

The impact of the new renewable obligations in the UK

River Basin Energy, 17th November 2011

Executive Summary

The UK Department of Energy and Climate Change (DECC) has completed its review of the UK green certificate scheme. The impact of this (amongst others) is to promote biomass use in combination with coal, “co-firing”. Wood pellets, being the most traded biomass for power generation are set to gain an advantage of over £10.3/GJ compared to coal, but the use of such fuels remains limited due to their inherent weakness in storage and low calorific value.

New fuels in the form of “bio-coal” represent a much more suitable fuel option and provide utilities a nearly £18/GJ advantage over coal. Additionally such fuels avoid conversion costs at the power station, and can be used to fully convert from coal. Production of bio-coal is being scaled, but the pace of this is limited by the capital markets. River Basin Energy is targeting the production of over 6m t/year, a quantity that would have the CO₂ reduction equivalent of removing 900.000 cars from the UK roads.

Introduction

On 20th October the UK Department of Energy and Climate Change (DECC) finalized its review of the UK green certificate scheme (known as the renewable Obligation Certificate or “ROC”). The aim of the review was to balance the conflicting objectives of meeting the government’s commitments to meet its 2020 renewable energy objectives while at the same time managing the fiscal impact under its commitment to austerity measures.

The intent of the review

The declared government aim is to support promising, yet immature, technologies, and at the same time encourage the rapid adoption of low capital renewable generation through the use of existing assets. This essentially means the conversion of coal assets to consume biomass. To encourage this DECC has re-defined the ROC support for co-firing biomass with coal, granting the following ROC support;

	Change	Old ROC (ROCs/MWh)	New ROC (ROCs/MWh)
Biomass cofiring (less than 15% biomass fuel)	Unchanged	0.5 ROC	0.5 ROC
“Enhanced” biomass cofiring (more than 15% biomass fuel)	New banding level, but increased from current levels	0.5 ROC	1 ROC
Biomass conversion	New banding level, but decreased from current levels	1.5 ROC	1 ROC
Dedicated biomass	Reduced after 1. April 2016	1.5 ROC	1.4 ROC

The new ROC banding recognised the current limitations of using biomass in coal power stations where a combination of;

- poor fuel quality;
- high conversion costs; and
- scarcity of biomass fuels;

have meant that very few conversion of coal assets have occurred under the old ROC scheme, and development of new-build bio-power units has been woefully slow. In fact only one UK power station, the RWE Tilbury facility¹, has successfully converted, and this has been at a significant cost and even then the facility has been forced to de-rate considerably. Notwithstanding this the effect of the Tilbury conversion is a CO₂ reduction equivalent to removing 200,000 cars from the UK roads².

Why Change?

The urgency for a solution to the UK’s coal sector is made all the more pressing due to the growth of the intermittent power that solar and wind energy has brought to the UK energy sector. Increasingly coal, nuclear and hydro are being forced to provide the surge capacity required on dark and calm nights³. This is disastrous to the generation economics of coal and nuclear, which are not suited to instantaneous load changes. To compound matters, the Large Combustion Power Directive (“LCPD”)⁴ imposed on the thermal power sector has forced owners to question the financial viability of many coal power stations, resulting 6 of the UK’s 16 coal power stations choosing to “opt out” of the LCPD, thereby electing oblivion over the cost of updating to new coal combustion standards⁵. This effectively places a question over 8%⁶ of the UK power sector. When this is compounded with the looming question over the future of nuclear power spreading from Japan to Germany and now impacting other northern European countries, the industry is perfectly poised for a power crisis: where will the “dark, calm” power come from⁷?

¹ [Tilbury Power station Biomass Conversion Scheme, Planning Application 2010](#)

² [Conversion data taken from FT article: "Drax to convert boiler to use biomass fuel"](#)

³ [Priorities for 2020 And Beyond, A Blueprint For An Integrated European Energy Network, European Commission 2011](#)

⁴ [Directive 2001/80/EC Of The European Parliament And Of The Council, 2001](#)

⁵ [LCPD Running Hours, 2010/11, DECC, 2011](#)

⁶ [European Union Large Combustion Plant Directive, Sourcewatch, 2011](#)

⁷ [The Energy Report, WWF, 2011](#)

Proponents of the “renewable only” view argue that a combination efforts to curb demand, integrate distribution and a full spread of diverse renewable generation can solve the dilemma, but the reality is that many of the technologies flagged for renewable base-load generation, such as tidal power, remain experimental at best, with no commercial generation installations yet in existence⁸. The dark reality is that we do not (yet) have a solution.

In contrast to this, Sweden, the pioneer of renewable energy since the 1980’s, has steadily focused on “dispatchable” (i.e. when needed) power dominated by biomass and hydro⁹. This is particularly important for a country where the peak demand is in the long winter nights. Sweden is the only nation in Europe that is on track for the EU 2020 targets; despite having the largest proportion of renewable energy at the time the EU targets were set. Now Sweden and is reaching for an oil-free economy in the next two decades.

The role of biomass in baseload power

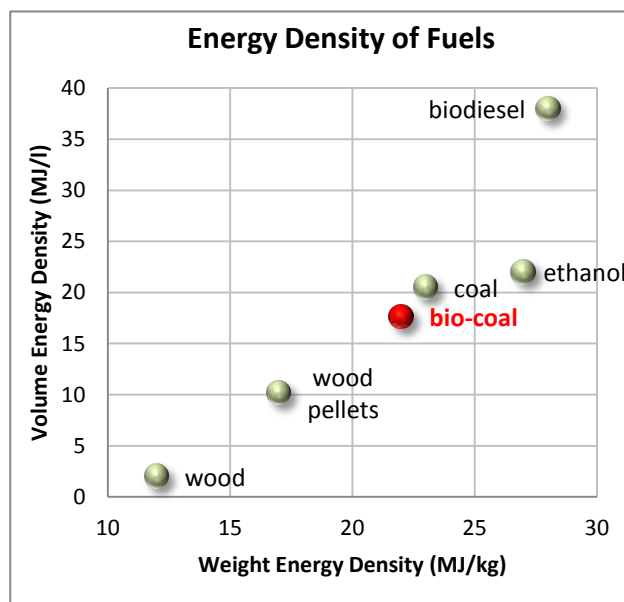
Following the Swedish example, the use of biomass has been particularly important, allowing existing thermal power units (oil, gas, coal) to go green. Moreover, all major policy makes spanning the UN, the EU and national governments, recognise that there is no coherent renewable policy without a substantial place for biomass. Even with this, there are still two problems to address;

1. The fuel is over there, the need is over here

For nations with big forests and small populations local biomass sourcing works. Finland, Sweden, Austria and Switzerland are all examples of this. For the UK, the only viable solution is to focus on the highest energy density possible. This simple logic has led RWE inexorably to the conclusion that wood pellets were the correct solution, and the only available fuel at industrial scale, and even then, the scale was insufficient for their needs, hence their €120m investment in Georgia Biomass¹⁰. In practice, international trade in wood pellets dominates the cross-border use of biomass, all driven by the simple logic of energy density.

2. Biomass is a poor replacement for coal

Traditional biomass fuels, including wood pellets, are simply not suited to these older coal stations; in addition to the very much higher water contents, biomass does not grind or burn in the same way. Worse still the fuels are prone to biological attack and, in the case of wood pellets must be kept dry at all times. The impact of this is that only a modest fraction (ca. 4%) of biomass can replace coal in a typical power station¹¹. To reach higher volumes, significant capital needs to be invested in storage, handling and combustion, and these conversion costs, while dramatically lower than new-build wind and solar, are still



⁸ [The Renewable Energy Centre, 2011](#)

⁹ [Climate Policy Tracker, 2010](#)

¹⁰ ["RWE Innogy builds world's largest pellet factory in Georgia", RWE, 2010](#)

¹¹ [Proceedings of Co-Firing Seminar, DTI's Sustainable Energies Programme, 2002](#)

significant. To replicate the Tilbury conversion for the larger UK power stations such as Drax, this still represents a massive financial undertaking of over £2 billion¹². This is 65% of the estimated cost of the London wind array¹³, and provides a generation capacity 4 times larger, yet would still represent a painful burden on the balance sheet of any utility.

What if conversion from coal to biomass was free?

The scene is ideally set for a fuel that is functionally identical to coal, but which is 100% renewable. The solution is neither costly nor fictional. The power industry has identified biomass “torrefaction” as the key solution. In essence, this is the drying and carbonization of biomass in a glorified coffee roaster to produce a “bio-coal”. This has all of the renewable attributes of biomass, but with a fuel functionality and energy density equivalent to coal.

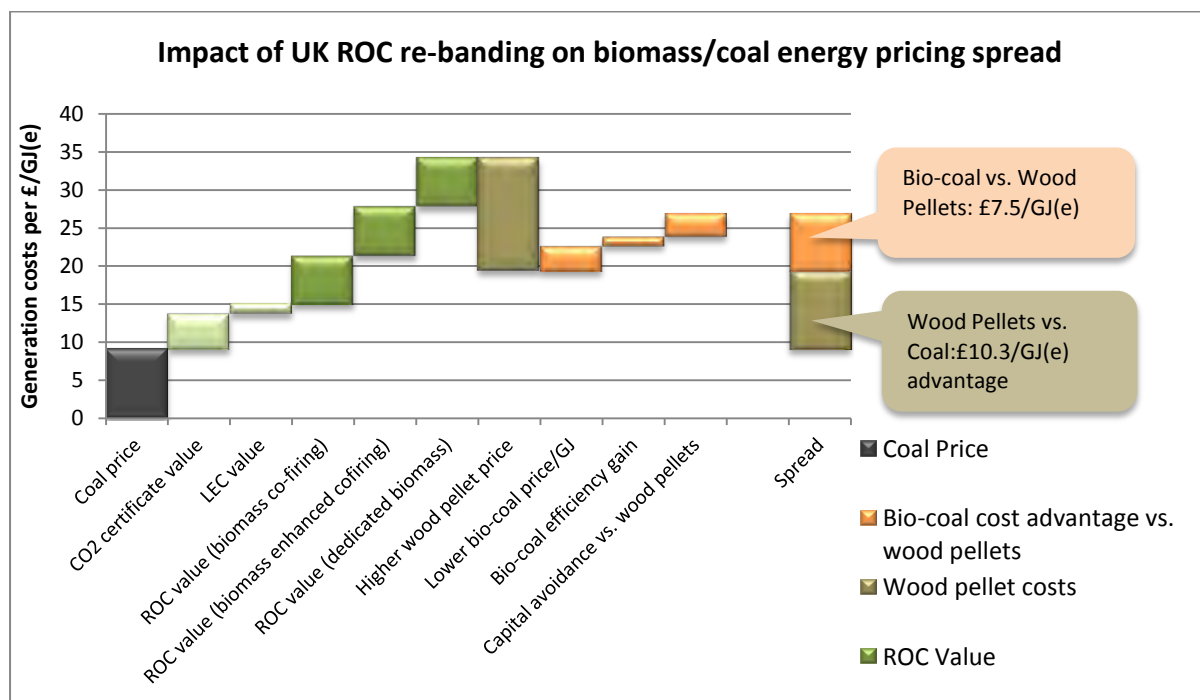
Utilities and developers are united in the view that this represents the way forward, but there are a number of significant impediments:

Scale: currently only a small number of companies have reached a semi-commercial scale. Of these only River Basin Energy, Topell, Stamproy and are truly operational, and none are yet capable of the industrial quantities required by the Utilities.

Conservatism: Utilities are conservative by nature, and none wish to make a commitment to a fuel they have not tested in large quantities. There is the vicious circle: no scale without finance: no finance without contract: no contract without scale.

In the mean time, the count-down clock is ticking on LCPD opted-out power plants (i.e. those slated for closure), bringing Europe closer to the “dark, calm” power crisis.

If the “dark, calm” power crisis were not enough, the economics of bio-coal use in the UK are also compelling;



¹² ["Drax considers biomass conversion", Environmental Finance, 2010](#)

¹³ ["Shell dumps wind, solar and hydro power in favour of biofuels", Guardian, 2009](#)

- With the new ROC banding, wood pellets would generate a £10.3/GJ advantage over coal, representing a 48% cost saving¹⁴.
- In comparison, use of bio-coal generates a further cost advantage of £7.5/GJ, made up by a combination of; (1) lower fuel cost/GJ; (2) avoidance of power plant de-rating¹⁵; and (3) capital avoidance. The net effect is for bio-coal to represent almost £18/GJ improvement over the cost of coal. Moreover, this conversion can be achieved immediately with no delay due to investments at the power station.

The impact of this is not lost on the utilities, with all major European players searching for the right way to support the evolution of bio-coal. RWE has once again entered the market first with a direct investment in Topell¹⁶, but this investment at maximum only places on the market 60.000t/year of bio-coal, insufficient even for one significant power station.

One company is trying to break the deadlock: River Basin Energy has plans to bring on line 6m tonnes of torrefied biomass (or “bio-coal”) over the next decade. This represents a small fraction of the required coal substitute, but it would make the company the largest merchant of biomass fuels Globally.

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¹⁴ Coal price, \$125/t; wood pellet price, \$193/t. Source: Hawkings Wright, Forest Energy Monitor, 2011.
ROC & LEC value Source: Bloomberg New Energy Finance.

¹⁵ Assumes typical power plant efficiencies for wood pellets, bio-coal and coal

¹⁶ [RWE Press Release, 2010](#)