Wind Turbines

Laurence GOULD PARTNERSHIP LTD renewables

Potential for the High Weald

There is good potential in the High Weald to Harness the power of the wind, particularly with small – medium scale turbines and in off grid situations.

However the heavily wooded and undulating nature of the area may preclude many locations from having suitable average wind strengths.

Care should be taken to design and locate wind turbines in locations sensitive to the areas landscape, natural and heritage features.

Introduction

Wind turbines simply use the winds kinetic energy to generate mechanical power for electricity generation, using a rotor, a mechanical drive train (usually with a gear box) and an electrical generator.

Wind turbines generate DC (Direct Current electricity) and an inverter is required to create a useable AC (alternating current).

There is huge variation in size and power output of wind turbines from a few 100W's to 3 plus MW (megawatts). They can be used in a variety of situations from small 'off grid' situations powering low energy light bulbs and storing energy in batteries right up to individual large turbines, and wind farms, supplying the national grid.

What size turbine?

Wind turbines are defined in rotor diameter and rated power or capacity (usually in kW – Kilowatts).

However their output is related to wind speed, and the rated power is only achieved for the time the wind speed is at its optimum. As a very rough guide, a good site for a turbine will produce an average output of only 30% of the rated power capacity of the turbine.

Therefore a 6kW (typical size for a community centre or hall) wind turbine has a rated capacity of 52,560kW per annum (if the wind was optimum for 24 hours a day and 365 days a year!) However the actual output may be 30% or even less than this i.e. <15,769kW per annum.

Manufacturers of turbines normally provide a 'power curve' within the specifications indicating the power produced at different wind speeds, these can be used to calculate the estimated annual power output for your wind conditions.

You need to consider this when finding a turbine to meet your requirements. As a guide an average household consumes about 4000kWh of electricity (excluding heating). With larger and older houses consuming more due to inefficiencies. Therefore the optimum size turbine for an average household would be 1.5 – 3kW.

Manufacturers of turbines normally provide a 'power curve' within the specifications indicating the power produced at different wind speeds.

Where is the best location?

Look for a clear aspect that faces the prevailing winds.

Although wind usually increases with height and the favoured locations are usually on hills, with minimal wind disturbance or turbulence from obstructions, many other locations may be suitable if they have adequate average wind to meet the chosen turbines demands.

How do I work out my Local wind conditions?

Knowledge of your local wind strength is key to the success of your project and predicting your energy outputs. Power from the wind is proportional to wind speed by a cubic ratio, therefore small drops in wind speed can dramatically reduce the potential energy output. Therefore if you halve wind speed the power goes down by a factor of 8 (2 X 2 X 2), a quarter of the wind speed gives you a 64th of the power!

In order to initially assess the suitability of a site for a turbine before investment the best source of initial local wind conditions is the NOABL database (www.bwea.co.uk). This will give you an average wind speed figure at a variety of heights, with the data generated by your postcode. The results shown presume no obstructions from buildings etc.

As a guide a minimum average wind speed of 4 – 4.5 m/s is required for a site to be viable for a turbine, ideally average wind speed should be closer to 6m/s. The next stage is to gather more site specific data. This can be relatively easily and cheaply done by erecting an anemometer as close to the desired height and proposed location. A basic anemometer and recording device can be purchased for between £100 and £150 pounds.

Can I create an 'Off grid' system?

If using an 'off grid' system the size and storage capacity of the batteries will determine what appliances can be run when there is no wind. Typical size turbine for electric fencing or low voltage lighting would be 100 watts and would charge 12 or 24V batteries.

Wind turbines can very effectively be combined with other renewable (or conventional) technologies to create a more constant and guaranteed power source for charging batteries – for example a combination of wind and Photovoltaic can work very well.

Can I sell excess power to the National Grid?

It makes more economic sense to use the power you generate yourself to directly replace what you would have normally purchased from an energy company (the price the energy company buys energy from you is usually about 2/3 of the price that they charge you!). Always shop around for the best deal, although you will have to buy and sell from the same company (combined supply and purchase agreement).

However if you are producing more electricity than you require, any excess or unused electricity can be exported or sold to the grid via an export meter.

If your turbine is rated above 5kW, your local network may need to be strengthened in order to link with a high voltage supply. Costs vary depending on distance but are usually between £5000 and £10000.

For more information on income from energy generation visit our website.

To calculate the potential income of your project visit our website.

Is there a good carbon payback?

Carbon payback is the amount of time it takes to repay the carbon that was used to make a product and is based on the carbon footprint of its manufacture.

Although paybacks are improving rapidly as technology develops, small micro scale turbines are relatively carbon inefficient and may not even deliver any real carbon savings over their lifetime, however small – medium scale turbines usually have a payback of 1-2 years and large scale turbines of between 500kW and 2MW have a much shorter payback of 6 months, although this does depend on their location and in particular the volume of concrete used in their support structures.

What about costs and maintenance?

Costs can vary widely depending on the quality of the turbine, size and location. Typical costs, including mast, inverters, turbine and installation would range from £2,000 for a 1kw system average estimated power output per year to £18,000 for a 6kw system.

Regular service checks are usually required and are important to ensure efficiency.

A typical lifespan would be 20 years for a turbine, although the blades may need replacing within this period and 6-10 years for a battery (depending on size).

The payback will of course vary depending on the efficiency and savings made.

To use our savings / payback and potential income calculators visit our website.

SWOT analysis

A SWOT Analysis is a strategic planning method used to evaluate the Strengths, Weaknesses, Opportunities, and Threats involved in a project or in a business venture.

STRENGTHS • Fairly easy installation • Reasonably priced with good payback • Range of sizes to fit most needs	**WEAKNESSES** • Requires ample space away from buildings and trees • Needs good average wind speeds
OPPORTUNITIES • Excess electricity can be exported to grid • Good for small off grid situations • Can be combined with other renewable technologies	**THREATS** • Planning will usually be an issue!

Planning Issues

Planning within the High Weald AONB

The High Weald Unit's role is to interpret government policy in the light of the AONB Management Plan (http://www.highweald.org/text.asp?PageId=254) and to provide advice to local authorities and others regarding planning applications. The Unit also responds to consultations regarding new planning policy at national, regional and local level, again based on the Components of Natural Beauty identified by the Management Plan. The Local Council is of course the responsible body as regards the exercise of planning powers.

Planning guidance (see below) actively encourages renewable development but makes allowances for designated areas such as the High Weald AONB:

In sites with nationally recognised designations planning permission for renewable projects should only be granted where it can be demonstrated that the objectives of designation in the area will not be compromised by the development, and any significant adverse effects on the qualities for which the area has been designated are clearly outweighed by the environmental, social and economic benefits.

Planning permission

Extracted from Planning and policy Statement (PPS) 22
http://www.communities.gov.uk/publications/planningandbuilding/pps22.

The planning regime for installing wind turbines is complex and evolving.
At present in most cases you will need to apply for planning permission from your local authority to add a domestic wind turbine to your house, or grounds surrounding your home.

It is up to each local authority to decide what information you may need to provide with your application. It may be helpful to contact your authority before applying to discuss the following planning issues:

- Visual impact
- Noise
- Vibration
- Electrical interference (with TV aerials)
- Safety.

A wind turbine development of 50MW or less installed capacity will need planning permission granted by the local planning authority under the Town and Country Planning Act 1990.

A wind turbine development of over 50 MW capacity will be considered by the Secretary for State for Energy, under Section 36 of the Electricity Act 1989, and the local planning authority will be a statutory consultee.

Always check with your local planning authority about planning issues before you have a system installed.

Building Regulations

If you wish to install a wind turbine which will be attached to your house building regulations will normally apply.

Size, weight and force exerted on fixed points would be considerable.

Building regulations also apply to other aspects of the work such as electrical installation. It is advisable to contact an engineer who can provide the necessary advice.

If the wind turbine is not attached to your house, then only the electrical installation and connection will be captured by the requirements of the building regulations.

Contacts

District or Borough Council Planning Departments for the High Weald area:

Horsham: **01403 215187**	Crawley: **01293 438787**	Mid Sussex: **01444 458166** **(main switchboard)**
Tandridge: **01883 732859**	**Wealden:** 01892 653311 (main switchboard)	**Rother:** 01424 787600
Hastings: **01424 783300**	**Sevenoaks:** 01732 227000 (main switchboard)	**Tonbridge & Malling:** 01732 844522 (main switchboard)
Tunbridge Wells: **01892 526121** **(main switchboard)**	**Ashford:** 01233 637311 (main switchboard)	

Further Planning Information

Planning Policy Statement 22: Renewable Energy – http://www.communities.gov.uk/publications/planningandbuilding/pps22

Planning for Renewable Energy: A Companion Guide to PPS22 - http://www.communities.gov.uk/publications/planningandbuilding/planningrenewable

High Weald Management Plan - http://www.highweald.org/text.asp?PageId=254

Useful contacts

British Wind Energy Association – http://www.bwea.com

Centre for alternative technology – www.cat.org.uk

Renewable energy association – http://www.r-e-a.net

Carbon Trust – www.carbontrust.co.uk

Energy Savings trust – http://www.est.org.uk

Potential Grant sources

Low Carbon Buildings programme – www.lowcarbonbuildings.co.uk

England Rural Development Programme – www.seeda.co.uk

WARR partnership (LEADER) – www.warrpartnership.org.uk

High Weald AONB (Sustainable Development Fund) – http://www.highweald.org

Carbon Trust (Interest Free Loans) – www.carbontrust.org.uk

Enhanced Capital Allowance Scheme – www.eca.gov.uk