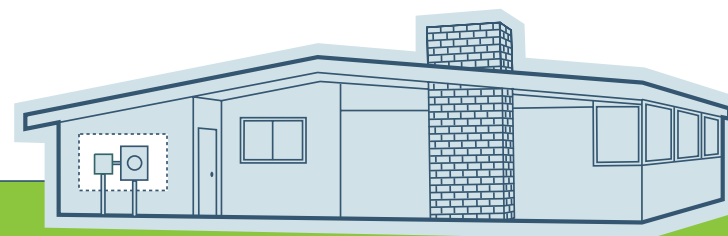
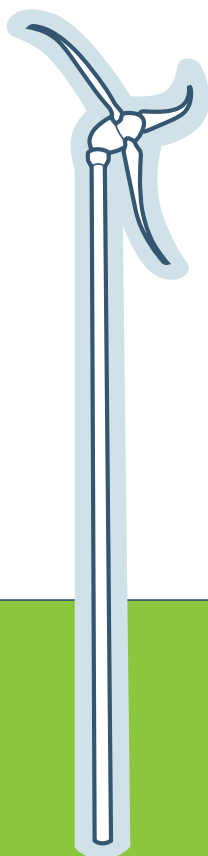
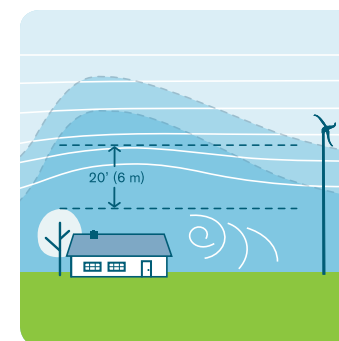


SITING WIND GENERATORS

This guide can help you decide if a residential scale wind generator is right for you.





INTRODUCTION

Is Wind Right for you? Wind generators are an effective source of renewable energy in many areas across the world. The American Wind Energy Association estimates there are as many as 13 million homes in the United States with a viable wind resource.

To make sure a small wind system is right for you, there things to consider:

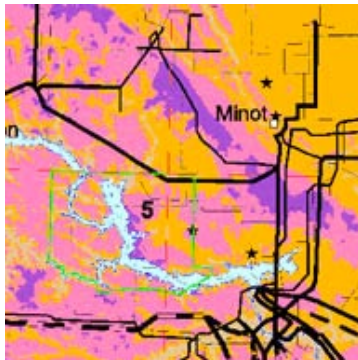
- You have at least 10 MPH (4.5 m/s) average wind speed. Best results at 12 MPH (5.4 m/s) or more.
- Your property is unobstructed from tall buildings and trees. Ideally, you should have .5 acres or more
- The local zoning allows a structure that is at least 42 feet (12.8 m) tall (see “Getting Connected Consumer Guide”)
- Your local utility has an existing interconnection agreement (see “Getting Connected Consumer Guide”)

Once you have determined you have the right conditions for a wind system, you will need to consider the best place on your property. Proper siting is critical to the performance and longevity of your investment. It can make the difference between years of trouble free operation or continuous frustration.

This guide is a precursor to investing in a small residential scale wind generator. Whether your reason for investing is because of your concern for the environment, helping reduce foreign fuel imports or pure economics, we at Southwest Windpower want to make sure you get the most from your wind generator. Before making any investment in small wind, be sure to review this guide carefully, ask lots of questions and once you feel confident, call your dealer.

DETERMINING YOUR WIND RESOURCE

“Do I have enough wind?” is often the first and most asked question. Generally, if you feel like you have a very windy site, you most likely have a good place for a wind system. It is always a good idea to do your homework just to make sure. Wind resources can vary from place to place. There are several places you can go to assist you.



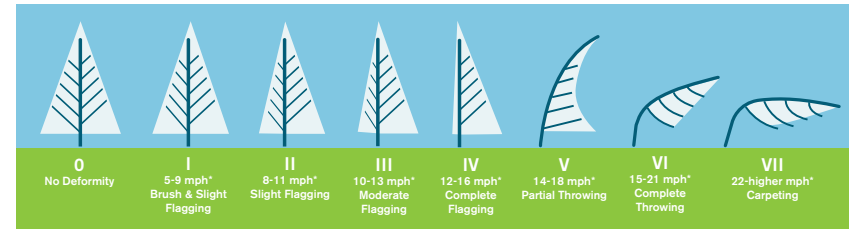
The U.S. Department of Energy recently developed a series of high resolution wind maps for much of the United States that will give you a good idea what your wind resource is at your location. Keep in mind, these maps are about 80 percent accurate and estimate the wind resource at about 150 feet (46 m) off the ground. Winds decrease the closer they are to the ground. You

want to make sure the location of your property on the map is in a Class III wind or better. These maps have a resolution of +/- 1 km (0.7 mile).

To find the map of your state, go to www.skystreamenergy.com (click on “Will Skystream Work for Me?”).

You may also obtain wind data from your local weather station, university or even television station. Airport data is not recommended. Airports are generally located in lower wind areas (valleys) and their measurement techniques do not produce good data.

If wind maps or local data doesn't work, another method is looking around and observing of the deformation of vegetation and trees on



Griggs-Putnam Index. *Probable mean annual windspeed. Data prepared by E.W. Hewson, J.E. Wade, and R.W. Baker of Oregon State University

and around your property. The Griggs-Putnam Index was a scientific study that looked at how wind deformed vegetation to determine the wind resource at a particular site. Compare the drawing above with your own property to determine your wind resource.

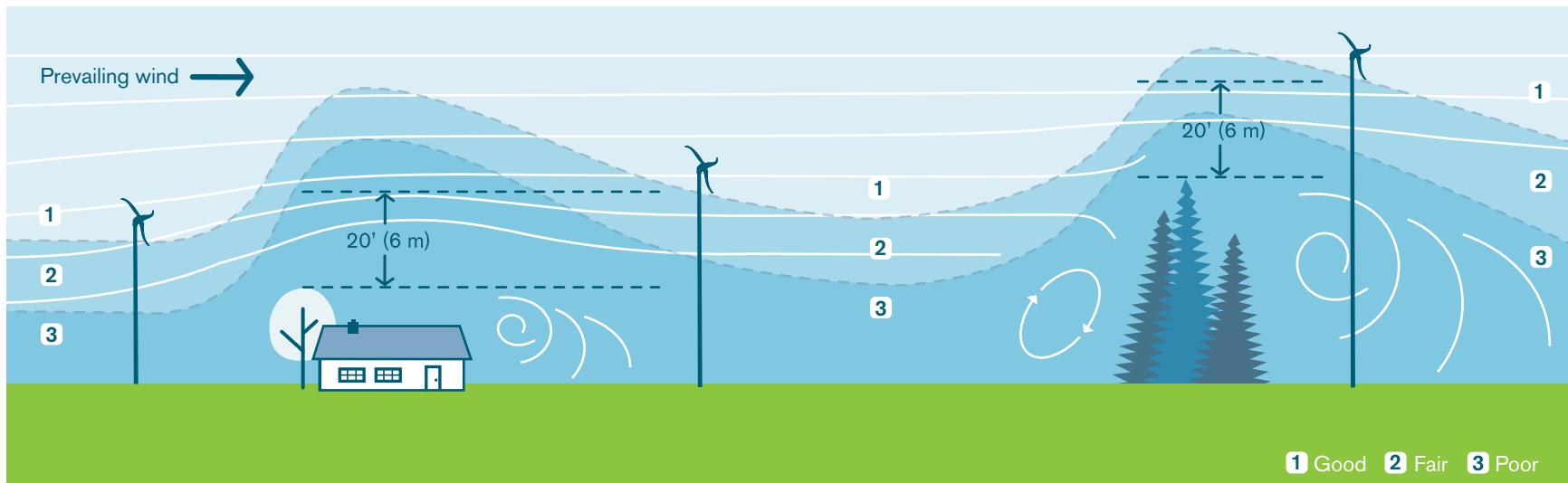
The last resource is conducting an actual wind resource assessment. This is by far the most accurate way of doing a site assessment but it is also the most expensive and time consuming. It involves the installation of a small tower on your property with 1-2 anemometers and a data collecting logger. Companies such as Second Wind offer such hardware and then charge a monthly fee for consolidating the data and generating a report.

Keep in mind that many Southwest Windpower dealers also perform site assessments.



Should I meter my site?

Generally, no, the cost of an accurate data logging system can be almost as much as a small wind system. Hand-held anemometers only measure the reading at arm's length and certain times of the day. They do not give an accurate overall wind speed for your site at the height that you would install.



SITING

Once you have determined you have a good wind resource, you will want to site your wind generator in the most optimum place.

The ideal position for a wind generator is a flat open space with good wind from at least one direction (known as the prevailing wind direction), a coastline, or a smooth hill top with an open area in the prevailing wind. The wind speeds up significantly near the top of the hill and the air flow should be reasonably smooth and free from excessive turbulence.

Excessive turbulence or “bad wind” causes fatigue damage and shortens a generator’s working life. When siting, keep away from local obstructions such as large trees and houses, or use a taller tower to ensure that the generator is well above the obstructions. Wind speed also increases with height so it is best to have the generator

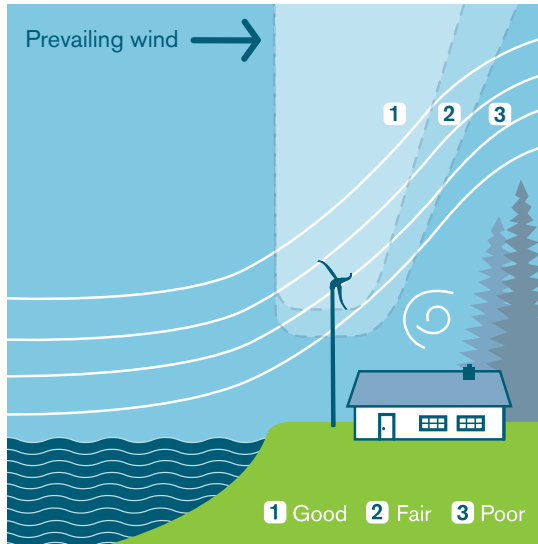
as high as your zoning laws and investment payback will allow. It is recommended to site your generator at least 20 feet (6 m) above any surrounding obstacles such as trees or buildings in a 250 foot (76 m) radius (see general siting image above).



What is the “best” site?

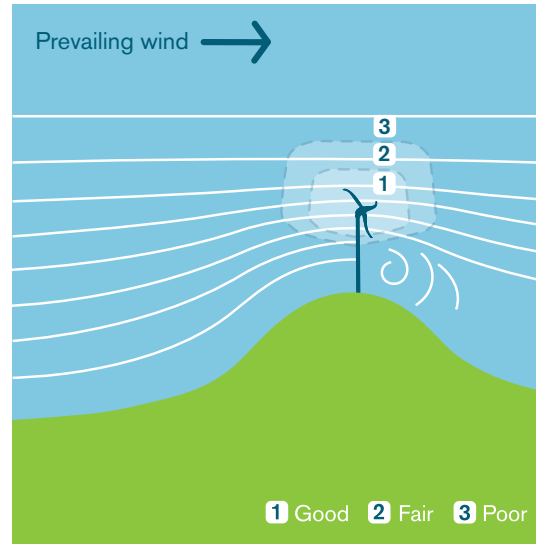
Wind resource is not the only consideration when siting. Components such as taller towers and running large amounts of wire—more than 500 feet (152 m) from your site—can add significant costs to your wind system. You will need to balance energy achieved in the best wind site over the cost of installation to determine the best overall placement of your system.

A-typical siting Considerations



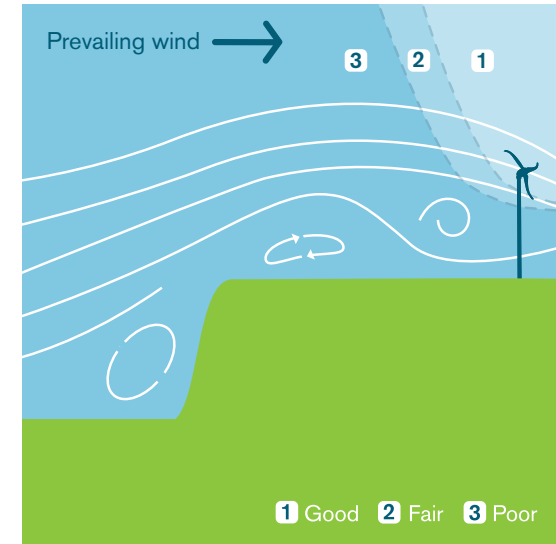
Coastal or Lakeside

Very strong prevailing winds typically blow from the ocean. If this is the case, it is very important to install your wind generator as close to the coastline as possible. Trees and taller structures can be down-wind from the wind generator.



Ridge Tops

Wind compresses as it blows over the top of a hill, increasing the wind speed. With proper placement, you may be able to use a shorter tower. We never recommend anything shorter than 33 feet (10 m). It is important to follow the general rule; that is the tower must be at least 20 feet (6 m) above any surrounding object.



Plateau/Mesa

Winds may be very turbulent running off a cliff causing wind shears. It is important to site the generator far enough from the cliff to avoid turbulent wind.

TOWERS

Because wind speeds increase with height, a residential wind generator is mounted on a tower. The tower also raises the generator above the air turbulence that can exist close to the ground because of obstructions such as hills, buildings, and trees.

Tower Height

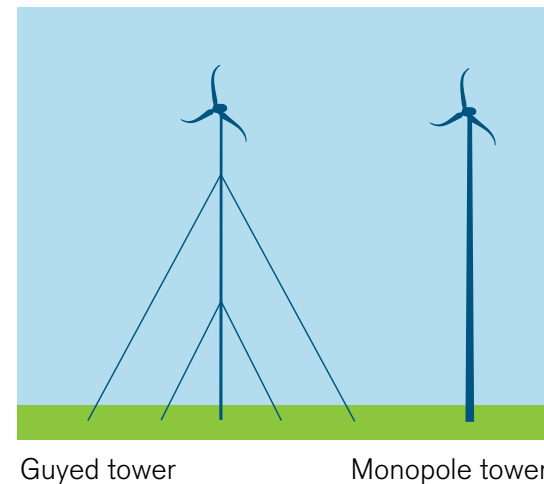
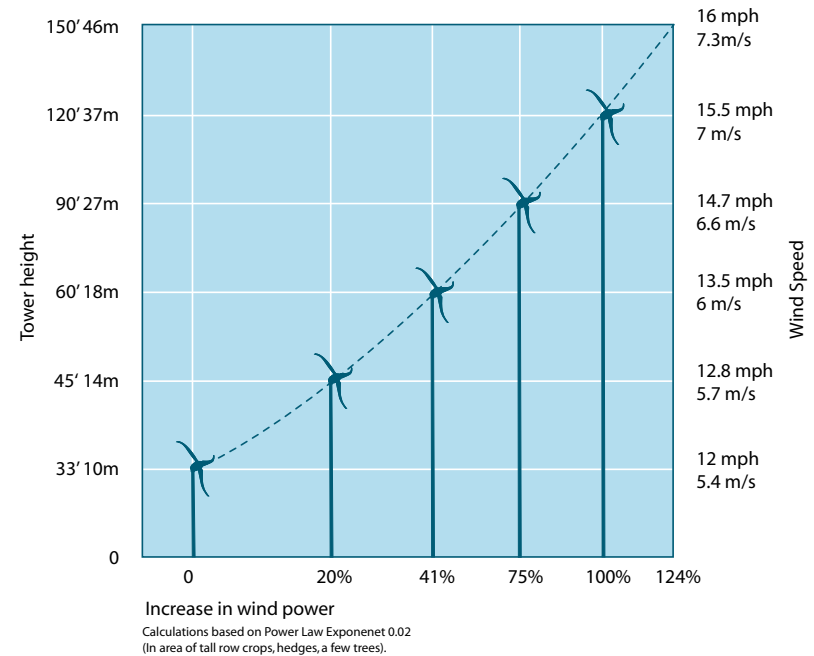
Your wind resource will be cleaner and stronger the higher you go. The taller your tower, the better your energy output. However, taller towers will increase the cost your installation and may not be allowed in some areas. While you should install your system in the tallest tower allowed, it is best to evaluate your overall energy and cost payback before investing in taller towers (see diagram at right, top).

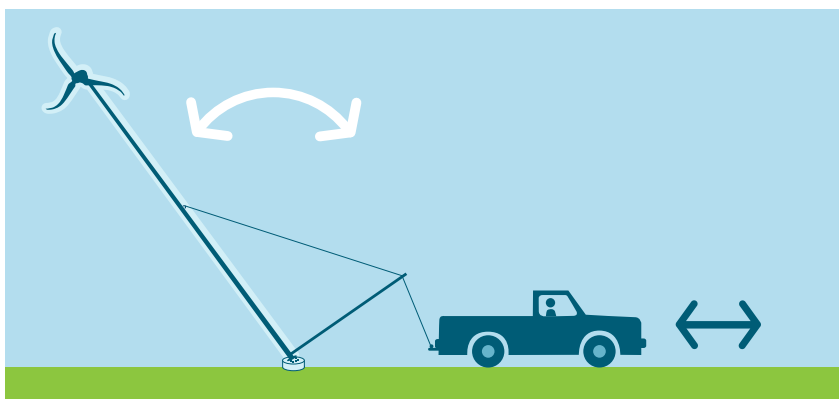
Types of Towers

The two most common types of towers are guyed and monopole. Both are available in various designs. Some can be tilted-down for easy access while others require a crane for installation and service (see diagram at right, bottom).

Guyed towers are less expensive than monopole towers. However, because the guy radius must be one-half to three-quarters of the tower height, guyed towers require enough space to accommodate them.

Monopole towers are more expensive but they offer the consumer an easy way to perform maintenance. Monopole towers can be lowered to the ground during hazardous weather such as hurricanes (see diagram on next page). Aluminum towers are prone to cracking and should be avoided.





Using a pickup to raise and lower a monopole tower.

Installation or Mounting

A general rule of thumb is to install a small wind generator on a tower with the bottom of the rotor blades at least 20 feet (6 m) above any obstacle that is within 250 feet (76 m) of the tower, 25 feet (7.6 m) to the hub.



Can I mount this on my roof?

Mounting small wind generators over 500 watts on rooftops is not recommended. Larger residential home wind generators vibrate and transmit noise to the structure on which they are mounted. This vibration can lead to noise and structural problems with the building. Mounting on the rooftop can also expose the generator to excessive turbulence that shortens its life.

RECAP

- 1 **Determine if you have enough wind** for a wind generator and the best resource on your site.
- 2 **Try to have clear, smooth access** to the prevailing wind, e.g. over open water or smooth ground. If possible site the generator on a smooth hill.
- 3 **Mount the generator on as high a tower as possible and well clear of obstructions**, but do not go to extremes. Easy access will be required for erection and foundations for the tower may be needed depending on the size and tower type. Remember, higher towers will add cost to the system that may not be countered by the energy output achieved. It is also important to ensure that the wind generator can be easily lowered for inspection and maintenance.
- 4 **Consult your local council** as to whether you need planning permission. You should try to minimize the environmental impact of the generator, and it will be helpful to inform your neighbors of your plans at early stage.
- 5 **If planning an interconnected system, consult with your utility** to obtain an interconnection agreement.