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SMALL TURBINE COLUMN:

FAQs: What you need to understand about a wind turbine for your home

by Mick Sagrillo

With the explosion of new wind turbines on the market due primarily to the rising cost of energy and lucrative state renewable energy programs, I am getting bombarded with questions about whether a particular wind turbine is a "good buy." Most of these questions are triggered by yet another rooftop wind "solution to the energy crisis." Regardless, there are some fundamental understandings that most callers lack. Following are answers to a few of the most often repeated questions:

I can buy this small wind generator to put on my roof. Will it power my house?

The short answer is probably not, unless your only electrical load is an exit sign.

First of all, you need to understand that any wind turbine you install on your roof or attached to your house must be small by design. Otherwise it will damage the structure of your roof or house, with potentially dire consequences to you home as well as your homeowners' insurance premiums. A review of rooftop wind turbines available will verify the fact that all of these turbines are small by design, although the web sites and sales literature will not specifically point this out.

All renewable energy generating devices have some sort of a collector that converts the renewable resource to something we find usable. A solar water heating panel converts sunlight to hot water. A standard solar hot water panel size is about four feet wide by eight feet long, making the area of the collector 32 square feet (4 x 8 = 32). One solar water panel can "collect" a certain amount of sunlight and as a result "generate" a certain amount of hot water. If you put up two panels, you have double the size of the collector, effectively doubling the amount of sunlight you can collect and therefore the amount of water you can heat. The lesson here is that the output, in this case hot water, is directly proportional to the size of the collector.

The same is true for a wind turbine, but in this case the collector is the spinning rotor, made up of a number of blades that rotate to turn the electrical generator. Small blades result in a small rotor diameter, which translates into a small collector area, which further translates into small amounts

of generated electricity. A small rotor simply cannot generate large amounts of electricity—this is fundamental physics.

Well then, what size wind generator do I need?

My response to this is "what size vehicle do you need?" If you are a commuter in the city, a small car may suffice. If you have a soccer team that you transport nightly, or a boat or camper to haul on the weekends, a larger SUV, van, or pickup truck may be in order. If you move entire households of furniture from state to state, you may need a semi truck. In short, your vehicle size is dependent on your needs.

In order to answer this question, you must have an idea of how much electricity you consume on a monthly or, better yet, annual basis. Your historic electric consumption for your household can be gotten from your utility. Typically, you size the wind turbine to offset your annual electric consumption. Consumption dictates size. To paraphrase Ian Woofenden at *Home Power* Magazine, if you tell us you consume a lot of electricity, we will tell you that you need a big wind turbine.

However, the most cost-effective way to power your home is not to buy a larger, and therefore, more expensive wind turbine, but to examine how your electric bill got to be so high in the first place. It is always cheaper to use electricity efficiently, conserving where appropriate, than it is to generate large amounts of electricity that are squandered by energy wasting appliances. Replacing your existing appliances with their most energy efficient counterparts is always more cost effective than installing a larger wind turbine.

For example, the average non-all-electric home (that is, one that not only uses electricity but other energy sources such as gas or LP) in the U.S. consumes about 1,000 kWh of electricity per month, or about 12,000 kWh per year. Depending on your wind resource and the tower height required to get the wind turbine above the trees, a wind system sized to generate this amount of electricity could easily cost $60,000 to $80,000 installed. If you were able to reduce the amount of electricity you require by retrofitting with high efficiency appliances so that you were only consuming 650 kWh per month, you could easily shave $20,000-$30,000 of that cost. As a benchmark, you would be hard pressed to spend even $20,000 to replace all of your major electrical appliances (refrigerator, dishwasher, microwave, air conditioner, all lighting, plus other large energy consumers) with their high efficiency counterparts. To quote the founder of *Home Power* Magazine, Richard Perez states: "Every $1 spent on energy efficiency saves at least $3 in renewable energy system costs."

So, will a wind turbine work at my house?

The only way of knowing if a wind turbine will work at your house is to have an understanding of what your wind resource is at your location. This is not a question about if it is ever windy there—it is probably windy during storms, but that is merely an observation about the weather. What you want to know about is the long-term average wind speed for your area, or historic climate data, not day-to-day weather.

The amount of electricity that a wind turbine can generate is a function of how much wind you can "collect." If you can consistently collect medium to high winds, you will generate much more electricity than if high winds are a rare occurrence only associated with thunderstorms. So living in an area with a good wind resource is important to the success of your wind system.

And equally important is being able to access that wind resource. If you want to float down a river on a raft, you need to be in a part of the river with strong currents. If you are in a protected cove off to the side and isolated from the river current, you may bob around a bit, but you will not make much headway down the river.

Similarly, in order for your wind system to actually generate electricity, your wind turbine must be situated in such a place where it can access the flow of the wind. This is why wind turbines are installed on towers that rise high over the surrounding trees and buildings in an area. Tall towers are necessary to gain access to the flow of the wind. Installing your wind system on a tower shorter than the area's tree line, or, worse yet, on top on your roof, is akin to floating in a sheltered cove of a river: you may occasionally bob a bit but there will be little forward progress. There is simply little energy in low winds that you can convert into usable electricity. Do you want kinetic yard art or a wind electric generator?

But the neighbors might object and say they don't want to look at it. If so, can I install it on a short tower or my roof?

The only two responses to this are: (1) you have a lot of educating to do with your neighbors to get them onto your side and not oppose your wind project, or (2) install a photovoltaic (PV) system instead.

The most difficult thing to do at a zoning hearing is battle over aesthetics. You cannot win these arguments. If you could, we'd all be wearing identical clothes. This is why good art is not created by committee.

The worse thing you can do is to "compromise" by installing the wind turbine on a tower too short for your site or on your roof as a gesture to your neighbors. Doing so will still cost you considerable dollars for the wind system, but with little to no electrical output.

Remember, do you want yard art or electricity?

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