

# **Key Facts and Figures Westmill Wind Farm (WWF)** Nov 2015



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## **1. The Site**

It was an airfield in the Second World War, restored in 1976, and is now an arable farm.

The flat open landscape is ideal for a wind farm, with turbines spaced linearly approx 150m apart at right angles to the prevailing south west wind. Only 1% of the farm total area covered is taken up by the turbines and associated works. The rest is used for farming activity.

Mean annual wind speed on site is 5.5 metres per second, which results in an annual output of 10.2 million kilo Watt hour (kWh), sufficient for over 2,100 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).

## **2. Turbines**

There are 5 turbines, each with 3 blades and capable of generating 1.3MW (million Watts) manufactured by Siemens in Denmark. Height to hub is 49m in two tower sections; rotor diameter is 62m with each blade being 30m long. Tower weight is 54 tonnes and this is capped by a nacelle weighing 46 tonnes (where the gearbox and electricity generator are housed). Finally, the rotor weighs 30 tonnes. To support the total 130 tonne weight of the turbine requires solid foundations. Each of the 5 foundations consists of ~ 330 cubic metres of concrete and ~ 36 tonnes of steel reinforcement.

The 5 turbines were delivered in sections by road from the port of Immingham. 2 cranes were used to erect the 5 turbines, in only 8 days

The turbines are designed for sites such as ours and can operate at low wind speeds although most of the electricity is generated at the higher wind speeds. They operate at wind speeds between 10 – 55 mph. The first electricity was generated on 19<sup>th</sup> February 2008.

A company called Jacobs maintains the wind farm remotely from Blyth in Northumberland, and come to site to carry out scheduled maintenance twice a

year. The turbines are monitored by Energy4All in Cumbria, who call out a maintenance engineer if necessary. The turbines are owned by Westmill Wind Farm Co-operative.

### **3. Getting the wind power to the electricity distribution system**

At the top of the turbine is a generator (a very large version of the alternator in a car) which is turned by the blades of the turbine. The generator produces electricity at 690 volts (your home is supplied at 240 volts) and this is then converted to 33 kV (thousand volts) in a transformer located at the bottom of tower. This high voltage is necessary to match the voltage of the local distribution grid run by Southern Electric.

The metres to measure our exported electricity generation are located in the Sub Station Control Room –the brick buildings near turbine 5 at the foot of the hill. Our exported electricity is carried by underground cable to Longcot where it joins the rest of the local distribution grid.

### **4. Environment**

The wind farm output reduces carbon dioxide emissions by about 4,800 tonnes per year. The energy required to construct the wind farm was recovered by electricity generation during the first year of operation. Thereafter, we are generating zero carbon energy for the rest of the expected 25 year life of WWF.

### **5. The Economics of WWF**

#### **Construction costs** (all figures in £ million)

5 turbines	£ 5.1
Balance of Plant	£ 1.4
Connection to the electricity grid	£ 0.6
Project Management etc	£ 0.2
Total construction costs	<u>£ 7.3 million</u>

The money to build and launch the wind farm was raised by a bank loan and by the WWF co-operative members buying shares in the wind farm. Over 2,600 shareholders put in a total of £4.6 million and £3.8 million was borrowed from the Co-operative Bank.

#### **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 thousand and paid a dividend of 2.3 pence per £1 share – an encouraging start. At the moment we effectively have a “mortgage” with the Co-operative Bank and what we currently pay them is mainly interest plus some capital repayment. Over time, as the interest payments decrease, our members will see an increase in dividends. We hope to give our shareholders an average rate of return over the life of WWF of over 6.5% per year.

**6. Performance in operation**

<b>Financial Year Ending</b>	<b>Actual (kWh)</b>	<b>Budget (kWh)</b>	<b>Variance</b>
<b>2008</b>	7,612,170	7,408,460	103%
<b>2009</b>	9,876,685	12,099,750	82%
<b>2010</b>	9,294,504	12,099,750	77%
<b>2011</b>	10,250,665	12,099,750	85%
<b>2012</b>	10,575,355	12,099,750	87%
<b>2013</b>	10,446,285	12,099,750	86%
<b>2014</b>	10,234,885	12,099,750	85%
<b>2015</b>	9,842,261	12,099,750	81%
<b>Total</b>	<b>78,132,810</b>	<b>92,106,710</b>	<b>86%</b>