



DOMESTIC WIND TURBINES

Information Service, Centre for Alternative Technology, Machynlleth, Powys, SY20 9AZ.
Tel: 0845 3308373 or 01654 705989 Fax: 01654 702782 e-mail: info@cat.org.uk
For more information sheets, see our web site: www.cat.org.uk/information

Introduction

The UK is the windiest country in Europe, and wind farms are a great way to generate renewable, low-carbon electricity. Investing in large-scale wind turbines is an effective way to support the development of renewable energy and get a financial return. See our *Investing in Renewables* information sheet for advice on community-scale options.

Although there is financial support available, installation of your own domestic-scale wind turbine will involve a big up-front cost, and may take several years to recoup this cost.

It's important to first take energy efficiency measures, as these tend to give a bigger saving on carbon emissions for a smaller cost. See our *Saving Electricity* and *Energy Efficiency in the Home* sheets for advice.

After that, low-carbon heating systems such as a wood-fuelled boiler or a heat pump may be a more cost-effective way to reduce domestic emissions. See our information sheets on these options for more advice.

If you've already investigated other options, and if you live in a very windy location, then read on to find out more about how you could get clean electricity from a small wind turbine.

Off-grid homes

In off-grid homes (i.e. homes not connected to mains electricity), small-scale wind power can be a good alternative to either grid connection (often expensive) or a diesel generator (noisy and polluting, and with ongoing fuel costs).

Many off-grid homes can make good use of a combination of wind and photovoltaic (PV) solar power. These complement each other well, as there is more wind in winter and more sun in summer. See our *Electricity for Off-grid Homes* information sheet for more advice on calculating your energy demand and sizing batteries.

How much wind?

Wind energy is very site specific. You need first to gauge average wind speeds at your site. In our experience, people tend to overestimate how windy their home is, and a turbine that mostly sits unmoving will promote neither renewable energy nor your bank balance. It's worth checking properly, or you may end up with an expensive wind vane!

There are online databases that predict wind speeds for a given post code or Ordnance Survey map grid location (e.g. www.bwea.com/noabl). However, studies suggest that these are often a poor indicator for the actual energy produced by domestic wind turbines. Before you spend many £1,000s on a wind turbine you should seriously consider spending a few £100 on wind measuring equipment (a mast and a data logger).

Siting a turbine

The power generated is proportional to the cube of the wind speed, which means that doubling the wind speed gives eight times as much power. Conversely, if the wind speed halves, you'll only get an eighth as much.

To get the best from a turbine you need to put it where it will receive the strongest possible winds. An ideal site is a smooth hilltop with a clear open stretch (at least in the prevailing wind direction). This is why turbines are rarely sited in towns.

Wind speeds increase significantly with height, so it makes sense to mount a turbine very high up. Most turbine suppliers provide poles or towers (often several metres high), and the additional cost should be repaid by the extra energy generated. A tower helps to avoid the turbulence created by obstructions such as buildings and trees – this turbulence reduces power output and increases wear and tear on the machine.

The installation of a wind turbine requires planning permission, as it will be above the

level of the house and will create a small amount of noise. Because of this it's sensible to talk to your neighbours about your plans – people will generally be more supportive if they are consulted before a planning application goes in.

Can I put a wind turbine on my roof?

We do not recommend rooftops or buildings as suitable mounting points. Turbines near roof ridges will receive only weak, turbulent winds. Field trials have found that building-mounted turbines perform poorly, producing only a small fraction of the energy they could produce under more suitable conditions (see for example www.warwickwindtrials.org.uk).

In addition, turbines can resonate in the wind and produce vibrations inside the building. The forces acting on the turbine in high winds can damage the structure of the building.

Choosing a turbine

The smallest turbines, costing a few hundred pounds, are designed to charge up a 12 Volt battery in a boat or caravan. To make a decent contribution to household energy use, a much larger turbine is needed.

The *rated power* of a turbine is the power produced at its 'rated' wind speed (often 10m/s). The overall performance of a turbine is usually displayed using a 'power curve' - a graph of power output against wind speed.

Domestic wind turbines are typically rated between 1kW and 10kW. Many factors affect how much energy you'll get, but a rule of thumb is that a 1kW turbine on a good site should generate 1000kWh over a year (the average UK household uses around 3700kWh of electricity annually).

What will it cost?

When calculating installation costs it is important to factor in the tower and any equipment needed to either store energy (batteries) or sell it to the grid (an inverter).

Costs of turbine plus tower and installation are typically between £2,500 and £6,000 **per rated kW**. The total cost of installing a 6 kW wind turbine is typically around £20,000.

Will it pay?

The *feed-in tariff* (FIT) scheme for renewable electricity generation can make wind power a very attractive option.

Under this scheme, a wind turbine receives a certain payment (e.g. 26.7 p/kWh for systems > 15 kW) for every unit of electricity generated from wind power, whether you use it yourself or sell it to the grid (for another 3 p/kWh). Even off-grid homes are eligible. For a 6 kW wind turbine in a good location, this could work out to annual payments of around £3,000, guaranteed for 20 years.

However, to be eligible for FIT income, the turbine has to be installed by a professional accredited under, and using equipment registered with, the Microgeneration Certification Scheme (MCS, contact details below).

Further information

For advice on setting up a small wind system, see our book *Choosing Windpower* (£7.99). For those with engineering experience, a well-equipped workshop and lots of time and enthusiasm, we publish *Windpower Workshop* (£12), which describes how to build a wind turbine from second hand & scrap materials. These and other books on wind power can be purchased through **CAT mail order**: Tel: 0845 330 4592; <http://store.cat.org.uk>

We run many courses on renewable energy systems, including wind power, here at CAT: Tel: 01654 704952; www.cat.org.uk/courses

Contacts

Microgeneration Certification Scheme

Tel: 020 7090 1082

Web: www.microgenerationcertification.org

Lists turbines accredited for feed-in tariffs.

British Wind Energy Association online

guide to small wind: www.bwea.com/small

Grants might be available in some areas:

Energy Saving Trust

Tel: 0800 512 012; web: www.est.org.uk

Advice about local funding opportunities.