

# Woodend Farm Biomass, Wind Turbine and Solar Photovoltaics



*Woodend Farming Partnership*

*Woodend,  
Duns,  
Berwickshire  
TD11 3QW*

*Farmer – John Seed*

*Date of Farm Visit – 22<sup>nd</sup> July 2014*

John Seed has installed a 950kW batch boiler, a 75kW wind turbine and a 50kW solar PV array making Woodend Farm self-sufficient in energy use.

## Background

Woodend Farming Partnership (WFP) is a 200ha arable farm that has installed 950kW of biomass, 75kW of wind and 50kW of solar PV.

The key reasons for WFP's investments into renewable energy were to reduce energy costs and to be as self-sufficient and sustainable as possible. Their investment into renewable energy means that they have significantly reduced their energy costs and can harvest and dry their crops quickly and efficiently.

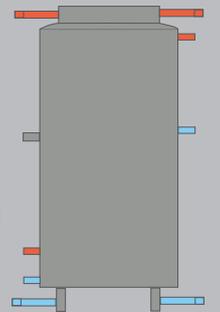
John Seed also runs Topling Ltd, a biomass boiler supply and installation business serving the rural market for biomass heating and distribution systems, mainly for district heating, crop conditioning and livestock production systems.

## Batch Boiler

A 950kW Big Straw Boiler or BSB was selected as it offered the opportunity to use the most practical fuel choices. The cost of this installation totalled £170,000, although this was a prototype project at the time. The fuel usually used is wheat or rape straw, although the boiler can burn a wide range of biomass, including woodchip, logs and energy crops.

A 100,000 litre accumulator tank is used to store heat which is then distributed through the district heating system as it is required by the drying floor and other heating and drying systems.

A large accumulator tank (water storage) is useful for this system as batch boilers work best when they are working at their highest capacity. An accumulator tank stores any heat that is not needed immediately for distribution at a later point in time.



This set up makes the system more efficient and easier to control. Originally a 450kW boiler was installed but it could only raise the air temperature of the floor dryer by 21°C. In order to raise the temperature of the dryer by 40°C John installed the 950kW boiler, allowing the drying system to operate more quickly and efficiently.

The replacing of the boiler was relatively straightforward, however claiming the RHI was less so. The ash from the boiler is mixed with poultry litter and applied to the farmland as a soil conditioner, helping to reduce fertiliser bills.

## Drying Floor

The old continuous flow dryer was replaced with an on-floor system that uses grain stirrers to improve drying. These systems can often be retrofitted to existing grain stores. The system at Woodend cost circa £91,000.

Two on-floor 600 tonne batch drying systems are heated via a 900kW water to air heat exchanger supplied with water at 85°C from the biomass boiler's accumulator tank. Duct work mounted directly above the floors in the apex of the roof runs the hot humid exhaust air past a 120kW air to air plate heat exchanger. This heat is then recycled back into the drying floor, reducing the fuel demand on the biomass boiler.

WFP supplies all of its own fuel and typically uses about 180 tonnes of straw per annum. In its first year of operation WFP dried over 3,000 tonnes of cereals, beans and rape, which would have used over 60,000 litres of oil at a cost of over £30,000. With the installation of the biomass boiler this expenditure was turned into revenue thanks to the RHI payments received.

## District Heating Network

In addition to the drying floor the boiler also supplies two houses via 211 meters of underground insulated heat transport pipework. The pipework connects to a plate heat exchanger at each house which plumbs into the existing heating system. This cost circa £18,000 to install and saves over £7,000 in kerosene costs per annum.

Heat is also supplied to a free range egg production and packing unit. 150 meter of piping runs to a 500 litre hot water cylinder with an integral heat exchanger to provide hot water for cleaning and domestic purposes, as well as space heating for the egg packing house.

The manure is dried on muck belts via a 24kW heat exchanger. It is then stored for spreading as a fertiliser.

## Wind Turbine

The wind turbine is a 75kW refurbished Vesta V17. Halus, who specialise in Vesta turbines that have been discontinued, undertook the refurbishment.

Halus refurbished Vesta V17 | Tip height 25m | Rotor diameter: 17 m | Swept area: 227 sq m | Rated wind speed 6.8 m/s

The total capital cost of the turbine and installation was £174,125. A breakdown of these costs includes: £81,033 for the turbine supply and install, £2,000 for the foundation works and grid connection totalled £45,000. The rest was made up from planning, labour, transport and crane hire.

The turbine should produce 140,000kWh per year (21% capacity factor). John believes he uses approximately 50% of the energy on site. This results in the turbine bringing in a benefit of approximately £35,000 a year (in reduced electricity costs and FIT payments), paying the turbine back in less than seven years.

## 50kW Solar PV Array

John took up a deal from the solar firm Isis Solar in 2011 which allowed them to put up 49.68 kW of ground mounted solar panels which would allow them to claim the FIT. In exchange John receives all of the electricity from the panels.

This deal had no capital costs for the WFP, only the loss of land use of approximately 1,000 m<sup>2</sup> (or a quarter of an acre). The panels will produce approximately 40,000kWh per year; to buy in this amount of electricity would cost the average user £4,500. Isis Solar no longer offers this deal due to the rapid cuts to FIT. However reducing capital costs of solar panels over recent years means paybacks of 6-10 years are still achievable.

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The Farming sector has become too reliant on fossil fuels, using renewable energy allows farmers to reduce the risk from volatile world fuel markets.”

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*John Seed July 2014*