

Westmill Wind Farm (WWF)**Key facts and figures**

Answers Senior



Using the correct words and numbers, fill in the gaps below.

130 tonnes	Wales	zero	61 metres	Southampton
Immingham	feather	75 to 150 metres	150m	
Five	Denmark	2.5 to 25 metres		Hungary
5 times	50 metres	England	lightning	carbon fibre
Sub Station Control Room		twice	30metres	5,200
Generator	three	1%	South-west	2,500

The Site

Turbines spaced linearly (almost East-West) approximately 150m apart maximising the prevailing South-west wind.

1% of the farm total area is taken up by the turbines and associated works.

Mean annual wind speed predicted on site is 6.3 metres per second (14 mph) Suggests an annual output exceeding 12 million kilowatt hour (kWh), sufficient for over 2,500 homes. (Note 1 kWh is the amount of electricity used in 1 hour by a 1 bar electric fire or used in 1 hour by 17 light bulbs rated at 60Watts).

Planning Permission

It took over 10 years to obtain planning permission to develop the wind farm Many arguments were made against the Wind Farm – see page 3.

Turbines

The five turbines were manufactured by Siemens in Denmark, each with three blades.

They are capable of generating 1,300 kW when the wind speeds are sufficient.

The blades are made from fibre-glass reinforced epoxy with lightning receptors protection fitted close to the tip.

Height to hub 50 metres

Two tower sections

Rotor diameter 61 metres (each blade is 30metres long)

Tower weight 54 tonnes

Nacelle weighs 46 tonnes (for gearbox and electricity generator).

Rotor weighs 30 tonnes.

Total weight of turbine 130 tonnes (your calculation)

Each foundations has ~ 330 cubic metres of concrete and
~ 36 tonnes of steel reinforcement.

Delivered in sections by road from the port of Immingham.

Erection: once the foundations were laid, the 5 turbines took only 8 days to erect.

Operate at wind speeds between 5.5 and 56 mph (2.5 to 25 metres per second or from Beaufort scale 2 (light breeze) to scale 9 (severe gale)).

If the wind goes above 56mph, the turbines automatically shut down. When this happens, the blades feather so that they present the least resistance to the wind.

Max wind speed until 15.08.09 = 17m/s

The first electricity was generated on 19th February 2008.

Maintenance

Siemens will monitor and maintain during the 5 year warranty period for WWF. Scheduled maintenance takes place [twice](#) a year.

Turbines are monitored at a unit in Newtown, [Wales](#). They will call out a maintenance engineer if necessary.

The electricity generated by Turbines 1, 2, & 3 is currently purchased by Good Energy and 3 & 4 by Co-operative Energy.

Sending the wind power to the electricity distribution system

At the top of the turbine, in the nacelle, is a [Generator](#) which is turned by the force of the wind on the blades of the turbine.

The meters to measure our exported electricity generation are in the [Sub Station Control Room](#). The electricity is carried by underground cable to Longcot where it joins the distribution grid to reach our homes, schools, shops and factories.

Environment

The wind farm output should reduce carbon dioxide emissions by about [5,200](#) tonnes per year.

In order to manufacture and construct the wind farm, considerable energy was used. It was recovered by electricity generation from the wind during the first year of operation.

Thereafter, we are generating [zero](#) carbon energy for the rest of the expected 25 year life of WWF.

Generation Income

We expect to generate sufficient electricity to earn around £ 1 million per year.

In our first financial year (the first 8 months of actual operation), we made a profit of £148,000 and paid a dividend of 2.3 pence per £1 share.