

# Power from the wind

Wind power is a clean, green source of electricity generation, without the greenhouse gases or air pollutants emitted by fossil fuel plants or the radioactive risks from nuclear power. Wind power is safe, everlasting and contributes to our energy diversity and security. Wind power is the world's fastest growing energy source and has the potential to create hundreds of thousands of jobs in manufacturing and construction.

Every unit of electricity generated by a wind turbine fully displaces a unit of electricity from a fossil fuel power station and the pollution it would have emitted.

## Our turbine

This turbine is a 225kW V29 model manufactured by Danish company Vestas. It is 36m high to the hub (top of the tower) and has a 29m diameter rotor. The turbine is connected to the buildings' electrical distribution network and the grid and is expected to generate at least 250MWh annually - more than double our anticipated consumption of 115MWh. Excess power (equivalent to the needs of over 30 homes a year) is exported to the local grid. It is sold to Herts-based electricity supplier Green Energy (UK) plc.



Photo Norman Childs

## In harmony with the landscape

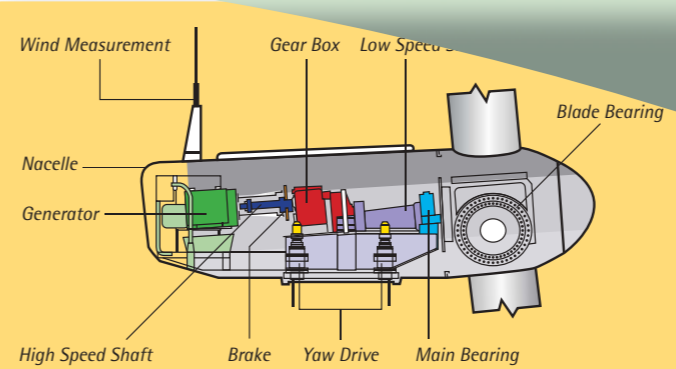
This wind turbine is the first to be built within sight of Britain's busiest motorway, the M25, and is seen by 170,000 motorists every day. It is also visible from trains on the nearby West Coast mainline. The turbine was granted unanimous approval by Three Rivers District Council's planning committee and public reaction since it went up in September 2003 has been very positive. We are demonstrating that wind power can be integrated into local developments and can be a popular addition to the landscape.

## What happens when the wind doesn't blow?

We have a range of renewable energy technologies on site that can provide energy over the course of the year. Wind turbines obviously only generate power when the wind is blowing (around 80% of the time depending on the location) but this tends to mirror periods of high energy consumption. This turbine should provide more than twice the amount of electricity we need every year, and still send surplus to the grid.



Photo Francois Schoor



## How does it work?

The turbine will start generating at 3.5 metres per second (m/s) (approx 8mph) and shuts down for safety reasons at 25m/s (approx 56mph). When the wind blows it turns the three-bladed rotor, which spins a shaft inside the nacelle. At lower wind speeds the rotor and the shaft will spin at 30rpm and at higher wind speeds 40rpm (connecting to either the small or large generator inside the nacelle). A gearbox increases the rotational speed to 1000/1500rpm in the generators where mechanical energy is converted to electrical energy. The electricity travels via cables down the tower and underground to the building and to the local grid (via a substation).

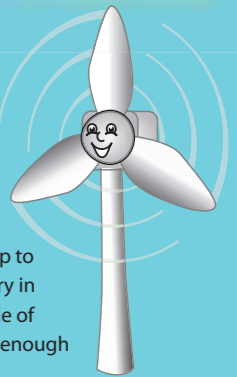
The frequency of the grid (50Hz) keeps the rotor and generator speed constant, regardless of fluctuations in wind speed. If it is turning at less than 30rpm then it is idling and waiting for the wind speed to pick up so that it can begin generating again.

The nacelle will automatically turn (or 'yaw') into the wind - you can see the weather vane and anemometer (for measuring wind speed) on the top. The blades have variable pitch for aerodynamic control.

## Noise and wind turbines

One of the most common myths about wind turbines is that they cause a noise nuisance. However, modern turbines are surprisingly quiet - as you can hear. Often any noise from the turbine is masked by the sound of the wind itself. Sensitive siting and layout design can also keep noise impact to a minimum.

## BEAUFORT'S ENERGY TRAIL



The tower is made of steel and there is a vertical ladder inside. When people climb they have to be attached to the ladder with a harness in case they fall. They can climb right up to the top to inspect the machinery in the nacelle. The blades are made of fibreglass so that they are light enough to be turned by the wind.

- ⚡ Can you work out how fast the rotor is turning - ie how many revolutions per minute (rpm)? (tip: count how many times one blade passes the tower while someone times you for a minute).
- ⚡ Can you reach round the tower with your arms outstretched?
- ⚡ How many people would it take to reach round it?
- ⚡ Is the tower smooth or rough, hot or cold? Can you feel it vibrate?

People have used the power of the wind for thousands of years. This is just a modern version of the old windmills that used to dot Britain's landscape. Instead of using the wind to grind corn for bread, we are using it to provide the electricity we need to run our computers or boil the kettles in our office.

