

BWEA Briefing Sheet

Small Wind Energy Systems

THE BRITISH
WIND ENERGY

ASSOCIATION

Why Small Wind?

Have you ever thought about the possibility of generating part or all of the electricity needs for your home, business or community? Small scale wind turbines are an ideal way of generating clean, renewable energy which will reduce your electricity bills and in the long term contribute towards a more sustainable electricity system.

Climate change is one of the main challenges facing mankind in the 21st century and it is now widely recognised that the causes of climate change are linked to human actions, particularly that of burning fossil fuels and the greenhouse gases they emit. In order to tackle this, the Government has set a target of 60% reduction in CO₂ emissions by 2050 and is encouraging the use of clean and emission-free renewable energy sources such as wind power.

Available Technologies

Wind turbine technology is well-established and due to its flexibility, it can be utilised practically anywhere. There are two basic systems available for using wind turbines to generate electricity - stand-alone or grid-connected. Wind turbine design can be either the more common horizontal axis type or vertical axis design. The turbine design and size to suit your site best is very dependent on your individual circumstances.



Rutland © Marlec Engineering Co Ltd

Stand-alone systems

Small wind turbines have traditionally been used to generate electricity for charging batteries to run small electrical applications, often in remote locations where it is expensive or not physically possible to connect to a mains power supply. Such examples include rural farms, island communities, boats and caravans. Typical applications are electric livestock fencing, small electric pumps, lighting or any kind of small electronic system needed to control or monitor remote equipment, including security systems.

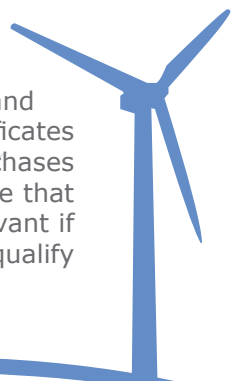


5kW turbines © Iskra Wind Turbine Manufacturers

Grid-connected systems

Here the output of the wind turbine is directly connected to the existing mains electricity supply. This type of system can be used both for individual wind turbines and for wind farms exporting electricity to the electricity network. A grid-connected wind turbine can be a good proposition if your consumption of electricity is high. The energy produced by the turbine can be used to reduce the energy taken from the grid, and for claiming Renewables Obligation Certificates (ROCs). The value of avoided electricity purchases is generally significantly higher than the value that

can be obtained from exporting power to the grid. This is particularly relevant if you are a business consumer of electricity as such onsite generation will qualify you for exemption from the Climate Change Levy.



When a wind turbine connection to the mains supply is made, it has to be approved by your local electricity company. They will insist on the connection being to a high technical standard and therefore the cost of incorporating power import and export metering and approved electrical protection equipment can be high. They may also limit the size of the wind turbine that may be connected in a particular area depending on the loading of the electrical distribution system in the vicinity. For small wind turbines, the cost of grid connection can be a substantial part of the total project cost.

Building-mounted turbines

Wind turbines installed directly on buildings are a new breed in the development of small scale wind. In this case, the wind turbine is directly mounted on to a building, usually on the rooftop or on the side of the building. Designs of such systems vary from manufacturer to manufacturer and include both vertical and horizontal axis machines.



Swift™ turbines © Renewable Devices



Turbine sizes

Small scale wind turbines vary in size with a range of models available, from less than 100 watts (W) up to 50 kilowatts (kW). Smaller, less than 100 W, microturbines, are often used to charge 12 volt (V) or 24 V batteries, for use on stand-alone systems. Turbines ranging from 0.6 kW to 50 kW can be used to provide electricity generation for individual houses and businesses, with rooftop models varying from 0.5 kW to 2.5 kW in size.

Siting a Small Wind Turbine

Wind speed

The first stage of any wind energy project is the available resource base. Feasibility assessment determines the average wind speed available on the site and accordingly the amount of energy that can be generated. Electricity produced by a wind turbine over a year depends critically on the annual mean wind speed at the site - higher wind speeds produce more energy. Sites located only a hundred metres apart can be significantly different. The ideal site is on a smooth and exposed hill top or rise and clear of any obstructions within a few hundred metres - such as trees or buildings. If connecting to the grid, the site should not be so far from the property or electricity connection that the cost of connection becomes excessive.

To assess the average wind speed at a particular site, a general indication can be established by using the UK wind speed database, available at www.bwea.com. This returns an estimated annual mean speed for a given Ordnance Survey grid reference. Wind speed can be measured by using an onsite anemometer, you can hire the mast and monitoring equipment, or consultants can do this for you. Several months of data at least are required to achieve an accurate figure - the longer the better. In general, small scale wind turbines start to generate electricity in wind speeds of approximately 2.5-4 metres per second (m/s) and their rated optimum wind speed is 10-12 m/s. For instance, a 6 kW turbine at a wind speed of 5 m/s will generate an average of 11,000 units of electricity a year.

Planning

Small wind energy installations require planning permission and local consultation with relevant stakeholders, such as neighbours. Deciding factors include environmental considerations, access to the site, noise and visual effect. Overall, national planning policies support the development of small scale wind energy, as noted below.

Planning Policy Statement 22 (PPS22) sets out a clear national policy framework on renewable energy for planning authorities in England to ensure that the Government's



renewable energy targets are met. Under PPS22 regional and Local Planning Authorities should recognise the full range of renewable energy sources, their differing characteristics, locational requirements and the potential for exploiting them subject to appropriate environmental safeguards. Small scale developments can also be permitted within areas such as National Parks, Areas of Outstanding Natural Beauty and Heritage Coasts provided that there is no serious environmental detriment to the area concerned. PPS22 introduces a new policy area for small systems by encouraging Local Planning Authorities to require that new developments should supply a percentage of their energy needs from onsite renewable energy sources. This is applicable to domestic, business and community developments. A good example of this in practice can be found in the London Borough of Merton Local Plan Policy PE.13: *Energy efficient design and use of materials*.

Scottish Natural Heritage (SNH) has specific guidance on location of wind farms in Scotland, which is contained in their policy statement "Strategic Locational Guidance for onshore wind farms in respect of the natural heritage" to be read in conjunction with the National Planning Policy Guidelines on renewable energy (NPPG6). Paragraph 7 deals specifically with smaller wind turbines and states that the special rules required for wind farms do not apply to small scale wind turbines: "*The guidance only applies to the consideration of onshore wind farms, and it excludes small wind developments of a domestic or small business scale, typically single turbines of under 50 kW capacity, which may be accommodated satisfactorily in most landscapes and in relation to which strategic guidance of this sort is unnecessary.*"

Costs of Small Scale Wind Energy

After the initial outlay of the wind turbine itself - and time spent obtaining planning permission, grid connection and power purchase agreement with your local electricity company - running costs are comparatively low and the fuel, the wind itself, is free. Wind energy technology is robust, requiring little in the way of maintenance; in fact most installations only require an annual check up. Turbines typically have a working life of 20-25 years.

Renewables Obligation

In addition to low maintenance costs, wind energy also has the benefit of counting towards the Renewables Obligation targets, introduced in April 2002. This is a legal requirement placed on electricity supply companies to source an increasing proportion of their supply from renewable resources up to 10% by 2010, and increasing to 15% by 2015. If your generation capacity is sufficiently large and is 'supplied' onwards, i.e. distributed through a network, you may be able to claim ROCs. In 2004, generators less than 50kW were included in the RO and therefore have the opportunity to claim ROCs, the minimum required power output is 0.5 megawatt hours per annum. The nominal value of a ROC at the time of writing was 3.22 pence per kilowatt hour in addition to any payment for the electricity itself, but the actual market value of a ROC can vary.



@Proven Energy

Climate Change Levy

An additional benefit of renewable energy for businesses is exemption from the Climate Change Levy. Introduced in April 2001, this is a tax on the business consumption of electricity, equivalent to 0.43 pence per unit or kWh. Businesses which generate electricity onsite from renewable sources can be eligible for a corresponding amount of Levy Exemption Certificates (LECs) again depending on the scale of generation. Small generators are likely to receive only percentages of the value of both the ROC and LEC, as some will be required as 'handling fees' by the company you contract to sell your electricity to. However, there are also schemes available from some electricity suppliers who will buy your ROC quota and administer all the related processes for the customer.

Funding

Clear Skies and SCHRI

The Clear Skies scheme offers grants and information on renewable energy projects in England, Wales and Northern Ireland, while the Scottish Community Renewables Initiative (SCHRI) applies in Scotland. As well as helping with costs, these programmes also advise on what type of renewable energy projects will best suit your needs. For more information on Clear Skies, go to www.clear-skies.org or call the Helpline on 08702 430 930, for SCHRI see www.est.org.uk/schri.



Proven turbine at Ladygrove Primary School © Michael Webb

The Rural Enterprise Scheme (England)

Run by The Department for Environment, Food and Rural Affairs (Defra), this programme provides assistance for projects that help to develop rural economies and communities. For more information, please log on to www.defra.gov.uk/erdp/ or call Defra Helpline on 08459 33 55 77.

Agricultural Business Development Scheme (Scotland)

This is a business development scheme for farmers/crofters in Scotland. Legal occupiers of agricultural units who have been actively engaged in agriculture for a minimum of two years are eligible to apply to the scheme for both investments in agricultural holdings and diversification projects. For more information, please visit www.scotland.gov.uk or call 01463 253065.

Local funding programmes

Contact your local Energy Advice Centre for more information on various local grant programmes: call the Energy Saving Trust (EST) Helpline on 0845 727 7200 to locate your nearest Energy Advice Centre. In addition, some energy supply companies have grants available for community projects, contact them directly for more information.

Loans

If you are not eligible for any funding options, you may want to consider a loan for your renewable energy project. The Triodos Bank offers loans specifically for renewable energy projects. For more information, please call 0117 973 9339.

Installing a Small Wind Turbine – in a nut shell

1. Get a reliable estimate of the wind speed at the proposed site. Turbine manufacturers should be prepared to help.
2. Mount the turbine on as high a tower as possible and well clear of obstructions, but do not go to extremes. Easy access will be required for erection, and foundations for the tower may be needed depending on the size and tower type. It is also important to ensure that the wind turbine can be easily lowered for inspection and maintenance.
3. Try to have a clear, smooth fetch to the prevailing wind, e.g. over open water, smooth ground or on a smooth hill.
4. Use cable of adequate current carrying capacity (check with the turbine supplier. This is particularly important for low voltage machines). Cable costs can be substantial.
5. Consult your local council as to whether you need planning permission. You should try to minimise the environmental impact of the turbine, and it will be helpful to inform your neighbours of your plans at an early stage.
6. For larger machines you may have to pay rates. This can make a big difference to the economics of the installation, again you should find this out by consulting your local council.

Links and further information

1. For manufacturers go to www.bwea.com/members/CompanyDirectory.asp and search under "Small System Suppliers" or call 020 7689 1960 for details.
2. See also Energy Saving Trust "Installing small wind-powered electricity generating systems", www.est.org.uk/bestpractice/publications.
3. For planning policy, see www.odpm.gov.uk (PPS22); www.snh.org.uk (SNH); www.merton.gov.uk/planning (Merton Council).
4. For details on domestic rooftop turbine trials go to www.bwea.com/you/own.html or call Scottish and Southern Energy Helpline on 01738 456663 or British Gas Helpline on 0845 601 2123.

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