

THE OUTLOOK FOR BIOMASS ELECTRICITY IN THE UK



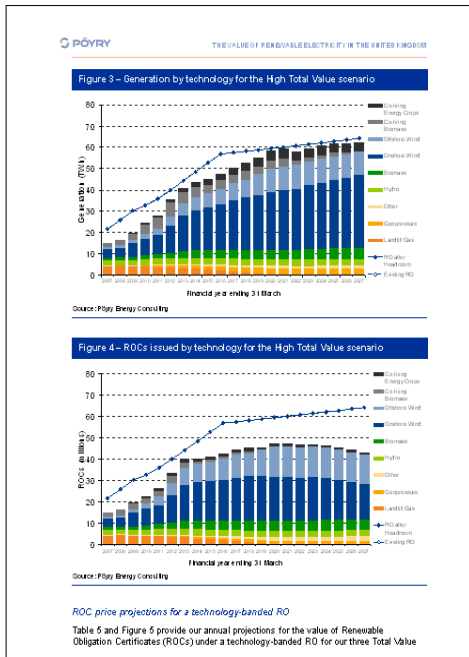
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www.cir-strategy.com/events/cleanpower

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THE PÖYRY GROUP: A UNIQUE PROPOSITION FOR THE BIOMASS INDUSTRY

Pöyry offers clients unique expertise across the biomass value chain



Caledonian Power Plant
Scotland, UK

28 MWe biomass-fired power plant, BFB boiler, extraction-condensing ST

<p>Project Description UPM-Kymmene (UK) Ltd is constructing a new biomass-fired power plant in Scotland. The plant will consist of a BFB boiler plant (28 MWe), an extraction-condensing steam turbine plant (28 MWe), fuel handling equipment and auxiliary systems. The paper mill produces LWC paper for both domestic and overseas markets. The plant will be fired with bark, sludge, forest residual, round wood and sawmill residues.</p>	<p>Client UPM-Kymmene (UK) Ltd</p> <p>Project Caledonian Power Plant The plant comprises a bubbling fluidised bed boiler, an extraction-condensing steam turbine, fuel handling equipment and auxiliary systems.</p>	<p>Services</p> <ul style="list-style-type: none"> Project management Complete BOE engineering including process, layout, piping, I&C, instrumentation and HVAC Civil design <p>Execution period 2007-2009</p>
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Pöyry Energy Oy
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Competence. Service. Solutions.

BIOMASS PROCUREMENT

Biomass Sourcing Strategies – From concept to implementation

Analysis of energy & carbon markets

- Leading provider of energy price projections in UK & Europe
- Experts on UK renewables regulation

Power station planning & engineering services

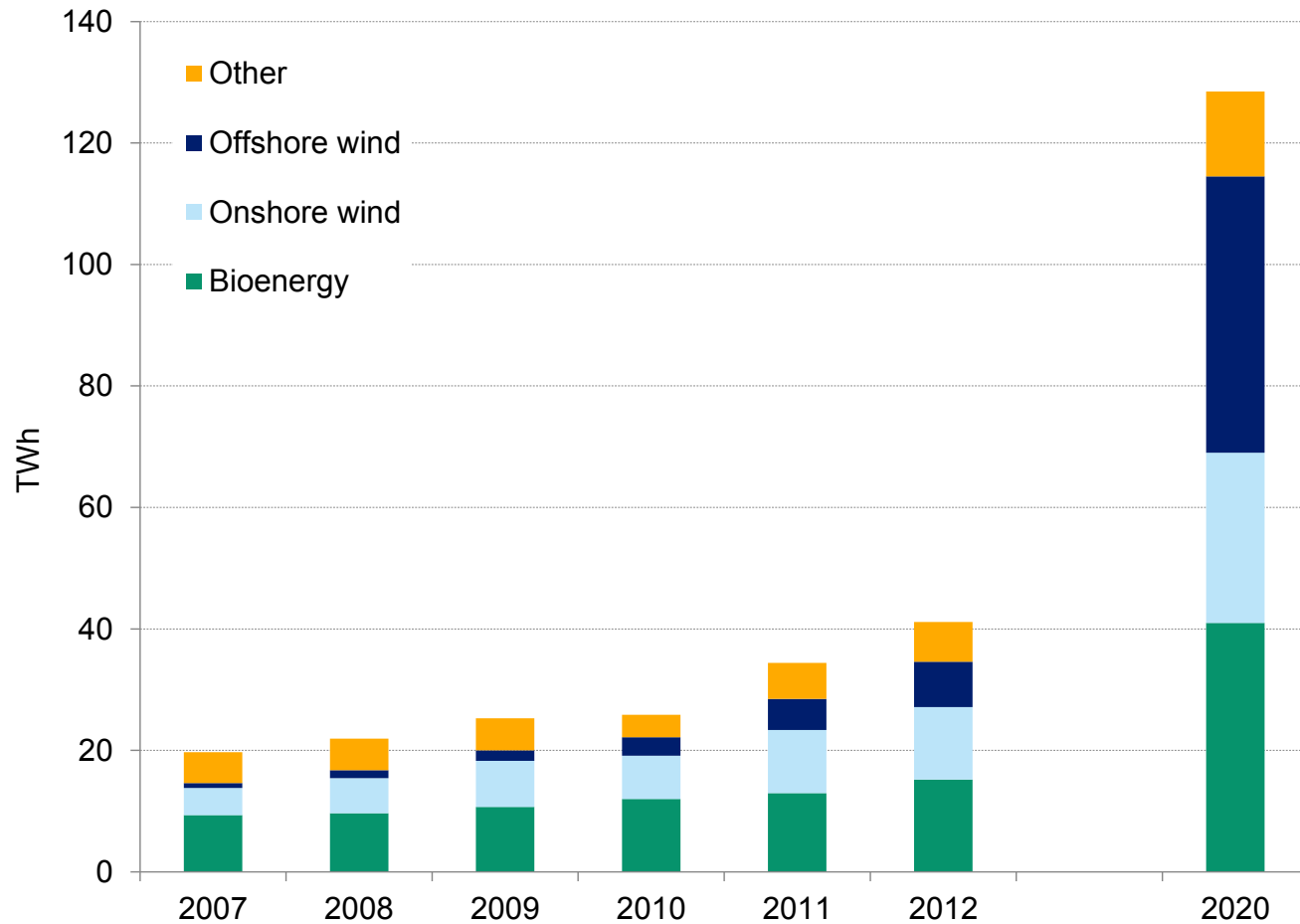
- Biomass engineering expertise located throughout the world
- Worked on over 160 bioenergy plants

Forestry & biomass market expertise

- Global network of forestry experts
- Advising most of the leading biomass projects in the UK

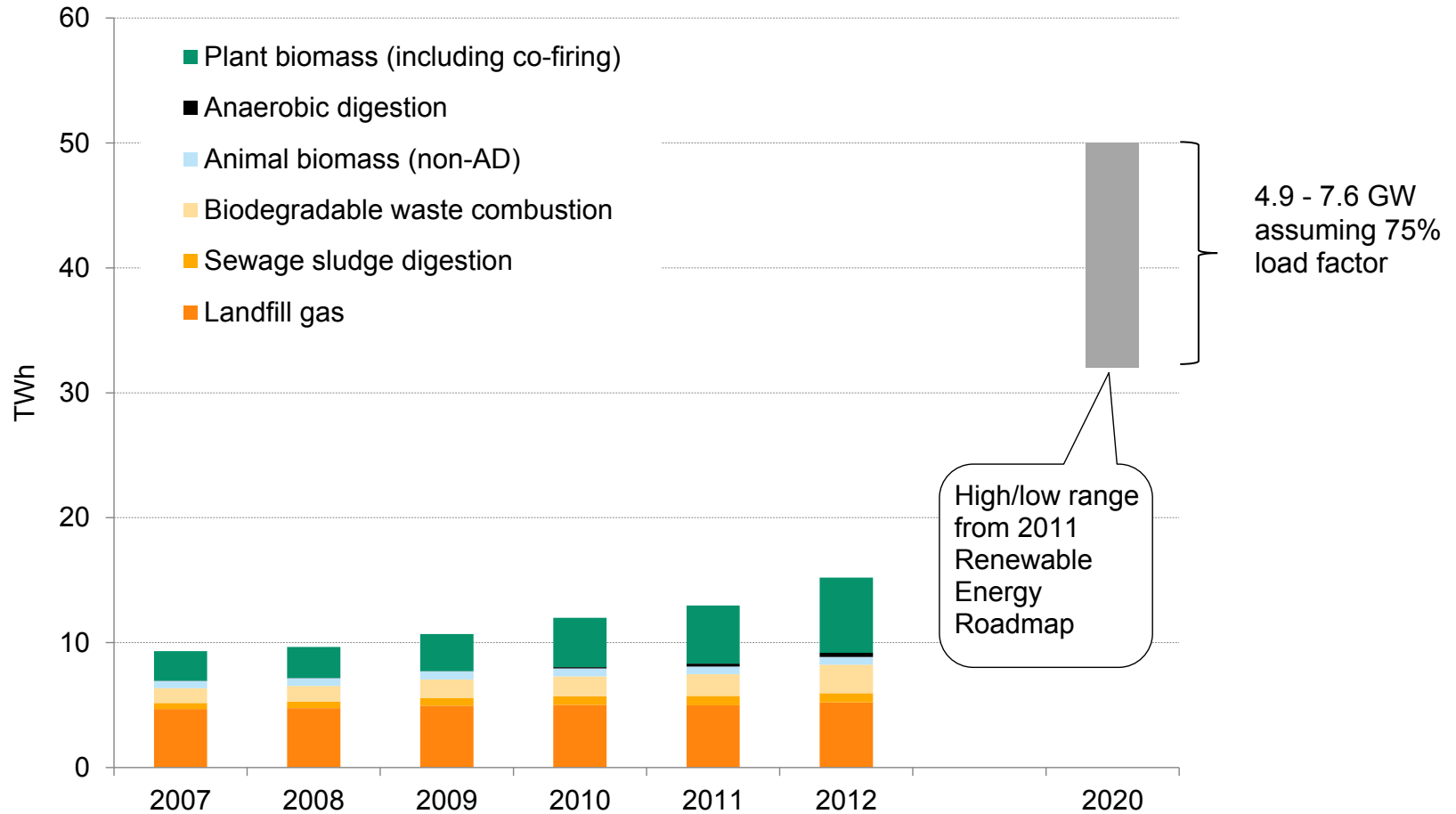
BIOMASS ELECTRICITY IS A KEY COMPONENT OF THE GOVERNMENT'S PLAN FOR MEETING THE 2020 RED TARGET

Biomass is projected to contribute around a third of renewable electricity



Source: DECC statistics for historic data (DUKES, Energy Trends)
2020 projections from DECC Renewable Energy Roadmap 2011 (average of high and low cases)

MOST OF THE GROWTH HAS COME FROM BURNING WOOD IN EITHER DEDICATED UNITS OR CO-FIRED WITH COAL



Source: DECC statistics for historic data (DUKES, Energy Trends)

BIOMASS ELECTRICITY REQUIRES FINANCIAL SUPPORT ...

... this is generally in the form of revenue support

ROCs

Renewable Obligation Certificates

- Current support mechanism for most biomass electricity technologies.
- Available for plants commissioning before April 2017.
- Number of ROCs/MWh ('banding factor') depends on technology. One ROC is worth approximately £40-45/MWh.
- ROCs are additional to revenue from sale of electricity into the wholesale market

CfD FiTs

Contract for Difference Feed-in Tariffs

- Part of the Government's Electricity Market Reform programme
- Replaces ROCs from 2017 (and available from 2014)
- Generator receives difference between tariff level and market price
- Tariff levels due to be announced this summer

Small-scale FiTs

Small-scale Feed-in Tariffs

- Applies to AD below 5MW
- Fixed generation tariff per MWh generated, plus optional export tariff.

ROC BANDING FACTORS

Year of commissioning	2013/14	2014/15	2015/16	2016/17
Dedicated biomass	1.5	1.5	1.5	1.4
Dedicated biomass with CHP	2.0	2.0	1.5+RHI*	1.5+RHI
Co-firing low range (<50%)	0.3	0.3	tbd**	tbd
Co-firing mid range (50-85%)	0.6	0.6	0.6	0.6
Co-firing high range (>85%)	0.7	0.9	0.9	0.9
Biomass conversion	1.0	1.0	1.0	1.0
Energy from waste	0	0	0	0
Energy from waste with CHP	1.0	1.0	1.0	1.0
Gasification/pyrolysis***	2.0	2.0	2.0	2.0
Landfill gas (open sites)	0	0	0	0
Landfill gas (closed sites)	0.2	0.2	0.2	0.2
Sewage gas	0.5	0.5	0.5	0.5

* Plants commissioning from April 2015 will receive the Renewable Heat Incentive for heat rather than an additional 0.5ROC uplift

** to be determined

*** Developers should be aware of the exact definition of these technologies

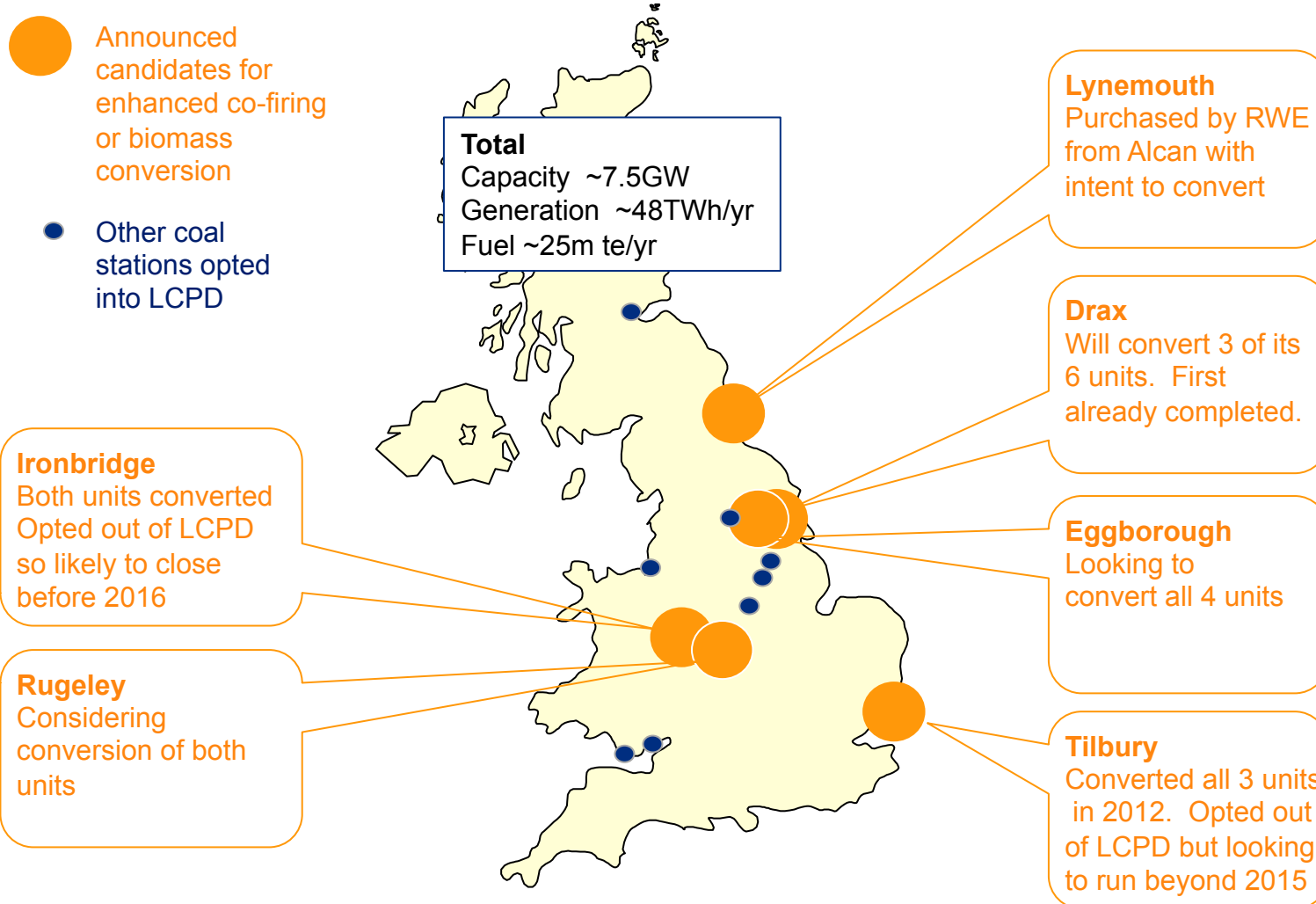
THE RECENT ROC BANDING REVIEW HAS LED TO INTEREST IN BIOMASS CONVERSION OF COAL UNITS

... as biomass conversion offers a means of extending the life of a coal unit

- The Industrial Emissions Directive imposes new, tighter, limits for SO₂, NO_x, and particulate matter emissions on coal power stations from 2016. The main compliance routes available are:
 - invest in additional abatement; or
 - opt to run for no more than 17,500 hours during 2016-2023, then close.
- Enhanced revenue from ROCs (at 1ROC/MWh) could help justify investment in abatement equipment.
- ROC income is essentially a negative variable cost and CO₂ cost is avoided, so marginal cost is lowered facilitating running at higher load factors (despite the higher fuel cost).
- Some operators may opt for CfD FiT support (likely to be 15 years) rather than ROC support (which is likely to expire in 2027 for these plants).

A NUMBER OF BIOMASS CONVERSION PROJECTS HAVE BEEN ANNOUNCED ...

... and other stations are thought to be looking at biomass conversion



... BUT NOT ALL OF THIS WILL GO AHEAD

What will determine the amount of capacity which converts?

Government appetite: the Levy Control Framework limits total renewable electricity support to 2020. Maybe around 4GW for biomass conversions (depending on other technologies)

Availability of sustainable biomass. The Atlantic basin currently has a surplus of biomass owing to decline of North American paper industry.

Demand from the rest of Europe. National Renewable Energy Action Plans imply a net import requirement to meet 2020 targets. Main competitors are NL, BE, DK, SE

DEDICATED BIOMASS WILL NOW PLAY A LESS SIGNIFICANT ROLE

- Around 500MW of large scale (>10MW) 'dedicated' new-build biomass generation capacity is operational or under construction.
- The Government sees a limited role for further new build because:
 - it is more expensive than co-firing or biomass conversion
 - it 'locks in' feedstock for the long term.
- Hence it has proposed a 'non-legislative' cap of 400MW of additional capacity.
- As a result, a number of large schemes have been cancelled (e.g. Drax 300MW projects, Centrica). However a number of projects are still under active development.
- Dedicated biomass with CHP is not included in the cap.

WHAT ARE THE KEY ISSUES FOR BIOMASS ELECTRICITY PROJECTS?

- **Regulatory risk**

- Various issues with the Renewables Obligation have slowed project development. The 400MW cap on dedicated biomass is the latest example, while the Levy Control Framework creates uncertainty for conversion projects.

- **Fuel supply**

- There is a limited UK biomass resource but certain global regions have surpluses (e.g. South East USA)
- Supply chains into Europe need to be developed. North American wood pellet producers are showing a high level of interest in the UK market.
- What will the price be, and how can price risk be managed?

- **Sustainability**

- Bio-mass will be required to meet strict sustainability criteria to qualify for ROCs, relating to land use and greenhouse gas savings
- For most likely supply baskets compliance should be achievable, but there is some additional regulatory uncertainty in this area.
- Risk of public opposition?

Conclusion: In the last year Government appetite for biomass electricity has focussed primarily on biomass conversions, although other bioenergy technologies will play a supporting role.



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