

# Feoch Farm: Biomass and Solar Photovoltaic



*Feoch Farm  
Darvel  
East Ayrshire  
KA17 0NF*

*Farmer: Jimmy Ireland  
Date of Farm Visit – 1<sup>st</sup> July 2015*

Jimmy has installed two farm scale systems; a 100kW woodchip boiler and a 3.6kWp rooftop solar PV system. These are matched to his on-farm needs to maximise returns.

## Background

Jimmy Ireland runs Feoch Farm with his brother, wife and sons. It consists of 900 acres of ground, 50 acres of which is used to produce cereals and the remainder used for grazing and silage production for a herd of suckler cows as well as a flock of pure and cross ewes. They also operate a contracting business, providing silaging ploughs, seed, slurry and spraying services to neighbouring farms.

## Biomass boiler

VG Energy installed a Heizomat 100kW biomass boiler with a 1,200 litre buffer tank on Jimmy's farm in March 2014 securing a RHI of 8.8p/kWh. It secured the RHI approval in May after a lot of paperwork. The current biomass boiler supplies heat to the farm house, an agricultural building and workshop.

This boiler has offset the £3,000 per annum Jimmy previously spent on Kerosene and has a payback period of five and a half years (see table 1); this is longer than Jimmy expected but still a good return. A second 100kW biomass boiler is installed and awaiting accreditation. It will serve a new drying floor which is currently in the 'concept' stage.

Jimmy and the local joiner built the silo for the biomass boiler, making it out of timber and plywood in the shape of a 50 pence piece as this eliminates 'dead space', preventing wood chip building up in the corners. The silo is able to store 12 tonnes of wood chip and is filled with a materials handler. There is sufficient storage to last an average of four months, although this will be significantly reduced during the winter.

In order to keep the build costs down further Jimmy dug the channel and ground works for the heat network pipe. For information on depths, width and materials to use when trenching please visit <http://mibec.co.uk/wp-content/uploads/2015/03/RAUVITHERM-Technical-Manual-April-2012.pdf>

The existing biomass boiler comes with 2 years free maintenance on the boiler and £600 thereafter.

**Table 1: Summary of Biomass Boiler**

Capacity	100kW
Energy produced	131,400kWh
Approximate Capital Costs	£55,000
Tier 1 energy payments (@ 8.8p/kWh)	£11,563
Tier 2 payments (@ 2.2 p/kWh)	£0
Savings from kerosene pa	£3,000
Annual Wood fuel required (30%MC)	37.5 tonnes
Annual Wood fuel costs (3.5p/kWh)	£4,599
Payback in years	5.52
Tax free return on investment	18.1%

If the boiler was installed in July 2015 a RHI of 4.4p/kWh would have been secured due to recent depressions. This would have increased the payback to 13 years.

Jimmy does not have access to sufficient timber on his farm to feed the biomass boiler so buys this from a local supplier. However, he

has had quality control issues with large slithers and dust being present in high quantities which can lead to boiler shutdowns. When buying woodchip a grading system is used to ensure that the correct size of wood chips are bought for the boiler. The boiler's manual will state what the maximum grade of wood chip it can take is. The most common grades are shown in table 2.

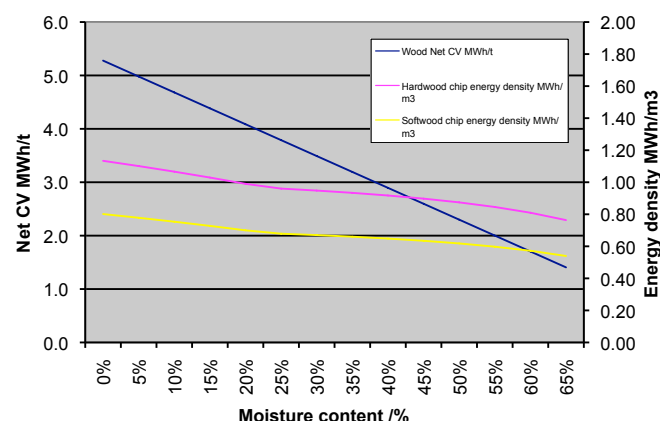
Table 2

Wood Chips Classification acc. To OENORM M7133				
Description		G30 Size	G50 Size	G100 Size
Single Pieces	Edge Length Max	85mm	120mm	250mm
	Cross Section Max	3cm <sup>2</sup>	5cm <sup>2</sup>	10cm <sup>2</sup>
Retained in coarse sieve		Max. 20%	Max. 20%	Max. 20%
Coarse sieve mesh		16 x 16mm	31.5 x 31.5mm	63 x 63mm
Retained in medium sieve		60 to 100%	60 to 100%	60 to 100%
Main Quantity nominal length		30mm	50mm	100mm
Medium sieve mesh		2.8 x 2.8mm	5.6 x 5.6mm	11.2 x 11.2mm
Passing medium sieve		Max. 20%	Max. 20%	Max. 20%
Fine sieve mesh		1 x 1mm	1 x 1mm	1 x 1mm
Passing fine sieve		Max. 4%	Max. 4%	Max.4%

Source: <http://www.remeha.co.uk/wp-content/uploads/2011/07/Generic-Wood-Chip-Specification.pdf>

The other important factor when using woodchip is moisture content (MC), the less water in the wood the more energy the boiler will get from it. Ensuring the boiler is correctly calibrated to the moisture content of the wood chip that will be used in the long term is important in the commissioning stages of the project. Graph 1 shows the effect moisture content has on the amount of energy (calorific value) in a tonne of woodchip.

Graph 1: Biomass energy by weight and volume



Source: Biomass Energy Centre

## Solar PV

VG Energy also installed a small 3.6kWp rooftop solar PV system on a rooftop. This system has reduced the electricity bills by 25% (see table 3). A testimony to the low maintenance and visual impact of rooftop solar PV systems is echoed in Jimmy's own words on the system "Fit and forget".

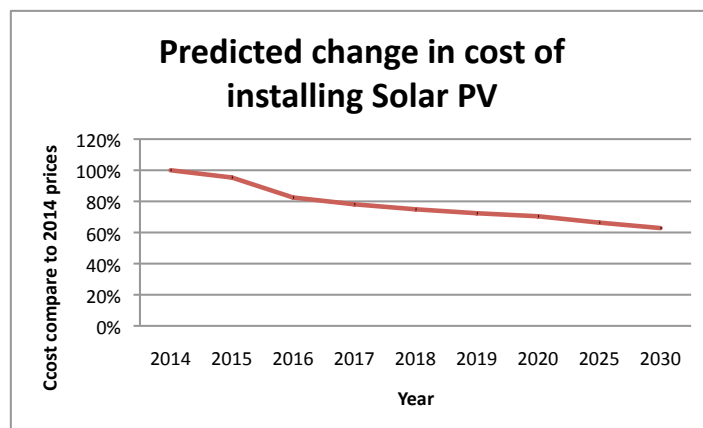
Table 3: Summary of Solar PV System	
Solar PV capacity	3.6kWp
Capital costs of supply and installation	£6,000
Annual income from FiT	£493.14
Annual income from Export	£79.47
Annual savings on electricity bill	£269.89
Annual Net income	£842.50
Investment Payback (years)	7.12
Tax free return on investment	14.04%

The price of solar PV systems has reduced by over 50% over the past three years and the Solar Trade Association predicts a downward trend to continue over the next five years (see graph 2). If this prediction is correct then it will be cheaper to install solar PV than to buy electricity from the grid without any subsidies sometime between 2018 and 2020. This is known as grid parity and has already been achieved in the commercial sectors in Germany, Spain and Italy.

### Definition of grid parity

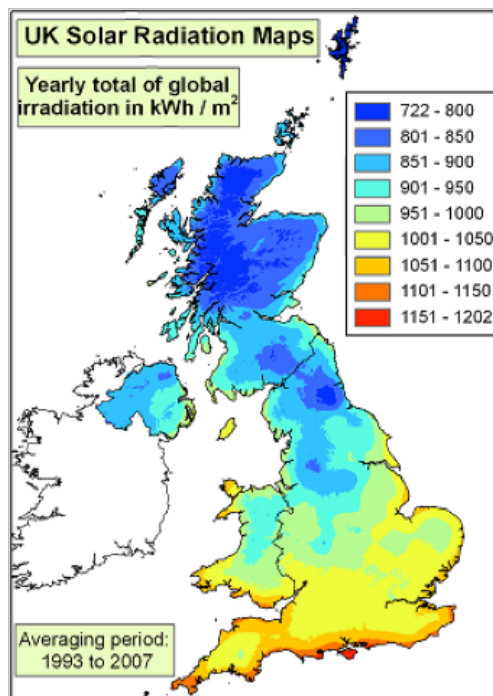
When an alternative energy source can generate electricity at cost that is less than or equal to the price of purchasing power from the electricity grid

Graph 2



Solar in Scotland may not be the obvious choice for renewable energy technology but schemes can be economically viable in all but the darkest blue sections of the map below in figure 1.

Figure 1



Source: Met Office

In addition to Solar and Biomass (which have saved the farm £6,000 pa in diesel, electricity and kerosine), Jimmy has also been trying to progress a 500kW wind turbine over several years, however this has been held up in planning for some time.

“Heat from the biomass boiler has made a vast difference to what we can do in the winter in the workshop when working on machinery”  
Jimmy Ireland June 2015