

“Do I have a good site for wind power?”

Wind-powered battery-charging systems can be cost-effective if the average wind speed is nine miles per hour or more at the location of the wind generator. If you are using wind in combination with photovoltaic power, it may be cost-effective if good wind is available only during part of the year. When the wind speed doubles, the power delivered is eight times as great. Most wind generators are designed to deliver maximum power at a wind speed of 30 mph. At 15 mph, they will deliver about 1/8 their rated power. A wind generator should be mounted at least 20 feet

higher than any obstruction within 300 feet to avoid turbulence. The power output of a wind generator will decrease roughly 3% for every 1000 feet of elevation. If you measure wind speed at ground level, you can expect about 1.5 times the wind speed 30 feet up, which equates to about three times the power. At 120 feet above the ground, wind speed will be twice what is measured at ground level and power output will be more than twice the output at 30 feet, and about 6 times the output at ground level.

Measuring Wind Speed

If you do not have a wind gauge, you can get a rough idea of wind speed from the table below.

Wind speed	Wind effect
0-1 mph	Smoke rises vertically
2-3	Direction of wind shown by smoke drift but not by wind vanes.
4-7	Wind felt on face; leaves rustle; ordinary wind vane moves
8-12	Leaves and twigs in constant motion; wind extends a light flag
13-18	Raises dust, loose paper; small branches are moved
19-24	Trees in leaf begin to sway; crested wavelets form on water
25-31	Large branches in motion; whistling heard in power lines

Kestrel

1000 Pocket Wind Meter

The Kestrel 1000 measures instantaneous, maximum and average wind speeds. Measurement unit options are knots, meters per second, kilometers per hour, miles per hour, feet per minute and Beaufort. Just hold it up to measure wind speed. Large, easy-to-read liquid crystal display with +/-3% accuracy. Measure down to 0.3 m/s.

Impeller and protective housing pop out for easy and inexpensive replacement. Includes slip-on hard case that protects the impeller, buttons and display from damage in your pocket or toolbox. It is waterproof and it floats. The replaceable battery provides 400 hours of use. One-year warranty.



Description	Item code	Price
Kestrel 1000 pocket wind meter	016-00253	\$85
Kestrel 1000 replacement impellor	016-00255	\$19

APRS

Wind Data Loggers

The Wind Data Logger is designed to provide an affordable and easy-to-use solution for wind site evaluation and wind generator performance. It records wind speed, as well as the time and date directly to a Secure Digital (SDTM) card to provide convenient data downloads. An inexpensive 128 megabyte SDTM card will store weeks of data at 30 second intervals and months of data at longer logging intervals. Microsoft Excel, OpenOffice.org, or practically any spreadsheet program can be used to view, graph, and analyze your wind data. Web-based software that makes your analysis even easier is provided. Simply upload your data and our software will automatically plot the data as well as provide basic statistics. It is in comes in a waterproof enclosure.

The solar powered models come with a 10-watt module, a side-of-pole mount for the module and a 7 amp-hour battery. The AC model operates on 90 to 264 VAC or 125 to 370 VDC and does not come with a solar module and battery. The #40R anemometer is a rugged, extra heavy duty version of the 3-cup anemometer.



Description	Item code	Price
APRS 6060 wind data logger - solar powered	016-00270	\$1,125
APRS 6063 #40R wind data logger - solar powered	016-00271	\$1,200
APRS 6061 wind data logger - AC Powered	016-00273	\$890
APRS 6064 #40R wind data logger - AC Powered	016-00274	\$976

Towers

Wind generators can be mounted on freestanding towers designed for antennas. They require a large, engineered concrete base for support, but since they do not require guy wires, they can be installed in a smaller space. Guyed steel truss towers, also designed for antenna mounting, are less costly and require a large area for guy wire placement.

A tilt-up pole tower is the most economical and the easiest to install. Wiring and mounting of the wind generator are done before the tower is erected. No climbing is necessary. Steel tubing can be purchased locally to save freight.

Skystream 3.7

The Southwest Windpower Skystream 3.7 is a residential wind generator that hooks up to your home to reduce or eliminate your monthly electrical bill. It's the first all-inclusive UL Recognized wind generator (with controls and inverter built in) designed to provide quiet, clean electricity in low winds. The Skystream is ideal for residential homes and small businesses. They are available for 120, 240 and 208 VAC operation and come with a monopole or sectional monopole tower or a kit for assembling a guyed tower with locally purchased pipe and anchors.

Skystream connects directly to your home. When the wind is blowing, your home is powered (in part) by Skystream; when it's not, your home is seamlessly powered by your utility, as usual. During periods of strong winds, Skystream can actually produce excess electricity. Depending on your utility, your meter will spin backwards – giving you credit for a later date. Estimated energy production is 400 kWh per month in areas that averages 12 mph windspeed.

If your site fits the following criteria, Southwest Windpower's Skystream 3.7 may work for you:

- At least 10 mph average wind speed (best results at 12 mph or more)
- Your property is at least a half acre and has unobstructed views
- The local zoning allows a structure that is at least 42' tall
- Your utility has an existing interconnection agreement for homeowners

With a rated capacity of 2.4 kW, Skystream can provide anywhere from 40 to 100 percent of the total energy needs of a household or small business. Its sleek, distinctive 12-foot diameter swept-wing blades and elegant form make Skystream an attractive addition to any home. With a guyless tower, Skystream blends in like a neighborhood street lamp. And because it operates at a low rpm, Skystream is as quiet as the trees blowing in the wind. 5-year limited warranty.

An optional two-way remote display unit lets you control your Skystream from up to 1000 feet (300 meters) away. You can also monitor performance and download energy performance data to your personal computer via USB converter.

To order, use the Item Code Determination chart below to get the item code for the Skystream you want to order. Skystream pricing is in the table to the right. Prices include Skystream 3.7, tower, Skyview monitoring software, and Skylevel uptower kit.



Tower type	Tower height	Land price	Marine price
Monopole	33 ft.	\$7,685	\$8,330
	45 ft.	\$8,520	\$9,164
	60 ft.	\$13,353	\$13,998
Guyed tower kit	30 ft.	\$6,298	\$6,942
	42 ft.	\$6,375	\$7,020
	70 ft.	\$6,812	\$7,457

Chose digits from each section to get part number											
Item Code Determination Chart	Base part number	Land	Marine	Tower Height (feet)			Single Piece	Sectional	Voltage		
Monopole Tower	016-1	1	2	33*	45*	60*	1	2	-120	-240	-208
Guyed Tower Kit	016-1	1	2	30	42	72	3		-120	-240	-208

Example: A Marine Skystream and 45' Sectional Tower for 240 volt operation is 016-12452-240

* 33-ft tower available as single piece only; 45-ft available as single piece or sectional; 60-ft available only as a sectional.

Model	Description	Item code	Price
SMarT Foundation kit 33" & 45'	Complete Foundation kit including Anchor bolts for 33' and 45' Monopole Towers	016-01402	\$1,280
SMarT Foundation kit 60' Tower	Complete Foundation kit including anchor bolts for 60' Monopole Tower	016-01404	\$1,280
32" Foundation bolt kit	Includes bolts and bolt template for 33-ft monopole tower on mat foundation	016-01010	\$565
42" Foundation bolt kit	Includes bolts and bolt template for 33-ft, and 45-ft tower on pier foundation	016-01009	\$658
42" Foundation bolt kit	Includes bolts and bolt template for 60-ft monopole tower on pier or pad-pier foundation	016-01020	\$658
Gin pole kit for monopole	Gin pole and hardware for 33' 6" monopole Tower Only	016-01011	\$364
Hinge plate kit for monopole	Hinge plate and hardware for 33' 6" monopole Tower Only	016-01012	\$322
Gin pole kit for 45' sectional	Gin pole and hardware for 45' 0" sectional monopole towers	016-01114	\$364
Hinge plate kit for 45' sectional	Hinge plate and hardware for 45' 0" sectional monopole towers	016-01115	\$322
Remote interface kit, 916 MHz	Includes wireless display, antenna and AC adaptor	016-01015	\$341
Skystream software utilities kit	Includes remote to USB adaptor and software	016-01016	\$99
Tower adaptor kit (5")	Includes aluminum casting and hardware to attach Skystream to Whisper 500 guyed tower kits or any 5" Schedule 40 pipe	016-01017	\$139
Battery charging controller kit	Includes battery voltage sensor and antenna (required for all battery charging)	016-01018	\$255

Southwest Windpower

The Whisper 100 and 200 from Southwest Windpower are shipped in a 24-volt configuration, but can easily be changed to 12, 36, or 48 volts by the installer. The included controller is adjustable for use with 12-, 24-, 36- and 48-volt battery systems and the voltage can be adjusted for any battery type. The control can be set to stop the blade from spinning when the battery is fully charged, avoiding wear when power is not needed. The control has a "selectable silent mode" setting that allows the user to select any specific period to automatically turn the wind turbine on or off. Whisper 200 is also available with nominal 120V and 230V output.

An optional digital display may be added to the control to display total kilowatt hours, peak amps, and peak and average wind speed. To measure wind speed, the optional wind speed sensor must be ordered. Use NRG model #40 anemometer available at: <http://www.nrgsystems.com/>



All Whisper generators have a 5-year warranty.

Whisper 100 Wind Generator

The Whisper 100 is designed to operate in a site with wind speed averages of 12 mph and greater. It delivers 900 watts peak power at 28 mph (12.5 m/s). It can provide 100+ kWh per month, 3.4 kWh per day, in a 12 mph average wind speed location. The 100, with its 7 ft. (2.1 m) rotor diameter and 40 sq. ft. swept area, is rugged enough for extreme environments. The Marine version is sealed and powder-coated for use in coastal and nautical environments.

Whisper 200 Wind Generator

The Whisper 200 is designed for the user who lives in low to moderate wind speed averages (less than 12 mph). The bigger brother to the 100, the 200 features a 10 ft (3.1 m) 3-blade rotor diameter and an 80 sq. ft. swept area that provides the user with greater output at low wind speed averages. The 200 has twice the swept blade area, providing double the potential energy, compared to the 100. It delivers 1000 watts peak power at 28 mph (12.5 m/s), but has a higher output than the 100 at lower wind speeds.

Whisper 500 Wind Generator

The Whisper 500 is a 3000-watt rated turbine that will deliver in excess of 500 kWh per month in a 12 mph wind. This machine has a 14-foot, 2 blade rotor providing 500 sq. ft. of swept area. It features a handmade fiberglass and foam core blade for smooth, high efficiency operation and low wind start-up. It also incorporates the patented "angle governor" design for quiet operation in high winds. The 500 is an excellent machine for village power projects, farms, ranches, backup power and remote homes with large energy demands. The Whisper 500 comes in two boxes and is shipped truck freight. Available in 24- and 48-volt DC versions.

Description	Weight	Item code	Price
Whisper 100 w/ charge controller	73 lbs	016-01154	\$2,495
Whisper 100 w/o charge controller	70 lbs	016-01155	\$2,240
Whisper 100 Marine w/ charge controller	80 lbs	016-01162	\$2,760
Whisper 200 w/ charge controller	85 lbs	016-01180	\$3,015
Whisper 200 w/o charge controller	80 lbs	016-01181	\$2,780
Whisper 200-120 volt w/o charge controller	80 lbs	016-01199	\$2,780
Whisper 200-230 volt w/o charge controller	80 lbs	016-01198	\$2,780
Whisper 200 Marine w/ charge controller	90 lbs	016-01189	\$3,195
Charge controller display for 100/200/500	1 lb	016-01211	\$105
Whisper 500 w/ charge controller 24V	310 lbs	016-01144	\$7,810
Whisper 500 w/ charge controller 48V	310 lbs	016-01145	\$7,810

High voltage (HV) generators and transformers available for long distance applications. Call for info.

Towers

A tilt-up pole tower is economical and easier to install. Wiring and mounting of the generator are done before the tower is erected. No climbing necessary. Purchase steel tubing locally to save freight.

Whisper 100/200 Tower Kits

Whisper 100/200 tower kits come in 24' (7.2m), 30' (9m), 50' (15m), 65' (19.5m), and 80' (24m) heights. Each tower kit comes with all hardware necessary to install a tower, except guy supports, pipe and cement. All parts bolt or clamp together and no welding is required. These tower kits use 2-1/2" (63.5mm) CQ40 fence pipe or Schedule 40 water pipe. Actual O.D. is 2.875" (73mm).

Whisper 500 Tower Kits

Whisper 500 Tower Kits are available in 30' (9.1m), 42' (12.8m) and 70' (21.3m) heights. Uses 5" Schedule 40 pipe.

Earth Auger Sets

Screw-in auger-type guy anchors can be used in loamy and gravelly soils. Other soil types may require concrete footings or expansion bolts. Use 36" and 48" augers with Whisper 100/200 installations and 48" and 60" augers on Whisper 500 installations. Consult an engineer or geologist if you have questions about guy supports. Do not use these auger sets with Whisper 500 towers.

Description	Item code	Price
Whisper 100 & 200 24' guyed tower kit	016-01083	\$364
Whisper 100 & 200 30' guyed tower kit	016-01089	\$585
Whisper 100 & 200 50' guyed tower kit	016-01095	\$812
Whisper 100 & 200 65' guyed tower kit	016-01098	\$1,072
Whisper 100 & 200 80' guyed tower kit	016-01101	\$1,268
Whisper 500 30' guyed tower kit	016-01110	\$1,164
Whisper 500 42' guyed tower kit	016-01104	\$1,268
Whisper 500 70' guyed tower kit	016-01107	\$1,788
36 Galvanized auger set of 4 - 24' 27' towers	016-01116	\$182
48 Galvanized auger set of 4 - 32' 50' towers	016-01122	\$214
60 Galvanized auger set of 4 - 65' 80' towers	016-01125	\$280
Whisper 100/200 60 amp brake switch	016-01227	\$75

Southwest Windpower

AIR X 400W and AIR Breeze 200W

Wind Generators

The AIR Breeze, introduced in 2007, is the next generation of the AIR X turbine. Both are available in land and marine versions. The quieter AIR Breeze features newly designed blades and higher power output at wind speeds below 12 MPH. Because of its increased efficiency at lower wind speeds and advanced blade design, the AIR Breeze is the best choice for small wind applications unless average wind speed is well over 12 MPH.

The Marine versions are corrosion-proofed for use in coastal and nautical applications. A white powder-coated housing and sealed electronics prevent damage from salt spray.

All units weigh 13 lbs, have a 46-inch rotor diameter and come with a 3-year warranty. The AIR Breeze is rated at 200 watts at 28 MPH wind and the Air X is rated at 400 watts at 28 MPH wind. A stop switch is included with the Marine versions; it can be ordered separately (016-01351; \$33) for the Land versions.

Volts / Use	AIR X		AIR Breeze	
	Item code	Price	Item code	Price
12V Land	016-01032	\$699	016-00985	\$699
24V Land	016-01035	\$699	016-00984	\$699
48V Land	016-01037	\$699	016-00986	\$699
12V Marine	016-01050	\$879	016-00987	\$879
24V Marine	016-01053	\$879	016-00989	\$879
48V Marine	016-01055	\$879	016-00990	\$879

AIR-Industrial Wind Generators

The Air-Industrial is capable of resisting the harsh environments that generally accompany mountaintop telecommunication sites, environmental monitoring sites and off-shore oil platforms. It has specially formulated blade material that can stand up to sub-zero temperatures, and its blades are spaced farther from the tower so that it can operate at sustained winds up to 130 miles per hour. Maintenance-free performance, easy installation and high power output make the AIR-Industrial ideal for any remote battery-charging application. The AIR-Industrial does not have an internal controller, so an external controller must be installed on the battery bank. The recommended external controllers are Morningstar TriStar TS-45 or TS-60, or a Xantrex C40. Set controller in "diversion load" configuration and add an air- or water-heating diversion load (see page 137). 3-year warranty.



Description	Item code	Price
AIR403 12V Industrial w/o controller	016-01056	\$905
AIR403 24V Industrial w/o controller	016-01062	\$905
AIR403 48V Industrial w/o controller	016-01074	\$905

AIR Tower Kits

AIR tower kits are available in roof mount, 27' (8.1m) and 45' (13.5m) heights. These kits are Professional Engineer Certified (PE Certified). Each tower kit comes with all hardware necessary to install a tower, except guy supports, pipe and cement. All parts bolt or clamp together and no welding is required. Purchase 1-7/8" steel tubing from chain link fence supplier. Roof mounts include vibration isolators, wall brace clamps and a safety leash, but do not include pole or lag screws.



Earth Auger Sets

Screw-in "auger" type guy anchors can be used in loamy and gravelly soils. Other soil types may require concrete footings or expansion bolts. Consult an engineer or geologist if you have questions about guy supports.

AIR Shutoff/Circuit Breaker

This interlocked pair of 60-amp circuit breakers protects wind-generator-to-battery wiring and allows you to disconnect and stop the wind generator for service. UL Listed breakers and NEMA 1 enclosure. For indoor mounting only. Can be used with all AIR-X wind generators.



Description	Item code	Price
AIR Marine tower hardware kit	016-01128	\$220
9' AIR Marine aluminum mast and 2 stays	016-01131	\$234
Roof kit without roof seal	016-01134	\$120
Roof kit with roof seal	016-01137	\$137
Roof seal – for roof mount kit	016-01140	\$65
27' AIR guyed tower kit (AIR only)	016-01086	\$190
45' AIR guyed tower kit (AIR only)	016-01092	\$310
29' EZ Tower kit including pipe and anchors	016-01081	\$573
36" Auger – set of 4; use with 24' & 27' towers	016-01113	\$129
36 Galvanized auger set of 4; for 24' & 27' towers	016-01116	\$182
48 Auger set of 4 32' - 50' towers	016-01119	\$140
48 Galvanized auger set of 4 32'-50' towers	016-01122	\$214
AIR Shutoff/circuit breaker	016-09003	\$172
30 amp circuit breaker kit	016-01225	\$26
50 amp circuit breaker kit	016-01226	\$26
100 amp circuit breaker kit	016-01222	\$59
Amp meter kit	016-01223	\$30
Stop Switch for Land Versions	016-01351	\$33
Diversion load for Air Industrial	016-01078	\$135

American Zephyr

Airdolphin Wind Generators

Zephyr combines advanced wind turbine technology with Japan's world-renowned manufacturing craftsmanship, to successfully develop the Airdolphin wind turbine — a next-generation, low-mass wind turbine which instantly adapts to changing wind conditions, from slight to stormy.

The total weight of the Airdolphin is 17.5 kg (38.5 lbs). Unlike larger turbines, the Airdolphin's low mass allows it to be mounted on existing structures like remote telecommunication towers, transmission line pylons and billboards, as well as near roads, railways and airports. Even factory and urban rooftops can become cost effective locations for producing usable electrical power.

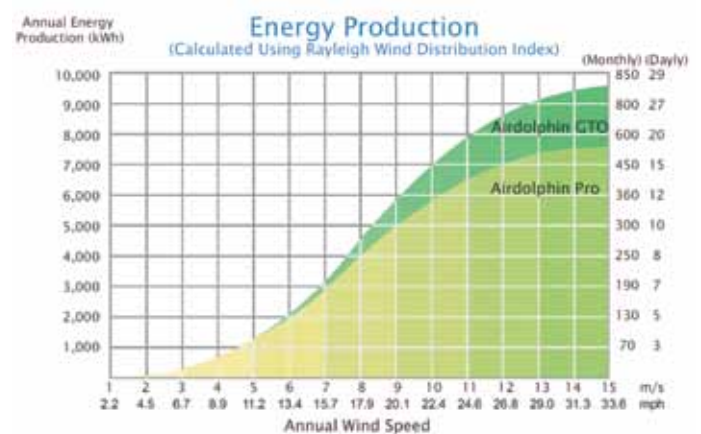
The blades of each Airdolphin are created with Zephyr's patented SD blade technology (noise reduction ridges). Their designers were inspired by the feather patterns of owl wings, which allow owls to fly in silence. This technology applies a series of thin ridges to the surface of each blade, creating micro vortices to keep the airflow attached to the airfoil longer than conventional blades, thus reducing decibel count.

Intelligent Power Management System

By realizing constant blade rotation speed, operation of the wind turbine has been made much more silent and secure. Their original and patented technology maintains uniform rotor spinning speeds while encountering turbulent gusts found in cities or raging winds at remote locations. These attributes are crucial for small wind turbines because they are often installed in cities where turbulence is caused by tall buildings. When the wind speed increases beyond 20 m/s (44.7 mph), the Airdolphin continues delivering output power at a reduced rpm eliminating the need for cut-out entirely. The intelligent power management system inside the turbine achieves its outstanding performance by software driven microprocessors including control firmware, an internal battery charge controller monitoring voltage and charging rates in a variety of climatic conditions, a web interface, and data logging functions.

Zephyr wind turbines are built with bolt-less self-fitting body parts, inspired by Japanese traditional block puzzle craftsmanship. This technique ensures an exact fit and provides superb resistance to adverse weather conditions, greatly minimizing maintenance requirements. All units come with a 5-year warranty.

24-volt and 48-volt battery charging models have built in charge controllers. The grid-tie GTO has a 250 VDC output and requires a separate grid tie inverter. Zephyr recommends using an SMA 3000US or 4000US inverter for grid tie applications. All turbines mount on a 1.5 inch Schedule 40 pipe. Maximum pipe diameter is 1-15/16 inches.



Airdolphin model	Wind turbine description	Item code	Price
Z-1000-24	Mark-Zero 24 VDC 1000-watt charger	016-03011	\$5,995
Z-1000-48	Pro 48 VDC 1000-watt charger	016-03013	\$5,995
Z-1000-250	GTO 1000-watt 250 V for grid-tie	016-03015	\$5,995
Airdolphin model	Accessory description	Item code	Price
RM-1000(E)-24	Remote monitor for 24 volt turbine	016-03020	\$1,495
RM-1000(E)-24	Remote monitor for 48 volt turbine	016-03022	\$1,495
RM-1000(E)-24	Remote monitor for 250 volt turbine	016-03024	\$1,495
Monopole tower - 30 foot		016-03041	Call
Monopole tower - 45 foot		016-03043	Call
Monopole tower - 60 foot		016-03045	Call
Monopole tower - 100 foot		016-03049	Call