TECHNICAL FACTSHEET: WIND POWER

What the dimensions for the various turbines?

The dimensions are as follows:

- 200W 2m diameter, 4.5m tower
- 300W 2.5m diameter, 6m tower
- 500W 2.7m diameter, 6m tower
- 1kW 3.0m diameter, 6m tower
- 2kW 3.6m diameter, 8m tower

Does your wind turbine produce 1kW per hour or per day?

You are confusing power (kW) and energy (kWh). The wind turbine power is measured in kW - this means the rate at which it produces renewable energy. If you measure the amount of energy produced by the wind turbine in a given time e.g. in a day, you would do so in kWh (kW hours). So if the turbine ran at rated power (2kW) for 4 hours, then it would produced 2kWx4h=8kWh of energy. Another example is a 100W lightbulb. This uses 0.1kW of power when it is running. If the light was lit for 5hours, then it would use 0.1 x 5hours = 0.5kWh of energy

Do I need planning permission?

Planning requirements vary from one area to another. Most planning departments will require planning consent for structures over 4m high. However, planning should not be required for temporary structures - and many people have successfully argued that a tilt-up tower (as supplied by our supplier), is a temporary structure, as it can be lowered to the ground when not in use. The same applies for mounting the turbine on any kind of moveable structure, such as a trailer, light gantry, cherry-picker or forklift. If planning consent is sought, it is normally granted without problems, and we can help with the wording of planning applications, if required. Approximately 95% of customers do not bother with planning permission, and this does not normally cause problems. You can always apply retrospectively, if required to do so.

Where should I site the wind turbine?

The turbine should be sited far enough away from living and sleeping areas so as not to cause disturbance. Consideration should also be given to neighbours in this respect - after all, they will not be

reaping the free electricity from the wind turbine! Generally the wind turbine should be at least 6m (for 4m towers) or 8m (for 6m towers) from the house. To ensure safety, the tower should be sited away from buildings, cars and play-areas etc. so that no damage will occur to property if the tower should fall for any reason. You should not allow anyone to come within 7m of the tower whilst the wind turbine is operating, or during windy weather, for safety reasons. Some companies advocate mounting a wind turbine on a rooftop or gable end. This is strongly discouraged by most installers for the following reasons: vibration will carry through the building structure and exaggerate noise inside the building; the building structure may be weakened by constant vibration, unless a very small turbine is used; planning consent is much less likely for roof-mounted turbines and the turbulence associated with a roof will reduce performance and lifespan In terms of performance, the wind turbine should be mounted in an open position away from trees, buildings or any other structures. The turbine should be mounted as high as practical, and with clear views to the prevailing wind. If possible, the turbine should be located on a hilltop, or ridge on the side exposed to the prevailing winds. Not all locations can provide ideal positions for wind turbines, but even theoretically poor sites can yield adequate results, although you may experience lower outputs.

How much noise do these make?

Wind turbines are not silent, but nor are conventional power sources (think of petrol or diesel generators!). The wind turbines make a swishing noise, caused by turbulence around the blades. This is not particularly loud, and often the noise of the wind itself and of trees buffeting in the wind is louder. However, in strong winds, the turbine can create a noticeable whistling noise - so it is not a good idea to site it immediately next to your house. As a guide, with double-glazing, it is unlikely that turbine noise will be noticeable inside a building 10metres away.

The survival wind speed (40m/s) seems low

Actually this is quite fast - it is equivalent to 90mph. This is the highest inland wind speed ever recorded in the UK. However most wind turbine failures are caused by gusts rather than constant high speed wind - often gusts will be far faster than the measured wind speed, and often come from a completely different direction. Customers in very windy areas-particularly on the coast in exposed locations - may consider this survival speed too low. In such circumstances, it is possible to trim the blades to a shorter length, which will reduce their performance in low wind speeds, but it will allow the turbine to withstand higher wind speeds without damage. It is important to bear in mind that these turbines are low-wind speed turbines, which in average UK winds, outperform wind turbines from another British manufacturer rated at 4 times higher power!

Can I get a grant for these systems?

In order to get approval for the government's so-called grant scheme, it is a necessary for us, as a distributor, to spend tens of thousands of pounds to register for the BRE's 'grant' scheme - and installers also have to spend a couple of thousand pounds to register. The scheme is supposed to be self-funding - in other words, the money we spend on registering for the scheme will then be used to provide the grants (after approximately 50% deduction for administration costs). If we do this, the price of the wind turbines would have to be increased substantially to cover our costs. Rather than subsidise the cost of this 'scheme', we feel it more beneficial to offer all customers good prices. Hopefully the government will re-think its grant scheme!

Can I connect the wind turbine to the grid to sell the electricity?

The wind turbines producing less than 1kW of power are low-voltage machines, designed for charging 24v-48v battery banks. You will need a 'grid tie inverter' to feed electricity into the mains supply. These are special inverters that must meet the requirements set out in the G83 electrical standard (http://www.iee.org/Publish/WireRegs/Commentary-updateJun03.pdf). However, grid-tie inverters are usually designed for input voltages of 200-600v, so most are not suitable for this application. There are a few available for example Phillips can provide suitable equipment which accepts low voltage input, but they are not suitable for grid-tie. We do offer 2kW and 1kW wind turbines in high voltage for customers wishing to attempt grid-tie systems.

How much maintenance do the systems require?

The wind turbines are very reliable. No strict maintenance is necessary, but the turbine blades should be checked regularly for damage, and to ensure that they are in balance, and the structural parts (tower, guy wires, anchors etc) should be checked for structural damage, cracks etc

Are spares available?

Yes, spares are available for these machines. The turbines are very reliable, so it is unlikely you will need spares, unless you make a mistake during installation.

Will the system need to be inspected by a electrician or be installed by an electrician?

As these are low voltage systems, you do not need to get an electrician to install or commission the system. However, if you plan to connect anything to your household wiring system, you should consult a qualified electrician.

What is the best way to utilise wind power?

Wind power is not a constant resource. For this reason you cannot generally run appliances directly from the turbine. Instead, there are three main ways to utilise wind power:

- Store the power in batteries, for reuse when needed
- Use the power to provide heating (especially useful as houses lose heat faster in windy weather)
- Sell the electricity directly to the grid, and buy it back when required.

What batteries should I use?

Any type of lead acid battery can be used, but the best batteries to use are 'deep cycle batteries'. Unlike

car batteries, these are designed to withstand deep discharge without damage. They are made with much thicker and heavier lead plates, which are more resistant to damage, and last many times longer than conventional lead acid batteries. Deep cycle batteries are also used for forklifts and leisure batteries. We can supply suitable deep cycle batteries at excellent prices- please ask us for details. Do not be tempted to buy gel cell batteries. These are good batteries, but not very suitable for renewable energy use. This is because gel cells are designed to be charged carefully, and within strict limitations. The variable nature of renewable energy makes this application quite unsuitable.

How many batteries do I need?

The smaller wind turbines are designed for 24v usage. The 500W turbine is designed for 36v and the 1kW for 48v. You therefore need to use the appropriate number of 12v deep cycle batteries connected in series i.e. 2x12v for 24v operation, 3x12v for 36v or 4x12v for 48v. If you need higher capacity, you can make up additional banks of batteries and put these in parallel - see diagram below:

What is the recommended system voltage and wattage, and why?

It is a matter of personal preference, and there are many variables that affect this decision. Often it is necessary to choose a wind turbine that has to integrate into an existing system - e.g. photovoltaic's, an existing battery bank or a DC backup system. In this case, your choice of turbine will be determined to some extent by the existing system voltage. If you are not constrained by this, you need to work out how much power you require, and how much power is available. Wind power varies enormously from one site to another, and even at different locations on the same site, but as a general rule, in a good location you will expect about 30% of the maximum output when you average out over the whole year. You can expect proportionately more power during the winter months, and periods of bad weather. Incidentally, it is possible to boost the performance of the wind turbine in very low wind conditions by using it will a smaller battery bank than intended. For example, if you use a 500W 36v turbine to charge 24v batteries, then the power curve will be shifted towards lower wind speeds, but with a penalty of having a lower maximum output. One customer reported that his Our supplier 500W turbine massively exceeded the output of a Proven 2kW turbine in almost all conditions, when used with a 24v battery.

How do I connect the batteries?

The batteries should be connected in series to produce the required voltage. In other words, if you wish to make up a 36v battery bank using three 12v batteries, you should connect the negative terminal of battery '1' to the positive terminal of battery '2' and the negative terminal of battery '2' to the positive terminal of battery '3'. The charge controller output should then be connected to the positive terminal of battery '1' and the negative terminal of battery '3'.

Where can I get the cables for the batteries?

Battery cable can be made up from sufficiently thick copper cable, short lengths of steel or brass bar with battery clamps attached, or if you have screw terminals, you can make connectors from steel plate with appropriately drilled holes. It is also possible to purchase battery cable from battery or renewable

energy suppliers, but expect to pay a high price!

Do you have 12v wind turbines for sale?

Yes, we can now supply the 200W and 300W turbines suitable for 12v operation

Can I use the 200W/300W wind turbine with 12v (or 500W/1000W turbine on 24v)?

Yes, you can use any of the wind turbines that we sell on 24v or 12v systems. This will mean that the maximum power output is reduced as the battery will act as a brake. For example, if you use the 500W (36v) turbine with 12 volt systems expect 1/3 of the power, so around 180Watts max, on a 24 volt system the same machine will produce about 365 Watts max. On the other hand your cut in speed is much reduced. If you were to use a 200 Watt (24v) wind turbine on a 12v system, its cut in speed will be reduced from around 4.5m/s to around 2.5m/s.

How do I tell how charged my Batteries are?

The state-of-charge of a lead-acid battery can, to a certain extent, be estimated by measuring the open terminal voltage. Prior to measuring, the battery must have rested for 4-8 hours after charge or discharge and reside at room temperature. A cold battery would show slightly higher voltages and a hot battery would be lower. Plate additions of calcium and antimony will also vary the open terminal voltage. Furthermore, AGM has a higher voltage plateau than the flooded lead acid State of Charge Voltage (open circuit) 100% 12.65v 75% 12.45v 50% 12.24v 25% 12.06v 0% 11.89v

Why does my inverter shut down unexpectedly?

This can be for two possible reasons - either the inverter is overloaded, or the voltage is too low (due to battery voltage too low, poor battery connections or insufficiently heavy battery cable). The inverter shuts down before the batteries are completely discharged to protect the battery from damage

Should I balance the blades before use?

Yes. Balancing the blades will result in trouble free running, smoother operation with less vibration and longer bearing life.

How do I balance the blades?

This is actually quite simply. First make sure that the blade tips are equidistant from each other. Then, with the turbine in its normal position, and stationary, blades and hub attached, simply place a weight onto one of the blades extended horizontally from the hub. Start with the weight next to the hub, and gradually move it outwards until the blade starts to turn. Measure the minimum distance required to start turning. Repeat with each blade. If all the measurements are the same, then the blades are balanced. If however, one blade requires the weight to be further out, it means that this blade is lighter,

and therefore more weight must be added. You can do this by sandwiching lead plates between the blades and the retaining plates.

Do I need to protect my turbine from Lightning?

In many areas, this is not a real threat, however wind turbine towers should be properly grounded or induced current from a nearby lightning strike could damage the associated electronics. Generally, the metal components of the tower and turbine should be grounded to one or more ground rods near the tower base. Very tall towers should have a ground rod at the base plus an additional ground rod at each guy anchor, with all guy wires that connect to that anchor bonded together

How much power can I feed into the National Grid (If using Grid-connect inverters)?

The electricity companies restrict grid-tie systems to 3.6kW per phase (ie 10kW for 3 phase), but this limit will be raised to 6kW per phase in Autumn 2007. The supply lines will handle a great deal more than this (an average house has a 100A fuse - so you can consume up to 24kW). You can often agree a higher grid-feed limit, but this normally requires a survey - which can cost up to