Renewables Update

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Renewables today

- Over the last year there have been reductions in the renewables financial incentives for both electricity and heat
- Viability now depends on displacing a current on site energy use, and getting the fuel savings
- We need to look at a sites energy usage and how we can displace that with renewables

Energy use on Farms
HEAT

Applications – District Heating

Connect more than one council tax paying building , then you're in the commercial RHI. However, beware;

- Carefully consider viability on distances over 50m
- Heat network design more important than boiler system design
- Actual losses are far higher than manufacturers predictions (x 2-3)
- Consider storing heat (hot water) at each building to save network constantly circulating

Applications – Grain drying

DRYING CURRENTLY UNDER REVIEW FOR THE RHI !!!!!

- Only usually viable if you already have a fixed dryer, mobile dryers possibly not eligible
- Even then only viable for over 1000 tonnes of grain
- Most effective with large boilers, smaller systems will delay grain logistics
- However it can be viable as part of small district heating networks. But will only pre-heat air a small amount

Applications – Wash down water

The legislation ***CURRENTLY*** has no minimum limit on how much heat is used for commercial purposes to make the whole system commercial. However this is also being consulted on

- Replace all hot water units in a dairy
- Even hot water wash down for lambing or calving pens eligible
- Hot water usage by itself rarely financially viable, needs other uses
- Can add a domestic property to the same boiler and it is still a commercial RHI system

Energy use on Farms
ELECTRICITY

Electricity use

- Animal shed lighting - *Doesn't suit Solar PV*
- Water heating
- Electric feed bruisers, crimpers etc..
- Grain spears / fans
- Domestic houses (but needs to be on the same distribution board as the renewable

Heating -

Biomass

Agricultural Log / straw Boilers

- Manually fed up to 3 time a day;
- Require fuel at around 20% MC to be effective;
- Can burn waste wood easily (pallets, etc…);
- ALWAYS with an accumulator tank;
- Low cost (comparatively);
- Only a handful have RHI emissions certificates for Straw

Wood Chip Boilers

Key Features

- Can burn fuels from 10% MC to 60%MC;
- Low cost fuel (~2-3p/kWh self supplied, ~ 3-3.5p/kWh commercial supply)
- Sizes from 50kW to 20MW+;
- High capital cost;
- Highly featured systems available;
- Fuel widely available (tree + chipper);
- Most can also burn wood pellets.

Pellet Boilers

- Lowest cost automatable boilers,
- highest cost fuel (4-5p/kWh)
- Pellets can be blown, augered or manually loaded;
- Pellets cannot be produced ‘in house’;
- Fully automated;
- Very clean burning;
- Quick to respond to heat demands.
- Current RHI rates and heating oil prices means that these systems are not usually financially viable

Biomass – Chip example

- District heating, with a grain dryer in the summer = 170,000kWh costing £7,500
- 100kW System = £120,000
- Chip costs (self produced) = £3,400
- RHI = 2.96p/kWh
- £5,000 income a year & £7,500 oil saving
- 13-14 year payback

Biomass – Straw example

- District heating, with a grain dryer in the summer = 170,000kWh costing £7,500
- 100kW System = £100,000
- Straw / Logs costs = £2,500
- RHI = 2.96p/kWh
- £5,000 income a year & £7,500 oil saving
- 9-10 year payback

Heating –

Heat Pumps

Heat pumps

- **NOT affected by recent RHI changes**

•Suits underfloor heating and warm air blowers as optimum with water temps of around 40 degrees

Heat pumps

- Can use either air, ground or water as a heat source
- Air source has typical electricity to heat ratio of 1:2.5 in Scotland
- Ground and water source has typical electricity to heat ratio of 1:3.5 in Scotland
- Also some Scandinavian animal units use their slurry stores as a heat source, which can yield ratios of well over 1:4.5

Heat pumps

- Air source capital costs = £500 per kW
- Ground source capital costs = £800 per kW
- Air source running costs = 3.6p per kWh
- Ground source running costs = 2.6p per kWh
- Air source RHI income = 2.61p per kWh
- Ground source RHI income = 9.09p per kWh

Heat pumps – Air source example

- District heating, with a grain dryer in the summer = 170,000kWh costing £7,500
- 100kW air source heat pump = £50,000
- Modification to heating systems = £ 30,000
- Electricity costs = £7,400
- RHI = 2.61p/kWh
- £4,400 income a year & £7,500 oil saving
- 17-18 year payback

Heat pumps – Ground source example

- District heating, with a grain dryer in the summer = 170,000kWh costing £7,500
- 100kW ground source heat pump = £80,000
- Modification to install wet heating system = £ 30,000
- Electricity costs = £5,300
- RHI = 9.09p/kWh
- £15,500 income a year & £7,500 oil saving
- 6-7 year payback

Electricity Only

Solar PV

- **Vastly reduced in recent FIT changes**

- **FIT = maximum of 4.36p/kWh (over 11p a year and a half ago, 40p at the start of the scheme)**

- **However, it can sometimes still be viable**

Solar PV – example

- Sheep and beef unit, 40,000kWh electricity use a year, costs £4,400:
- 40kW roof mounted PV system = £35,000
- Annual Yield = 35,000 kWh
- FIT = 4.36p/kWh
- £1,500 income a year & £1,500 electricity saving
- 11-12 year payback

Hydro

- **Vastly reduced in recent FIT changes**

- **FIT = 7.8p/kWh (15p a year and a half ago, 22p at the start of the scheme)**

- **However, it can sometimes still be viable**

Hydro – example

- **Sheep and beef unit, 40,000kWh electricity use a year, costs £4,400:**
- **50kW hydro system = £200,000**
- **Annual Yield = 200,000 kWh**
- **FIT = 7.8p/kWh**
- **£15,600 income a year & £4,400 electricity saving**
- **10 year payback**

Heating and Electricity

Anaerobic Digestion

- **Currently undergoing very big changes to the financial incentives**

- Future AD units will rely on larger proportions of wastes
- Very close scrutiny of the financial case required
- Need secure supplies of feedstock

AD - Feedstock type

Feedstock	Biogas Yield (m3 per tonne)	Energy per tonne (kWh)
cattle slurry	15 - 25	75 - 125
pig slurry	15 - 25	75 - 125
poultry manure	30 - 100	150 - 600
maize silage	120 - 180	600- 900
grass silage	80 - 120	400 - 600
whole crop rye	120 -180	600 - 900

Slurry is a very low yield feedstock (the animal has digested most of it already) therefore it is normally combined with silage or another energy crop to give viable yields.

Anaerobic Digestion – feedstock

Annual feedstock requirements for a 500kWe plant

- 100,000 tonnes of slurry!!!!!!!
- 40,000 tonnes of cattle manure
- 30,000 tonnes of poultry manure
- 16,000 tonnes of silage (450 ha)
- 13,000 tonnes of whole crop rye (330 ha)

Anaerobic Digestion – for pig units

- There are now small scale units available which may suit the quantity of wastes available to some beef units, however it is likely that other animal wastes and possibly some crops will be still be required

- Some dedicated slurry only units are available, until the price comes down not yet viable, but it may not be far away.

Anaerobic Digestion – example

- 100 head beef unit, 40,000kWh electricity use a year, costs £4,400. House heating £4,000 a year:
- 2,000m3 of slurry a year 200,000kWh of energy
- Enough to supply a 10kWe CHP over the winter (very few available at this scale)
- 90,000kWh electricity & 90,000kWh heat available
- FIT = 6.24p/kWh , RHI = 4.43p/kWh
- £9,600 income a year & £8,400 fuel saving,
- Cost of sub 100kWe AD system = £400,000??
- Cost doesn't increase significantly up to 50kW therefore would need other feedstocks to make it viable

Contacts

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