



E³A: Small Wind Energy Applications for the Home, Farm or Ranch

Steps in the Small Wind Series

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Basics of electrical consumption

Small wind systems generally make electricity for use in a home, farm or ranch. Understanding how electricity is used can help you know the difference between power and energy.

Most electrical devices measure power in watts. Power usually refers to an instantaneous measure, and energy refers to power produced over time. Watt is a measure of power and watt-hour is a measure of energy. A light bulb with a 100-watt power rating will use the energy of 100 watt-hours if it is turned on for one hour.

In most homes, electricity from an electrical utility is measured in kilowatts on a meter read by the utility. It records the energy in kilowatt-hours used during a billing period and the customer is billed for that amount. According to the U.S. Energy Information Administration, the average Missouri home used 13,344 kilowatt-hours in 2011.

The turbine in a small wind system may be described in terms of its power, but the actual energy generation is measured in kilowatt-hours. In small wind, the terms power and energy often are used interchangeably.

What is a small wind turbine?

There is no common definition of small wind. Small wind is usually defined by the electric utility, and most utilities limit the size of wind turbine they will allow net metering. Most Missouri utilities define small wind as having a generating capacity of fewer than 50 kilowatts. Grid-connected home systems typically have a generating capacity of three to 10 kilowatts. Consult your utility company to find out how small wind is defined in your area.

Off-grid systems and batteries

A small wind system not connected to an electric utility is called an off-grid system. Off-grid systems are common when it is prohibitively expensive to connect to an electric utility, often due to a remote location. Off-grid systems are more complex because they require batteries to store energy. Off-grid systems require you to consider total electrical use of your home, battery systems and backup generation. Consult a qualified system designer when considering an off-grid system.

Net metering

Most small wind turbines are designed for net metering, which is offered by utilities to allow people to connect their wind turbines to the electric utility to offset energy use. In some states, net metering and interconnecting your generator to the utility are managed as two separate processes. Many homeowners choose to remain connected to a utility because a small wind generator may not supply all of the electricity used by the home. Maintaining a connection to the utility supplements electricity production from the wind turbine. The amount of energy used is tracked on a special electrical meter. When the wind turbine produces more electricity than is used, the meter spins backward. At the end of a billing period, the customer pays the net amount to the utility. The net is the difference between the amount of utility energy used and the amount of energy produced. It is not meant to generate income, only to credit you for the energy you produce.



Photo credit: DOE NREL

Common myths about net metering

MYTH: I will be paid for any excess electrical generation.

REALITY: In Missouri, excess production is purchased by the utility at wholesale rates. Standards vary by utility.

MYTH: One turbine will offset all electrical consumption on my property.

REALITY: This is only true if all electrical consumption is tied to one meter and there's one turbine per meter. For example, a rural farm with a meter for the home, one for the shop and three for irrigation water would have to consolidate all of the meters into one or install multiple wind turbines to offset their entire consumption.

MYTH: I will run my electrical system in the summer and then use a whole year's worth of wind energy to credit that account for a smaller total utility bill.

REALITY: This depends on the billing period used by your utility. This occurs most commonly in irrigation systems. The irrigation system operates in the summer, but the best wind generation occurs throughout the year. In an annual adjustment period, the total amount of wind power generation for the year can be used to offset electricity used for irrigation. Check with your utility to find out their rules before buying any wind turbine equipment.

MYTH: I can use my existing kilowatt-hour meter.

REALITY: Most meters have to be converted to be used for net metering. Some utilities provide this meter; others will ask you to pay the expense. Ask your utility.

MYTH: If the power from the utility goes out, I will still have power from my wind turbine.

REALITY: This is only true if you also have a battery storage system. Otherwise, when the power from the utility goes out, so does the power from your wind system. Grid-connected systems disengage from the grid during a power outage to protect utility workers when they are repairing the utility system.

Your electrical consumption

The first step in buying a small wind system is to determine your electrical usage. Contact your local utility and ask for a 12-month electrical use history in kilowatt-hours for your home. Some utilities provide this history online or in your monthly statements. You also need to find the cost per kilowatt-hour. When you have your energy information for one year, fill out Table 1 to calculate the number of kilowatt-hours used and the average cost per kilowatt-hour for the 12-month period.

Your utility can provide estimates based on energy use for similar homes in the area if you are planning new construction or an off-grid system.

Table 1. My electrical consumption.

Month	Kilowatt-hours	Cost	\$/kWh
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			
Total			

Understanding your consumption and opportunity

Evaluate your utility statement to understand how a small wind system would change your bill. There are a few common mistakes to keep an eye out for:

- Not all charges can be offset with a small wind system. Some utilities have a base charge assessed to all customers. There may be system demand charges for high seasonal or monthly power usage that may not be offset with a small wind system. Ask your utility to explain which charges might be offset before purchasing a small wind system.
- When calculating your average cost per kilowatt-hour, pay attention to how much of the total cost is the actual cost of electricity, which you can offset, and how much of the cost comes from base fees, demand charges and other fees that cannot be offset. If, for example, your total cost per kilowatt-hour were \$0.10, but half of that cost came from fees that cannot be offset, you would only be offsetting costs of \$0.05 per kilowatt-hour. The cost of electricity is a significant consideration in conducting economic analysis.

- Does your utility allow you to consolidate meters if you have more than one? Some utilities only allow one wind turbine per meter.
- Look for seasonal swings in use. This is important if your bill settlement, or true up, period is monthly.
- Talk to your utility about future electricity costs. Some utilities are sensitive to price increases. Others have long-term contracts and know their energy costs many years into the future. Cost of energy can be a significant factor when looking at the economic value of a small wind system.



Photo courtesy of DOE NREL

References

U.S. Department of Energy. (2011, March). EIA Consumption Price and Expenditures Estimates. *State Energy Database*. Retrieved April 12, 2011, from <http://www.eia.doe.gov/states/seds>



Notes

Original work created by Montana State University Extension and the University of Wyoming.
Adapted with permission by University of Missouri Extension.



■ Issued in furtherance of the Cooperative Extension Work Acts of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture. Director, Cooperative Extension, University of Missouri, Columbia, MO 65211 ■ an equal opportunity/ADA institution ■ 573-882-7216 ■ extension.missouri.edu