QUICK START GUIDE

2025

ECO-ROOF ENERGY HUB FOR SLANTED ROOFTOPS

www.flowerturbines.com | +1 (806) 318-1116 | support.us@flowerturbines.com

Table of Contents

Introduction & Recommendations

Thank you for purchasing our products. This guide will highlight some basic and important information. For more detailed information about wind energy, please see the resources at www.flowerturbines.com

This product consists of a group of 1-meter turbines on a platform that enables no-drill installation of wind and solar on slanted roofs. A variation of this product is also available for flat rooftops. The slanted roof models come in modules of three turbines on the top of connected beams that extend on each side of the roof. The beams are arranged to fit solar panels and weights. They are not drilled into the roof; they have high-friction rubber points that lie on the roof. There are additional locations for weights.

These will come with either several hybrid wind/solar charge controllers or separate wind and solar charge controllers. We will choose these for you according to your project.

The flat Eco-roof for 1-meter turbines has these special features:

1. No drilling into the roof is required. It stays in place by weight, balance, and friction.

2. Since flat roofs are not truly flat, it has a patented arrangement for adjusting the turbine shafts so that they are vertical. A simple tool like a plane with a bubble will help you install this. This balancing enables the turbines to spin symmetrically and last longer.

3. The turbine distances are pre-set to achieve a Bouquet Effect™ whereby each turbine added makes the others perform better. They should be oriented correctly towards the wind; your salesperson will help you with that. Ideally, you can put several of the modules together to create a stronger Bouquet Effect™.

4. The solar panels slope upwards towards the turbines, thereby accelerating the wind towards the turbines.

5. For slanted roofs, the turbines are placed on the very top, thereby exposed to wind from all directions.

The Eco-roof also comes in a version with two 2-meter high turbines. The 2-meter model does not have weighting plates because there is sufficient weight in the turbines themselves. They do include extending joints on the bottom to spread the weight over more of the roof. It is your responsibility to find out what your roof can handle. We anticipate that most residential rooftops can support the 1-meter versions, and most commercial rooftops can support the 2-meter versions; however, confirming your particular rooftop's weight capacity remains your responsibility.

1. The flat 3-turbine version conveys 40.25 pounds per square foot (196.5 kilograms per square meter).
2. The flat 5-turbine version conveys 37.95 pounds per square foot (185.3 kilograms per square meter).
3. The flat 2-turbine 2-meter blade version conveys 42.4 pounds per square foot (207 kilograms per square meter).
4. The slanted roof version weight depends on how many solar modules you fit on the side of the roof. Assuming two rows of solar panels on each side, the system conveys 42.4 pounds per square foot (207 kilograms per square meter).

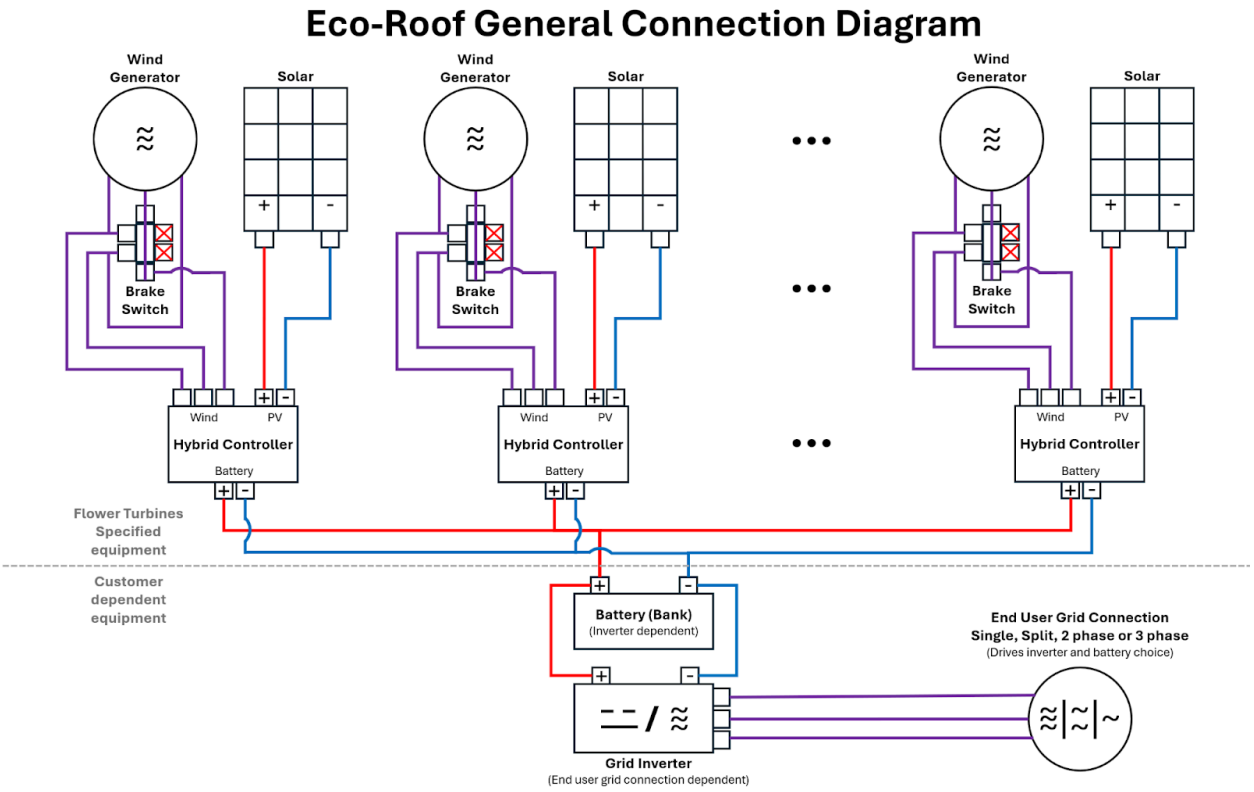
The arrangement may be on or off the grid.

In both cases, they will usually have a charge controller that connects the turbine generator to a battery, and, for a grid connection, an on-grid inverter. In our EU-compatible models, our smaller installations allow for grid connection without a battery, as some of our inverters are produced with charge controllers included.

The electricity generated usually is arranged as follows:

1. The turbine shaft is connected to a permanent magnet generator of 24 or 48 volts that produces AC power that needs to be adjusted for use.
2. The next step for the electricity is to pass through a charge controller which rectifies the AC to usable DC power.
3. The DC power from the charge controller then either goes to a battery, usually 12, 24, or 48 volts, which is often a source for off-grid power, or to a battery/inverter combination or inverter alone that goes to the grid. As mentioned, in the EU for some projects, the controller is built into the inverter. In all cases, the specifics will depend on your project (parameters like size of the turbines, wind speed, number of turbines in the project, etc.), and we may give you a custom solution using the elements above or similar ones. For many small on-grid projects in countries with US-type voltage, the on-grid inverter will be connected to a 48 volt battery.

Below is a wiring diagram in those cases where we provide a hybrid wind/solar charge controller:



You may choose the battery you want to go with the system.

You may choose to have us buy it for you or buy it yourself. We sometimes recommend you purchase it yourself, as batteries may be difficult to transport.

When you choose a battery, it needs to have voltage compatible with the system we make for you. Our staff will help you with that. You will need to decide how much back-up power you want your battery to have. Most batteries will be sold by “ampere hours”. You can multiply that number by the battery voltage to get the number of watts. Let us say that you find a battery with 1000 watts. If you decide that you want to have storage available to power a 10 watt light bulb, this battery will do so for 100 hours. This calculation is approximate, and, if you want emergency backup, you should buy somewhat more than the amount you think you will need.

The Small Tulip turbines will provide small amounts of power at normal wind speeds.

Its major use in small numbers is to provide for small off grid power needs or to supplement solar power. When larger quantities of these turbines are clustered together in what we call a

bouquet, they will produce much more power.

Output per small turbine in various numbers
Below are power curves/tables for the expected power of each turbine when appropriately placed in a group of 3, 6, or 9 (that is, 1, 2, or 3 Eco-Roof Modules side by side on a roof). A power curve is a table or plot of wind speed versus expected power. Your actual results can be higher if you have strong gusts and lower, depending on the electronics used for the project.

The following tables provide an overview of the power output generated by a single Small Tulip turbine up through groups of 3 through 9. It demonstrates how wind speed, measured in meters per second and miles per hour, influences the turbine's energy production, expressed in watts.

Efficiency rises the more turbines grouped in a bouquet.

Use these tables to estimate the energy output based on wind speeds in your area.

Table 1: Power Output of Each Turbine in a Bouquet of 3 Turbines by Wind Speed
(Watts produced by a each Small Tulip turbine, in a group of three turbines [one Eco-Roof module], shown in meters per second and miles per hour)

Wind Speed (m/s)	Wind Speed (mph)	Power Output (Watts)
0.0	0.0	0.0
0.5	1.1	0.0
1.0	2.2	0.1
1.5	3.4	0.2
2.0	4.5	0.5
2.5	5.6	1.0
3.0	6.7	1.7
3.5	7.8	2.7
4.0	8.9	4.0
4.5	10.1	5.7
5.0	11.2	7.9
5.5	12.3	10.5
6.0	13.4	13.6

6.5	14.5	17.3
7.0	15.7	21.6
7.5	16.8	26.6
8.0	17.9	32.3
8.5	19.0	38.7
9.0	20.1	45.9
9.5	21.3	54.0
10.0	22.4	63.0
10.5	23.5	72.9
11.0	24.6	83.9
11.5	25.7	95.8
12.0	26.8	108.9
12.5	28.0	123.0
13.0	29.1	138.4
13.5	30.2	155.0
14.0	31.3	172.9
14.5	32.4	192.1
15.0	33.6	212.6

Table 2: Power Output of Each Turbine in a Bouquet of 6 Turbines by Wind Speed
(Watts produced by each Small Tulip turbine, in a group of six turbines [two Eco-Roof modules side-by-side] in meters per second and miles per hour)

Wind Speed (m/s)	Wind Speed (mph)	Power Output (Watts)
0.0	0.0	0.0
0.5	1.1	0.0
1.0	2.2	0.1

1.5	3.4	0.3
2.0	4.5	0.7
2.5	5.6	1.4
3.0	6.7	2.4
3.5	7.8	3.9
4.0	8.9	5.8
4.5	10.1	8.2
5.0	11.2	11.3
5.5	12.3	15.0
6.0	13.4	19.4
6.5	14.5	24.7
7.0	15.7	30.9
7.5	16.8	38.0
8.0	17.9	46.1
8.5	19.0	55.3
9.0	20.1	65.6
9.5	21.3	77.2
10.0	22.4	90.0
10.5	23.5	104.2
11.0	24.6	119.8
11.5	25.7	136.9
12.0	26.8	155.5
12.5	28.0	175.8
13.0	29.1	197.7
13.5	30.2	221.4
14.0	31.3	247.0

14.5	32.4	274.4
15.0	33.6	303.8

Table 3: Power Output of Each Turbine in a Bouquet of 9 Turbines by Wind Speed
(Watts produced by each Small Tulip turbine, in a group of nine turbines [three Eco-Roof modules side by side] in meters per second and miles per hour)

Wind Speed (m/s)	Wind Speed (mph)	Power Output (Watts)
0.0	0.0	0.0
0.5	1.1	0.0
1.0	2.2	0.1
1.5	3.4	0.4
2.0	4.5	0.9
2.5	5.6	1.8
3.0	6.7	3.2
3.5	7.8	5.0
4.0	8.9	7.5
4.5	10.1	10.7
5.0	11.2	14.6
5.5	12.3	19.5
6.0	13.4	25.3
6.5	14.5	32.1
7.0	15.7	40.1
7.5	16.8	49.4
8.0	17.9	59.9
8.5	19.0	71.9
9.0	20.1	85.3
9.5	21.3	100.3

10.0	22.4	117.0
10.5	23.5	135.4
11.0	24.6	155.7
11.5	25.7	177.9
12.0	26.8	202.2
12.5	28.0	228.5
13.0	29.1	257.0
13.5	30.2	287.9
14.0	31.3	321.0
14.5	32.4	356.7
15.0	33.6	394.9

As illustrated in the power curves, the energy output significantly increases with the number of turbines positioned in a bouquet as well as higher wind speeds. By leveraging the Bouquet Effect™, turbines work together to enhance efficiency, delivering greater energy production than individual units. Proper placement and alignment are key to optimizing performance and maximizing the benefits of wind energy.

In all cases, you will have the greatest benefit by using more turbines to achieve a stronger Bouquet Effect™.

Safety Warnings

Although our turbines are made with safety in mind, a few precautions are necessary:

1. Prevent accessibility to children.

2. Packaging and small parts can cause choking, do not allow small children to have access to them.

3. The unit should be used in a protected area. If on the ground, each unit should be surrounded by a chain link fence (so wind can pass through) and secured with a lock.

4. Do not place your hand inside the turbine while it is in operation. If the turbine is spinning at low speeds, you can carefully slow it down manually by gently applying pressure with

a thick, non-metallic object, such as a sturdy rubber or wooden tool. This minimizes the risk of injury and protects the turbine components. Never use a mental object or excessive force to stop the turbine.

5. Do not run your fingers along any of the blade or metal edges, since they may still have sharp areas.

6. Depending on the project, a certified electrician and/or contractor should do installation work.

7. Hire a licensed/bonded installer for roof mounting.

8. Hire a licensed contractor or sub-contractor to pour and install concrete/foundational mounting.

9. Consult local regulations and ensure compliance with all local building codes and grid connection regulations.

10. Keep the products stored in a dry environment at room temperature up to the date of installation.

Parts Breakdown

1. **Turbine (Top)**
   The blades are made of ABS plastic and are connected to the shaft by rods. The blades have been tested to withstand wind speeds up to 125 miles per hour.

2. **Base (bottom)**
   This consists of a generator which attaches to the turbine shaft above and a flange below, which can be attached to a pole or some other stationary structure.

3. **Electrical components**
   a. **Generator**
      This permanent magnet generator is rated at 100 watts but can generate up to 200 watts for short periods. The charge controller limits the output to about 100 watts. It connects to the turbine shaft.
   b. **Charge Controller**
      Our custom-designed charge controller consumes minimal background electricity, reducing battery drain when not in use. It has:
      - A light indicating charging status.
      - A switch to stop the turbine.

4. **Brake (electronic and/or mechanical)**
   The 1-meter turbines have an electronic brake only. There is also programming in the control system to brake at certain wind speeds automatically.

5. **Boxes for Weighing**
   The flat roof models require concrete tiles or other weights to be inserted inside an attached box with dimensions 300 mm x 315 mm x 150 mm (L x W x H). We do not provide these tiles/weights.

6. **Beams for Placing Solar Panels**

Tools & Hardware

1. **Tools** (not provided)
   A variety of wrenches will be needed, depending on the product.
   a. 16mm socket wrench
   b. 6mm, 8mm, or 10mm Allen wrench

2. **Hardware** (provided):
   a. 3 or 5 Small (1m) Turbines (assembled)
   b. Base

Substructure Preparation

1. **Fencing**
   We recommend a chain link fence so wind can pass through.

2. **Foundation**
   This model of Flower Turbines' Eco-Roof Energy Hub is made to go on flat and near-flat ground and rooftops.

3. **Mount Turbine to Base**

Mounting Turbines to the Base

1. **Hardware**
   Feed bolts with flat washers and nuts through the mounting flange to various mounting options, per situation.

2. **Wires**
   Provide wire extensions to reach the charge controller, per situation.

Connecting Electrical Components

This can vary depending on your system. A licensed electrician should be used. Installation must be conducted by a licensed and registered professional to ensure compliance with all local electrical codes and standards.

The generator will have three output wires. All three should be connected separately to the appropriate connection on the controller or inverter. It does not matter which wire attaches to which connecting pole on the controller or inverter. Some controllers may have multiple poles but label three for wind. Only those should be used. The solar panels will be grouped separately. For more connection based information, refer to your charge controller and battery operation manuals.

1. **Off-Grid (Systems of 3)**
   Installation must be conducted by a licensed and registered professional to ensure compliance with all local electrical codes and standards.
   - Connect the wind turbines to a charge controller, which will regulate the voltage and current going to the batteries to prevent overcharging and ensure efficient energy storage.
   - Link the charge controller to a battery bank, selecting batteries that match the system's voltage and capacity requirements to store energy for use when wind production is low.
   - Attach an inverter to the battery bank to convert the stored DC power to AC power, making it suitable for household appliances, and ensure that all connections are secure and protected from environmental factors.

2. **On-Grid (Systems of 5 or Multiple Systems of 3)**
   The On-Grid Flower Turbine system can generate renewable energy and connect seamlessly to the public electrical grid. With a robust power capacity, it enables efficient energy use and potential savings on utility bills.
   - Connect the turbine to the inverter, ensuring that the system is properly grounded and securely mounted, with all wiring following local electrical codes.
   - Link the inverter to the main utility grid, allowing for the seamless transfer of excess energy generated by the solar panels back into the grid, which may require approval from the utility company.

Maintenance

1. General inspection and listen for noise. We recommend an annual check of your turbines.
2. Check for loose wires. Inspect all electrical connections, including those between the turbine, charge controller, and inverter, to ensure they are secure and properly connected. Look for signs of wear, corrosion, or damage in the wiring. If you find any loose or damaged wires, tighten the connections or replace the wires as needed to maintain optimal performance and safety.
3. We recommend greasing for adequate lubrication once every two years, more often in settings of average wind more than 7 meters per second, less often in winds below 5 meters per second.

Table 4: Greases Compatible with 3m Tulip Turbines

BEARING	GREASE BRAND	GEAR
Aralub HLP2	ARAL	Aralub LFZ1
Rhus L 474/2	MOTUL/BECHEM	Berulit GA 400
Energrease LS - EP2	BP	Energol WRL/GR 154 GS
Grease LMX	CASTROL	
Beacon EP2	ESSO	Surret Fluid NX
Mobilux EP2	MOBIL	Mobilgear OGL 007
Retina EP2 - Alvania EPLF2	SHELL	Malléus GL 205
Multis EP2 - Lical EP2	TOTAL	Ceran AD+

Troubleshooting

This section addresses common issues you might encounter and provides basic steps for troubleshooting your turbine system. If the issue persists, please contact Flower Turbines support.

1. **General Troubleshooting**

    - **Loose Connections**: Ensure all screws and bolts are securely tightened.

- **Misaligned Parts**: Re-align parts if they do not fit as expected.
- **Regular Checks**: Periodically check the assembly for any loose components or wear and tear.

2. **Turbine Not Spinning**

- **Possible Causes:**
  - Low wind speed below the cut-in threshold (0.7 m/s or 1.57 mph).
  - Debris or obstruction in or around the turbine.
  - Mechanical or electrical component failure.
- **Solutions:**
  - Verify wind speed in the area.
  - Inspect the turbine for debris or obstructions and clear them if present.
  - Check for loose or disconnected wires in the generator or charge controller.

3. **Low or No Power Output**

- **Possible Causes:**
  - Low wind speeds or inconsistent gusts.
  - Faulty connections to the charge controller or inverter.
  - Malfunction in the generator or charge controller.
- **Solutions:**
  - Confirm wind conditions meet operational thresholds.
  - Inspect all wiring connections for secure and proper setup.
  - Verify that the charge controller and inverter are operational. Contact support for advanced troubleshooting.

4. **Unusual Noise or Vibration**

- **Possible Causes:**
  - Loose components (blades, shaft, or base).
  - Worn or damaged bearings.
  - Misalignment in the turbine assembly.
- **Solutions:**
  - Conduct a visual inspection for loose bolts or parts. Tighten if necessary.
  - Schedule maintenance to grease or replace worn bearings.
  - Ensure the turbine is securely mounted on a stable foundation.

5. **Brake Not Engaging Automatically**

- **Possible Causes:**
  - Programming issue in the charge controller.
  - Electrical connection failure in the braking system.
- **Solutions:**

- Have a licensed electrician reset the charge controller.
- Inspect connections to the brake system for faults or corrosion.

6. **Controller or Indicator Light Malfunction**

- **Possible Causes:**
  - Faulty controller unit.
  - Disconnected or damaged wiring.
- **Solutions:**
  - Verify power is reaching the controller.
  - Check for loose or damaged connections and secure them.
  - Replace the controller if needed and contact support for assistance.

7. **Turbine Stopped Working After a Storm**

- **Possible Causes:**
  - Excessive wind speeds caused damage to components.
  - Debris lodged in or around the turbine.
- **Solutions:**
  - Inspect the turbine for visible signs of damage and remove debris.
  - Verify the integrity of the blades, shaft, and base.
  - Contact a licensed professional or Flower Turbines support for repairs.

Liability Disclaimer

The manufacturer assumes no liability for any damages, injuries, or losses resulting from failure to comply with the specified assembly guidelines and safety standards. It is imperative that all assembly procedures be performed by certified professionals to uphold the product warranty, ensure safety, and preserve operational integrity. Unauthorized assembly or modification will void all warranties and protections provided by the manufacturer.

Warranty Information

1. **Warranty Statement for Flower Turbines:**

   Flower Turbines warrants that its turbines are free from defects in materials and workmanship for a period of five (5) years applicable only to components made by Flower Turbines from the date of delivery to the original purchaser. Other components have their own warranty periods.

2. **Exclusions:**

   This warranty does not cover damage caused by misuse, neglect, improper installation, accidents, acts of nature, or unauthorized modifications.

3. **Claim Process:**

   To initiate a warranty claim, the original purchaser must submit a claim along with proof of purchase. Flower Turbines reserves the right to inspect the product and determine the validity of the claim.

4. **Limitation of Liability:**

   Flower Turbines' liability under this warranty is limited to repairing or replacing the defective product at its discretion and excludes any incidental or consequential damages from product use.

5. **Extent of Warranty:**

   This warranty is valid only for the original purchaser and is non-transferable.

Frequently Asked Questions

1. **Q: What are the dimensions of each turbine?**

   A: Each unit is 0.55m (1.79ft) in width and 1.149m (3.77ft) in blade height.

2. **Q: What is the maximum roof angle on which I can use this?**

   A: 3° is the maximum angle on which this model of the Eco-Roof Energy Hub can operate.

3. **Q: What are the minimum and maximum wind speeds?**

   A: The cut-in wind speed is 0.7m/s (1.57mph) and maximum survival wind speed is 54m/s (120.8mph). Our custom charge controllers include a built-in braking control for safety in high winds that may exceed the turbine’s max wind speed ability.

4. **Q: What are the lowest and highest temperatures at which the turbines will operate?**

A: These turbines will operate at a range of -4°F to 122°F (20°C to 50°C).

5. **Q: How long will my turbines last?**

   A: These units are designed to operate for twenty (20) years, but we recommend checking them annually for any damage that could impact their lifespan.

Contact Information

For further assistance or inquiries, please contact us at:

Phone: +1 (806) 318-1116
Email: support.us@flowerturbines.com | support.eu@flowerturbines.com
Website: www.flowerturbines.com