



Logie Estate wind and Biomass



Alasdair Laing right and Alec Laing left.

*Logie Estate
Forres
Moray
IV36 2QN, Scotland*

*Owner- Alasdair Laing
Date of Farm Visit – 13th November 2014*

Logie Estate has invested in a 50kW wind turbine and a 195kW biomass district heating network. They also have a quarter share of a joint venture which will develop 27.6 MW of wind power when built.

Background

Half of Logie Estate is made up of individual let farm businesses which are mainly livestock orientated with some barley production; the rest is made up of commercial and amenity forestry. The owners graze Longhorn Cattle in the fields surrounding Logie Steading which has been developed over the past 25 years and boasts a café, farm & garden shop, whiskey & wine shop, bookshop, art galleries and workshops.

In 2009 a consultant from Napier University was asked to look at the resources available on Logie estate and suggested what options they might have. Wind, biomass and hydro were all considered and the analysis led to the estate installing a 50kW wind turbine and a 195kW biomass boiler. More recently they have also entered a joint venture to develop a 27MW wind farm.

Small Wind

**Endurance E-3120, 50kW turbines • Hub height: 24.7 metres
• Rotor diameter: 19.24 metres**

A planning application was made in June 2011 and the turbine was built in July 2012 on a site that has wind speeds of 5.7m/s. Scaled Energy project managed the turbine installation and supplied the Endurance E-3120. The construction was undertaken by local contractors Billy Mitchell with specialist lifting supplied by Andrew Plant and the access road constructed by Grant Nicolson. The total cost of the installation was £292,000 (ex VAT). Energy yield for the site in 2013 / 2014 was 105,498 kWh giving total sales (Electricity and FiT) of £35,000. Taking account of operation and maintenance costs the simple payback of the project is expected to be 13 years.

Big Wind

**12 x Enercon E70, 2.3MW turbines • Hub height: 64 metres
• Rotor diameter: 51 metres**

In 2010 Alasdair was approached by Muirden Energy to discuss the development of a medium scale wind farm at Glaschyle. The success of the 50kW wind turbine encouraged Alasdair Laing to engage with the larger wind farm concept as active partners rather than simply passive participants. In 2012 a 40m wind monitoring mast was erected to assess the wind speed at the site. Subsequently a planning application for a 32.2 MW scheme was submitted, which was turned down at the end of 2013. The decision was appealed and received approval in March 2014.

Financing discussions will begin next year with RBS, Santander, Barclays, Close Brothers and MUFG all having showed interest in the project. Upon financial deal being completed, construction is likely to take place during 2016 with energisation due in March 2017, one month before the Renewable Obligation Certificates (ROCs) system closes and Contract for Difference (CfD) become the new method for financing wind farms.

The hill has an average wind speed of 8m/s. For a project of this scale a ten year prediction of the wind speeds is required to secure funding. This is currently being undertaken by Garrad Hassan. Sufficient wind modelling is vital in assessing what turbine to select and to determine the output of the wind farm. The table below shows the current predictions of the costs and benefits of the project.

Item	Estimated figure
Planning	£150,000
Grid	£1,000,000
Turbines	£25,000,000
Civil, electrical, site works	£3,500,000
Technical and insurance	£1,000,000
Funding costs	£4,000,000
Contingency	£3,500,000
Total	£38,150,000
Generation	75,000 MWh
Income	£7,550,000
Operation costs	£1,700,000

Biomass

Logie Estate installed a 195kW ETA boiler in late 2012. The boiler is situated in a purpose built building that also houses the accumulator tank, the pumps, control system and the fuel storage. The boiler provides heat to Logie House (270m from the boiler), the steading shops (70m) and four cottages (up to 190m). Fuel is produced on the estate, stored in purpose built shed at a cost of £45,000.

Each local authority has varying rules on flue regulation. In the case of this project the planning permission required the flue to be erected to a height of 7.5m in order to mitigate against poor air quality at ground level.

As there was no building suitable for housing the boiler on site a package solution from HWEnergy was opted for. The above ground storage requires woodchip to be lifted in through the roof of the storage container via a scissor lift trailer. The design restricts the ability to fill the storage space to capacity as well as raises snow loads concerns in a hard winter.

District Heating Networks Carbon savings* = 70 tonnes CO2e per year or 850 round trips to Edinburgh from Logie in a VW Passat Estate*****

*based on approximate figures

**based on all previous heat supplied from heating oil.

Source; Biomass Energy Centre

***based on figures from the DVLA

Motivation for the project was fuel security given the estate's existing forestry operations, and the ability to use low value wood as well as a sense of responsibility to use sustainable forms of energy.

Despite the use of high specification pipe work used, heat loss is still an issue which the estate has not fully bottomed out, as is excessive electricity consumption. These will extend the payback on the project but do not make it unattractive. One of the redundant boilers from Logie House is now used as a back up to boost the systems during periods of extreme cold and to cover for servicing and breakdowns.

District heating network

The houses and steading units are connected to the district heating network via heat exchangers. Each tenant is metered and charged at 6.5 p/kWh. This rate is based on an assessment of the savings available over oil or electricity coupled to a reasonable return on the capital and running costs of the scheme.

There is c. 500m of high spec heat transport insulated Rehau Rauthermex pipe. The high amount of pipe work and the 3215 m2 of heated floor space would typically not be possible to serve with a 195kW boiler, however the heat demand of the steading is during the day and the heat demand of the residential properties is mostly at night, this staggering of heat demand allows the properties to be served by a smaller boiler.

In general the tenants have been positive about the new system. There was initially some nervousness about the cost of heat which Logie allayed by offering weekly meter readings until the tenants became comfortable with the system. Beyond that Logie's impression is that people, particularly those dealing with customers in the Steading units, like to be in a position to use "green" energy.

Lessons learnt by Alasdair Laing:

1. Pay close attention to boiler house design, whether using an existing building or a bespoke one. At Logie, although there appears to be plenty of space in the shed, access to pipework and gauges is awkward.
2. Be meticulous about the "cleanliness" of the fuel supply – emptying a full hopper because some stones in the chip have jammed an auger is not fun.
3. Focus on heat loss in the design stages.
4. Ensure that initial set up of pumps and control systems is correct.
5. Consider the use of wireless meters for ease and speed of reading and data transfer.

Fuel supply

The wood chip fuel is supplied by the estates forestry operation and is included in the Forest Management Plan which was submitted during the RHI application process. Logie is also to be entered onto the Biomass Suppliers List. They aim to season timber for a minimum of 12 months before chipping and the Estate is building up experience in drying differences between species, sites, etc. Small round wood is set aside from thinnings and clear fell it is then seasoned, normally at roadside but when necessary adjacent to the chip shed where there is plenty of space. A contract chipper comes in as required (2-3 times per year) and chips direct into the woodchip storage shed. The storage shed is 2 miles from the boiler house, each delivery takes an hour. About 120 tonnes of wood chip can be stored, enough for 6-8 months depending on whether its summer or winter.

The chip is loaded into a scissor lift trailer with a tractor bucket. Which is powered from the tractors hydraulics and requires a hydraulic booster pack to provide enough oil for the rams. The number of deliveries varies with heat demand but is roughly one every 10 – 12 days in summer and weekly in winter.

Finances of scheme

Item	Cost
Boiler, Boiler House, equipment, pipework & heat exchangers	£264,885
Meters	£5,845
Civils & building work	£61,748
Additional plumbing work (wet system to Steading)	£18,750
Total	£351,228
RHI income	£21,000
Heat sales income	£21,000
Annual running cost (estimate)	£20,000
Note: Annual running costs include tractor & driver at full rate, back up oil, electricity, woodchip, servicing and insurance.	



The success of the wind turbine has encouraged us to approach the larger wind farm development as active partners rather than simply passive participants



Alasdair Laing, November 2014