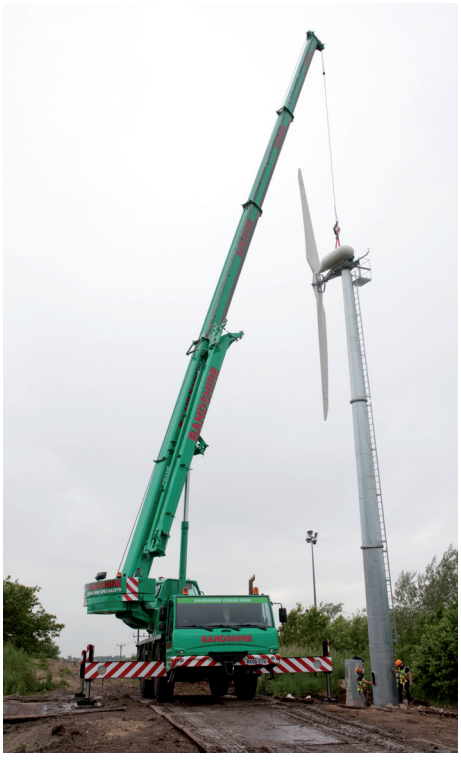
Wind turbine at a rail station TfGM (Manchester)

CONCEPT

The Horwich Parkway Rail Station presented an ideal opportunity to invest in a wind turbine to supply renewable energy and contribute towards TfGM's Climate Change Strategy to reduce carbon emissions by 13.5% by 2015 (from 2007/2008 levels).

SUPPLIER

Wind turbine :
Myriad Wind, Myriad CEG



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OBJECTIVES

- Contribute towards achieving TfGM's Climate Change Strategy commitment to reduce carbon emissions by 13.5% by 2015 (from 2007/08 levels);
- Together with other energy efficiency measures at Horwich Parkway Rail Station, contribute towards achieving a carbon-neutral public building;
- Raise awareness of the potential application of renewable energy technologies in public transport provision.

INVESTMENT DESCRIPTION

Wind power is the conversion of wind energy into a useful form of energy. As such, a wind turbine converts the kinetic energy of the wind into electrical power.

The suitability and potential power that can be generated from a wind turbine is determined by a number of factors. Two of the most important factors are wind speed in a given location and the swept area of the turbine blades. The swept area refers to the area of the circle created by the blades as they sweep through the air. The larger the swept area, the more power it is capable of extracting from the wind. The height of the turbine above ground level is another important determinant.

Feasibility work identified that the local topography and an average wind speed of 5.6 m/s at 10 m made Horwich Parkway Rail Station a good site that could potentially generate substantial quantities of electricity through the installation of a wind turbine. There were also no major obstructions to offer wind turbulence and affect the performance of a turbine.

Several different types of turbines with varying power ratings were evaluated with a Gaia-Wind 133 (11 kW) chosen as the preferred option. The Gaia-Wind 133 is a two-blade turbine with a swept area of 133 m² and standing at 18 m via a monopole mast. The Gaia-Wind 133 was chosen for its high energy capture at low wind speeds, high reliability record and low noise pollution. The turbine is capable of producing up to 27,000 kWh/year.

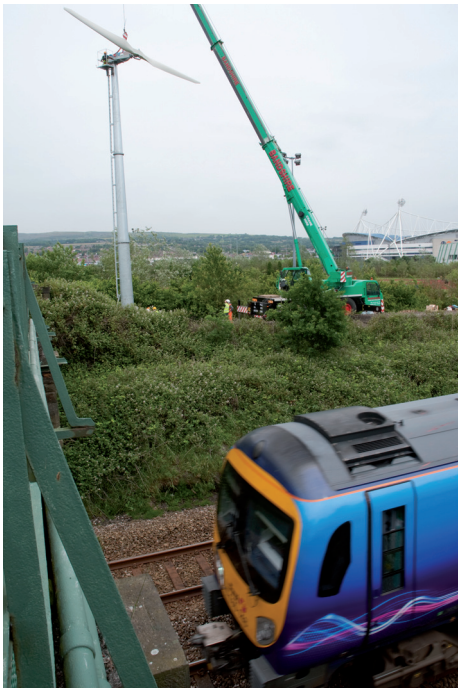
COST

The cost to supply and install the Gaia-Wind turbine was €81,600 (£68,000). The total cost of the investment was €237,600 (£198,000), which included diverting overhead electricity cables necessary to install the turbine and planning requirements such as environmental surveys.

The scheme has been funded through a combination of T2K INTERREG grant (50%) and further contributions from NWDA (North West Development Agency), Bolton Metropolitan Borough Council (BMBC) and TfGM funding.

Results	
Investment costs (€)	237,000
Annual maximum production (kWh)	27,000
Lifetime CO_2 savings (TCO_2)	238
Operational costs (€/year)	540

Gaia-Wind 133 – Technical Data	
Peak power output	11 kW at 10 m/s
Rotor speed	56 rpm (fixed)
Rotor diameter	13 m
Swept area	133 m^2
Rotor orientation	downwind
Number of blades	2
Blade material	glass fibre
Gearbox	two-stage low noise



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RESULTS

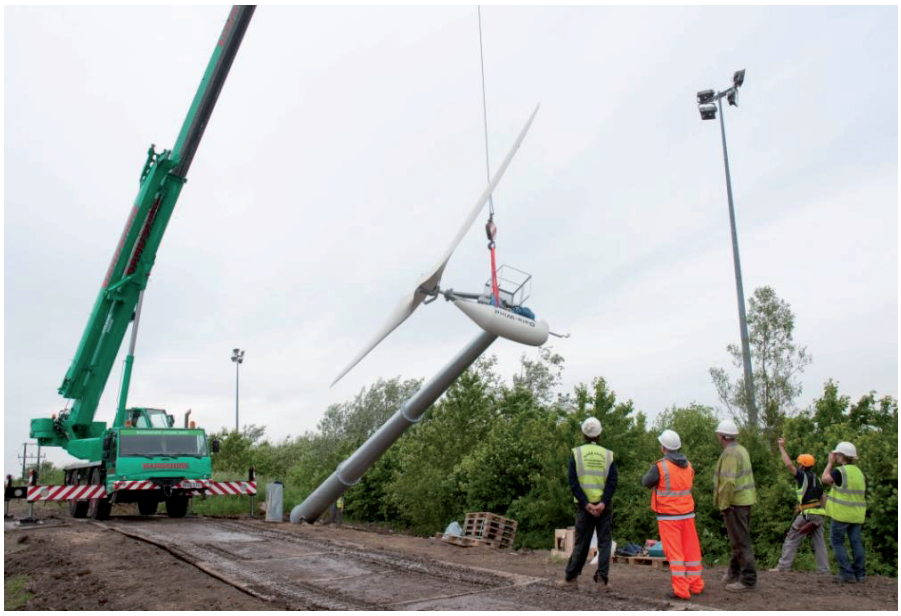
In its first full year of operation, the wind turbine produced around 18,000 kWh. The lower than expected figure is as a result of lower than average wind speeds for the area. As of 3rd January 2014, the turbine had generated 22,505 kWh. This has been due to significant periods of de-commissioning in 2013 to allow for construction works for a new Park & Ride facility adjacent to the turbine site at Horwich Parkway Rail Station.

Current EU state aid rules means TfGM are ineligible to claim the Feed in Tariff (FIT) for the HEP. FIT is a financial incentive from the UK Government to encourage uptake of renewable electricity-generating technology. From 1st April 2014, for wind turbines of the Gaia-Wind 133 size, the tariff is 17.78 p/kWh.

In addition to FIT payment, an extra payment can be received for any excess electricity exported back to the grid. This is called the export tariff and is currently at a rate of 4.64 p/kWh and paid by the electricity supplier.

LESSONS LEARNED

Undertaking an adequate and reliable feasibility study is imperative to ensuring that investment in a wind turbine is suitable. It may be advisable to undertake this across a public transport company's estate to evaluate where it can have the most impact in terms of energy and CO_2 savings. There are many different types and sizes of wind turbines on the European market. The main two choices are between a vertical-axis and a horizontal-axis turbine. Different turbines will offer different benefits and drawbacks in terms of power output, necessary planning permissions and noise and visual impact. Ultimately, a wind turbine is dependent on the wind resource which is inherently unpredictable. It is important to configure the cut-in and cut-out wind speed to maximise efficiency.



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