

Green Drives Crucial to Green Project



Beacon Energy is a non-profit making company that aims to promote public awareness of global warming and encourage the reduction of CO₂ emissions. West Beacon Farm features numerous interlinked renewable energy technologies including wind turbines, photo-voltaic panels, a ground-source heat-pump system, a hydrogen energy storage system incorporating an electrolyser, storage tanks and two fuel cells, a combined heat and power unit powered by propane, solar water heating and two water-powered generators.

These technologies enable Beacon Energy to be virtually independent from the national grid and fossil fuels. Each technology feeds its energy into a common DC bus via Unidrive SP AC drives from Control Techniques and further Unidrives feed on site single and three-phase electricity needs.

“We chose Unidrives because of their versatility,” explains Loughborough University PHD research student Matthew Little, who has been heavily involved in the development of the integrated system. “We needed drives with a particular mix of features – on-board programming, high speed communications, four-quadrant control – and a supplier who would provide us with

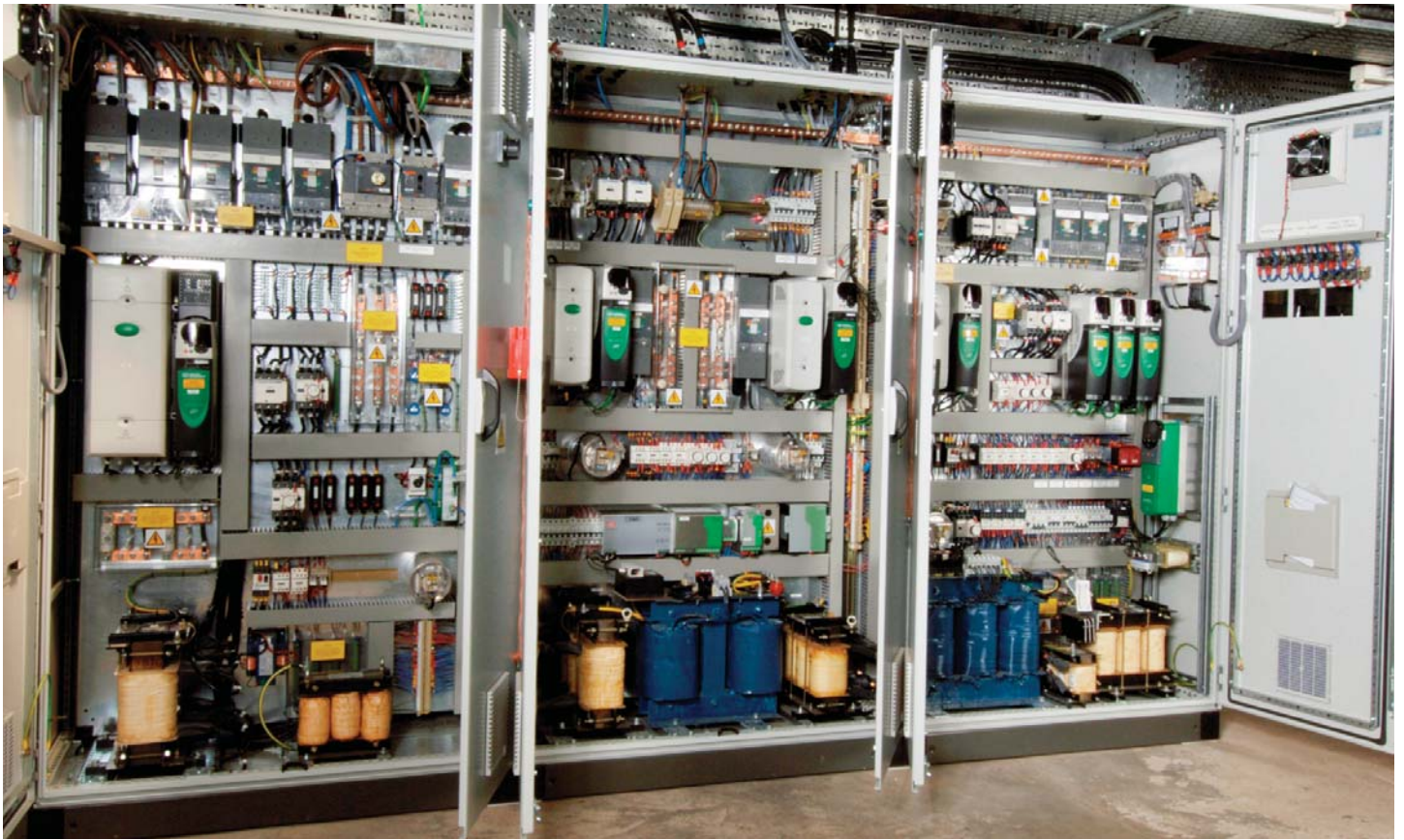
exceptional support throughout the project. Control Techniques loaned us drives and other equipment, helped us with design and programming and have been on hand to help at each stage.”

Control Techniques has supplied a total of 14 drives to West Beacon Farm, nearly all being Unidrive SP, fitted with a programmable application module to give on-board programming and CT-Net high-speed networking for data collection and diagnostics. Data is fed into a PC running LabView, which interfaces with CT-Net and monitors every aspect of the system helping to analyse the effectiveness of the different technologies. “We’ve used Control Techniques’ toolkit, SyptPro, for programming all of the drives and found it to be very straightforward,” adds Matthew Little.



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A 37kW Unidrive works in four-quadrant mode and is the only link to the mains electricity supply. This has two main functions; to maintain the DC voltage in the grid and to export excess generated power back to the grid. “In practice, we use virtually no mains power at all,” says Matthew Little, “but it is there just in case.”

Two wind turbines drive 25 kW / 415 V three phase induction generators that feed power to the DC bus via 30 kW Unidrive AC drives. The system is set up so that, at a pre-determined generator speed, the drives synchronise and connect (catching a spinning motor/generator), set the motoring current to zero and start to generate at 50 Hz, feeding DC power to the DC bus. If, after a set time, the turbines are not generating power, the drives close down again.

Four solar arrays contribute a further 6 kW at 120 volts and the Totem combined heat and power rig adds another 15 kW via a Unidrive SP, as well as providing 38 kW of heating for the farm house.

The energy storage system comprises a high energy density 20 kWh battery at 620 volts and an alkaline electrolyser that produces clean hydrogen that is stored in 48 high pressure (137 Bar) tanks, giving a further 4MWh of energy storage. This hydrogen is used, when required in two proton

exchange membrane fuel cells that, together, produce 7 kW of power via power converters to the DC bus.

A reverse osmosis (RO) rig filters rainwater for supply to the house and electrolyser and is supplied by pump driven by a 1.5 kW Unidrive SP. A 5 kW Unidrive SP controls the compressor pump that steps up the hydrogen pressure from 25 to 137 Bar for storage. Two 12 kW Unidrive SPs supply both the single phase supply to the farm house and the three phase supply to the farm machinery, whilst a 4.5 kW Unidrive SP drives the pump for the heat pump, which extracts heat from the nearby lake to supply the heating system for the house (the 4 kW pump generates 10 kW of heat). Unidrives also control pumps for the water supplies to the house, the hanger and the fire prevention system and further drives provide power for the winch and general amenities local to the wind turbines.

Matthew Little concludes “We have been supported by many suppliers, and Control Techniques’ contribution, in particular, has been crucial throughout.”

KEY BENEFITS
● ON-BOARD PROGRAMMING
● HIGH SPEED COMMUNICATIONS
● FOUR-QUADRANT CONTROL
● EXCEPTIONAL SUPPLIER SUPPORT



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