WindStream Technologies
economical energy

SolarMill®

SM1-1P, SM1-2P, SM2-3P, SM2-5P, SM2-6P

User manual

SM1 - Product shown may vary slightly from specific model shipped

Version 2.01 REV 11.3.13

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Welcome!

Dear Customer,

Thank you for your purchase, and congratulations on becoming a SolarMill® owner!

We are excited that you have chosen to purchase WindStream's renewable, hybrid energy generation system. This manual will provide a basic overview of the product, available product configurations, siting, installation, and operation of your SolarMill. Please read through this manual to ensure the best possible performance and results from your installation. Technical assistance will be provided via our customer service team. Please email us info@windstream-inc.com if you need any assistance.

Thank you for your purchase, and congratulations on becoming a SolarMill owner!

Sincerely,

Team Windstream

Installers, please write down the Serial Number(s) installed and service contact information in this booklet and give to the customer. The Serial Number is located on the underside of the frame in the base of the unit.

SolarMill Serial Number(s)

Serial number(s)	Installed by	Commissioning date

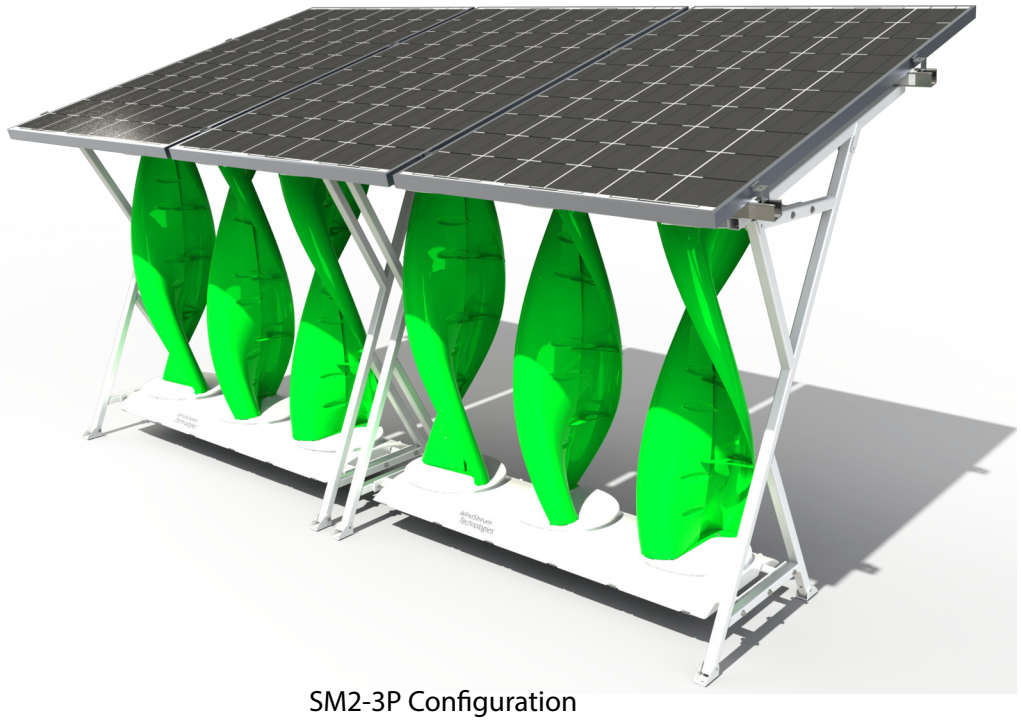
Distributor/Installer contact information:

Product Overview

WindStream Technologies has created the SolarMill, a low-cost, highly efficient means of harnessing both the sunlight on your site and the wind energy available from the turbulent winds present at low altitude in both urban and rural environments.

The SolarMill is a modular, renewable energy system designed for both on and off grid applications. This system will provide you with the lowest possible up front and operating costs, leading to a fast return on your investment. The SolarMill utilizes 3 low-profile (one meter tall) Vertical Axis Wind Turbines (VAWTs) mounted on a single base to collect wind power. The unique mounting geometry allows for various solar panel configurations. The system is completely modular, allowing the system to be daisy-chained to maximize total energy production in the simplest possible circuit.

SolarMills are highly efficient and produce power from wind speeds as low as four and a half (4.5) mph. The company's patented platform is a cost-effective and highly efficient distributed energy solution currently unmatched in the marketplace. SolarMills are designed to supplement your energy needs, reduce your energy costs and lower your overall environmental impact.



SM2-3P Configuration

Document Scope

This manual provides an operation overview of the SolarMill in the following configurations:

• SM1-1P

• SM1-2P

• SM2-3P

• SM2-5P

• SM2-6P

Please keep this manual in a convenient place for future reference.

Target Group

This manual is for the end user, and contains important information regarding siting, use cases, and visual inspection of the SolarMill unit. Installation and maintenance is to be performed by an authorized distributor or their approved professional installers.

Renewable Energy Incentives

To support and encourage the deployment of renewable energy many governments and local utilities offer a range of incentive programs. Your authorized WindStream distributor can help you to identify and understand the programs and requirements you may be eligible for in your local area.

In the USA www.dsireusa.org provides a resource for researching Federal state and Local incentive programs

Safety Information

WARNING: Hazardous voltages, currents, or other conditions that could cause serious bodily injury or death exist in the equipment or may be associated with its use.

Fast moving parts. Do not install this device in a location accessible to children and/or pets.

ONLY qualified personnel such as a WindStream Technologies' employee, Authorized installer, licensed contractor, or WindStream certified engineer should install the TurboMill or system of TurboMills.

The installation must be installed following the guidelines established by state and local regulations. Consult a local electrical contractor, the local planning and zoning office and local Electric Utility for details and regulations. This manual is not intended to be used for the installation of this product but to serve as an overview of the Turbomill, it's functionality, hook-up and maintenance. The SolarMill Technical Guide is required to properly install this product.

Once installed, use caution when approaching the device. The rotating turbines can present a serious threat that can cause injury, even at low speeds.

WARNING: Never touch the rotating turbines.

WARNING: Never try to stop the turbines by hand.

Warranty related

The warranty and safety are dependent upon the proper installation of the product.

Installations not performed by qualified personnel will not be covered under WindStream Technologies' limited warranty .

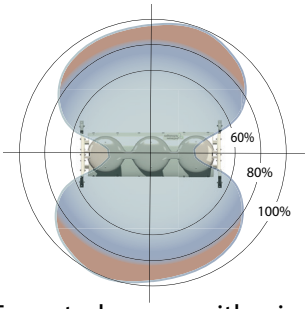
Turbines must not be allowed to turn until the low voltage bus is connected to charged batteries. Turbines should be secured if the voltage drops below 30 VDC to avoid damage to the electronic controller.

SolarMill Siting

Siting of a SolarMill requires knowledge of the prevailing wind, an eye toward sun exposure, and an assessment of the architecture available for mounting the units. Talk with a distributor, or see our siting tools at www.windstream-inc.com for help with siting.

Prevailing winds

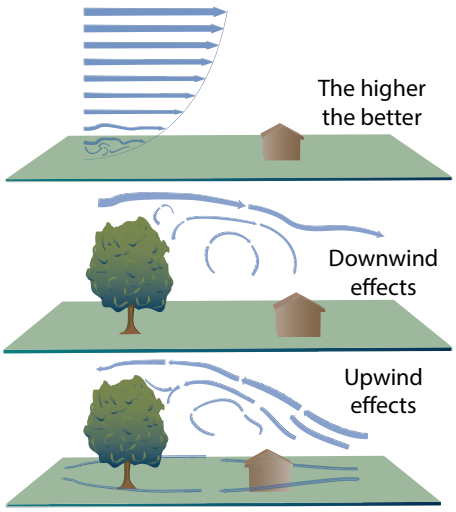
Most locations have a large proportion of their available wind power coming from a single direction, (or sometimes 2 opposite directions). This is termed the prevailing wind direction. The SolarMill turbines are omnidirectional, but the row of turbines does result in some directionality. The line of SolarMills should optimally be set up within 45 degrees of perpendicular to the prevailing wind direction. Ultimately, the aerodynamics of the architectures dictates positioning choices.



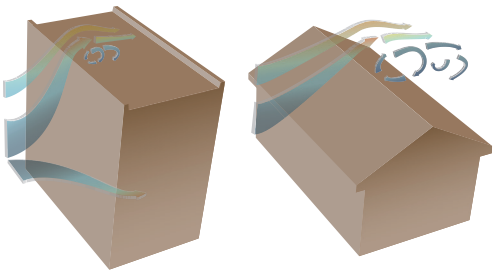
Expected power with wind at suboptimal angles

Architecture aerodynamics

The TurboMill is designed specifically to mount directly to the roof of a building or other structure. Consideration must be given to the geometry of the roof structures and obstacles surrounding the installation. Placing the turbines in a location where trees and other structures would block the prevailing winds should be avoided.



An ideal siting location for a building mounted turbine is on a building that is taller than the surrounding buildings and natural obstructions both upwind and downwind. This will minimize the effect of the surroundings on the wind flow effects immediately above the roof.



A location at the peak of a pitched roof or on the windward edge of a flat rooftop is optimal as the wind there is accelerated. Other locations on the roof, as the figure shows, have only small wind velocities and high turbulence. Following these siting guidelines will help to minimize avoidable energy losses for building-mounted wind systems.

Sun Exposure

Solar panels need to be placed where they get sun exposure throughout the day. Shading for any portion of the day will automatically eliminate power produced during that period.

In terms of direction, fixed-angle solar installations are usually optimized when they face due south in the northern hemisphere, and due north in the southern hemisphere. Furthermore, when balanced for winter/summer exposure, panels are tilted up at the same angle as the latitude of the

location. However, deviations from optimal solar panel direction only result in very modest reduction in power produced, allowing the units the flexibility to follow the architecture when needed. For more information on siting, see the siting resources on www.windstream-inc.com, or speak with a distributor.

Installation Overview

The SolarMill is designed to provide considerable flexibility in it's mounting configurations. Generally rooftops will fall into two categories: Flat and pitched. In both cases, the product generates significant tipping forces in high winds, so the installation must be strong enough to withstand both considerable tensile forces and compressive forces. This often requires adding members below the units to spread the loads. Windstream distributors can provide these as well as any leg extension kits needed to position the units properly. The resulting structure can be connected directly to the structure of the building, or if it is preferred to not penetrate the roof surface and the roof is sufficiently strong, the structure can be freestanding, and ballasted.

All configurations require installation by distributor approved technicians, and involvement with permitting bodies where localities require. Discuss mounting options with your distributor.

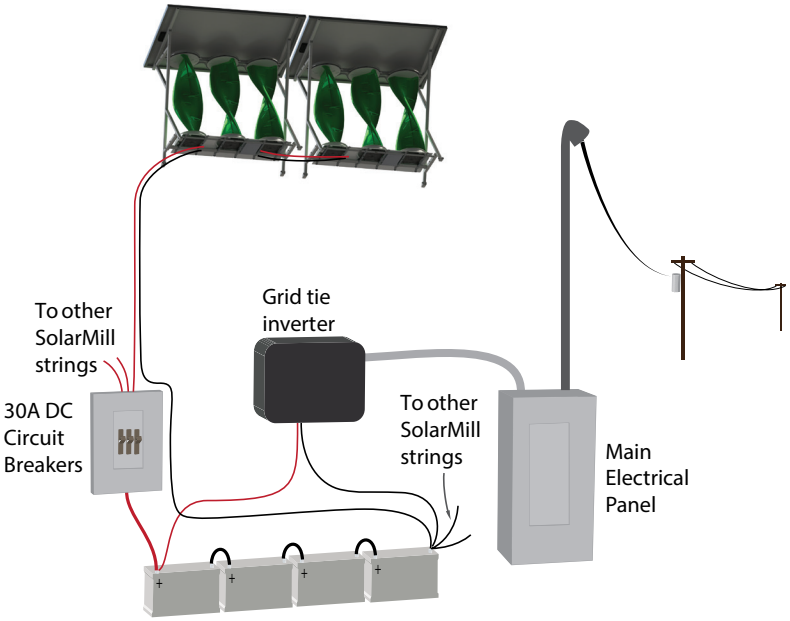
Electrical Use Cases

The SolarMill unit outputs DC power and that power is used to charge to a set of (4) 12V deep cycle lead acid batteries. After the batteries, the customer has two choices on how to use this available energy.

Grid tied

In this configuration, the bank of batteries is connected to a grid tie inverter which connects to the user's electrical panel*. This inverter pushes power back to the grid efficiently when the batteries become fully charged. Check with your distributor for WindStream approved inverter models compatible with this type of connection.

*Grid connected systems may require application and agreement with the local power utility.

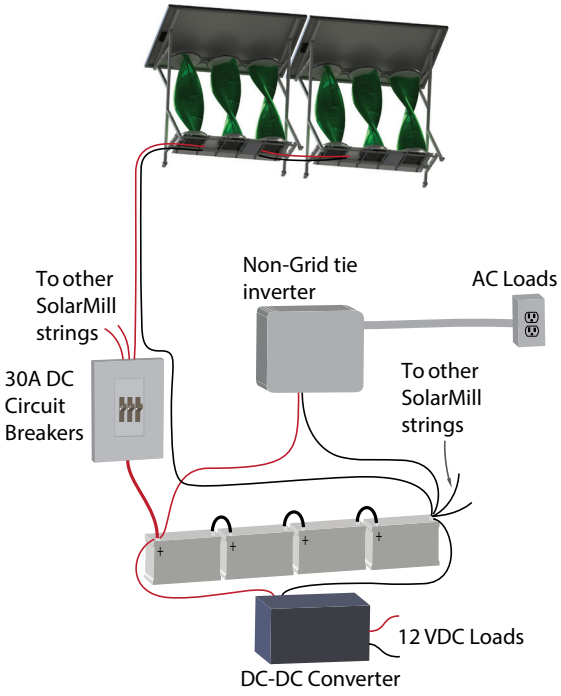


Grid-tied application

Off-grid storage, with DC or AC loads

The batteries can be used to supply power to electrical devices in off grid settings. This electrical energy can power DC powered devices through a voltage converter (if necessary), or can power AC devices through a WindStream approved non-grid tie inverter**. It is important to stress that if loads are not continuously discharging the batteries, it will likely result in wasted energy producing potential. A full charge cycle on the battery can occur in a short amount of time. When the batteries are fully charged, the system will cease energy production to protect the batteries.

**Non-grid-tie inverters are not intended to push power to the grid.



Off-Grid application

What To Expect / Troubleshooting

The SolarMill unit is designed to be maintenance free to the user. However, it is important to know what to look for when observing your SolarMill Installation.

Normal operation

The wind turbines should run silently and easily. All turbines should begin spinning in a light breeze. Note that at the very lowest wind speeds, it is not unusual for the turbines to start up at slightly different wind speeds. However, if a turbine still is not turning at a higher windspeed, or is wobbling or causing a persistent noise, please call your distributor or installer for service to ensure the product is operating properly and all the fasteners are tightened.

Stormy weather

The turbines are equipped with an automatic mechanical brake to prevent excessive turbine rpm in extremely windy conditions. Each turbine may make a “click” noise in high winds when the brake engages. The brake resets automatically when the wind goes below 5 mph. Equipment should be secured or removed in the event of an impending hurricane. Please call your distributor with assistance.

Power production

If you have purchased an add-on monitoring package, your SolarMill should be producing at least some power whenever the sun is shining. If the monitoring graph shows no power being produced, it is possible that there is an electrical connection problem. It is important to contact your distributor or installer to investigate the cause, because a wiring problem can damage the SolarMill control electronics..

SolarMill Specifications

WIND GENERATION OVERVIEW	
Axis	Vertical Axis
Height (wind portion only)	51.2 in (1.3 m)
Footprint width (SM1)	52 in (1.3 m)
Footprint width (SM2-3P)	116 in (2.95m)
Footprint depth	28 in (0.70 m)
Swept Area	1,519 in^2 (0.98 m^2)
Rotor Diameter	12.99 in (0.33 m)
Blade Materials	Galvanized G-90 Steel
Corrosion Prevention	PPG Spectracron® 360 2K
Weight	101 lbs (45.8 kg) Turbine and structure only
Design Life	20 Years
PERFORMANCE	
Energy Potential (Per SM1 Unit) 3 turbines, 1 panel	700 kWh per year @ 5 m/s ave wind and optimal sun exposure
Energy Potential (Per SM2-3P Unit) - 6 turbines, 3 panels	1600 kWh per year @ 5 m/s ave wind and optimal sun exposure
Rated Power Output (wind only)	143 W @ 11 m/s
Maximum Power Output (wind only)	500 W @ 17 m/s
Cut-In Wind Speed	4.5 mph or 2 m/s
Cut-Out Wind Speed	38 mph or 17 m/s
ELECTRICAL INFORMATION	
Maximum Bus Voltage	56 VDC
Maximum Current	30 Amps per string (more in parallel)
Electrical Connection	On-Board Battery Charge Controllers Grid-Tied Inverter (Optional)
Generator Type	Brushless, Permanent Magnet Generator
PV module type	Monocrystalline, 250 W (may differ in some markets)
Recommended battery type	12V Deep Cycle AGM Lead acid

Limited Warranty

LIMITED WARRANTY. WindStream Technologies, Inc. warrants to the original Purchaser only that the Products will be free from defects in workmanship and material for 5 years after the shipment date (the "Warranty Period"). WindStream's warranty will not extend to any Products that have been subjected to: (a) improper installation or storage; (b) ordinary wear, tear or deterioration of the Products; (c) operation or maintenance not in accordance with applicable operating instructions; (d) accident, damage, abuse or misuse; (e) modification by any party other than WindStream or (f) abnormal or unusual operating conditions or applications, including any application in any way different from that for which such Product was designed. Any modification, tampering or manipulation of the Products, any alteration of any parts or any substitution of parts not provided by WindStream or not authorized by WindStream shall render void all of WindStream's warranties with respect to the Products. WindStream MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING THE PRODUCTS AND WindStream SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND FREEDOM FROM INFRINGEMENT CLAIMS.

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