



# Small scale wind power



A 6kW Proven wind turbine (Proven)

## What is it?

Wind turbines extract power from the wind with a rotor that typically consists of three or more blades. They come in wide variety of designs and can rotate vertically or horizontally although horizontal ones are by far the most common. They range from small 100 watt microturbines used to charge 12-24 volt batteries to 20 kilowatts (kW) machines which can export electricity to the grid during times when more electricity is produced than can be used.

Smaller models (up to 6kW) can be roof mounted whilst larger turbines tend to be mounted on masts around 15 metres high. They are particularly useful where mains electricity is not available or is expensive to connect. There are currently about 650 installations in the UK but only a handful in Dorset.

## Can I produce all my electricity requirements using this technology?

The total yearly power produced by a turbine depends on the blade length of your chosen turbine, the average wind speed of your site, and the site not being obstructed by other buildings or trees. You can find the average annual wind speed for your postcode from the British Wind Energy Association website ([www.bwea.com/noabl](http://www.bwea.com/noabl)). You may alternatively wish to monitor your site with an anemometer which can be bought for as little as £45.

Wind speed is critical; the power generated, in kW is proportional to the cube of the wind speed so if the wind speed doubles, the power produced will be eight times as much. As a guide a minimum average windspeed of 4.5-5 metres per second (m/s) is required for a site to be viable for a wind turbine.

Turbine manufacturers should provide you with a "power curve" which indicates the power produced by a turbine at different wind speeds. Smaller turbines can start-up at 2-3 m/s but do not reach their rated power until 10-11 m/s.

It is difficult to predict the output of roof mounted turbines but as a guide a 1 kW Windsave turbine with a 1.75 metre

blade might realistically produce about 650 kilowatt hours (kWh) per annum at an average wind speed of 4.5 m/s. This is about 20% of a typical households needs.

By contrast an appropriately sited 6 kW Proven 6000 turbine with a blade diameter of 5.5m should be capable of producing 7500 kWh of electricity at an average wind speed of 5 m/s. This is about double the needs of a normal home.



Erecting a 6kW Proven turbine (Proven)

## Where is the best place to put a turbine?

When assessing the best site for your wind turbine you should consider the following aspects:

- Put the turbine as high as possible. The wind speed increases with height. Small turbines should be around 6-15m above ground level.
- Avoid turbulent wind streams. Locate the turbine away from trees, buildings and other obstacles. The distance should be ten times the obstruction's height if placed behind a building and at least twice the height if located in front. Roof mounted turbines are likely to be subject to plenty of turbulence so you will have to accept a reduction in performance.
- With stand alone turbines locate at least 50m away from your neighbours property to avoid noise or flicker disturbance.
- Look for a clear aspect that faces the prevailing wind.

## How much maintenance is required?

All wind turbines have an expected life span of 20 – 25 years and should be serviced annually. This usually involves visual and noise checks for blade corrosion and component failure. Some parts may need lubrication, but most systems have sealed bearings requiring no maintenance. For systems that use batteries you will need to keep the electrolyte regularly topped up and grease the terminals, unless they are maintenance free batteries.



| Model       | Rotor (m) | Rated power | Estimated power output per year at 5m/s | Total cost inc. installation | LCBP Grant |
|-------------|-----------|-------------|---|------------------------------|------------|
| Windsave    | 1.75      | 1000W       | 883 kWh                                 | £ 1,600                      | £ 480      |
| Swift       | 2.1       | 1500W       | 1031 kWh                                | £ 4,500                      | £ 1,350    |
| Proven 600  | 2.55      | 600W        | 1363 kWh                                | £ 8,000                      | £ 600      |
| Proven 2500 | 3.5       | 2500W       | 3164 kWh                                | £ 10,900                     | £ 2,500    |
| Proven 6000 | 5.5       | 6000W       | 7805 kWh                                | £ 22,000                     | £ 5,000    |
| Iskra AT5-1 | 5.4       | 5300W       | 6455 kWh                                | £ 20,000                     | £ 5,000    |

Source: Building for a Future magazine Winter 2005/06

### What does it cost?

Some models, with their estimated performance, are listed above. The installation cost includes the turbine, mast and inverters but excludes VAT. Additional costs that you should consider include any battery storage that might be required and any foundation work and laying of concrete required for a stand alone turbine. If you intend to export surplus electricity to the grid you will need an export metre costing around £400 and if your turbine is more than 5 kW your grid connection might need strengthening.



A 5.3kW Iskra wind turbine (Iskra)

### Can I get a grant?

The Low Carbon Buildings Programme (LCBP) offers a maximum of £1000 per kW installed up to a maximum of £5000 and subject to a maximum of 30% of the project costs, as shown above. The installer and the product must be approved and a condition of the grant is that you must already have installed a basic level of energy efficiency measures including wall and loft insulation, adequate heating controls and low energy light bulbs. Community groups can

get 50% funding through this same programme (up to a maximum of £30,000) and can also apply to energy companies with green energy funds.

### What is the pay back?

A 1 kW Windsave producing 650 kWh would save about £78 per year based on current electricity prices. With a grant this would pay for itself in 15 years. A machine producing 7500 kWh of electricity could save £900 per annum. A Proven 6000 would pay for itself in 15-20 years with a grant. Sites with greater average wind speeds will pay back even quicker.

The carbon payback - the time needed to generate enough green electricity to cancel out the total energy used in making the turbine- is around 1 year for most turbines.

### Do I need to get a grid connection?

As with all renewable electricity technologies it is usually best to use the power you produce rather than selling it to an electricity company. Ideally you should try to stagger your use of the power so you are consuming it when the wind is blowing such as using your washing machine during windy days.

If you are producing more electricity than you need you can export the excess to the National Grid via an export meter. You will still be billed for any electricity that your property draws from the grid (current price is about 12p per kWh) but may also sell the excess back at a lower price. The price varies between buyers, so it is worth shopping around. A typical current price is around 7.5p per kWh.

If your turbine is rated at more than 5kW, the network may need to be strengthened. The cost can vary from £4,000 - £10,000 depending on the extent of work needed and the distance to the high voltage supply. You must also obtain a "Parallel Connection Agreement" from your local Distribution Network Operator and a "Combined Supply and Purchase Agreement" from an electricity supplier.

### Are there any planning issues?

Always check with your local authority, before installing a system. Typical issues that need addressing include visual impact, noise and possible changes to the character of conservation areas or listed buildings. As most roof mounted wind turbines need to be sited above the ridge height they will require planning permission.



Swift turbines on the Weymouth Sailing Academy

As a rule small stand alone turbines with mast heights lower than 15 metres do not need an Environmental Impact Assessment (EIA) and are permitted in Natural Parks, Areas of Outstanding Natural Beauty (AONBs) and Heritage Coasts as long as there is no serious environmental detriment to the area concerned.

**What is the potential for this technology in Dorset?**

In the UK we have 40% of Europe's total wind energy resource, but currently produce only about 0.5% of our electricity from this source. Dorset, as a coastal area, is particularly windy and there is enormous potential to harness the wind to bolster our indigenous electricity supplies. Nevertheless, even small scale wind projects should aim to be sensitive to Dorset's unique environment and the heritage value of listed buildings and conservation areas.



1.5 kW Swift turbine blade

**Pros and cons of small scale wind power**

**Roof mounted**

**Pros**

- Fairly easy installation
- Reasonably priced

**Cons**

- In most cases will only produce about 25% of a houses electricity needs
- Turbulence can significantly reduce performance and the life expectancy of a turbine
- Vibration can cause problems if connected to brick buildings

**Stand alone**

**Pros**

- Stand alone systems should produce enough electricity to export to the grid
- Expensive but potential for a high return on investment in exposed locations

**Cons**

- Requires lifestyle changes to gain maximum benefits (i.e. using appliances when the wind is blowing)
- Require ample space away from buildings and trees



### Wind installers operating in the South West

It is best to check that a product and installer are approved by the Low Carbon Buildings Programme. Always get several quotes before committing to an installer.

| Company                          | Telephone    | Website  |
|----------------------------------|--------------|--|
| Aeolus Power                     | 01454 633323 | <a href="http://www.aeoluspower.co.uk">www.aeoluspower.co.uk</a>       |
| Proven Energy                    | 01560 485570 | <a href="http://www.provenenergy.co.uk">www.provenenergy.co.uk</a>     |
| Renewable Devices (Swift)        | 0131 5353301 | <a href="http://www.renewabledevices.com">www.renewabledevices.com</a> |
| Segen Ltd                        | 01252 401025 | <a href="http://www.segen.co.uk">www.segen.co.uk</a>                   |
| Sustainable Energy Installations | 01256 392704 | <a href="http://www.sei-energy.co.uk">www.sei-energy.co.uk</a>         |
| Wind & Sun                       | 01568 760671 | <a href="http://www.windandsun.co.uk">www.windandsun.co.uk</a>         |
| Windsave                         | 0141 4207400 | <a href="http://www.windsave.com">www.windsave.com</a>                 |
| Iskra Wind Turbines Ltd          | 0845 8380588 | <a href="http://www.iskrawind.com">www.iskrawind.com</a>               |

## More information

|                                  |              |  |
|----------------------------------|--------------|--|
| British Wind Energy Association  | 0207 6891960 | <a href="http://www.bwea.com/small">www.bwea.com/small</a>                       |
| Energy Saving Trust case studies | 0845 1207799 | <a href="http://www.est.org.uk/myhome">www.est.org.uk/myhome</a>                 |
| Renewable Energy Officer         | 01305 228530 | <a href="mailto:k.lindegard@dorsetcc.gov.uk">k.lindegard@dorsetcc.gov.uk</a>     |
| Low Carbon Buildings Programme   | 0800 9150990 | <a href="http://www.lowcarbonbuildings.org.uk">www.lowcarbonbuildings.org.uk</a> |
| Dorset Community Renewables:     | /            | <a href="mailto:wheaton-greens@tiscali.co.uk">wheaton-greens@tiscali.co.uk</a>   |
| Dorset Energy Advice Centre      | 0800 512012  | <a href="http://www.deac.co.uk">www.deac.co.uk</a>                               |
| Dorset Agenda 21                 | 01305 213721 | <a href="http://www.dorsetagenda21.org.uk">www.dorsetagenda21.org.uk</a>         |