

## Wind turbines

### Wonderful wind

The UK has some of the best wind in Europe. This is probably why the number of wind turbines being used to generate electricity here has increased dramatically in the last 10 years.

At present there are nearly 200 large operational wind turbine projects connected to the National Grid around the UK. These comprise over 2000 wind turbines, generating enough electricity to supply nearly 1.5 million homes. The cost of energy from wind turbines is becoming more competitive with the cost of energy from fossil fuels and the more wind turbines there are, the cheaper it will get.<sup>1</sup>

### How does a wind turbine work?

Wind turbines are really quite simple.

1. The wind blows against the rotors, which causes them to spin.
2. The rotors are connected to a shaft which runs to a generator via a gear box.
3. The shaft turns the generator.
4. The generator produces electricity.



### Controlling the turbine

Small wind turbines have a vane on the back so that they always face into the wind. For large wind turbines, which weigh several tonnes, this would not work. Instead they have an electronic control system which monitors wind direction. This is connected to a motor and gearbox, which can control the direction in which the rotor faces. This is called its yaw.

If the wind blows too hard it could spin the rotor so fast that it causes damage to the shaft and generator. Again, electronic sensors monitor the wind and rotor speed. If the rotor speed is too high a brake can be applied and the individual rotor blades can be feathered – this means that they are each turned edge on into the wind, so that they no longer rotate. This adjustment is carried out by the rotor blade pitch mechanism.

### But it isn't windy all the time

In theory, a wind turbine rated at 1 megawatt (MW) should be able to produce  $1 \text{ MW} \times 8760$  (the number of hours in a year) = 8760 megawatt hours (MWh) of electrical energy per year.

However, when the wind doesn't blow, the rotor doesn't turn and no electricity is generated. Wind turbines, like other methods of generating electricity, also require some time for routine maintenance during which they will not be able to generate electricity. This time is accounted for by multiplying the maximum possible energy output by a load factor. For wind turbines this is generally about 30%, which means that the actual energy generated per year would be 30% of 8760 MWh - so 2628 MWh.

<sup>1</sup> www.bwea.com