

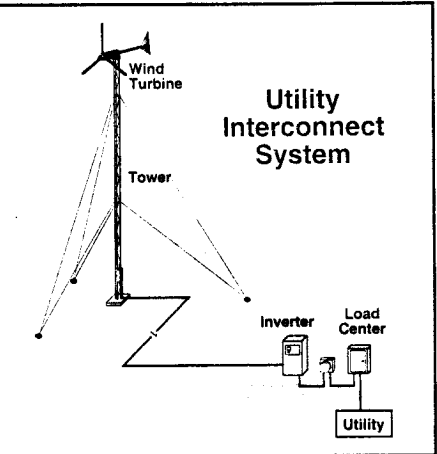
BERGEY WIND TURBINES

Bergey wind turbines are modern wind-driven generators designed for high reliability, low maintenance, and automatic operation in adverse weather conditions. They benefit from more than eighteen years of Bergey Windpower R&D, production, and the delivery of wind turbines to all fifty states and more than sixty countries around the world. They incorporate the latest technologies in aerodynamics, structures and electronic control systems. BWC wind turbines are available in three sizes: 850 watts, 1500 watts, and 10 kilowatts (10,000 watts).

Cost effective, simple to install, and built to last, Bergey wind turbines set the standard against which other windpower systems are judged.

UTILITY INTERCONNECT

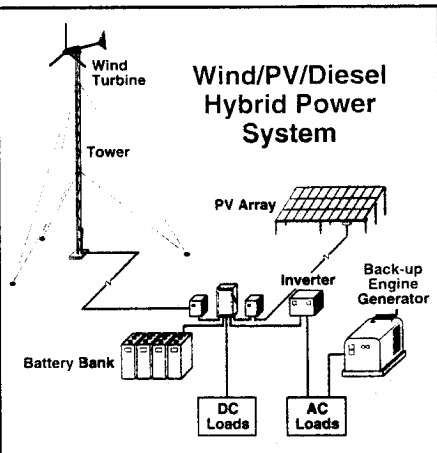
For homes (or businesses) that are served by utility power, wind turbines can be used to reduce utility bills. In such applications, the home is served simultaneously by the wind turbine and the utility. When the wind turbine



is generating power, the current is fed into the home through a synchronous inverter that converts the turbine power into a form that is compatible with the utility power. The electric meter is slowed down by the amount of power being generated by the wind. If the wind is providing more power than is being used in the home, the meter will actually turn backward in states that permit "net billing". In other states, excess power is sold back to the utility company.

BATTERY CHARGING

The BWC wind turbine designs allow them to charge batteries in remote locations. The bat-



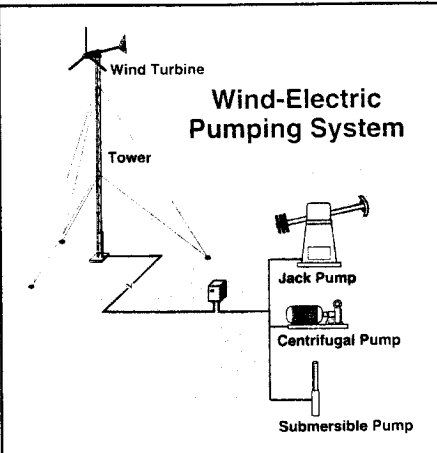
teries can operate DC loads directly. With a stand-alone inverter, they can provide alternating current for AC appliances. All BWC turbines can be combined with photovoltaic (PV) cells or gas/diesel generators to satisfy specific power needs. Hybrid wind/PV systems are particularly attractive because the daily and seasonal outputs for each source tend to be complementary.

WATER PUMPING

The three-phase output of the BWC wind turbines enables them to drive three-phase motors directly. The motors operate in synchronization with the turbine rotation. The variable rpm is well suited to water pumping. Standard off-the-shelf pumps and motors can be used. The control system is simple, requiring no batteries or inverters. The wind turbine can be located at the best energy site, which may not be directly over the well.

SITING

Since the output of a wind turbine is a function of the **cube** of the wind velocity, the average wind speed at the installation site is extremely important. For example, an increase in the average wind speed from 11 mph to 14 mph can double the output of a wind turbine. Anemometer data, tree flagging and the performance of nearby wind systems can help in evaluating the site. Obstacles and turbulence tend to reduce power output. Whenever possible, the wind turbine should be placed at least 10 m (33 ft) above obstructions within a radius of 100 m (330 ft). Cliff-side installations should be avoided because of extreme turbulence.



SIMPLE DESIGN

BWC wind turbines have been thoroughly tested and refined to eliminate all unnecessary parts. Incorporating direct drive, passive controls, special bearings, and extensive corrosion protection, BWC units do not require any scheduled service. A simple annual inspection is recommended.

LOW SPEED PM ALTERNATOR

The power generating systems used in all BWC wind turbines are based on permanent magnet alternators that are driven directly by the rotor. With no gearbox, there is no need for regular oil changes or gearbox replacement. The fixed stator design also eliminates the need for commutators or brushes in the alternator.

POWERFLEX® ROTOR

The patented POWERFLEX® rotor system provides the performance of variable pitch blades with the simplicity of fixed pitch blades. It combines torsionally flexible blades with precisely located pitch weights near the tips. Aerodynamic and centrifugal forces act together to twist the blades toward the best angle for each wind speed. The fiberglass blades are exceptionally strong and fatigue resistant. An extra-stiff blade option is available for use at unusually severe wind sites.

AUTOFURL® OVERSPEED PROTECTION

BWC wind turbines are designed to survive in wind speeds up to 54 m/s (120 mph). At wind speeds of about 15 m/s (34 mph), the AUTOFURL™ system turns the rotor partially out of the wind through a unique application of aerodynamic forces and gravity. It does not rely on brakes, springs, or other devices. When the high winds subside, the rotor automatically turns back into the wind.

VOLTAGE CONTROL SYSTEM

The BWC 850 is available in battery charging versions with outputs of 12 and 24 volts DC, the BWC 1500 with outputs from 12 volts to 120 volts, and the BWC EXCEL with outputs of 48 and 120 volts. Each Voltage Control System (VCS) uses solid-state electronics to monitor the battery voltage. When the battery voltage reaches a preset level, the VCS unit reduces the current delivered to the batteries from the wind turbine, thus avoiding battery overcharge. A battery equalize function is provided on all VCS units.

PUMP CONTROL UNIT

Water pumping versions of the BWC wind turbines can operate with a variety of pump systems powered by three-phase electric motors. The motors are driven directly at variable speed by the output of the wind turbine. The operation is monitored and controlled by the Pump Control Unit (PCU). With an inherent power match between the wind turbine and the pump, there is no need for intermediate batteries or inverters. The PCU can also provide motor drive control for other applications, such as stripper oil wells and ice-making equipment.

POWERSYNC® INVERTER

The BWC EXCEL-S, using the POWERSYNC® Inverter, operates in synchronization with the power grid by locking onto the utility generated alternating current. The BWC POWERSYNC® has a high operating efficiency, low distortion of the output voltage wave form, and comprehensive diagnostics to insure safe operation.