cost more than US$7,000. I'd much rather see a customer put that money into a taller tower or a datalogging system to evaluate their installed system's performance. The only reason to monitor a site pre-installation is to predict turbine production costs down to the fraction of a penny. But 99.9 percent of all residential wind projects are built because the owner *wants* to harvest energy from the wind. If a homeowner's motivation is pure economic return, I give them a copy of the *Wall Street Journal* and wish them well.

**Do you recommend using vegetation as an indicator of a site's wind resource? What other nontechnical indicators do you use?**

Absolutely! If the trees on a site show flagging—deforming of their branches from wind—there's no question that a viable wind resource exists. However, the absence of flagging does not mean an absence of wind! Flagging only occurs when winds blow consistently from one direction. Even Class 5 high-wind sites will not show flagging if the wind direction changes a lot.

I also try to talk to hunters, crop duster pilots, and farmers. Folks who spend a lot of time outside know if it's windy and where.

**What about print and Web resources for wind data? Are they useful and accurate for individual sites?**

At this point, just about every state with a reasonable wind resource has been "mapped." The U.S. Department of Energy's Wind Powering America Web site is a great place to start (see Access). Your state energy office or public service commission may have wind maps as well. I caution people to view the maps critically. First off, wind is really site specific. A wind map may show an area as having a great resource, but a particular site might be sheltered by a ridge, located in a valley, or deep within a stand of 100-foot-tall evergreens. Many of the older wind maps don't have fine enough resolution to capture this kind of detail.

You also have to understand that all wind maps are computer-generated models based on a limited set of information, and as such they are inherently limited. On the other hand, my sense is that the newest supercomputer wind resource models being developed (by WindLogics and AWS Truewind, for example) are reasonably accurate even at the micro level.

**What do the average wind-speed numbers really mean? Is knowing the average wind speed at the local airport useful?**

Good questions! Average wind-speed data can be really useful if it is from a valid source. By that I mean a nearby site with similar exposure to the prevailing winds, with similar topography and similar vegetation. To be valid, the average should also be calculated from at least hourly recordings.

Your local Federal Aviation Administration office can be a real help in finding out how the averages were determined. If you know the average wind speed, you can make a reasonable estimate of a turbine's annual energy production based on a manufacturer's published performance data. To be safe, I usually derate the estimate by 20 percent to avoid creating false expectations.

**How do you decide the proper height of the tower? What's the difference in a wind generator's output at "X feet" and "X + 40 feet"?**

Because the power in the wind is proportional to the cube of the wind speed, small changes in average wind speed mean big increases in available wind power. Ground clutter (trees and other vegetation, buildings, etc.) all reduce wind speed and cause more turbulence. This robs a turbine of its "fuel."

We also know that wind speed increases with elevation. Tall towers let us "reach" up to higher wind speeds and less turbulence. A turbine mounted on a 120-foot tower will produce about 30 percent more energy per year than one on an 80-foot tower! More important, turbulence really pounds the snot out of blades and bearings. Your turbine will last a lot longer and you'll have lower maintenance costs if it's installed on a taller tower. In summary, use the tallest tower you can, use the tallest tower you can, and use the tallest tower you can.

**Do you have any general advice about turbine selection and sizing?**

I've met a lot of people who want to install the biggest turbine they can afford and then pay for their kids' college fund by selling excess electricity to the local utility. Sadly, we still have to work within the constraints of a skewed economic system, where the true cost of grid energy is not reflected in our utility bills. The typical rates paid by utilities for excess wind energy will not send anyone out for a grande espresso, let alone college. So, my advice is to pick the turbine that will most closely produce as much electricity as you use in a year. This provides the highest value by offsetting retail-rate grid purchases while minimizing excess energy sell-back.

**How do you decide whether it's "worth it " to install a wind turbine?**

Wow. Tough question. Most folks who decide to own a turbine do so because of the perceived value of clean energy, self-reliance, protection against utility rate hikes, and because they *like* wind energy. For me, the biggest question is, will I still feel good about selling a turbine to this customer ten years from now? The answer depends on the customer's expectations, the site, and the turbine.

**What do you predict for the future of home-scale wind energy?**

I'm excited and optimistic about the future. Looking at the technology, we're seeing new turbines coming to the market from Southwest Windpower and Abundant Renewable Energy, to name two. These machines are based on state-of-the-art designs for performance, reliability, and construction, and I hope they will enjoy great success in the field.

On the policy front, we're seeing more utilities and co-ops adopt progressive tariffs that support customer-owned renewables. Recently in Wisconsin, We Energies, our largest utility, changed its wind net-metering tariff to increase the allowed wind generator size from 20 KW to 100 KW!

Finally, none of this happens in a bubble. The cost of fossil fuel is going up, which means higher electric rates for all consumers. Not to sound callous—I know higher energy costs are hurting people and businesses—but every utility rate hike reinforces people's awareness about the opportunities for wind and solar energy to make a real difference for our environment and our pocketbooks.

**Any closing sage advice for folks contemplating their first wind-electric system?**

Their *first* wind system? Well, if the system is designed, installed, and maintained properly, it should be their *only* wind system! I guess it comes down to this: There are a thousand reasons *not* to generate your own electricity from the wind, including significant economic, utility, and zoning barriers. But at the end of the day, we face certain truths: Fossil fuels are a limited energy resource, our current electric generation methods are compromising the rights of our children to inherit a healthy planet, and the cost of grid electricity will continue to go up.

Renewable energy gives us the ability to change this balance of power. We can make and use clean energy in our neighborhoods, on our farms, and at our businesses. We know that when all the costs are factored in, renewables *are* more economical than burning coal or splitting atoms, and we can feel good about it.

If you're considering wind energy, I say bully! Wind energy is both remarkably simple and amazingly complex. So do your homework. Talk to people who live with turbines, take a workshop, and go to an energy fair. Understand what wind energy can do and what it can't. An educated consumer is the wind dealer's best friend. And when your system is up and running, take the time to sit back and enjoy watching it spin!

## Access

David Blecker, PE, Seventh Generation Energy Systems Inc. • 877-229-9201 or 608-424-1870 • Fax: 866-762-7496 • info@seventhgenergy.org • www.seventhgenergy.org

Interviewer: Ian Woofenden, PO Box 1001, Anacortes, WA 98221 • ian.woofenden@homepower.com

"Apples & Oranges 2002: Choosing a Home-Sized Wind Generator," Mick Sagrillo, *HP90*

"Wind-Electric Systems Simplified," Ian Woofenden, *HP110*

"Wind Generator Tower Basics," Ian Woofenden, *HP105*

NRG Systems wind measurement systems • www.nrgsystems.com

RENEW Wisconsin's Small Wind Toolbox • www.renewwisconsin.org/wind/windtoolbox.html

**Wind Data:**
Wind Powering America • www.eere.energy.gov/windandhydro/windpoweringamerica/wind_maps.asp

National Wind Coordinating Committee • www.nationalwind.org/resources/state.htm

National Oceanic & Atmospheric Association • www.ncdc.noaa.gov/oa/climate/online/ccd/wndspd.txt