

**CLEEN**

Cluster for Energy and Environment



**Research report  
D 1.1.4 WP 1 Task 1.1  
Helsinki 2014**

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# **Expansion of biomass capacity in central Europe An analysis of new plant projects by major utilities**



Sustainable Bioenergy  
Solutions for Tomorrow

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**Name of the report: Expansion of biomass capacity in central Europe**

**Key words: Renewable energy, biomass, plant project, renewables support framework**

## **Summary**

New legislation and renewables support frameworks are being introduced all across the Europe, including the United Kingdom and Poland. The changes to support frameworks are causing instability in the renewable energy sector as the upcoming support levels have not yet been confirmed. In the UK, the upcoming regulatory is likely to be more suitable for conversion of existing coal plants to biomass plants rather than construction of new dedicated biomass plants. In Poland, renewable electricity is currently supported by green certificates, but the certificates are planned to be replaced by feed-in-tariffs.

In Europe many biomass projects have been recently cancelled and companies are focusing more on wind power and combined cycle gas turbines. Major utilities are investing more in Belgium and Netherlands rather than Germany due to a more favorable regulatory framework.

Several new lignite and coal plants have been built with the option of co-firing, especially in Germany. Most of the utilities have a subsidiary for renewables, but these renewables companies do not handle co-firing plants. In addition most of the utilities do not provide information on their co-firing rates on their web sites; in some cases companies do not mention co-firing at all even though other sources provide evidence on it.

Espoo, February 2014



## Contents

<b>1</b>	<b>Introduction</b> .....	<b>2</b>
<b>2</b>	<b>Companies</b> .....	<b>3</b>
<b>2.1</b>	<b>E.ON</b> .....	<b>3</b>
2.1.1	EEW .....	3
2.1.2	Projects .....	3
<b>2.2</b>	<b>Vattenfall</b> .....	<b>6</b>
2.2.1	Projects .....	7
<b>2.3</b>	<b>RWE</b> .....	<b>7</b>
2.3.1	Essent .....	8
2.3.2	Projects .....	8
<b>2.4</b>	<b>Centrica</b> .....	<b>12</b>
<b>2.5</b>	<b>Scottish Power</b> .....	<b>12</b>
<b>2.6</b>	<b>Drax Group</b> .....	<b>12</b>
2.6.1	Projects .....	13
<b>2.7</b>	<b>Électricité de France</b> .....	<b>14</b>
<b>2.8</b>	<b>Scottish and Southern Energy</b> .....	<b>15</b>
2.8.1	Forth Energy.....	15
2.8.2	Projects .....	15
<b>2.9</b>	<b>EnBW</b> .....	<b>16</b>
<b>2.10</b>	<b>EWE</b> .....	<b>16</b>
<b>2.11</b>	<b>Tauron</b> .....	<b>17</b>
<b>2.12</b>	<b>GDF Suez</b> .....	<b>17</b>
2.12.1	Electrabel .....	17
<b>2.13</b>	<b>PGE</b> .....	<b>17</b>
<b>3</b>	<b>Renewable support frameworks in different countries</b> .....	<b>18</b>
<b>3.1</b>	<b>UK</b> .....	<b>18</b>
<b>3.2</b>	<b>Poland</b> .....	<b>19</b>
<b>3.3</b>	<b>Germany</b> .....	<b>20</b>
<b>3.4</b>	<b>Netherlands</b> .....	<b>20</b>
<b>3.5</b>	<b>Belgium</b> .....	<b>20</b>
<b>4</b>	<b>Support levels for planned and canceled biomass projects</b> .....	<b>21</b>
<b>5</b>	<b>References</b> .....	<b>24</b>
	<b>Appendix</b> .....	<b>26</b>



## 1 Introduction

This report provides an overview of projects for new biomass fuelled power plants in central European countries. It covers the plans for new plants by major utilities in the following countries:

- Belgium
- Germany
- Netherlands
- Poland
- United Kingdom

Most of the new plant projects have been found from PiE power plant project tracker in Platts Power in Europe September 30, 2013 and January 20, 2014 editions. Other material includes Platts Power in Europe articles, companies' homepages and annual or interim reports. Information acquired from PiE tracker has been brought up to date from other sources in cases when more recent information has been available.

This is the status of public information on February 11<sup>th</sup>, 2014. Other changes in company plans have probably occurred, but could not be found from public sources. This report encompasses the new plant plans in the above countries by the following utilities and their subsidiaries:

- E.ON
- Vattenfall
- RWE
- Centrica
- Scottish Power
- Drax group
- Electricite de France
- Scottish and Southern
- EnBW
- EWE
- Tauron
- GdF Suez
- PGE

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## 2 Companies

### 2.1 E.ON

<p><u>E.ON ambition in biomass</u> (E.ON, 2013)</p> <ul style="list-style-type: none"> <li>• Convert existing fossil E.ON plants to exclusively use biomass as fuel</li> <li>• Focus regions: UK, France, Belgium</li> <li>• Support biomass co-firing in fossil E.ON plants</li> <li>• Ensure sustainable international fuel sourcing</li> </ul>
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In Poland E.ON has only wind power. In Germany E.ON has biomass plants with an output of around 30 MW currently installed. E.ON Germany is focusing on biomethane production (e.g. 10MW biomethane facility in Schwandorf).

E.ON UK has two operating biomass plants:

- Steven's croft, 43.3MW, dedicated biomass
- Ironbridge, 450MW, coal-to-biomass conversion

E.ON also has new biomass plant projects in Belgium, Netherlands and France.

#### 2.1.1 EEW

E.ON is a shareholder (49%) in EEW Energy from Waste GmbH. EEW was formerly known as E.ON Energy from waste AG, but in March 2013 private equity group EQT bought major share (51%) of the company and a venture company EEW Energy from Waste GmbH was formed. EEW operates 17 waste-to-energy plants in Germany and one in Netherlands.

#### 2.1.2 Projects

##### 2.1.2.1 Belgium

Langerlo, Genk	E.ON	400 MW	Biomass conversion	Q1 2015	Applied
Platts PiE tracker (The McGraw-Hill Companies, Inc, 2013)	<p>July 2013: Flemish Environment Minister Joke Schauvliege in agreement with Limburg provincial government and grants E.ON environmental permit for this conversion.</p> <p>Nov 2012: E.ON plans to convert 460-MW coal-firing plant in Langerlo to a 400-MW wood pellet-fuelled biomass plant. It has received environmental permits, investment decision to be taken in 2013. Conversion would take 18 months with plant in operation by 2016.</p> <p>Dec 2011: Flemish minister Joke Schavliege says refusal of environmental license for E.ON's Antwerp coal plant proposal justified because of the existing high levels of NOx and particulate emissions in</p>				



	<i>the Antwerp harbour area. E.ON says to focus on converting Langerlo coal plant to 100% biomass, and bidding for 200-400 MW new biomass plant in Antwerp harbour.</i>
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### 2.1.2.2 Netherlands

Maasvlakte, Rotterdam	E.ON	1,100 MW	Coal/biomass	Q1 2014	Construction
<p>Platts PiE tracker (The McGraw-Hill Companies, Inc, 2013, 2014)</p>	<p><i>Jan 2014: still in commissioning phase with no set date for commercial operation.</i></p> <p><i>Aug 2013: on track for commercial operation Q1 2014.</i></p> <p><i>July 2013: boiler pressure test completed. Grid connection finalized. Boiler cleaning finalized. First coal firing expected by end of summer. "This autumn we expect to deliver the first electricity to the grid": E.ON.</i></p> <p><i>Sept 2012: back in construction after T24-related steel issues. Commissioning to start Q3 2012. First coal firing expected in Q2 2013. First power to grid due summer 2013. H2 2013 to be period of testing and trial runs.</i></p> <p><i>March 2012: ROAD CCS project passes final review stage of environmental impact assessment by Dutch EIA Commission.</i></p> <p><i>Aug 2011: permitting on-going. Turbine almost finished. Minor delay on boiler. Mitigating actions planned.</i></p> <p><i>May 2010: joint E.ON/Electrabel CCS project on the Maasvlakte, known as ROAD, is to receive €150 million from the Dutch government over 2010-2019. This is additional to the €180 million that the European Commission is providing over 2010-2014.</i></p> <p><i>Jan 2010: Greenpeace Nederland places another procedural obstacle in the way of this project. The Rotterdam court has ruled that E.ON's construction license "was wrongly issued. The disputed decision is therefore annulled." E.ON believes this relates to steel mesh installed in the river to prevent fish getting into the cooling water plant.</i></p> <p><i>July 09: E.ON Netherlands applies for EU CCS project funding jointly with Electrabel for this project. The demo phase aims at capturing 1.1 million ton CO2/yr, transporting the gas 20-km offshore in the North Sea. Cooperation with Taqa - the Abu Dhabi National Energy Company - has been reached for this final stage.</i></p> <p><i>May 09: Alstom to supply steam turbine generator package: supercritical steam parameters of 285 bar and 620°C to deliver net 46% efficiency. New unit to <u>be able to co-fire biomass</u> and is being designed for</i></p>				





	<p><i>subsequent retrofitting with carbon capture technology.</i></p> <p><i>April 08: Construction begins. Project had been on hold following legal challenge from Greenpeace Netherlands.</i></p> <p><i>Dec 07: E.ON signs agreement for GATE LNG terminal (Gasunie/Vopak) to take steam heat from plant. Plant will also provide power to GATE.</i></p> <p><i>Nov 07: E.ON says all it needs to proceed is a natural habitat license and a construction license, which it hopes to get in early 2008. Greenpeace asks Council of State to strike down environmental licenses.</i></p> <p><i>July 07: Provisional licenses published.</i></p>
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### 2.1.2.3 France

Various sites	Various	420 MW in all	Biomass	Q4 2012	State awards
Platts PiE tracker (The McGraw-Hill Companies, Inc, 2013, 2014)	<p><i>Oct 2013: Doosan Power Systems and Groupe ADF enter 18-month partnership following award of a major biomass conversion and turbine upgrade project at E.ON's coal-fired Provence power plant in Gardanne. Conversion works are under with scheduled first firing in autumn 2014 and start-up operations commencing early 2015.</i></p> <p><i>May 2013: SNET (E.ON) awards biomass conversion contract to Doosan Heavy Industries to transform coal-firing unit at Gardanne, Provence. The new biomass unit will have a capacity of 150 MWe.</i></p> <p><i>Oct 2011: government contracts for 420 MW biomass plant rather than 200 MW originally envisaged. 15 projects approved for FITs, most in 13-26 MW range, but one - E.ON's Provence project - is for 150 MW. Behind some of the development companies are larger concerns - Biolacq Energies and Cofely are GDF Suez-owned. In all the projects should attract €1.4 billion of investment.</i></p>				

### 2.1.2.4 United Kingdom

Ironbridge, Shropshire	E.ON UK	450 MW	Biomass conversion	2013	Approved
Platts PiE tracker (The McGraw-Hill Companies, Inc, 2013)	<p><i>March 2012: E.ON to convert one unit at its Ironbridge coal-firing units in Shropshire to biomass to begin operation by early 2013. Unit will run its remaining operational hours on the new fuel mix until its planned closure by December 2015 under the Large Combustion Plant Directive. Power stations converted to biomass are to receive one Renewable Obligation Certificate per MWh produced under the government's proposed new subsidy levels.</i></p>				



<b>Royal Portbury Dock, Bristol</b>	E.ON	150 MW	Biomass	2015	Abandoned
Platts PiE tracker (The McGraw-Hill Companies, Inc, 2013)	<p>March 2012: final approval received but uncertainty over subsidy levels is delaying a final investment decision.</p> <p>Jan 09: E.ON Climate and Renewables' 150-MW Bristol biomass power project gains a January 2, 2013 grid connection agreement with National Grid, to connect to the 132-kV Seabank substation.</p> <p>Aug 08: E.ON plans to invest around £300 million in the Portbury Dock Renewable Energy Plant, burning wood that would largely be brought to the plant by boat. E.ON has issued scoping statement to North Somerset Council, the Department for Business, Enterprise and Regulatory Reform and others. It hopes to submit full application to BERR in mid-2009.</p>				
Additional Information	October 22 <sup>nd</sup> , 2013 E.ON announced cancellation of Royal Portbury Dock project. (Power Engineering International, 2013)				

<b>Lostock, Northwich, Cheshire</b>	EEW - Energy from Waste group	60 MW	Energy from waste	2014	Approved
Platts PiE tracker (The McGraw-Hill Companies, Inc, 2013)	Oct 2012: DECC approves project following public enquiry. To be fuelled by pre-treated, non-recyclable waste. Plant to supply energy to Tata Chemicals Europe's Lostock factory. Tata is a partner in its construction.				

## 2.2 Vattenfall

Vattenfall has five waste-to-energy CHP plants in Germany. One of them, Borsigstraße in Hamburg, also has one biomass-fuelled unit, which was added in 2005.

- Rüdersdorf, 35 MWe / 118 MWth, waste-to-energy CHP
- Lauta, 15.7 MWe / 80.35 MWth, waste-to-energy CHP
- Borsigstraße, 20.3 MWe / 100 MWth, 2 units waste to-energy and one biomass CHP unit
- Rugenberger Damm, 24 MWe / 146 MWth, waste-to-energy CHP
- Vera, 12.3 MWe / 9.2 MWth, waste-to-energy CHP
- Moabit, 140 MWe / 240 MWth, co-firing CHP

In the end of 2012 Vattenfall cancelled plans for two biomass boilers in Lichterfelde, Germany, and continued with CCGT instead. Vattenfall is finalizing the biomass



combustion plant Märkisches Viertel in early 2014, but currently there are no other plans for biomass projects in Germany (Vattenfall, 2014; Svensk Energi, 2014).

Vattenfall Heat Poland was sold in August 2011 to Polish PGNiG S.A. and Tauron (Vattenfall, 2011). In Netherlands, Vattenfall has some biomass project plans, but it is currently uncertain whether the plans will be realized (Vattenfall, 2014; Svensk Energi, 2014). Vattenfall is also investigating the option for co-firing in Netherlands,

## 2.2.1 Projects

### 2.2.1.1 Germany

<p><b>Lichterfelde,</b> Marzahn, Berlin</p>	<p>Vattenfall Europe</p>	<p>2 x 300 MWe, 230 MWth</p>	<p>CCGT</p>	<p>Q4 2016</p>	<p>Approved</p>
<p>Platts PiE tracker (The McGraw-Hill Companies, Inc, 2013)</p>	<p><i>Mar 2013: Iberdrola Ingeniera y Construccion wins tender to build Lichterfelde CHP plant. Construction due to start Feb 2014, complete Dec 2016.</i></p> <p><i>Nov 2012: <u>Vattenfall cancels plans for two biomass boilers at Klingenberg</u>, but new CCGT cogen unit at Lichterfelde is approved, as is similar unit at Marzahn.</i></p> <p><i>July 2011: Vattenfall calls for bids to supply three gas-firing heat and power units, each of up to 299 MWe, 120 MWth, at Berlin sites Lichterfelde, Klingenberg and Marzahn. District heat refurb tenders to follow.</i></p> <p><i>March 09: Vattenfall drops plans for 800-MW coal-firing cogeneration plant, launches scheme for two 20 MWe/150 MWth biomass plants at the Klingenberg site for commissioning in 2014, and one or two combined cycle gas turbine plants, to have a total capacity of 580 MWe/450 MWth, at one or both of the Klingenberg and Lichterfelde sites, by about 2015. Whichever option is chosen, the old 450-MWe gas-firing Lichterfelde cogen plant is to be replaced with a CCGT plant by 2014. Tender for the plants scheduled during 2009. Building biomass and gas capacity instead of coal would allow VE emissions in the city to be reduced to 6.4 million tonnes/year in 2020, compared with 13.3 million tonnes in 1990 and an average 7.5 million tonnes/year over the period 2006-2008.</i></p>				

## 2.3 RWE

RWE currently has five operating biomass plants in Germany:

- Berlin-Neukölln/Gropiusstadt, 20 MWe / 65 MWth, wood-firing CHP plant
- Güterglück, 6.5 MW, biogas plant
- Siegen-Wittgenstein, 5 MWe / 30 MWth, biomass-firing CHP plant
- Bergkamen, 20 MW, biomass-firing power plant



- Grevenbroich, 716 kW, biogas plant

In addition RWE is focusing on increasing pellet production capacity as they consider pellets to be probably the most important fuel for converted power plants and co-firing coal plants.

RWE announced in November 2013 reductions of 25 million euros in the renewable energy sector including giving up on RWE Innogy's biomass sector and offshore logistics (Handelsblatt, 2013). In January 2014 RWE announced that they will continue with their plans for Lynemouth's coal to biomass conversion as Lynemouth power plant is part of RWE Generation, not RWE Innogy. RWE Innogy's decision to focus on hydropower and onshore and offshore wind power, rather than biomass, will have greater effects on Germany than UK (PLATTS, 2014).

### 2.3.1 Essent

Essent is a subsidiary of RWE. Essent is operating in Netherlands and Belgium. Essent has two plants operating and one ongoing project using biomass or waste in Netherlands.

### 2.3.2 Projects

#### 2.3.2.1 Netherlands

Eemshaven	RWE	1,600 MW	Coal	Q1 2014	Construction
Platts PiE tracker (The McGraw-Hill Companies, Inc, 2013)	<p><i>March 2012: RWE re-applies for disputed environmental permits. Province of Groningen council to reach decision within three months.</i></p> <p><i>Sept 11: Groningen issues nine-month permit for work on power station itself to continue. RWE applying for new nature protection permits.</i></p> <p><i>Aug 2011: Council of State court revokes 2008 nature protection permits issued by Groningen and Friesland. Assessment of impact on protected areas deemed to be incomplete NB deepening of navigation channel. Also concerns re nitrogen impact on North Sea islands and cooling water discharge.</i></p> <p><i>Jun 2011: Tennet opens 380-kV Oudeschip high voltage station, crucial to Eemshaven capacity additions.</i></p> <p><i>Feb 2011: total cost put at €2.7 billion.</i></p> <p><i>March 09: Alstom wins €500 million contract to supply two 800-MW boilers. The ultra-supercritical steam boilers are due to be completed in 2013, Alstom said, and are capable of 47% efficiency. <u>Units designed to co-firing up to 10% biomass</u>, and can be retrofitted with carbon capture equipment.</i></p> <p><i>Jan 09: RWE buys Essent for €9.3 billion, confirms construction is</i></p>				



	<p><i>underway. Plant to use 10% biomass, scheduled to be completed by 2012. "Essent's experience in biomass co-firing is industry leading and will complement RWE's construction of the Eemshaven power station," says RWE.</i></p> <p><i>Jan 07: RWE submits plans for approval to authorities in Groningen province. Plant to be co-fired with biomass. Site is 49 hectares by the port, whose eastern basin is being extended for this and other projects.</i></p> <p><i>Nov 06: RWE calls for EPC bids for 800-MW coal units, two for Hamm, two for this project.</i></p>
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<b>Borssele, Zeeland</b>	EPZ	350 MW	Biomass conversion	Unknown	Approved
Platts PiE tracker (The McGraw-Hill Companies, Inc, 2013)	<p><i>July 2013: Dutch draft energy agreement raises prospect of subsidy for this conversion project to prevent closure. EPZ majority owner Delta says it has licenses for the conversion, but needs subsidy. Unit is too old to apply for co-firing subsidy under SDE+ support scheme. Existing coal-firing capacity is 420-MW. Conversion would result in flexible capacity of 75-350-MW. <u>Minority shareholder in the plant is RWE.</u></i></p>				

### 2.3.2.2 Germany

- Bergheim – Paffendorf, 7.4 MW, biogas plant, commissioning in 2014
- Velen, biogas plant, 4 MWe / 10 MWth, construction in 2014

<b>Niederaussem, Nordrhein-Westfalen</b>	RWE Power	1,100 MW	Lignite	2018	Applied
Platts PiE tracker (The McGraw-Hill Companies, Inc, 2013)	<p><i>Sept 2013: RWE says no need to rush decision on this Boaplus project.</i></p> <p><i>Oct 2011: RWE Power lodges request with Cologne government to alter regional spatial development plan to allow it to build a 1.1 GW lignite-firing plant at its existing power station site at Niederaussem. Four 300-MW units would be closed when the new plant is commissioned. RWE hopes permitting can be completed within two-to-three years, after which a construction decision on the €1.5 billion investment would be due. Possible commissioning date of 2018. RWE says twin boiler concept would make the plant considerably more flexible, complementing intermittent renewables. Use of a hybrid cooling tower would avoid plumes of water vapour and <u>co-firing of biomass also an option.</u></i></p>				



### 2.3.2.3 United Kingdom

<b>Markinch, Glenrothes, Scotland</b>	RWE Innogy	50 MW	Biomass	Q3 2013	Construction
Platts PiE tracker (The McGraw-Hill Companies, Inc, 2013, 2014)	<p><i>Dec 2013: in the commissioning phase.</i></p> <p><i>Apr 2010: Siemens wins steam turbine-generator award from EPC contractor Aker Solutions.</i></p> <p><i>Sept 09: RWE Innogy to press ahead with construction of this 50-MW, £200 million biomass plant in the Scottish county of Fife after signing a "multi-million pound" heat and power supply deal with paper manufacturer Tullis Russel. To replace existing coal-firing power plant supplying Tullis Russel's factory at Markinch, Glenrothes. RWE Innogy expects to start first phase of construction before the end of 2009 and have the plant operational in 2012. To be firing by up to 400,000 tonnes of regionally sourced new and used wood. Scottish govt to contribute £8.1 million.</i></p>				
Additional Information	Markinch Biomass CHP is close to completion and is now in the commissioning phase (RWE Innogy, 2013)				

<b>Tilbury, Thames Estuary</b>	RWE npower	750 MW	Coal to biomass conversion	Q1 2012	Operational / Cancelled*
Platts PiE tracker (The McGraw-Hill Companies, Inc, 2013)	<p><i>July 2013: plant to close in October, reflecting poor market conditions and end of operational hours under LCPD opt-out rules. Sept 2012: RWE applies to local council to extend life of biomass plant by 12-15 years.</i></p> <p><i>June 2012: 200-MW Unit 8 returns, fuel hoppers at Units 9 and 10 still being fixed, due back before end-August. Feb 2012: fire damages two of three converted units, earliest expected return date for undamaged Unit 8 is late April, late summer for units 9 and 10.</i></p> <p><i>Jan 2012: two 250 MW commissioned, a third close, commercial power due in a week or two.</i></p> <p><i>Apr 2011: RWE npower plans to convert existing 1,100 MW coal plant at Tilbury to 750-MW, 100% biomass-firing plant this year, with hope of re-licensing to avoid LCPD closure in 2015. Longer term options include a CCGT at this site.</i></p> <p><i>Nov 09: RWE, Dong Energy and Peel Energy pull out of government's £1</i></p>				



	<p><i>billion CCS competition, initially proposed for this site.</i></p> <p><i>March 07: two new 800-MW coal units would cost over £1 billion, RWE says. Environmental scoping document submitted to DTI. Post combustion capture likely option.</i></p> <p><i>April 06: feasibility study launched for 1,600 MW clean coal project, to use supercritical plant technology. CCS technology could be ready by 2016 and could reduce the station's carbon dioxide emissions levels by as much as 90% per year, RWE said</i></p>
Additional Information	<p>Biomass conversion plans in Tilbury abandoned due to poor market conditions and Tilbury should be closed 31.10.2013. Tilbury was converted to biomass in 2011 on a trial basis. (RECYCLINGPORTAL, 2013)</p>

<b>Stallingborough, Lincs</b>	RWE Innogy	65 MW	Biomass	Unknown	Suspended
Platts PiE tracker (The McGraw-Hill Companies, Inc, 2013)	<p><i>Dec 2010: shelved while RWE reviews investments.</i></p> <p><i>Oct 2010: RWE npower Renewables submits further environmental information. Sept 08: Helius sells project to RWE Innogy for £28.14 million. Helius to receive 13% of the yearly profit after tax over the first 24 years of operation. Helius has also signed a four-year technical services agreement with RWE Innogy to provide ongoing support to ensure the plant is delivered on time. RWE Innogy is to invest around €260 million in developing the new plant, with Helius Energy involved in the construction, implementation and start-up phases.</i></p>				

<b>Lynemouth, Northumberland</b>	RWE Npower	420 MW	Biomass conversion	2014	Pre-proposal
Platts PiE tracker (The McGraw-Hill Companies, Inc, 2013, 2014)	<p><i>Dec 2013: included in a list of 'affordable' low carbon projects negotiating an early price guarantee contract with the government.</i></p> <p><i>Dec 2012: Alcan completes sale of this 1972, 420-MW coal-firing power station to RWE Npower, which is to decide in 2013 whether to convert it to biomass.</i></p>				



## 2.4 Centrica

Centrica does not have any biomass plants and has abandoned biomass plant projects in the end of 2012; they are now focusing on wind power. The following quotation from their chief executive's review gives clarity on their current investment plans:

*"However, as with all our investment options, we will only deploy capital where we see attractive value, aligned to our core competencies. In this context, we announced in October that we would not proceed with plans to build two dedicated biomass plants, following recent clarification on the regulatory framework indicating a Government preference for coal conversion."* (Centrica, 2013)

*"We have also decided not to proceed with planning applications to develop dedicated biomass power stations at Roosecote and Brigg, with recent clarification on the regulatory framework indicating a preference for co-firing and coal conversion. As the market becomes increasingly dependent on fixed price support mechanisms, we will leverage our competencies, investing only where we see value."* (Centrica, 2013)

*Cancelled plans / closed plants:*

### UK:

- Roosecote, 80 MW, dedicated biomass
- Brigg, 137 MW, dedicated biomass

## 2.5 Scottish Power

Scottish Power is a subsidiary of Spanish Iberdrola. Scottish Power had one biomass co-firing plant in UK, Cockenzie power station, but operation was ceased in March 2013 and plans are to replace it with CCGT.

Scottish power is now focusing on wind and wave power. They have no plans for biomass at least for now.

## 2.6 Drax Group

Drax is converting 3 of its 6 coal units at Drax power station, UK. First unit was converted and started operating on biomass in April, 2013. Second unit planned to be running in summer 2014. Drax is planning and evaluating conversion of the fourth unit, new biomass pellet plant facilities and also CCS. (Drax Group plc, 2013)

In 2012 Drax canceled plans for two dedicated biomass plant projects in UK (in Selby and Immingham, 299MW both) due to "highly challenging" proposed support level and regulatory uncertainty.





## 2.6.1 Projects

### 2.6.1.1 United Kingdom

<b>Heron, Immingham</b>	Drax/Siemens	299 MW	Biomass	Q4 2014	Cancelled
Platts PiE tracker (The McGraw-Hill Companies, Inc, 2013)	<p><i>Oct 2012: project cancelled because of insufficient support and regulatory uncertainty.</i></p> <p><i>Aug 2012: ROC support confirmed at 1.5 ROCs/MWh.</i></p> <p><i>Aug 2011: formal consent granted by government.</i></p> <p><i>Aug 2010: Drax not ready to invest under current support system (1.5 ROCs/MWh, but review risk). Jan 2010: this project proposed for the Port of Immingham receives approval from North Lincolnshire Country Council. Secretary of state's decision expected around September 2010, Drax says.</i></p> <p><i>Aug 09: Section 36 application for Immingham project to be made by end of year, Drax says.</i></p> <p><i>Jan 09: 290-MW Immingham Renewable Power Station biomass project at Killingholme gains October 31, 2014 connection agreement with National Grid to connect to 400-kV Killingholme substation.</i></p> <p><i>Oct 08: Drax Group to develop three 300-MW biomass-firing power stations with Siemens Project Ventures. Total cost of the program is put at around £2 billion. Ownership of the plants is to be split 60% Drax and 40% SPV. Drax is to manage and operate the business and will be responsible for biomass procurement and trading. It is proposed that the plants will use Siemens' turbine technology. Drax has secured rights to port sites at Immingham and Hull for two of the plants.</i></p>				

<b>Drax, Selby, North Yorks</b>	Drax	3-unit conversion	Biomass	Q2 2013, 2014	Construction
Platts PiE tracker (The McGraw-Hill Companies, Inc, 2013, 2014)	<p><i>Dec 2013: biomass conversion of unit 3 and 1 included in a list of 'affordable' projects negotiating an early price guarantee contract with the government. A third unit has already been converted and is in operation.</i></p> <p><i>March 2013: Government guarantees £75 million of debt relating to three-unit conversion project. Drax on track to convert first 660-MW unit fully to biomass in April 2013, with a second to follow in 2014. Drax to invest between £250-300 million this year, including £50 million for plant efficiency and other non-biomass projects. The total cost for biomass</i></p>				



	<p><i>conversion remained in the range £650-700 million.</i></p> <p><i>Dec 2012: Drax secures financing to support transformation into predominantly biomass-fuelled generator. Has gained up to £100 million amortising term loan from UK Green Investment Bank and a £400 million revolving credit facility maturing in April 2016.</i></p> <p><i>Aug 2012: Drax commits progressively to convert three of its six operating units to biomass, after review awards 1 ROC/MWh for converted plant. Feb 2012: <u>Drax cancels plans for a 299-MW dedicated biomass project at Selby</u> due to "highly challenging" proposed support level. Conversion project still active.</i></p> <p><i>Aug 2011: consent granted by government for 299-MW dedicated biomass plant.</i></p> <p><i>Jun 2010: Drax in talks with Department of Energy and Climate Change on possible support for 100% conversion of one its 660-MW coal-firing units to biomass.</i></p>
Additional Information	<p>First unit converted and operational</p> <ul style="list-style-type: none"> <li>• Drax unit 2, biomass conversion, summer 2014</li> <li>• Drax unit 3, biomass conversion, 2016</li> </ul> <p>(Drax Group plc, 2013)</p>

## 2.7 Électricité de France

EDF Energy in UK is not focusing on biomass but on wind power, nuclear, coal and CCGT.

EDF is active in Polish markets and is the major shareholder in many energy companies in Poland, which have biomass plants. The Kogeneracja plant has commissioned a 100% forest biomass boiler and EC Krakow has increased its capacity to burn biomass to 15% in co-combustion with coal at three of its plants. In addition to Kogeneracja and EC Krakow plants, EDF is using biomass in EDF Wybrzeże. (EDF, 2013a)

- The Kogeneracja (1 boiler), dedicated biomass
- EC Krakow (3 units), 460 MWe / 1118 MWth, co-firing biomass with coal, co-firing capacity 15%
- Elektrociepłownia Gdańska, 217.3 MWe /736.2 MWth, co-firing biomass with coal, co-firing capacity unknown



## 2.8 Scottish and Southern Energy

Scottish and Southern has one biomass dedicated plant in the UK, Slough Heat and Power, and one anaerobic digestion plant, Barkip. Two multifuel plant projects planned, Slough Multifuel and Ferry Multifuel.

- Slough Heat and Power, 80 MW, dedicated biomass
- Barkip, 2.2 MW, anaerobic digestion

### 2.8.1 Forth Energy

SSE is a part owner in a venture company Forth energy, which will develop renewable energy around Forth Ports' sites in Scotland and England. Forth energy has three biomass projects: Carron dock, King George V dock and Rosyth.

### 2.8.2 Projects

#### 2.8.2.1 United Kingdom

- Multi-Fuel energy Ltd: Slough Multifuel, 32MWe / 20 Mwth, multi-fuel CHP
- Forth Energy: Rosyth, 100 MWe / 30 MWth, dedicated biomass

Ferrybridge, West Yorkshire	Multi-Fuel Energy Ltd	68 MW	Multi-fuel	2015	Approved
Platts PiE tracker (The McGraw-Hill Companies, Inc, 2013)	<p><i>April 2012: SSE and Wheelabrator Technologies to develop a £300 million multi-fuel generation facility at Ferrybridge. The joint venture - Multifuel Energy Ltd (MFE) - expects to begin full construction of a 68 MW multi-fuel facility later this year. Output to be sold to SSE. Hitachi Zosen Inova is construction contractor. Permitted Oct 2011.</i></p> <p><i>Jan 2012: CCPilot100+ carbon capture plant at Ferrybridge completes commissioning, embarks on two-year testing period. The £21 million project is collaboration between SSE, Doosan and Vattenfall. The post-combustion solvent scrubbing unit is designed to capture 100 tonnes of CO<sub>2</sub>/day from equivalent of 5-MW at the 1,960-MW coal-firing plant.</i></p> <p><i>Nov 09: SSE applies to build multi-fuel CHP facility at its Ferrybridge site, to use range of fuel sources such as biomass, waste wood and waste-derived fuel, and look to provide heat to other industrial processes at the site.</i></p>				

Carron dock, Grangemouth	Forth Energy	120 MWe, 200 MWth	Biomass	2017	Approved
	<p><i>Jun 2013: Consent granted by Scottish Government. Capital cost put at £465 million. Plant to take around three years to build following a year's design and engineering, with generation in 2017.</i></p>				



<p>Platts PiE tracker (The McGraw-Hill Companies, Inc, 2013)</p>	<p><i>Aug 09: SSE details plans for dedicated biomass plants at four sites in Scotland owned by port operator Forth Ports. Forth Energy, set up in June 2008, has prepared proposals to build a combined total of 400-MW of biomass-firing power capacity at sites in Dundee, Leith, Rosyth and Grangemouth. Plants to produce heat to be used at other facilities at the sites. Fuel mainly to be softwood from sustainably-managed forests in the UK and overseas. SSE said it would undertake consultations on the proposals, and intends to seek consent in 2010 to build the plants.</i></p>
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<p><b>King George V dock, Dundee, Scotland</b></p>	<p>Forth Energy</p>	<p>120 MW</p>	<p>Biomass</p>	<p>2017</p>	<p>Applied</p>
<p>Platts PiE tracker (The McGraw-Hill Companies, Inc, 2013)</p>	<p><i>Apr 2013: addendum on air quality submitted as part of Dundee biomass plant application.</i></p> <p><i>Aug 2010: Forth Energy applies to Scottish government to build 120-MWe biomass plant in Dundee at the King George V dock. Forth Energy likely to file planning applications for three other plants over the next few months - for the 200 MWth Grangemouth biomass plant at Carron dock, Grangemouth; the 60 MWth Leith biomass plant at Imperial dock, Edinburgh; and the 30 MWth Rosyth biomass plant, near Edinburgh.</i></p> <p><i>Aug 09: SSE details plans for dedicated biomass plants at four sites in Scotland owned by port operator Forth Ports. Forth Energy, set up in June 2008, has prepared proposals to build a combined total of 400-MW of biomass-firing power capacity at sites in Dundee, Leith, Rosyth and Grangemouth, SSE said. Plants to produce heat to be used at other facilities at the sites. Fuel mainly to be softwood from sustainably-managed forests in the UK and overseas. SSE said it would undertake consultations on the proposals, and intends to seek consent in 2010 to build the plants.</i></p>				

## 2.9 EnBW

EnBW has three biomethane plants in Baden-Württemberg: in Laupheim-Burgrieden, Blaufelden-Emmertsbühl and Riedlingen. EnBW has also other biomass plants in Germany. According to EnBW factbook 2013, EnBW is not having plans for large-scale biomass plants.

## 2.10 EWE

- Wittmund, 2.5 MWe / 3.4 MWth, biogas plant
- Surwold, 950 kWe / 1.307 MWth, biogas plant
- Werlte, 2.5 MWe / 3.3 MWth, biogas plant



## 2.11 Tauron

*“According to estimates of Tauron Group, it is expected to double or even triple the use of biomass in the process of power generation within the next three years. Currently, biomass is being fired in three power plants belonging to Tauron”.* (POLCOALDEX, 2013)

- Tychy, 40 MW, dedicated biomass
- Jaworzno, 50 MW, dedicated biomass
- Stalowa Wola, 20 MW, dedicated biomass
- Jaworzno, co-firing power plant, uncertainty over co-firing
- Laziska, co-firing power plant, uncertainty over co-firing
- Siersza, co-firing power plant. uncertainty over co-firing
- Katowice, co-firing CHP, uncertainty over co-firing
- Bielsko-Biala, co-firing CHP, uncertainty over co-firing

## 2.12 GDF Suez

GDF Suez is active in Poland as a subsidiary GDF Suez Energia Polska, which is number one biomass operator in Poland. GDF Suez Polska has at least one biomass plant (205MW) in Polaniec.

- Polaniec green unit plant, 205 MW, dedicated biomass

### 2.12.1 Electrabel

Electrabel is active in Belgium, but it is part of GDF Suez. In Belgium Electrabel has plants operating on biomass.

## 2.13 PGE

There are no identified investment projects concerning biomass for PGE. New investments are directed to CCGT, nuclear and wind power. Currently PGE has at least six power plants in which they list biomass as one of the main fuels.

- CHP Bydgoszcz, 262 MWe, co-firing CHP, uncertainty over co-firing
- CHP Zgierz, 17 MWe, co-firing CHP, uncertainty over co-firing
- Power Plant Bełchatów, 5298 MWe, co-firing power plant, uncertainty over co-firing
- CHP Kielce, 11 MWe, co-firing CHP, uncertainty over co-firing
- Power Plant Turów, 1899 MW, co-firing power plant, uncertainty over co-firing
- CHP Szczecin, 68 MWe, co-firing CHP, uncertainty over co-firing

### 3 Renewable support frameworks in different countries

#### 3.1 UK

In the UK the main support mechanism for renewable electricity generation is the Renewables Obligation (RO). Electricity generators receive Renewables Obligation Certificates (ROCs) different amount by different renewable technology. However, the British Government is introducing a new support system, Contracts for Difference (CfD). The RO will be closed in 2017 for new generation, but in addition the Government has set a 400 MW cap for dedicated biomass power production. Therefore only 400 MW of new dedicated biomass power may be added under RO support scheme. The newly introduced cap has led to cancellation of several dedicated biomass projects.

In the new support system (CfD) there will be support for biomass conversion and biomass CHP, but not for dedicated biomass electricity-only power plants. Government sees that dedicated biomass power plants are not as cost-effective as the other technologies. Final contract terms for CfD will be introduced in December 2013. Although CHP plants will receive support from the CfD, it has been argued that the support level for CHP would be considerably lower than in the current RO. (The Renewable Energy Association, 2013)

**Table 1 ROC support for biomass in UK**

United Kingdom	Until April 2016	From April 2016
<b>Biomass conversion</b>	1,0 ROC / MWh	1,0 ROC / MWh
<b>Dedicated biomass</b>	1,5 ROC / MWh	1,4 ROC / MWh
<b>Dedicated biomass with CHP</b>	1,5 ROC / MWh	1,4 ROC / MWh
	<b>2013/2014</b>	<b>2014/2015</b>
<b>Co-firing of biomass (50-85%)</b>	0,6 ROC / MWh	0,6 ROC / MWh
<b>Co-firing of biomass (&gt;85%)</b>	0,7 ROC / MWh	0,9 ROC / MWh
<b>Energy from waste with CHP</b>	1,0 ROC / MWh	1,0 ROC / MWh

**Table 2 Average ROC price conversion**

<b>British Pound to Euro exchange rate</b>	1 GBP = 1,1757 EUR
<b>180 day average: 6.6 - 17.11.2013 (Exchange Rates UK, 2013)</b>	
<b>Average ROC price in UK in October 2013 (NFPA, 2013)</b>	£43,37
<b>Average ROC price in €</b>	50,99 €/ROC

### 3.2 Poland

In Poland the Ministry of Economy is regulating the use of forest biomass in order to create a sustainable biomass sector and to stabilize the use of forestry resources. In Poland it is obligated to have certain amount of non-forest biomass in the overall fuel balance. The amount is based on the combustion technology. Combustion technologies are separated in three different categories (4biomass, 2013):

- Combustion of biomass with other fuels (co-firing)
- Combustion of biomass only (100% of biomass)
- Combustion of 100% biomass – installation that were classified as operational before 31.12.2012

Figure 1 illustrates the necessary shares of non-wooden biomass required in combustion from 2010 to 2017.

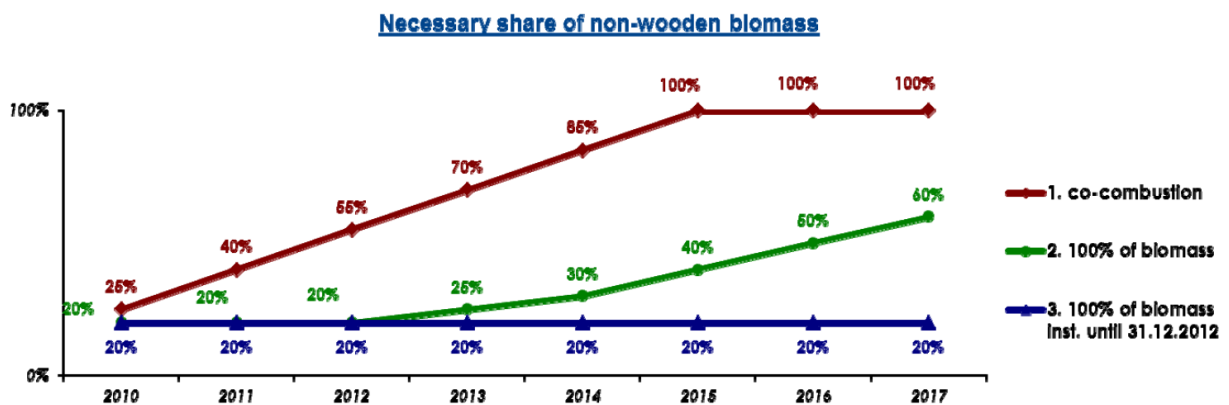


Figure 1 Necessary share of non-forest biomass in combustion in Poland (EDF, 2013b)

Poland is currently supporting renewable energy sources using Green Certificates. Producers of electricity receive one green certificate per megawatt hour electricity produced by eligible technologies. Green Certificate system has been ineffective due to the fact that each technology receives the same amount of certificates, which has allowed co-firing of biomass to dominate the certificate market. In response, the Ministry of Economy in Poland announced that Green Certificates will be abandoned and an auction-based feed-in tariff (FiT) system will be introduced in the near future.

The introduction of the new support scheme framework is causing uncertainty at the moment as the details of the FiT system have not been announced. As yet it is unknown which renewable technologies will be supported, but it has been suggested that old hydropower and co-firing of biomass would be omitted from the FiT support system. An auction system could also be introduced by 2016, but the problem is how the certificate system will be phased out. (PV-magazine, 2013)



### **3.3 Germany**

Germany does not support biomass systems over 20 MWe. Therefore there is no support for large-scale co-firing nor dedicated biomass (Hoefnagels, R. et al., 2012). In Germany, the feed-in-tariff system is more complex and therefore it is significantly harder to define the actual support level in Euros per megawatt hour for a single power plant without knowing the technical and fuel details. In this report support levels for biogas plants in Germany have been calculated by Deutsches Biomasseforschungszentrum's compensation calculator (DBFZ, 2013). Support levels include only basic tariff, where 8760 full-load hours are used, so no bonus tariffs are added. Therefore the calculated support levels are inaccurate.

### **3.4 Netherlands**

In Netherlands the premium tariff support system, SDE+, does not currently support co-firing, but the Government is planning to support biomass co-firing through SDE+ from 2014 onwards (GAIN, 2013). It is also yet unclear if SDE+ will support biomass conversions (Argus Media, 2013).

### **3.5 Belgium**

In Belgium, the electricity from biomass is supported using regional green certificates. In Flanders region co-firing biomass receive support for the share of the net biomass output but in Wallonia region co-firing is supported only if the biomass co-firing rate is over 70%. In Flanders producers used to receive one certificate per one megawatt hour until 2012, but from 2013 onwards producers receive green certificates according to a banding factor (Febeliec, 2013). The banding factor is specific for each technology and the amount of electricity needed for one certificate is calculated by dividing one megawatt hour by the banding factor (RES LEGAL, 2013). In Flanders the banding factor for solid biomass is 1 and the price for one certificate is between 93€ and 100€. There appears to be no support for biomass above 20 MW currently in Flanders (RES LEGAL, 2013).



## 4 Support levels for planned and canceled biomass projects

This section provides an overview of support levels for the planned and recently canceled biomass projects in the utilities.

**Table 3 Planned and canceled biomass projects – E.ON**

<b>E.ON - Planned and canceled biomass projects by November 2013, *) in operation</b>						
	Plant location	Country	Plant type	Power Output (MW)	Support level in 2013 (€/MWh)	Operational / Status
<b>Active</b>	Langerlo, Genk	Belgium	Biomass conversion	400	0	2015
	Maasvlakte, Rotterdam	Netherlands	Coal co-firing	1100	0	2014
	Ironbridge, Shropshire	UK	Biomass conversion	450	50,99	2013*
	Lostock, Northwich, Cheshire	UK	Waste-to-energy	60	50,99	2014
<b>Cancelled</b>	Royal Portbury dock, Bristol	UK	Dedicated biomass	150	76,49	Canceled

**Table 4 Planned and canceled biomass projects – Scottish and Southern Energy**

<b>Scottish and Southern Energy - Planned and canceled biomass projects by November 2013</b>						
	Plant location	Country	Plant type	Power Output (MW)	Support level in 2013 (€/MWh)	Operational / Status
<b>Active</b>	Slough Multi-fuel	UK	Multi-fuel	50	Unknown	
	Ferrybridge, West Yorkshire	UK	Multi-fuel	100	Unknown	2015
	King George V dock, Dundee, Scotland	UK	Dedicated biomass	120	76,49	2017
	Carron dock, Grangemouth	UK	Dedicated biomass	120	76,49	2017

**Table 5 Planned and canceled biomass projects – RWE**

<b>RWE - Planned and canceled biomass projects by November 2013, *) in operation</b>						
	Plant location	Country	Plant type	Power Output (MW)	Support level in 2013 (€/MWh)	Operational / Status
<b>Active</b>	Eemshaven	Netherlands	Co-firing (up-to 10%)	1600	0	2014
	Borssele, Zeeland	Netherlands	Biomass conversion	350	0	2013
	Nordhein-Westfalen	Germany	Co-firing	1100	0	2018
	Bergheim-Passendorf	Germany	Biogas	7,4	93 + possible bonus tariffs	2013*
	Velen	Germany	Biogas	4	108 + possible bonus tariffs	2014
	Markinch, Glenrothes, Scotland	UK	Dedicated biomass CHP	50	76,49	2013
	Lynemouth, Northumberland	UK	Biomass conversion	420	50,99	Pre-Proposal
<b>Cancelled</b>	Tilbury, Thames Estuary	UK	Biomass conversion	750	50,99	Closed
	Stallinborough, Lincs	UK	Dedicated biomass	65	76,49	Suspended

**Table 6 Planned and canceled biomass projects – Centrica**

<b>Centrica - Planned and canceled biomass projects by November 2013</b>						
	Plant location	Country	Plant type	Power Output (MW)	Support level in 2013 (€/MWh)	Operational / Status
<b>Cancelled</b>	Roosecote	UK	Dedicated biomass	80	76,49	Canceled
	Brigg	UK	Dedicated biomass	137	76,49	Canceled

**Table 7 Planned and canceled biomass projects – Vattenfall**

<b>Vattenfall - Planned and canceled biomass projects by November 2013</b>						
	Plant location	Country	Plant type	Power Output (MW)	Support level in 2013 (€/MWh)	Operational / Status
<b>Cancelled</b>	Klingenberg, Berlin	Germany	Biomass CHP	2x20	Tariffs	Canceled

**Table 8 Planned and canceled biomass projects – Drax Group**

<b>Drax Group - Planned and canceled biomass projects by November 2013, *) in operation</b>						
	Plant location	Country	Plant type	Power Output (MW)	Support level in 2013 (€/MWh)	Operational / Status
<b>Active</b>	Drax unit 1, Selby, North Yorks	UK	Biomass conversion	660	50,99	2013*
	Drax unit 2, Selby, North Yorks	UK	Biomass conversion	660	50,99	2014
	Drax unit 3, Selby, North Yorks	UK	Biomass conversion	660	50,99	2016
<b>Cancelled</b>	Drax unit, Selby, North Yorks	UK	Dedicated biomass	299	76,49	Canceled
	Heron, Immingham	UK	Dedicated biomass	299	76,49	Canceled



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## Appendix

RWE Group | RWE Innogy | Business Approach | Renewable Technologies | Political Framework

### The renewables support framework in Germany is based on fixed feed-in tariffs

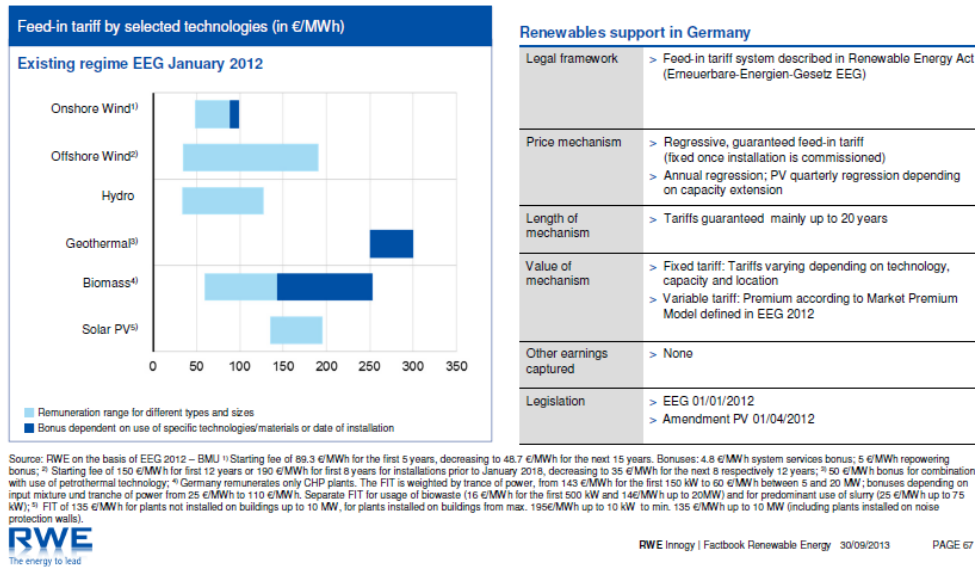


Figure 2 Renewable support framework in Germany (RWE, 2013)

Table 9 Tariff structure for electricity from biomass in Germany (EEG, 2011)

rated average annual capacity	tariff for					
	biogas (excl. biowaste fermentation and small manure installations) and solid fuel installations				biowaste fermentation installations <sup>5)</sup> (Section 27a)	Small manure installations (Section 27b)
	basic tariff	substance tariff class I <sup>2)</sup>	substance tariff class II <sup>3)</sup>	gas processing bonus (Section 27c(2))		
[kW <sub>el</sub> ]	[ct/kWh]					
≤ 75 <sup>4)</sup>						25 <sup>6)</sup>
≤ 150	14.3			≤ 700 standard cubic metre (scm)/h: 3	16	
≤ 500	12.3	6	8	≤ 1,000 scm/h: 2		
≤ 750	11	5		≤ 1,400 scm/h: 1		
≤ 5,000	11	4	8 / 6 <sup>4)</sup>		14	
≤ 20,000	6	-		-		

- Over 500 kW and up to 5,000 kW only 2.5 ct/kWh for electricity from bark or forest waste wood.
- Only for selected, ecologically desirable substances.
- Over 500 kW and up to 5,000 kW only 6 ct/kWh for electricity from manure (only nos. 3, 9, 11 to 15 of Annex 3 of the Biomass Ordinance (BiomasseV)).
- Applies exclusively to biogas installations which ferment certain types of biowaste (pursuant to Section 27a (1)) and which are directly connected to a facility for post-rotting the solid fermentation residues. The post-rotted fermentation residues must be recycled. The tariff may only be combined with the gas processing bonus.
- Special category for biogas installations utilising manure of up to 75 kW installed capacity at the site of the biogas generation plant; may not be combined (i.e. no additional basic tariff, substance tariff or gas processing bonus).

## UK: Renewables support framework based on renewable obligations and tradable certificates

### Renewables support in UK

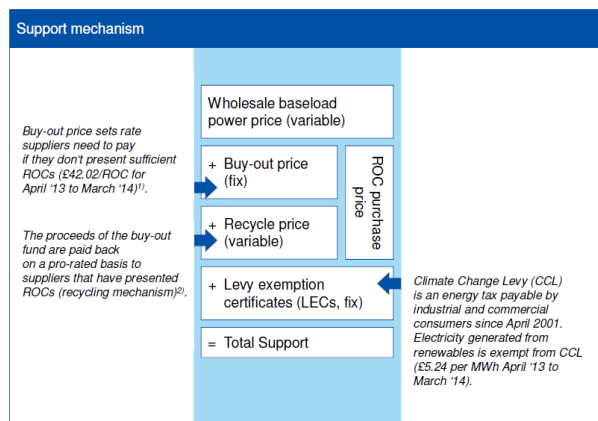
Legal framework	> Renewables Obligation (RO)
Price mechanism	> Certificate-based, indirect variable subsidy
Length of mechanism	> Annual Compliance Periods (CPs), legislation from 2002 until 2037
Value of mechanism	> Renewables Obligation Certificate (ROC) outturn value for 2011/12 (CP12) was £42.07/MWh
Other earnings captured	> Power price > Levy Exemption Certificates
Future changes in legislation	> New ROC banding from April 2013 - 2017 > New <5MW FIT bands > Carbon floor price established from April 2013 > Transition from ROC to FIT Contracts for Difference (CFD), starting in 2014 with ROC closing to new projects from 2017

### ROC bands by technology (effective from April 2013)

Technology	ROCs/MWh April 2013
Onshore Wind	0.9
Offshore Wind	2 in 2013 - 15; 1.9 in 2015/16; 1.8 in 2016/17
Hydro	0.7
Dedicated biomass with CHP	1.5 until 31 March 2016; 1.4 from 1 April 2016
Dedicated biomass	1.5 until 31 March 2016; 1.4 from 1 April 2016
Biomass conversion	1
Co-firing of biomass (enhanced)	Mid-range (50-85%) 0.6; High-range (>85%): 0.7 in 2013/14 & 0.9 from 2014/15

Figure 3 Renewable support framework in UK (RWE, 2013)

## UK: Revenues from renewable energy combine market price, ROC purchase and tax incentives



### Renewables Obligation Certificates (ROC)

- > A ROC is the green certificate issued for electricity from eligible renewable source, which is both generated and consumed within the UK
- > Generators are issued ROCs (which they can then sell on) for each MWh of eligible electricity generated

### Renewables Obligation (RO)

- > Electricity suppliers are obliged to redeem ROCs or pay the buy-out price for a proportion of their supply (20.6% in 2013/14 for England, Scotland and Wales and 9.7% for Northern Ireland). A buy-out fee is payable for any shortfall
- > Most suppliers purchase ROCs from their generation assets or enter into long-term purchase agreements with independent generators
- > In 2010, new RO legislation created a minimum fixed headroom of 10% between ROC generation and suppliers' MWh obligation

<sup>1)</sup> Buy-out price is updated each year by Ofgem to reflect changes in Retail Prices Index (RPI).

<sup>2)</sup> Since the size of the buy-out fund is dependent on the volume MWh's for which suppliers fail to redeem ROCs, this value depends upon the obligation target being greater than the available renewables obligation certificates (in 2010/11 the compliance ratio by ROCs amounted to 72% of the total obligation target).

Figure 4 Renewable Obligation Certificates in UK (RWE, 2013)



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## The renewables support framework in Poland

### Renewables support in Poland

Legal framework	> Green Certificates (GC)
Price mechanism	> Certificate-based, indirect variable subsidy
Length of mechanism	> Not specified
Value of mechanism	> Green Certificate (GC) – Average certificate price in 2012 (exchange market): PLN 260.20 (€ 62.14) <sup>1)</sup> – Substitution fee in 2013: PLN 297.35 (€ 71.01) <sup>2)</sup>
Other earnings captured	> Power price
Future changes in legislation	> The certificate scheme in Poland is currently under revision. The Ministry of Economy published the fourth draft of a new renewables law. The law is expected to come into force at the end of 2013. One of the main changes will be technology specific coefficients. <sup>3)</sup>

### Detailed provisions on the promotion of renewables (Order of 18/10/2012)

Coefficient (GC/MWh)	Technologies
1.0	All eligible technologies  In Poland producers of renewable power are granted one certificate per MWh. There is no differentiation between renewable technology concerning the number of certificates issued per MWh.

#### Eligible technologies

- > Hydro (including large hydro)
- > Wind
- > Biomass (including cofiring)
- > Solar
- > Biogas
- > Geothermal

<sup>1)</sup> Price as of 6 February 2013 (Source: Polish Power Exchange (TGE)).

<sup>2)</sup> Source: Polish Energy System Authority (Urząd Regulacji Energetyki – URE).

<sup>3)</sup> Source: Draft Renewable Energy Sources Act, Version 2.0.2, 9 October 2012.

**Figure 5 Renewable support framework in Poland (RWE, 2013)**