Small wind generators for boats

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Today’s cruisers carry so much electrical equipment that wind turbines, solar PV arrays, and hydro-generators are becoming more and more common. The marine wind turbine has been around for several decades now and has gradually been refined to give a much higher degree of efficiency. Better alternators, CAD-designed blades, life-sealed bearings, and smart charge controllers make the latest devices more reliable, quieter, and safer.

The majority of marine wind turbines are horizontal axis devices, either upwind or downwind driven. These are powerful and, as such, need speed and/or charge output limiters, or they can burn out the batteries and self-destruct in storm-force winds. Vertical axis turbines are more suited to trickle charging - usually connected to one or two batteries up to 200Ah capacity. The blade design means they are unidirectional and thus have no need for a bulky tail fin to point them into the wind. They are also considerably quieter than most horizontal turbines and much easier to mount and install.

Modern turbines usually sport a one-piece, cast aluminum body and, commonly, three aerodynamically designed plastic/composite blades. One of the first of these models, the original Air-X, worked exceptionally well, particularly in high winds. However, it was so noisy that neighboring boats frequently complained, leaving the owner the option of turning it off or moving well away from other boats. Since then, CAD-inspired blade design has significantly helped to reduce ambient noise levels, although none could be termed silent.

Once your battery bank is fully charged, additional energy from the turbine needs to be dissipated, or the turbine stopped. Low power vertical-axis models don’t usually produce enough to warrant fitting a regulator, but the more powerful models all need some form of charge limiter to prevent overcharging. The simplest form of regulation is to switch it off when no further charge is needed. If you electrically disconnect the turbine, however, it can either damage the alternator diodes or carry on spinning at an even higher speed, so most are electrically ‘braked’ by shorting out their output wires, and a high-current switch is usually provided for this action.

If you leave a turbine running unattended, you’ll need an automatic regulator, and there are two systems commonly available. The first lets the turbine continue to spin and produce power, diverting any that isn’t needed into ‘dump’ resistors to burn off the excess as heat. While effective, it is pretty rudimentary, and you have to be careful where you mount the bulky resistors, which can get quite hot. Alternatively, some use this unwanted charge to pre-heat the hot water tank via an immersed element. Other turbines incorporate ‘pitch control’, comprising feathering blades that either flatten out or turn edge into the wind to regulate turning speed at high wind speeds.

A variety of automatic charge controllers are available, some more sophisticated than others, and you don’t necessarily need to use one from the same manufacturer unless it specifically states that you

must. A basic model has a voltage-sensitive on/off switch that will trigger at a pre-set threshold battery voltage. The more useful controllers have a built-in display for monitoring turbine output and battery condition. Some can also accept and distribute charge from other sources, such as solar or hydro generation.

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The Auecoor Solar Wind Hybrid System is the best system to hook your boat/sailboat with. It is a hybrid system that utilizes both solar and wind power generation. This system is highly efficient, it is designed to withstand heavy wind loads, and it is ready to install on a boat/sailboat. They also produce many models to serve your needs, from 500 Watts all the way up to 2000 Watts in optimal weather conditions.

All models come with a 400-Watt wind turbine generator, and then you can add as many 120-Watt high-conversion, waterproof and flexible solar panels as you need. This unit is also pretty easy to install. The solar panels are easy to transport, and they come with pre-drilled holes for easy installation. This is my personal favorite kind of setup and the one that I believe is the best for any serious boater. It provides 2 renewable sources of power that guarantee that whether you are making a passage or liveaboard in a nice beach somewhere, you will have dependable power as if you were living connected to the grid.

Although the latest generation Air Breeze, made by Primus Windpower, provides an increased charge output, it is also quieter and should apparently outlast its predecessors. Its low start-up speed (4.2kn) means that, on average, it should be able to produce more energy than some higher-rated turbines over long periods of low-to-moderate wind speeds. Though it only has a maximum output of 200W, its output has been optimized to provide a more constant charge in typical northern European and Mediterranean wind conditions. The new Air Breeze weighs less than 6kg and has an integral electronic charge controller and over-speed regulator, rendering bulky dump resistors unnecessary and making installation considerably quicker and easier.

The latest in the Rutland wind turbine line up, the 1200, is Marlec’s answer to the third generation three-blade, permanent magnet turbine models. More powerful than the 914i, it features a ‘Tri-namic’ blade design, which is said to provide a low start-up speed, very quiet running, and more power towards the top end of the wind scale. With a claimed peak production of 483W (that’s 35.5A at 12V) in 29 knots of wind, the 1200 can also supply a very useful 40W of power in just 10 knots of wind - a more realistic average in most waters.

The 1200’s charge controller has dual outputs for two separate battery banks and can accept up to a 20A solar PV supply. It reduces the turbine speed automatically after winds reach 30 knots, regulating the charge without using dump resistors. It also has an integral start/stop switch and can support a remote display, which connects to the controller via a simple Ethernet cable.

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