Promotion of biogas and its market development through local and regional partnerships

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Task 2.1

Country specific conditions for the implementation of biogas technology

Comparison of Remuneration

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1 Introduction

The following document gives an overview on remuneration for energy produced from biogas in 9 EU countries (Austria, Belgium, England and Wales, France, Germany, Italy, Poland, Slovenia and Spain) as regulated for the year 2008. Most commonly, biogas is converted to electricity and heat. The electricity is sold (fed-in) to the (public) electricity grid. The heat is used or sold locally. New developments are made in order to use biogas as a fuel for transport or to inject it directly into the gas grid.
Regarding the feeding-in of biogas-electricity to the electric grid, there are mainly 2 systems in use across the EU: **feed-in tariffs** and **certificates** (quota). In some countries, fiscal incentives are additionally given. Chapter 2 verbally summarises the system specifications. Chapter 3 compares the remuneration for electricity in values.
For more information on the Biogas Regions Project, please visit www.biogasregions.org.

2 Qualitative Description of Remuneration System

Austria

In Austria, the *"Ökostromgesetz"* (Eco-Power Law) regulates the **fed-in tariffs** since 2002. Currently the *"Ökostromgesetz 2008" (BGBl I Nr.114/2008, 8.8.2008)* is in force. The tariffs are published in the *"Ökostromverordnung 2008" (BGBl II Nr. 59/2008, 14.2.2008).* For 2008, a bonus due to high substrate prices is regulated by the *"Rohstoffs-Zuschlagsverordnung 2008" (BGBl II Nr. 212/2008, 19.6.2008).*
The remuneration is calculated based on the amount of green electricity that is fed into the grid. A minimum overall efficiency of 60% for electricity and heat production is required. The tariffs are guaranteed for 15 years. A use of non-agricultural substrates reduces the tariff by 30%. The tariffs depend on the size (el. capacity) of the plant and range between 16.94 ct/kWh (100 kW_{el} only agricultural substrates) to 7.9 ct/kWh (>1000 kW_{el} mixed substrates). In 2008, an additional bonus of 4 ct/kWh due the high prices for agricultural substrates was granted. The heat can be sold freely on the market. A feeding in of biogas into the gas grid is possible with many restrictions (CH4 content, cleaning of the gas, compression, …) and in practice not yet competitive. More information is found at: http://www.e-control.at/portal/page/portal/ECONTROL_HOME/OKO/EINSPEISETARIFE/

Belgium

In Wallonia, the remuneration system of "green" energy is regulated by the Walloon Government Decree (WGD) of 30th November 2006 (modified by the WGD of 25th January 2007 and 20th December 2007) related to the promotion of power produced by renewable energy or cogeneration.

It describes the mechanism of the **green certificates** (GC) that is in operation since the 1st October 2002. A green certificate is a transferable certificate issued to producers of green power for a number of kWh generated which is equal to MWh_e divided by the carbon dioxide saving rate. This saving rate is calculated by dividing the carbon dioxide gain achieved by the system under consideration by the carbon dioxide emissions of the traditional reference electric system (steam and gas turbine) defined and published annually by the Walloon Commission for Energy. The carbon dioxide emissions are those generated by the green power generation as a whole and include fuel production, emissions during combustion if applicable, and waste processing if applicable but also the transportation of external wastes or fuel consumption for energy crops. The price of Green Certificates is guaranteed at a minimum price of 65 €/GC for a period of 15 years. But the average value is around 90€/GC and depends on the GC virtual market. The green producer may sell the green certificates to different

actors of the market (power supply companies, the transmission system operator ELIA, the Federal Government). For plants with a capacity higher than 5MW, the system is the same except for the carbon dioxide saving rate that is diminished.

On top of the GC, the remuneration of power depends on the prices of the market, remuneration of heat is decided by the seller.

For the remuneration of biogas as biofuel or injected into the grid, there is no application in Belgium for the moment.

England and Wales

The *Utilities Act 2000* gives the Secretary of State the power to require electricity supply companies to include a specified percentage of renewable energy in their total electricity sales in the UK. The detail of the requirement appears in the periodically issued "Renewables Obligation (England and Wales) Orders". There are separate Orders for Scotland and Northern Ireland.

Suppliers meet their obligations by presenting "Renewable Obligation **Certificates**" (ROCs) and where they have a short-fall they must make a payment into a buy-out fund. The buy-out price is a fixed price per MWh of shortfall and is adjusted in line with the Retail Price Index each year. The proceeds of the buy-out fund are paid back to suppliers in proportion to the number of ROCs they have presented. If, for example, a particular supply company submitted 20% of the total number of ROCs that were submitted then it would receive 20% of the total funds that defaulting companies paid into the buy-out fund. The closer the supply companies get to the target percentage (which is slowly being increased), the lower would be the value of ROCs.
There is no differentiation between technologies at present but from April 2009 some will receive "double ROCs" – anaerobic digestion is one of those technologies.

There is no financial revenue incentive for renewable heat or bio-methane (grid injection or vehicle fuels).

France

The regulation for the electric **feed-in tariff** is the « *Arrêté du 10 juillet 2006 fixant les conditions d'achat de l'électricité produite par les installations qui valorisent le biogaz NOR: INDI0607869A* »
(Statement of the 10th July 2006 laying down the terms of purchasing the electricity produced by biogas plants.)
The tariff is defined for electricity from CHP plant (biogas injection; biogas as transport fuel are not existing) and is made up of 3 components:

- a *cogeneration rate* (depending on the power of the equipment, has risen since 2006)
  - plants smaller than 150 kW_{el}: **9** €ct/kWh_{el}
  - plants between 150 kW_{el} and 2 MW_{el}: **9** to **7** €ct/kWh_{el} (linear interpolation)
  - plants larger than 2 MW_{el}: **7** €ct/kWh_{el}
- a *methanisation bonus* of **2** €ct/kWh_{el}
- and an *energy efficiency bonus* (depending on the total efficiency)
  - total efficiency (valorisation) in terms of heat and electricity that is sold and/or used
  - total efficiency smaller than 40%: **no bonus**
  - total efficiency between 40% and 75%: **0** to **3** €ct/kWh_{el} (linear interpolation)
  - total efficiency above 75%: **3** €ct/kWh_{el}

The heat can be sold freely on the market. The regulation guarantees the tariff for 15 years.

Germany

In year 2000 the *EEG (Erneuerbare Energien Gesetz – renewable energies law)* became law, which was renewed in 2004. The *EEG* regulates the **feed-in tariffs** for all renewable energies. This law will fundamentally be renewed in 2009 once more, resulting in higher tariffs and avoiding eventual misuses of law *EEG* 2004.The tariff depends on:

- size ($kW_{el.}$) and age of the plant (see table below)
- feedstock (energy crops, waste, liquids…)
- technology (innovations in machinery/technique and/or so called *dry* fermentation, means without addition of liquids)
- combined heat and power (CHP) (efficient utilization of produced heat, without respect to the heat used for fermentation and the plant itself)
- Guaranty of remuneration for 20 years (falling 1.5 %/year since 2005 - changing system from 2009)

The period of payment is guaranteed for 20 years, but reduced by 1,5% / year . In case of new or additional construction (if recent investigation > 50% of the costs for rebuilding an existing unit of similar size) results in a total "new" biogas plant: guaranty for 20 years restarts again, remuneration *including* all possible premiums.

tariff in €ct/kWh	**up to 150 $kW_{el.}$**	**151 to 500 $kW_{el.}$**	**501 kW to 5 $MW_{el.}$**	**5 to 20 $MW_{el.}$**
basic prices (year of start-up = 2008)	10,83	9,32	8,38	7,91
bonus for purely agricultural substrates	+6	+6	+4	0
bonus for CHP – use of heat	+2	+2	+2	+2
bonus for new technologies	+2	+2	+2	0

Italy

Renewable energy sources producers can apply for the emission of **green certificates** (CV).
There are two kinds of applications:

- Final bilance, according to net energy actually produced by the plant in the year previous to the application for green certificates;
- Estimation, according to foreseen net productivity of the plant.

The "estimation" green certification can be required for the current year or for the following year.
For the renewable energy plants that started operating between 1st April 1999 and 31st December 2007 the green certificates are granted for 12 years.
The *Financial Law 2008* and the *Law 29th November 2007 n. 222* introduced relevant news about the support to energy produced by renewable energy sources plants.

Following the producer's application, as an alternative to green certificates, a **fixed tariff**, depending on the renewable source will be granted for 15 years. This mechanism includes plants that started the activity after 31st December 2007 with an average nominal annual power up to 1 MW. At the end of the 15 years electric energy is paid following the same procedure under economic conditions included in article 13 of the *Legislative Decree n. 387/2003*. The fixed tariff can vary every 3 years with a Ministerial Decree in order to assure the right remuneration to foster renewable energy sources.
The full tariff is equal to:

- 30 €ct/kWh for the biogas produced by agricultural wastes, breedings and forestall wastes from short system.
- 18 €ct/kWh for biogas from waste disposals and from depuration processes and the biogas other than the one described in the previous point.

Starting from 2008 the green certificates are worth 1 MWh and they are granted by the GSE.
The number of Green Certificates is equal to the net production of electric energy from renewable energy sources multiplied by a coefficent K that refers to the kind of source:

- K=1.8 for the biogas produced by agricultural wastes, breedings and forestall wastes from short system (obtained within 70 kms from the plant that uses it to produce electric energy)
- K=0.8 for biogas from waste disposals and from depuration processes and the biogas other than the one described in the previous point.

The reference price is 112,88 € per MWh, VAT net. It is calculated as the difference between:
the reference value of 180,00 € per MWh and the average value of the selling price of electric energy 2007 equals to 67,12 € per MWh.

Poland

In Poland the main law for the energy from the renewable sources is "Prawo Energetyczne" – Energy Law. This law is being renewed almost every year. The most important change to this law was made on 1st October 2005. This document introduced the **green certificates**. In Poland the producer of the renewable electricity can obtain income from the two sources:

1. The price of the electric energy, which is guaranteed, and represents average price of the electric energy on the market in the previous year,
2. The price of the certificate of origin, which depends from the present rate on the Energy Stock Exchange

Electricity - production of the electricity and heat requires license. The license is given by the "Energetic regulation office" for 10 to 50 years. To receive the license the "decision about the facility location and terrain development**"** is obligatory.
In Poland the operator of the electricity grid is obligated to buy the energy and heat that is produced from the renewable materials (green certificate). It is also obligated to build the grid to the plant but it is not specified how long it should take. There is no difference between the prices of energy produced from different renewable sources. The el. power capacity of the plant doesn't influence the plant either. The price depends only from the average price of the electric energy on the market in the previous year and from the present rate on the Energy Stock Exchange.
The average price of the electric energy on the market in the year 2007 was **128.44** zł/MWh, which gives in current rate **32.35** €/MWh, **0.03** €ct/kWh.
The price of the certificate of origin on the Energy Stock Exchange on 10th December 2008 was **243.48** zł//MWh, which gives in current rate **61.3** €/ MWh, **0.09** €ct/kWh.
The exchange rate is 3.9703

Slovenia

The Slovenian government adopted a Decree (on 14 March 2002) on the price and premium for the purchased electricity from qualified producers or electricity from RES (**feed -in tariff**) - Uredba o pravilih za določitev cen in za odkup električne energije od kvalificiranih proizvajalcev električne energije , Ur.l. RS, št. 25/2002 *(Decree on the Rules for Setting prices and for purchasing electricity from qualified electricity producers, Official Journal of the Republic of Slovenia No 25/2002*). The new decree defines a fixed price and premium (feed - in tariff) for the purchased electricity from qualified producers (QP) of electricity from renewable energy resources (small hydro, biomass, wind,

geothermal, solar, waste and all other RES for power plants – biogas plant). The current fixed price and premium for the purchased electricity from bio-energy sources in Slovenia is defined in the Decision on prices and premiums for the purchase of electricity from qualified electricity (Sklep o cenah in premijah za odkup električne energije od kvalificiranih proizvajalcev električne energije, Ur.l. RS, št. 65 in 98/2008 *(Decision on prices and premiums for the purchase of electricity from qualified electricity producers, Official Journal of the Republic of Slovenia No 65/2008 and amendment 98/2008)*. The last change in fixed prices and premiums for the purchased electricity from RES was in June 2008 and premium for electricity from biogas plants in October 2008.

The prices and premiums are valid for biogas plants with status of qualified electricity producer which are connected to low or middle voltage of distribution electricity network. The prices and premiums reduce for 5% if the biogas plant is connected to the high voltage of electricity network, and for 5% and 10% after 5 years or 10 years of the start of operation of the biogas plant.

Spain

In Spain, the first regulation where it was told about electricity regulation from RES was the *Spanish Royal Decree 2366/1994*. While the first time was told the difference between the terms “ordinary” and a “special” electricity was in the *Spanish Law 54/97* of the electricity sector. Where “special regulation” group made reference to installations which use renewable energy sources, residues or cogeneration. After that then *Spanish Royal Decree 2818/1998*, about electricity production by installations supplied by resources of renewable energies, residues or cogeneration was passed.
The last update of the compensation scale of the electricity distribution has been the *Spanish Royal Decree 222/2008*.
The remuneration is calculated based on the amount of renewable electricity that is fed into the grid. A minimum overall efficiency of 45% for electricity and heat production is required for biogas in the case of plants of el. capacity) ≤100 MW. The tariffs are guaranteed for 15 years, but in the case of fix tariff there is even a guarantee after 15 years but with a lower tariff. There is no extra bonus for electricity production in special regime from biogas if the feedstock is agricultural substrates (energy crops). It is the same than from sludge, manure, urban residues, industrial organic residues etc…The tariffs depend on the size (el. power capacity) of the plant. On the other hand the Power guarantee has a remuneration about 2 €/MW of elec. power capacity installed and by hour.
The heat can be sold freely on the market but there are no initiatives in this way. A feeding in of biogas into the gas grid is not possible by the lack of regulation.
There are two ways of calculate the price of the fed electricity produced in special regime in Spain. The operator can choose between the options – currently on an annual basis:

- the **fixed regulate tariff** ranges
- the **market pool** depends on the market price for electricity and ranges from 6.7691 to 10.5607 €ct/kWh

Elec. capacity	Period	Fixed Tariff €ct/kWh	Market pool €ct/kWh
≤500 kW	first 15 years	13.7945	10.8859
≤500 kW	> 15 years	6.8714	-
≥500 kW	first 15 years	10.2935	6.7691
≥500 kW	> 15 years	6.9225	-

3 Quantitative Comparison

On the next page, the remuneration of 4 different types of wet fermentation (< 15% DM) biogas plants is compared in figures:

substrates (feedstock)	size – el. capacity [kW]	operation time [h/year]	el. energy [MWh/year]
agricultural	100	8000	800
	500		4000
non-agricultural (wastes)	100		800
	500		4000

Electricity from Biogas – Comparison of Remuneration in 2008

country	time[1] of authorisation [months]		remuneration for electricity [€ct/kWh] excl. VAT				remuneration for electricity[2] [€/year] excl. VAT			
	permission of construction	permission of operation	agricultural substrates		non-agricultural substrates		agricultural substrates		non-agricultural substrates	
			100 kW_{el}	500 kW_{el}	100 kW_{el}	500 kW_{el}	100 kW_{el}	500 kW_{el}	100 kW_{el}	500 kW_{el}
Austria	6 – 18	3 – 12	20.94[3]	17.99[3]	11.86	9.79	167,520[3]	719,600[3]	94,864	391,720
Belgium	4.5 – 8	4.5 – 8	21.78	21.78	22.20	22.20	169,697	848,484	177,640	888,199
England and Wales[4]	2 – 18	3 – 12	14.8	14.8	14.8	14.8	118,600	593,000	118,600	593,000
France[5]	18	10	14.0	13.7	14.0	13.7	112,000	548,000	112,000	548,000
Germany[6]	6 – 12	3 – 9	21.83	15.77	10.83	9.77	174,640	790,920	118,640	550,920
Italy	1[7]	6[7]	30[8]	30[8]	18[8]	18[8]	240,000[8]	1,200,000[8]	144,000[8]	720,000[8]
			28[9]	29[9]	17[9]	17[9]	226,547[9]	1,162,736[9]	136,243[9]	681,216[9]
Poland	6 – 18	6 – 12	12	12	12	12	96,000	480,000	96,000	480,000
Slovenia	6 – 24	6 – 12	18.94	18.94	6.116	6.116	151,520	757,600	48,928	244,640
Spain	12 – 18	3 – 9	13.7945	10.2935	13.7945	10.2935	110,356	411,740	110,356	411,740

[1] time span that is needed for authorisation procedures, starting from the submission of the application documents to the authorities

[2] all of the produced electricity is fed into the grid; an operation time of 8000h/year is assumed

[3] includes an additional bonus of 4 ct due to high prices for agricultural substrates (energy crops)

[4] 1 £ = 1.2358 € (5th Nov. 2008)

[5] a total efficiency of 75% or more is assumed

[6] form plants built after 1st Aug. 2008 – including all possible bonuses (combined heat and power use and new technology)

[7] if the plant power is up to 250 kW the owner has only to produce the Municipality "*Denuncia di Inizio Attività*", if the plant power is over 250 kW and the *Autorizzazione Unica* gives permission of construction and to operation

[8] option "fixed tariff"

[9] option "green certificates"; factor K = 1.8 (agricultural substrates) or K = 0.8 (non-agricultural substrates); a revenue due to energy sales of 8 €ct/kWh is included

Country Specific Conditions
Comparison of Remuneration

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