

# SKYSTREAM HYBRID 6™

## OWNER'S MANUAL NORTH AMERICA EDITION

- Installation Manual Is Provided Separately
- This manual focuses on the solar tracker portion of the complete Skystream Hybrid 6 wind + solar system. As a result, this manual should be used in conjunction with the Skystream 3.7 manual that focuses on the wind turbine portion of the system. The two together provide a complete guide to the Skystream Hybrid 6 system.

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## Southwest Windpower

**Congratulations on your purchase and welcome to our family!**

Dear Skystream Hybrid 6 Owner,

Thank you for your purchase of the Skystream Hybrid 6™ solar tracker system. When used in conjunction with the Skystream 3.7 wind turbine, it comprises one of the most technically advanced renewable energy systems available today. The combined solar and wind system maximizes your renewable energy production from a small footprint and smoothes your renewable energy production over time due to the complementary nature of solar and wind resources.

Before going further, please complete and return the enclosed Warranty Registration Card. This will assure you of being kept up-to-date with the latest developments from Southwest Windpower. These include new options, performance tips, up-dated software to maximize output and technical notices. It is important for you to know that we do not sell or distribute your information to any third party. We understand your privacy is important.

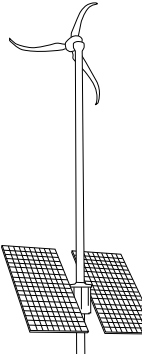
The terms of your warranty require proper installation of your Hybrid 6™ system. We strongly recommend that you site and install your system using trained professionals in order to maintain your warranty and to achieve the best possible performance of your system.

If you have any questions or comments, we would like to hear from you. Please call during working hours, Monday-Friday, 8:00am – 5:00pm, Mountain Standard Time (daylight savings not observed). Our phone numbers are 928-779-9463 or toll free 866-807-9463.

Again, welcome to our family and thank you for investing in the future of solar energy with Skystream Hybrid 6™.

Sincerely,

Southwest Windpower



**Enter and save the serial and model numbers below. You will need these numbers when talking with your dealer or Southwest Windpower Technical Services**

Motor serial number \_\_\_\_\_  
Controller serial number \_\_\_\_\_  
Tracker serial number \_\_\_\_\_  
Dealer/Installer Name & Number \_\_\_\_\_  
\_\_\_\_\_

Skystream Hybrid 6 Owner's Manual  
3-CMLT-1101  
Revision: A

### In this manual

-  **IMPORTANT:**  
Please take note
-  **TIP:** Helpful information  
to ease the installation
-  **Professional installation**  
highly recommended
-  **Warning:** Risk of injury  
or death - proceed with  
extreme caution

# IMPORTANT SAFETY INSTRUCTIONS

READ THESE INSTRUCTIONS IN THEIR ENTIRETY BEFORE INSTALLING OR OPERATING.



**PROFESSIONAL INSTALLATION:** Southwest Windpower strongly recommends Skystream Hybrid 6™ be installed by trained professionals. Proper installation is required to maintain your warranty.

## GENERAL INSTRUCTIONS

- 1) SAVE THESE INSTRUCTIONS.** This Owner's Manual and the associated Installation Manual contain important instructions that must be followed during installation, maintenance, and use.
- The Skystream Hybrid 6™ system uses and generates high voltage AC and DC electricity that could cause major injury or death. As a result, only trained personnel should work on the system. Observe safety precautions at all times. Use "Lock-Out" and "Tag-Out" procedures during servicing to prevent unintended exposure to electricity.
- The Hybrid 6™ system includes exposed and moving parts that move periodically and unexpectedly. As a result, access to the Skystream Hybrid 6 system must be restricted. Systems that are mounted at heights within reach of individuals should be fenced to avoid interference, injury, or collisions by passing individuals or equipment. Systems should also be fenced or otherwise restricted if there is a risk of uninformed people climbing or using ladders to touch or disturb the system.
- The Skystream Hybrid 6™ must be mounted at heights that comply with all local building codes and that are within the structural capabilities of the tower. The maximum clearance (height) from the surface of the lower tower flange (at the foundation) to the lower edge of the solar panel array is as specified in the table below. If in doubt, consult your dealer or Southwest Windpower.

Tower	Maximum Clearance (Height) Between Lower Tower Flange and Lower Edge of Solar Panel
SWWP 45-19 "Standard"	4 feet (1.2m)
SWWP 45-19 HD (Heavy Duty)	8 feet (2.4m)

- Properly complete and return all warranty registration cards. Failure to do so may affect your warranties.
- Do not use unauthorized fasteners. Use fasteners supplied with the Hybrid 6™ system.
- Maintain tightness of fasteners according to torque requirements (see Maintenance and Inspections).

## INSTALLATION INSTRUCTIONS

- Installation must be performed by trained personnel who are familiar with and capable of handling heavy mechanical equipment and high voltage AC and DC electricity.
- Always obtain a building permit prior to construction.
- Skystream Hybrid 6™ must be installed in accordance with the Skystream Hybrid 6™ Installation Manual and local and national building codes. Failure to do so will affect and possibly void your warranties.
- Installation must be performed in compliance with the National Electric Code (NEC) and all local building codes.
- Use only proper grounding techniques as established by the NEC as well as electrical disconnect switches, wire sizes and types.
- Install the Skystream Hybrid 6™ system on a calm day with negligible wind at ground level. Solar panels will experience strong forces in windy conditions.
- Use proper hydraulic hoists, cranes, or other lifting equipment to safely lift Skystream Hybrid 6™ components or systems.
- Always wear appropriate protective personal equipment such as closed toe work shoes, hard hat, work gloves, and safety glasses when working on or installing the Hybrid 6™ system.
- The Skystream Hybrid 6™ system complies with international safety standards. Therefore, the design and its installation must never be compromised:
  - Do not open inverter covers. Doing so without factory authorization will void the warranty.
  - Apply the proper torque to all fasteners.
  - Install only on a Professional Engineer (PE) certified tower.
- Skystream may only be installed on a tower approved by Southwest Windpower for use with the Skystream Hybrid 6™ system. Do not install Skystream Hybrid 6™ on roofs or unauthorized towers.
- Do not use unauthorized fasteners. Use fasteners supplied with Skystream Hybrid 6™. Contact your dealer for authorized replacement fasteners.
- The Skystream Hybrid 6™ must be mounted at heights that comply with all local building codes and that are within the structural capabilities of the tower. The maximum clearance (height) from the surface of the lower tower flange (at the foundation) to the lower edge of the solar panel array is as provided in the table found in this manual under General Instructions. If in doubt, consult your dealer or Southwest Windpower.

## IMPOTANT PRECAUTIONS PRIOR TO INSTALLATION AND USE

### Intended Use

Skystream Hybrid 6™ is a wind and solar powered electricity generation system containing multiple integral AC power inverters. It is designed to supplement the electrical power provided by the local electric utility company in residential and commercial applications by connecting directly to the user's main AC utility panel. Skystream Hybrid 6™ may also be utilized to provide power with battery based residential electrical systems or utility grid connected systems with battery back-up.

Skystream Hybrid 6™ is designed to operate at sites with average wind speeds less than 19 mph (8.5 m/s), equivalent to International Electrotechnical Commission (IEC) Class II wind conditions. The installation of Skystream Hybrid 6™ at sites with higher average wind speeds will accelerate component wear and require more frequent inspections for the wind turbine, tower, and solar tracking system and framework. There are no solar insolation constraints on locating Skystream Hybrid 6™.

### Unintended Use

Utilizing Skystream Hybrid 6™ for other than its intended purposes or with inappropriate equipment or modifying Skystream Hybrid 6™ is not authorized by Southwest Windpower and will void the warranty and may result in serious or fatal injury.

- Do not attempt to use power sources other than the wind or sun to power Skystream Hybrid 6™, for example connecting pulleys or use as a water powered turbine.

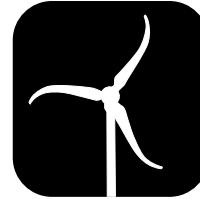


**IMPORTANT: Precautions listed here cannot address all the possible misuses of Skystream Hybrid 6™. Please contact Southwest Windpower if you have any questions regarding the proper installation or use of Skystream Hybrid 6™.**

### Installation Personnel

Southwest Windpower strongly recommends professional installation of Skystream Hybrid 6™. While Skystream is not difficult to install and many homeowners have successfully installed their own Skystream systems, knowledge of local zoning and building code requirements, construction techniques, as well as residential electrical systems is required for a safe installation.

Skystream dealers displaying the following insignia have completed factory training on the correct and safe installation of Skystream.



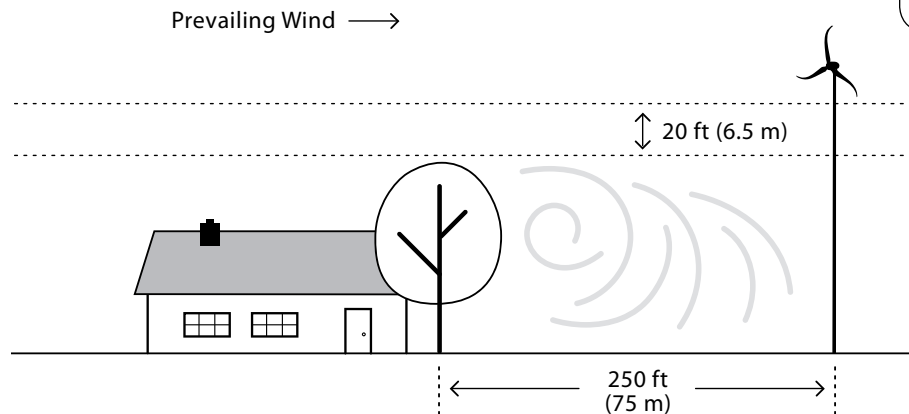
**Skystream Dealer**

## SELECTING THE BEST LOCATION FOR YOUR SKYSTREAM HYBRID 6™

The best location to install your Skystream Hybrid 6™ may be influenced many factors. These include building code restrictions on tower heights and setbacks from property lines, the location and height of surrounding obstructions or shading, the direction and strength of prevailing winds, the length of wire runs, the tower height you've chosen, and the ability to fence or otherwise avoid unintended contact with the system by untrained personnel. Your dealer can help you balance these tradeoffs to find the location on your property that will best achieve your goals.

To maximize solar energy production from your system, position the tower so that the solar panels will be unshaded throughout the day through the entire year. In planning for shading, remember to account for seasonal effects of the sun rising and falling in the sky from summer to winter and changes due to leaves of deciduous plants.

To maximize wind energy production from your system, the general rule for optimum performance of the Skystream 3.7 wind turbine is that it be installed 20 feet (6.5m) above any surrounding object within a 2500 foot (75m) radius. See the figure below.



Optimal Skystream location.

### Local Requirements

Building codes and installation regulations may vary greatly depending upon country, state, county, city, and local jurisdictions. Be sure to obtain all required building permits BEFORE beginning installation. Make sure you understand all inspection and installation requirements. Many locations may require installation by a licensed professional to meet building code requirements or to qualify for rebate incentives.

### Utility Requirements

Be sure to contact your local electric utility company prior to installation. Many utility companies will require an "Interconnection Agreement" prior to installation. Some utilities may also require installation of a separate power meter for Skystream Hybrid 6™.



**TIP:** See our website: [www.windenergy.com](http://www.windenergy.com) for a sample interconnection agreement that may be used by a utility that has yet to establish a program.

## HOW TO START AND STOP YOUR SKYSTREAM HYBRID 6™

You need to take two independent actions to fully start or stop your Skystream Hybrid 6™ solar tracker system. Note, see your Skystream 3.7 Owner's Manual concerning how to start and stop your Skystream 3.7 wind turbine.

### 1. Starting and Stopping Solar Panel Tracking

Take these actions to start solar tracking by the solar tracker array:

- a. Confirm that the controller unit is connected to one solar panel and micro-inverter.
- b. Turn the switch on the controller unit to the "on" position (see Figure 1).

Once turned on, capacitors within the controller will begin to charge using energy produced by the solar panel. Once the controller senses that sufficient energy has been stored, the tracker will automatically begin to track the sun. Note, if you turn on tracking at night, tracking won't begin until daytime when solar energy becomes available to power the unit.



Figure 1: Controller On/Off Switch

To turn off tracking, turn the switch on the controller unit to the "off" position (see Figure 1).

Note, turning the tracking function on or off has no impact on the function of the Skystream 3.7 wind turbine.

### 2. Connecting Hybrid 6™ to the Electric Grid

In order to benefit from the electric energy generated by the solar panels, the output of the solar panels must be connected to the electric grid. If the outputs of the solar panels and wind turbine have been combined, the same action will serve to turn on your Skystream 3.7 wind turbine. See your Skystream 3.7 Owner's Manual for a more complete description of how to start and stop your turbine.

- a. To connect your Hybrid 6™ system to the grid, turn to "on" the circuit breaker at the electrical utility panel where your Skystream Hybrid 6™ system is connected to the grid. If, as recommended, your installation also includes a second electrical disconnect within sight of the tower which holds the turbine and solar tracker, you will also need to turn that disconnect to the "on" position to complete the circuit to the grid.
- b. To disconnect your Hybrid 6™ system from the grid, turn to "off" the circuit breaker at your electric utility panel. Or, turn to "off" the second electrical disconnect. Turning off either will interrupt the circuit and prevent the Hybrid 6™ from delivering energy to the grid. If the outputs of the solar panels and wind turbine have been combined, this same action will also serve to turn off your Skystream 3.7 wind turbine.

"ATTENTION" labels, depicted below, are provided to indicate the location(s) of the AC power disconnect switch(es) or circuit breaker(s). Apply the labels in prominent locations where they will be seen by operators or service personnel.





## WHAT TO EXPECT FROM YOUR SKYSTREAM HYBRID 6™ – OPERATING CHARACTERISTICS

You will quickly become familiar with the daily operating cycle of the tracking solar array of your Hybrid 6™ system, which is described below. Any deviations from normal behavior should be investigated with the help of your dealer. For a description of operating characteristics of your Skystream 3.7 wind turbine, please see your Skystream 3.7 Owner's Manual.

### Daytime Behavior

As the end of the night, your tracker will be parked in a south facing position. Once the sun rises in the east, the solar panel connected with the controller will begin to charge the controller. Once the controller voltage has risen and sufficient energy has been stored, the controller will automatically turn on and acquire a GPS signal. The controller unit will then wait until the next ten minute mark from the GPS, then activate the motor and chain drive to move the solar panels to face the sun.

Thereafter, through the course of the day, the panels will move automatically every ten minutes in order to track the sun.

As the sun descends in the west at the end of the day, energy production decreases and controller voltage will drop. Once controller voltage drops to a "go-home" level, the tracker will automatically move to a south facing position and stay there until morning.

**SAFETY WARNING: THE TRACKER MOVES UNEXPECTEDLY AND WITHOUT WARNING.** To avoid injury to people or damage to equipment, people and equipment and all other obstructions must be kept clear of the tracking solar array at all times, including the chain drive and pinion gear at the bottom of the controller.

### Nighttime Behavior

In response to decreasing energy production and a drop in controller voltage at the end of the day, the controller will automatically move the solar array to a south facing position. The array will remain parked in that position overnight. Once energy production resumes in the morning and the controller voltage rises, the controller will "wake up" and begin its daytime cycle of tracking actions at 10 minute intervals.

## WHAT TO EXPECT FROM YOUR SKYSTREAM HYBRID 6™ – ENERGY PRODUCTION

### Benefits of Solar Tracking and Hybrids

Your Skystream Hybrid 6™ is the most advanced hybrid solar and wind energy solution available. No other product combines solar and wind power in one package with a shared footprint. This means that your system uses minimal space while providing the energy output of a high performance wind turbine plus that of high efficiency tracking solar panels. The latter provide up to 40% more energy than comparable fixed solar systems.

Traditional “fixed” solar panel mounting systems don’t compensate for the changing location of the sun throughout the day. As a result, there is only one instant in any given day when a fixed solar panel is perfectly perpendicular to the sun, achieving maximum energy capture. At all other times of the day, the energy capture is diminished due to a less optimal sun angle. The Skystream Hybrid 6™ tracking system overcomes this shortcoming by tracking the sun as it passes across the sky.

The extent to which your solar tracker increases solar energy production relative to a fixed system depends on factors including latitude, seasonal cloud coverage, and weather patterns. In general, customers can expect an improvement between 25% and 40% when compared to a fixed solar mounting system. For example, the Skystream Hybrid 6™ tracker is forecast to increase solar energy capture by 26% in Miami, Florida when compared with a fixed mount system, whereas the improvement in Bismarck, North Dakota is projected to be 34%.

Installing a hybrid system as opposed to a wind or solar-only system gives you the added benefit of more consistent energy production throughout the year. In most locations, the solar and wind resources are complementary; that is, when the sun isn’t shining, it tends to be windy, and when the sun is shining, it tends to be calm. Figure 1 illustrates this phenomenon at a location in Rochester, New York. Notice that solar and wind energy production vary widely throughout the year while the sum of the two is more consistent (smoothed).



Figure 1: Complementary wind and solar energy production

### Preparing Your Monthly Forecast

To develop a monthly energy forecast for your system, we recommend you visit and use Sitelook™, Southwest Windpower’s proprietary on-line estimator available at <http://www.windenergy.com/sitelook/consumerTB.html>. The software has built-in climate databases which are used to account for seasonal shifts in solar and wind resources. It also accounts for elevation, seasonal temperature fluctuations, and product specifications. Sitelook™ will determine your expected electricity bill savings and provide a detailed report.

It is important to understand that your modeled energy forecast represents an expected average result. Just as rain varies from year to year, so will your wind and solar results. Wind is especially variable and your Skystream 3.7 Owner’s Manual provides a table of environmental factors affecting your energy output from wind. Your solar output will vary, too, depending on variations in cloud cover, temperature, and airborne or panel dust. As a result, annual variations in your total energy capture of +/- 15% or more are to be expected.

## Your Enphase Envoy™ Energy Reports

After you have used Sitelook™ to create your solar energy forecast, you can use your Enphase Envoy™ account to track your actual solar production. Each of the solar panels on your Skystream Hybrid 6™ is equipped with its own Enphase™ inverter. Through your online Enphase Envoy™ account, you can observe the real-time performance of each of your solar panels. The following image depicts the real-time performance of a Skystream Hybrid 6™ installed at Southwest Windpower's home office.



**Figure 2: Envoy solar performance dashboard**

The above image indicates the individual solar panels are all functioning properly as they all show similar solar production (approximately 350 Watt-hours each so far for the day). If one panel were producing significantly less than the others, this might indicate shading of that panel. Alternatively, something may be wrong, in which case you should contact your dealer.

In addition to real-time performance results, your Envoy™ account provides your historical energy production from month to month and year to year. This will allow you to compare Sitelook's predicted energy production with your actual production. The following figure, from a Skystream Hybrid 6™ system at Southwest Windpower's home office, shows an example of the information contained in Envoy's monthly report.

## Energy Production and Peak Power for October 2011

Week	Peak Power	Energy Produced
10/01/2011 - 10/07/2011	1.35 kW	52.3 kWh
10/08/2011 - 10/14/2011	1.35 kW	78.3 kWh
10/15/2011 - 10/21/2011	1.33 kW	81.4 kWh
10/22/2011 - 10/28/2011	1.35 kW	67.8 kWh
10/29/2011 - 10/31/2011	1.33 kW	33.6 kWh
<b>October 2011's Total:</b>		<b>313 kWh</b>
<b>Previous Month's Total:</b>		<b>278 kWh</b>
<b>Year to Date:</b>		<b>844 kWh</b>

**Figure 3: Envoy Energy Summary**

As you compare your actual production with the projections from Sitelook™, remember that similar to rain, your actual yearly energy production can easily fluctuate by +/- 15% or more from your forecast of average results. This is due to normal fluctuation in wind and solar resources from year to year as well as the fact that the Sitelook model used to create the forecast may not perfectly match the characteristics of your particular installation.

## Activating Your Enphase Envoy™ Account

Your Enphase Envoy™ account is a vital tool for monitoring performance of your Hybrid 6™ system. Your system installer should activate your Enphase Envoy™ account at the time of installation. Please consult your installer and applicable Enphase Envoy™ manuals concerning initiation and use of the service.

## **SERVICE**

Your Skystream Hybrid 6™ turbine, solar tracker, and tower system should be serviced only by qualified technicians who are trained to perform the service. Under no circumstances should untrained personnel be allowed to perform service or repairs.

If service is required, please contact your dealer. If a dealer is not available, contact Southwest Windpower Technical Services for assistance.

## **MAINTENANCE AND INSPECTIONS**

These Maintenance and Inspections Instructions pertain to the Skystream Hybrid 6™ solar tracker mechanism and solar panel array. Please see the Skystream 3.7 Owner's Manual for Maintenance and Inspections instructions relating to your Skystream 3.7 wind turbine.

### **Cleaning Solar Panels:**

To maintain optimum performance, it is important that the glass covers on all solar panels are kept clean to enable undiminished transmission of light to the underlying solar cells. As a result, check regularly for any accumulation of dirt or dust. When required, spray the panels with low pressure water to clean or follow any specific instructions provided by the solar panel manufacturer. The required cleaning frequency depends on local conditions. Do not use equipment or chemicals that might scratch or cloud the cover glass.

Snow or ice on solar panels will also diminish their performance. However, snow or ice should only be removed manually if it can be done without damaging the glass in any way. It is preferable to let snow and ice disappear naturally. Follow any specific instructions provided by your solar panel manufacturer.

### **Scheduled Maintenance and Inspections**

It is important to conduct periodic inspections of your solar tracker mechanism and solar panel array to ensure that all parts are performing as intended. Southwest Windpower recommends a regular program of major and minor inspections and recording results in a Logbook as described below. Major inspections are performed by trained technicians and minor inspections are performed visually by the owner.

## What Inspections Should My Dealer/Installer Do?

1. Major Inspections of Solar Tracker Mechanism and Solar Panel Array
  - a. How Often: Should be performed at 6-months-in-service and every five years thereafter (ideally within one month of target date).
  - b. Who: Should be performed by trained technicians.
  - c. **Safety Warning:** Turn off tracking and grid connection prior to inspections. See “How to Start and Stop Your Skystream Hybrid 6™ elsewhere in this manual.
  - d. Specific Actions:
    - i. Solar Panels and Glass Covers: Check visually for any cracked or broken solar panels. Check for excessive dust or dirt and clean as necessary.
    - ii. Motor Sprocket and Drive Chain: Check for wear of motor sprocket and chain. Replace or make adjustments as necessary. Lubricate the chain and motor sprocket with an outdoor grade grease. Safety Warning: Be sure solar tracking is turned off before inspecting or touching sprocket or chain (see 1.c. above).
    - iii. Drive Motor Assembly: Confirm that the motor is tight to the gearbox and that the gearbox is tight to the shell assembly. Make adjustments or replace as necessary.
    - iv. Tapered Rollers: Apply force to the solar panel cross arm in multiple directions to check for any looseness of the tapered rollers inside the frame. Check that the unit is level and is tracking properly. Adjust the tapered rollers if necessary.
    - v. Mechanical Integrity: Check the tightness of all hardware including shell attachment bolts. Check for any obvious misalignment or deformation of components. Tighten all fasteners as necessary.
    - vi. Control Module: Open the equipment bay and check for any evidence of water entry. Seal the clear window with silicon sealer if necessary.
    - vii. Wiring: Check for cable wear or chafing. Confirm that cables passing from the solar panels to the shell assembly have a drip loop to help keep water out of the electrical equipment bay. Adjust or replace cables as necessary.
    - viii. Surface Finish: Inspect all surfaces for chips or corrosion and apply touch up paint as required.

- ix. Envoy™ Reports: Review Enphase Envoy™ reports to confirm correct operation of solar panels and micro-inverters. Use Envoy™ diagnostics to identify any issues.

## What Inspections Should I Do?

2. Minor Inspections of Solar Tracker Mechanism and Solar Tracker Array
  - a. How Often: Should be performed at annual intervals, in years in which a “Major Inspection” isn’t performed (ideally within 1 month of target date). Contact qualified technicians to remedy any out-of-normal conditions that are discovered.
  - b. Who: Should be performed by system owner.
  - c. **Safety Warning:** Turn off tracking and grid connection prior to inspections. See “How to Start and Stop Your Skystream Hybrid 6™ elsewhere in this manual.
  - d. Specific Actions:
    - i. Solar Panels and Glass Covers: Check visually for any cracked or broken solar panels. Check for excessive dust or dirt and clean as necessary.
    - ii. Hardware Integrity and Fasteners: Check visually for any loose hardware or fasteners. Check for excessive noise or vibration during movements. Confirm that the unit is level.
    - iii. Motor Sprocket and Drive Chain: Check for evidence of wear, slackness, droop, or rust on the chain. Confirm the presence of adequate lubrication. Safety Warning: Be sure solar tracking is turned off before inspecting or touching sprocket or chain (see 2.c. above).
    - iv. Wiring: Check visually for any loose, disconnected, or abraded wires or cables. Confirm that there is a drip loop between solar panels and shell assembly.
    - v. Surface Finish: Check for rust or corrosion.
    - vi. Envoy Reports: Review Enphase Envoy™ reports to confirm correct operation of solar panels and micro-inverters. Use Envoy™ diagnostics to identify any issues.

Results of major and minor inspections should be recorded in a logbook such as suggested by the table below. All issues found should be remedied by qualified technicians.

**Table 2: Skystream Hybrid 6™ Solar Tracker System Logbook**

Serial Numbers: \_\_\_\_\_  
 Installation Date: \_\_\_\_\_

Scheduling

	6 Month	1 Year	2 Years	3 Years	4 Years	5 Years
Type of Inspection	Major	Minor	Minor	Minor	Minor	Major
Target Inspection Date						
Actual Inspection Date						
Person Performing Inspection						

Results of Visual Checks,  
 Technician & Owner

- Solar Panel Integrity						
- Solar Panel Cleanliness (Glass Covers)						
- Motor Sprocket & Drive Chain: Tightness and Lubrication						
- Mechanical Integrity & Level						
- Wiring						
- Surface Finish						
- Envoy Reports Analysis						

Additional Trained Technician Reviews

- Drive Motor Assembly	Not Applicable					
- Tapered Rollers						
- Fastener Torques						
- Control Panel Sealing						

Summary of Actions Taken/Notes						
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## END OF DESIGN LIFE – 20 YEARS

Your Skystream Hybrid 6™ turbine, solar tracker, and tower system is designed for twenty (20) year life in locations with IEC Class II winds according to the IEC 61400-2 "Design Requirements for Small Wind Turbines." This corresponds to locations with average wind speeds of 19 miles per hour (8.5 m/s) which are extremely windy sites.

Actions to be taken after 20 years of operation are as follows:

1. Schedule a major inspection of the complete turbine, solar tracker, and tower system by a trained technician. This includes thorough internal and external reviews of the turbine and solar tracker mechanisms, checking the condition of all moving and electrical parts. It also includes inspecting the tower, foundation, wiring, and grounding rods or cables for any signs of corrosion, cracking, or excessive wear. All elements showing evidence of excessive wear, fatigue, or corrosion should be repaired or replaced. In addition, all fasteners should be re-torqued to the correct values before returning those elements to service.
2. If it is determined that it is safe to continue operating the turbine, please see your Skystream 3.7 Owner's Manual concerning the mandatory replacement of all turbine blades as a balanced set.
3. If it is decided to take any elements of the system out of operation, including turbine or solar tracker mechanism, then dispose of those elements according to the section of this manual "Disposal of Skystream Hybrid 6™." Please also read and comply with any specific disposal instructions provided in Enphase or solar panel manufacturer's Owner's Manuals concerning disposal of those components.

## FREQUENTLY ASKED QUESTIONS

### 1. How long should it take my unit to begin tracking at the beginning of the day?

It depends on the amount of sun that is present on the solar panels. With full sunlight, it should take approximately 15 minutes.

### 2. How do I stop the solar tracker from providing power to the grid?

Turn to "off" the circuit breaker at the electric utility panel where your Hybrid 6™ is connected to the grid. Or, if equipped, turn to "off" the secondary electrical disconnect within sight of the tower. For additional instructions, see the section of this manual "How to Start and Stop Your Skystream Hybrid 6™." Note, depending on your system wiring, this action may also turn off your Skystream 3.7™ turbine.

### 3. How do I stop the sun tracker from tracking the sun?

Turn to "off" the switch on the controller. For additional instructions, see the section of this manual "How to Start and Stop Your Skystream Hybrid 6™."

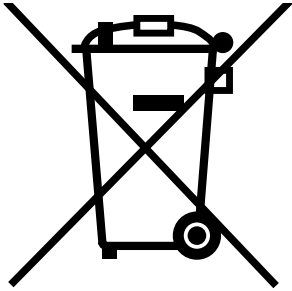
### 4. What happens if I lose utility power?

The unit will continue to track the sun but no power will be delivered to the grid. This is in compliance with electric utility regulations.

### 5. Should I clean dust, dirt, snow or ice from the glass panel covers?

Clear panels allow for greater energy capture but they must be cleaned in a safe manner that will not scratch, cloud, or break the glass. We recommend removing dust or dirt with a low pressure water spray. It is preferable to let snow and ice disappear naturally. Contact your solar panel manufacturer for specific recommendations for your panels.

## DISPOSAL OF SKYSTREAM HYBRID 6™



This symbol shown on Skystream Hybrid 6™ or its packaging indicates it may not be treated as household waste. Dispose of Skystream Hybrid 6™ properly by delivering relevant parts to the applicable collection point for recycling electrical equipment.

By ensuring Skystream Hybrid 6™ is disposed of correctly, you will help prevent harm to the environment which may be caused by inappropriate disposal of this product. The recycling of materials will help conserve natural resources.

For more detailed information about recycling Skystream Hybrid 6™, please contact your local waste disposal authorities, your household waste disposal service or the dealer where you purchased Skystream Hybrid 6™.

Skystream Hybrid 6™ was manufactured in compliance with the Restriction of Certain Hazardous Substances in Electrical and Electronic Equipment 2002/95/EC (RoHS) and therefore does not contain any of the materials regulated by that standard.



## Skystream 3.7<sup>®</sup> Technical Specifications

### Wind Technical Specifications

<b>Wind Turbine</b>	Skystream 3.7
<b>Rated Capacity</b>	2.4 kW
<b>Rotor Diameter</b>	12 ft (3.72 m)
<b>Weight</b>	170 lb (77 kg)
<b>Swept Area</b>	115.7 ft <sup>2</sup> (10.87 m <sup>2</sup> )
<b>Type</b>	Downwind rotor with stall regulation control
<b>Direction of Rotation</b>	Clockwise looking upwind
<b>Blades</b>	(3) Fiberglass reinforced composite
<b>Rated Speed</b>	50 - 330 rpm
<b>Maximum Tip Speed</b>	216.5 ft/s (66 m/s)
<b>Alternator</b>	Slotless permanent magnet brushless
<b>Yaw Control</b>	Passive
<b>Grid Feeding</b>	120/240 VAC Split 1 Ph, 60 Hz 120/208 VAC 3 Ph compatible, 60 Hz (Check with dealer for other configurations)
<b>Braking System</b>	Electronic stall regulation with redundant relay switch control
<b>Cut-in Wind Speed</b>	8 mph (3.5 m/s)
<b>Rated Wind Speed</b>	29 mph (13 m/s)
<b>User Monitoring</b>	Skyview wireless 2-way interface
<b>Survival Wind Speed</b>	140 mph (63 m/s)
<b>Warranty</b>	5 year limited warranty

### Solar Technical Specifications

<b>Solar Panels</b>	235 W PV panels
<b>Rated Capacity</b>	1.41 kW (Skystream Hybrid 6™)
<b>Size, tracking module</b>	44" (112 cm) h x 24.1" (61 cm) diameter
<b>Weight, tracking module</b>	125 lb (57 kg)
<b>Mount</b>	High strength steel
<b>Operating Environment</b>	All weather
<b>Temperature operating range</b>	-6 F to 149 F (-21C to +65C)
<b>Controller power consumption</b>	0.982 Wh/day typical Sleeping Mode: 0.018 Wh/day Active Mode: 0.964 Wh/day
<b>Grid Feeding</b>	Microinverters (included)
<b>Sun Tracking</b>	Microprocessor-based true position sun tracking. GPS enabled for automatic initialization. No batteries.
<b>Sun Tracking Range</b>	Horizon to horizon
<b>User Monitoring</b>	Enphase Envoy™ monitoring system
<b>Survival Wind Speed</b>	90 mph (40 m/s)
<b>Warranty</b>	5 year limited warranty
<b>Tower Mounting</b>	Southwest Windpower 45-19 HD towers for new systems; retrofit options are available for some existing Skystream 3.7 installations. Certain conditions apply for retrofits. Contact your dealer for more information.

## WARRANTY GUIDE FOR YOUR SKYSTREAM HYBRID 6™

Your Skystream Hybrid 6™ system contains several major subsystems. Your warranty coverage for these sub-systems is provided according to the tables below. Please contact your dealer or Southwest Windpower Customer Service if you need assistance completing warranty registration forms.

### Warranty Coverage by Sub-System

SUB-SYSTEM COVERED	SOURCE OF COVERAGE
1. Skystream 3.7 Wind Turbine	Skystream Hybrid 6™ Limited 5-Year Warranty from Southwest Windpower (see following page for full text). Please complete and return the warranty registration card included in your literature pack, including serial number, in order to facilitate proper handling of your warranty coverage. Please contact Southwest Windpower at 928-779-9463, or toll free 866-807-9463, concerning service needs or warranty claims.
2. Skystream Hybrid 6™ Solar Tracker Mechanism and Solar Panel Framework	Skystream Hybrid 6™ Limited 5-Year Warranty from Southwest Windpower (see following page for full text). Please complete and return the warranty registration card included in your literature pack, including serial numbers, in order to facilitate proper handling of your warranty coverage. Please contact Southwest Windpower at 928-779-9463, or toll free 866-807-9463, concerning service needs or warranty claims.
3. Solar Panels Used In Solar Tracker	Warranty coverage is provided by the solar panel manufacturer. Please complete and return to the manufacturer all required warranty registration materials. Please record serial numbers of each panel as those are typically required by the manufacturer.
4. Enphase Inverters Used In Solar Tracker	Warranty coverage is provided by Enphase. Please complete and return to Enphase all required warranty registration materials. Please record serial numbers of each inverter as those are typically required by Enphase.
5. Tower Used to Support Turbine and Solar Tracker	Warranty coverage is provided by the tower manufacturer. Please complete and return to the tower manufacturer all required warranty registration materials.
6. Tower Foundation	Foundation Installer

## Skystream Hybrid 6™ Limited 5-Year Warranty

### WIND TURBINE AND SOLAR TRACKER MECHANISM WARRANTY AGREEMENT

#### Hardware Warranty

Southwest Windpower, Inc., (“Southwest Windpower”) will repair or replace free of charge any part or parts of the Southwest Windpower Skystream 3.7® wind generator or solar tracker mechanism (solar tracker mechanism as used in this Warranty does not include solar panels, solar panel inverters, or associated wiring) determined by Southwest Windpower to be defective in materials and/or workmanship under normal authorized use consistent with product instructions for a period of five years from the date the original purchaser (“Customer”) receives the wind generator and solar tracker mechanism (“Start Date”). This warranty extends only to the original purchaser. The Customer’s sole and exclusive remedy and the entire liability of Southwest Windpower, its suppliers and affiliates under the warranty is, at Southwest Windpower’s option, either (i) to replace the wind generator or solar tracker mechanism with a new or reconditioned wind generator or solar tracker mechanism, (ii) to correct the reported problem, or (iii) to refund the purchase price of the wind generator or solar tracker mechanism. Repaired or replaced products are warranted for the remainder of the original warranty period.

#### Restrictions

Problems with the wind generator or solar tracker mechanism products can be due to improper use, maintenance, non-Southwest Windpower additions or modifications or other problems not due to defects in Southwest Windpower’s workmanship or materials. No warranty will apply if the wind generator or solar tracker mechanism (i) has been altered or modified except by Southwest Windpower, (ii) has not been installed, operated, repaired, or maintained in accordance with instructions supplied by Southwest Windpower, (iii) has been exposed to winds exceeding 140 mph (63 m/s), or (iv) has been subjected to abnormal physical, thermal or electrical stress, misuse, negligence, or accident. If Southwest Windpower’s repair facility determines that the problem with the wind generator or solar tracker mechanism is not due to a defect in Southwest Windpower’s workmanship or materials, then the party requesting warranty service will be responsible for the costs of all necessary repairs and expenses incurred by Southwest Windpower.

#### Warranty Claims and Return Procedures

In order to be eligible for service under this Limited Warranty, the Customer MUST return the warranty registration document included with this Limited Warranty within sixty (60) days of the start of the Warranty Period. Alternatively, customers may register their system on line through [www.windenergy.com](http://www.windenergy.com).

Customers experiencing a problem with their Skystream Hybrid 6™ system should first contact an authorized Southwest Windpower Skystream dealer in an attempt to diagnose and resolve the issue. If it is confirmed that there may be a

warrantable issue, the customer may request the assistance of the authorized dealer or notify Southwest Windpower Technical Services directly in order to start the claims process with Southwest Windpower. Claims notification may be made by phone or in writing. Whether made by the dealer or by the Customer, the warranty claims notification must include a description of the alleged defect, the physical location of the system, relevant serial numbers for the system, the manner in which the system was used, the original purchase date, and the name, address, and phone number of the party requesting warranty service. All claims for defects shall be deemed waived unless made within thirty (30) days following discovery of the defect.

In response to such notification, within three (3) business days, at Southwest Windpower’s discretion, Southwest Windpower will take action to attempt to confirm whether a warrantable issue exists and to resolve the issue, either through an exchange of information between the requesting Customer and Southwest Windpower, or by assigning an authorized Southwest Windpower representative to inspect the system in person to evaluate the issue and implement repairs, or by issuing a Return Authorization (“RA”) to the Customer under which the Customer may return the applicable equipment to Southwest Windpower for inspection and repair. If Southwest Windpower chooses to send a representative, the Customer must make the applicable equipment accessible for inspection and servicing by the representative at reasonable times.

If Southwest Windpower issues an RA for return of the equipment, such equipment shall be shipped at the expense and risk of the party requesting warranty service, including but not limited to proper packaging of the equipment. If Customer no longer has the original packaging, Southwest Windpower may send packaging materials to the Customer. Southwest Windpower will be under no obligation to accept any returned equipment that does not have a valid RA number attached or plainly visible. Customer’s failure to return the agreed equipment within thirty (30) days of Southwest Windpower’s issuance of an RA number may result in cancellation of the RA.

Southwest Windpower will use all reasonable efforts within ten (10) business days of receipt of the alleged defective equipment to repair or replace such equipment. If upon inspection, the warranty claim is found invalid for any reason, Customer may be charged at Southwest Windpower’s or the authorized representative’s then current rate for repair or inspection services and return shipping expenses. In such event, the Customer will be informed of the repair charges, and upon Customer approval of such charges, the Customer will be charged for the repairs and return shipping. If the Customer refuses to approve repair charges for any equipment for which a warranty claim is invalid, return shipping charges may apply. Customer property remaining at Southwest Windpower for more than thirty (30) days without required Customer approval of return shipping charges becomes the property of Southwest Windpower.

For equipment repaired under warranty by Southwest Windpower, all parts that Southwest Windpower replaces shall become property of Southwest Windpower on the date that Southwest Windpower ships the repaired equipment back to the

customer. Equipment repaired or exchanged by Southwest Windpower under warranty is warranted for the remainder of the original Warranty Period.

### **Disclaimer**

EXCEPT FOR THE EXPRESSED WARRANTY SET FORTH ABOVE, SOUTHWEST WINDPOWER DISCLAIMS ALL OTHER EXPRESSED AND IMPLIED WARRANTIES, INCLUDING THE IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY AND NON-INFRINGEMENT. NO OTHER WARRANTY, EXPRESSED OR IMPLIED, WHETHER OR NOT SIMILAR IN NATURE TO ANY OTHER WARRANTY PROVIDED HEREIN, SHALL EXIST WITH RESPECT TO THE PRODUCTS SOLD UNDER THE PROVISIONS OF THESE TERMS AND CONDITIONS. SOUTHWEST WINDPOWER EXPRESSLY DISCLAIMS ALL LIABILITY FOR BODILY INJURIES OR DEATH THAT MAY OCCUR, DIRECTLY OR INDIRECTLY, BY USE OF THE PRODUCT BY ANY PERSON. ALL OTHER WARRANTIES ARE EXPRESSLY WAIVED BY THE CUSTOMER.

### **Limitation of Liability**

Under no circumstances will Southwest Windpower or its affiliates or suppliers be liable or responsible for any loss of use, interruption of business, lost profits, lost data, or indirect, special, incidental, or consequential damages, of any kind regardless of the form of action, whether in contract tort (including negligence), strict liability or otherwise, resulting from the defect, repair, replacement, shipment or otherwise, even if Southwest Windpower or its affiliate or supplier has been advised of the possibility of such damage. (Note: some states and provinces do not allow the exclusion or limitation of incidental or consequential damages, so these limitations may not apply to you.) Neither Southwest Windpower nor its affiliates or suppliers will be held liable or responsible for any damage or loss to any items or products connected to, powered by or otherwise attached to the Hardware. The total cumulative liability to Customer, from all causes of action and all theories of liability, will be limited to and will not exceed the purchase price of the product paid by Customer. This Warranty gives the Customer specific legal rights and the Customer may also have other legal rights that vary from state to state or province to province.