

From: [Wightman, Stuart](#)
To: [Clydesdale, Alison](#)
Cc: [Woods, Michael \(DETI\)](#); ["Marten, Lucy"](#); [Stewart, Chris \(DFE\)](#)
Subject: FW: RHI information
Date: 08 June 2016 23:24:55
Attachments: [Costs associated with conversion from oil to biomass fuel - May 2016.docx](#)

Alison

I've checked NIAO's rate of return calculation in Table 3. To calculate annuitized capital costs and rates of return, we need to use the 'PMT' function in MS Excel.

In their worked example in Table 3, to provide a 12% rate of return on an initial £45,000 investment, the RHI must provide a total return of almost £133k over the 20 years (annuitized cost of £6.7k). This is over and above meeting the additional barrier and opex costs associated with biomass. The worked example in Table 3 needs to include additional barrier costs as I've highlighted below. But taking their profit figure of £243k, this equates to a rate of return of 26.5% which is in line with what they're quoting. This would reduce to around 23% if they include additional barrier costs of £30,920 over 20 years.

Presentationally, it is inaccurate and misleading for the all of the £243k to be referred to as pure profit. It should at least have £90k removed to cover the capex costs over 20 years. In addition, RHI recipients need to cover the full biomass operating costs (not just the additional costs over oil).

Happy to discuss.

Thanks, Stuart

From: Wightman, Stuart
Sent: 08 June 2016 21:35
To: O'Neill, Brian
Cc: Clydesdale, Alison; Higgins, Paucic; Wilkinson, Tomas; Woods, Michael (DETI)
Subject: RE: RHI information

Brian

Sorry for the delay, I've been tied up in meetings for the last 3 days.

I attach a paper provided by CAFRE which sets out the current costs (May2016) of running a biomass (pellet) versus an oil boiler. The key figures are that an oil boiler would cost £3k versus a biomass boiler at £30k (this could increase to as much as £50k for completely new installations). Biomass boilers will cost an extra 1.16 p/kwh to run because of the higher fuel, electricity and maintenance costs.

The operating cost for a 99kW pellet boiler are assumed to be 4.01p/kWh. This is made up of:

Pellet cost £150 per Tonne @4416kWh/Tonne (Assuming 4800kW/Tonne at 92% efficiency)	3.36p
Average increased use of electricity by biomass boiler @12p/kWh	0.30p
Average Boiler servicing cost	
0.25p	
Average Remedial Repairs	
0.10p	
Total	
4.01p/kWh	

With regard to running 24/7, CAFRE have confirmed that a biomass boiler running for 8760 full load hours would require 5.84 services per year. Each service requires boiler shut down for at least 6 hours. $6 \times 5.84 = 35.04$ hours. The boiler would therefore run for $8760 - 35 = 8725$ hours. $8725 \times 99 = 862775$ kWh. CAFRE have spoken with a number of installers who suggest that if a boiler was to run continuously on full load hours it would need replacing after 5 (five) years. This is backed up by CAFRE's experience with its own 300kW biomass boiler (Enniskillen

campus) which has undergone extensive repairs after 2861300kWh. If this boiler was running at full load 24/7 these repairs would be necessary on an annual basis.

It should also be noted that the original 5.9p biomass tariff was based on meeting:

- an annuitised capital cost of 12% for 20 years (covering the capital costs plus 12% return factoring inflation)
- annuitised upfront barrier costs associated with biomass (£718/yr was used in 2012 business case)
- Ongoing barrier costs associated with biomass (£828/yr was assumed in 2012 business case)
- Ongoing additional running costs (fuel, maintenance, electricity, etc) associated with biomass over oil

Tables 3 and 4 in the draft report don't appear to factor in any barrier costs or maintenance costs. More importantly, the capital costs have not been presented in an annuitised basis. Annuitising the capital costs takes account of depreciation / inflation – i.e. for the original 2012 tariff calculation to provide a rate of return of 12% over 20 years on a £30,400 initial investment (50kw boiler), £81,460 must be recovered over the 20 years (over and above barrier and operating costs) and not just £34,048 (or 112% of original outlay) which is what Tables 3 and 4 assume.

Happy to discuss.

Thanks

St

From: O'Neill, Brian
Sent: 08 June 2016 09:00
To: Wightman, Stuart
Cc: Higgins, Pauric; Wilkinson, Tomas
Subject: RHI information

Hi Stuart

Grateful if you could please forward on the RHI information as requested.

Many thanks

Regards

Brian

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Costs associated with conversion to biomass vs. oil

Oil has traditionally been used for heating domestic properties and commercial buildings with an element of accommodation e.g. leisure centres, nursing homes, offices, hotels, factories etc and within the agri-food sector particularly for heating mushroom growing houses, glasshouses and heating for dairy unit wash water. (Poultry units have traditionally used LPG as the main source of fuel for heating).

When the cost of oil was at its height (February 2013 @ 65.3p/litre) there was a move towards conversion to biomass with wood chip around £90 per tonne and wood pellets around £165 per Tonne delivered. (Oil = 6.1p/kWh, Chip = 2.6p/kWh and Pellets = 3.4p/kWh). From October 2014 the price of oil began to fall. Currently May 2016 the situation is Oil = 2.8p/kWh, Chip = 3.1p/kWh and Pellet 3.1p/kWh (lowest available).

Currently the cost of fuel is on a par and would not encourage conversion to biomass, due to the additional costs associated with a biomass installation:

	120kW Oil boiler*	99kW Wood Pellet
Purchase Cost	Up to £3,000	Around £30,000
Average Running Cost	2.85p/kWh	4.01p/kWh
Boiler Maintenance Cost	0.04p/kWh	0.25p/kWh
Remedial repairs	negligible	0.10p/kWh

*Biomass boilers would normally be around 20% lower capacity than the oil boiler they replace due to nature of operation e.g. buffer tanks.

The difference in maintenance costs between oil and biomass is significant. An oil boiler will generally require one service per year whilst a biomass boiler will require up to four services per year based on running hours. Average cost for an oil boiler service is around £200 per year, average service cost for biomass is £1600 per year. A biomass boiler also has a significant number of moving parts (and also electronic components) which will need replacing much as you would with a car.

CAFRE experience

The CAFRE estate has three wood chip and five wood pellet boilers.

Wood Chip

Boilers were installed during 2007 (150kW) 2008 (320kW) and 2010 (300kW). After years running all boilers have required extensive remedial work, including the replacement of motors, gearboxes, augers and electronic components. Some of these repairs can be related to issues with the quality of wood chip either in relation to moisture content (too high) or quality i.e. quantity of fines or oversized particles, the remainder natural wear and tear. The cost of these repairs has run into thousands of pounds over the last four years.

Wood pellet

Boilers were installed during 2009 and 2015. Maintenance costs on the pellet boilers have been lower. The one long-term pellet boiler has given fewer problems than the chip boilers although a number of components required replacement after four years (ember bed, grate, outer ring and hood) increasing running costs.

It will be interesting to see the long-term performance of the boilers installed during 2015 in terms of maintenance and remedial work – have improvements been made over the five years since our previous boiler was installed during 2010.

Cathal Ellis

Senior Renewable Energy Technologist

CAFRE Greenmount