

Data sheet

Wind turbines create electricity using the power of the wind. Sources of energy like wind and solar power are called renewable sources of energy because they don't use up natural resources like oil or gas.

Around 2% of the electricity generated in the UK comes from wind turbines. This is enough to supply half a million homes.

Power facts

Power output is measured in watts (W). One kilowatt (kW) is 1000 W, and 1 megawatt (MW) is 1 000 000 W.

The power generated by a wind turbine depends on the diameter of the blades and the speed of the wind. You can use this formula to estimate the power of a turbine.

$$P = \frac{D^2 \times W^3}{60}$$

P is the power generated in watts

D is the diameter of the blades in metres

W is the wind speed in mph

Wind farm projects

Project	Bradwell-on-Sea	Whitelee	Camster	Drone Hill
Number of turbines	10	39	25	22
Cost of manufacturing each turbine	£360 000	£620 000	£400 000	£230 000
Cost of transporting each turbine	£80 000	£195 000	£110 000	£65 000
Power output (megawatts)	5	42	15	9

Cost of project = $N(M + T + £10\,000)$

N is the number of wind turbines in the project

M is the cost of manufacturing each wind turbine

T is the cost of transporting each wind turbine

Tempest



Diameter: 3.7 m
Price: **£5875**

Squirrel 150



Diameter: 1.5 m
Price: **£755**

Apollo 1200



Diameter: 2.7 m
Price **£2450**

Produces
1200 W of
power!

Question key:

-  Open
-  Beginner
-  Improver
-  Secure pass

Questions

- 1** The UK produces about 45 000 MW of electrical power.
 - a** What percentage of the UK's electrical power comes from wind power?
 - b** Calculate how many MW of electrical power come from wind power.
- 2** The table opposite shows four planned wind farm projects.
 - a** Use the formula given to calculate the cost of building the Camster wind farm.
 - b** How much more will it cost to build the Whitelee project than the Drone Hill project?
 - c** The Bradwell-on-Sea wind farm project has a budget of £7 million. Will it go over budget? Show all of your working.
- 3** A newspaper prints a report on wind power.

Daily ★ Record

£1 million per MW

A REPORT ON THE COST
OF NEW WIND FARMS



Do you agree with the headline? You must show your working.

- 4** The world's largest wind turbine is the Enercon E-126. It has a diameter of 126 m. Use the formula given to work out the amount of power produced by the Enercon E-126 if the wind speed is 18 mph. Round your answer to the nearest 100 000 W.
- 5** Chloe wants to buy a wind turbine for her house. She compares three different products.
 - a** How much more does the Tempest cost than the Squirrel 150?
 - b** Calculate the power output of the Tempest if the wind speed is 12.5 mph. Round your answer to the nearest watt.
 - c** Calculate the power output of the Squirrel 150 if the wind speed is 15 mph. Round your answer to the nearest watt.
- 6** The average wind speed at Chloe's school is 9.5 mph. The manufacturer of the Apollo 1200 claims that it will produce 1200 W of electrical power. Do you agree with this claim? Show all of your working.