



## Renewable Energy Solutions

### Small wind energy system

#### 2. Technical information

*Wind energy has been used for thousands of years to mill grain and pump water. Now, modern wind energy systems use the energy of the wind to turn turbines, which convert this energy to electricity. Wind has the potential to produce substantial amounts of green electricity, and small wind energy systems have a genuine role in achieving this.*

#### What are the basic components of a small wind energy system?

Small wind energy systems are based on a rotor, a generator or alternator mounted on a frame, a tail (usually), a tower, wiring, and the electrical components: controllers, inverters, and/or batteries.

#### There also two different ways of installing small-sized wind turbines:

- **Mast mounted:** these are free standing and are erected in a suitably exposed position, often around 2.5kW to 10kW in size.
- **Roof mounted:** these are smaller than mast mounted systems and can be installed on the roof of a SME hotel where there is a suitable wind resource. Often these are around 1kW to 5kW in size.

#### There are two different types of small wind turbines in the market:

**Horizontal-axis wind turbines (HAWT)** have the main rotor shaft and electrical generator at the top of a tower, and are pointed into the wind by a simple wind tail. Small HAWT can also be installed in roofs.

**Vertical-axis wind turbines (VAWT)** have the main rotor shaft arranged vertically. Key advantages of this arrangement are that the turbine does not need to be pointed into the wind. By using VAWT the generator and gearbox can be placed near the ground. VAWT are able to take wind from multiple directions, so that they are more applicable for use at low heights, on rooftops, and in urbanized areas. Their ability to function well at low heights is particularly important when considering the cost of a high tower necessary for traditional HAWT.



Horizontal-axis wind turbines (HAWT)



Vertical-axis wind turbines (VAWT)



## Is a small wind energy system suitable for my hotel?

A small wind electric system will work for you if:

- The hotel property has a good wind resource
- No large obstacles like buildings, trees or hills are near your hotel
- There is enough space
- The local zoning codes or covenants allow wind turbines
- Your hotel is comfortable with long-term investments



## Design your small wind energy system

For hotel applications, you should establish an energy budget to help define the turbine size you will need. Depending upon the average wind speed in the area, a wind turbine rated in the range of 5 to 20 kW would be fine to make a first significant contribution to an SME hotel energy demand.

Wind turbine manufacturers will help you size your system based on your electricity needs and the local wind patterns. Manufacturers can provide you with an expected annual energy output of the turbine as a function of annual average wind speeds and will also tell you the maximum wind speed at which the turbine is designed to operate safely. This information will help you decide which turbine size will best meet your electricity needs.

## Will I need any permits or inspections to install a small wind energy system?

Turbines used for hotels are much quieter than their wind farm counterparts, but you'll need to check with your local authorities as "bigger" turbines could not be permitted in some areas. Small vertical turbines emit lower noise, have a lower profile and are considered to be generally more aesthetically pleasing than their small horizontal axis counterparts.

A residential wind turbine can be a relatively large device, needs to be high above nearby buildings and mature tree lines, and often must abide by zoning laws.





### TIPS:

- Small wind turbines can be mounted on a free-standing pole or mast or on a building above the highest point of the roof.
- Bigger turbines should be mounted on a suitable tower to raise them above any nearby obstacles. A good rule of thumb is that turbines should be at least 9 m higher than anything within 150 m. In general, an effort should be made to make sure that a small wind turbine is as far away as possible from large upwind obstacles.
- The economics of a wind system are very sensitive to the average wind speed in your hotel and the electricity prices. As a rule of thumb, you should have at least a 15 km/h average wind speed and be paying at least 10 € cents/kWh for electricity. Some new vertical axis models are now being produced to generate electricity with wind speeds as little as 8 km/h.



### Link to other solutions

- Small wind energy systems complement PV solar energy systems very well.
- A solar-wind hybrid energy system can provide a more reliable source of electricity because the sun tends to shine stronger when the wind is slack and vice versa.
- Battery storage provides more consistent output from a wind turbine.
- Costs vary, as hybrid systems can be tailored to meet site conditions and customer needs.





## BENEFITS FOR THE HOTEL



### COST REDUCTION

- The wind doesn't send monthly bills!!!
- The wind will never send you a bill!!

Over the long term, a wind turbine is a good investment because a well-sited wind system increases property value, similar to any other hotel improvement.



### STAFF INVOLVEMENT

Train your staff as guides to show guests the small wind energy system you have installed and explain them how it works, you can both attract more tourists and further involve your staff in order to get them feeling more responsible for their working place!

## BENEFITS FOR THE ENVIRONMENT



### GUEST INVOLVEMENT

By installing a small-scale domestic wind turbine on a suitable site, you can generate electricity to help power your home, reduce your energy bills and cut down harmful carbon dioxide (CO<sub>2</sub>) emissions at the same time.



### CARBON EMISSIONS REDUCTION

Install a demonstration diagram near your small wind turbine to show your guests how the wind is producing clean energy for your hotel. Surprise your “small” guests with a colourful windmill to show them the power of the wind. By motivating your guests, they will also feel more responsible and involved in taking care of your hotel! Guests will value the fact that your hotel is environmentally conscious.

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