

Frogwell Lodge

Haddon Hill, Skilgate, Exmoor

SMALL-SCALE WIND POWER



Location of Turbine.



Details of the Project

Up until late 2001 electricity for the 3 bed cottage was supplied solely by a single cylinder Lister diesel generator. The wind turbine system was installed as an alternative to the option of mains connection. At the time of installation, partly due to the foot and mouth outbreak, the neighbouring landowners were reluctant to allow access across their land for running a spur off the mains network. Mr Robson therefore chose the option of a standalone wind system with battery storage to complement the diesel generator. At the time this had favourable economics.

The site is at 300m above sea level and has a good approach from the prevailing South-Westerly wind and so is perfect for a wind power scheme.

During the planning stages objections from local residents meant that a site meeting was required involving all interested parties and the National Park planning team. A compromise layout resulted, with the turbine being repositioned out of sight from the adjoining car park.

A series of improvements commenced in April 2002 following a technical review, including modifying the tower to 12m height, up-rating to 12 batteries and fitting a second inverter.

How the system Works

The wind turbine is mounted on a rigid steel tower with a concrete foundation of approximately 1m depth. The turbine is an upwind design, which finds the wind direction with the help of a tail vane. High speed winds are coped with by virtue of its hinged tail-vane and rotor being mounted on an inclined hinge. The function of this safety system is to limit the rotation speed of the rotor and hence to limit the axial forces acting upon the rotor, and the mechanical stresses in the generator. As wind-speed increases, the force on the rotor increases and gradually it turns out of the oncoming wind. As this happens the machine is able to capture less of the available power and so slows down. The position of rotor, tail and vane are stable at every wind speed, i.e. the torques around the hinge axis and around the vertical axis of the rotor head are in balance.

Battery Bank.



An underground cable takes the generated DC electricity to the turbine junction box in the stable building, where it is connected to the turbine control box. From here the power is either fed to the battery bank, or is diverted to dump loads if the batteries are fully charged. The dump loads lose the heat

Stuart Robson, Frogwell Lodge - Reactions to the Wind Turbine

“In the event of a power cut in the local network the house, being standalone, is unaffected.”

“The turbine is very therapeutic to watch” (It’s actually visible while seated at the kitchen table).

to the outside air, although this could be diverted to immersion heaters in future.

Two inverters take power from the battery bank and convert it to usable domestic AC at 230V. If the battery voltage drops below a set level the generator will start up in parallel.

The operating hours of the generator have dropped significantly although at present there is no kWh meter fitted, and so no calculations of fuel saving have been done.



Turbine control unit and Inverters

Maintenance

The access panel on the tower base is removed to check the power cables and unwind as necessary. At the same time the battery acid levels are checked and topped up as appropriate. Service periods for the generator are now significantly longer due to reduced usage.

Owner / Operator's Comments

The performance of the system has been compromised by the positioning of the tower in such close proximity to the line of Beech trees at the border of the property. The approaching wind is unimpeded but there is a barrier to the wind leaving the turbine, resulting in a reduced power output. The owner remains convinced of the merits of the technology but makes the following comments.

“You can't just put up a turbine and expect to get electricity, it's got to be in the right place! If the authorities say it should be inconspicuous and suggest placing it behind something, then you must argue that it will not be in a practical position. Don't back down, push for an effective installation otherwise there is no point.”

“When approaching a wind power supplier to quote for a system, the power requirements should be increased by half again of the current consumption. This allows the site owner to install extra appliances that might not have been possible before the turbine was installed (due to generator size limitations).”

“Quotations should be obtained and carefully compared between a connection to the mains network and the proposed system.”

Costs

Two thousand pounds were granted by the National Park towards the scheme. The total cost of phase 1 of the scheme was in the order of £11.5k. After the technical improvements this figure became £17.5k.

Technical Details

Wind Turbine	Fortis - Montana
Generator	5.8kW DC Permanent Magnet - no gearbox
Cut-in / Rated Windspeed	2.5m/s / 16m/s
Rotor	3 blades comprising 5.7m diameter
Blades	Mechanical Furling to avoid overspeed
Brake	Mechanical Disc Brake
Storage	12 cell Varta battery bank operating at 24V
Connection	2x Victron 2.5kW Inverters giving AC output
Distance from Buildings	10m
Mast Height	12m
Diesel Generator	2.5kW Lister Petter

