Financing mechanisms for biogas projects in Central and Eastern Europe

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Preface

The BiogasIN project “Development of sustainable biogas markets in Central and Eastern Europe” (Contract No. IEE/09/848) is supported by the European Commission in the “Intelligent Energy for Europe” Programme. The objective of BiogasIN is to effectively improve the framework conditions for the installation of new biogas plants in 7 Eastern European countries: Bulgaria, Croatia, Czech Republic, Greece, Latvia, Romania and Slovenia.

BiogasIN consists of 10 European partner organizations. The project is coordinated by the Croatian Energy Institute “Hrvoje Pozar”.

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Communities. The European Commission is not responsible for any use that may be made of the information contained herein.

Abbreviations

- **CEE**: Central and Eastern Europe
- **CHP**: Combined Heat and Power Generation
- **EC**: European Commission
- **EEG**: German Renewable Energy Law
- **IEE**: Intelligent Energy Europe
- **kW**: kilowatt
- **kWh**: kilowatt hour
- **NREAP**: National Renewable Energy Action Plan
- **RED**: Renewable energy directive
- **RES**: Renewable energy source
1. Introduction

Biogas as one of the best possibilities for waste recovery to renewable energy and valuable fertilizer can contribute to achieve the ambitious targets set by the European renewable energy directive (RED, 2009/28/EC), which determines that 20% of the final energy consumption has to be provided by renewable sources by 2020.

Main drivers of the growing interest in the biogas sector are not only waste management and energy production, also socio-economic benefits for rural regions with significant agricultural sectors. Biogas production and its utilization open up new activity fields to the agricultural sector.

Central and Eastern Europe (CEE) provides high potential for biogas production and utilisation due to its significant agricultural sector. This potential still remains undeveloped, because of insufficient framework conditions for the set-up of new biogas plants in terms of complex permitting procedures and inappropriate financing mechanisms. One of the main focuses of the project BiogasIN, supported by the Intelligent Energy for Europe Programme of the European Union, is to improve the access to financing possibilities for biogas plants in seven countries: Bulgaria, Croatia, Czech Republic, Greece, Latvia, Romania and Slovenia (Picture 1).

![Picture 1: Geographical coverage of the BiogasIN project](image)

Legend: Green – BiogasIN target countries

This report is mainly based on outcomes of studies and surveys related to the current financing mechanisms in the BiogasIN countries. It provides an overview about biogas financing mechanisms and pinpoints main discrepancies in the availability of financing possibilities for biogas plants and offers recommendations for a successful support of biogas plants by adapting financing mechanisms.
2. **Biogas financing mechanism basics**

Financing mechanisms which are available for the electricity production from biogas can generally be characterized through a distinction between direct and indirect policy instruments. Direct policy instruments aim to stimulate the implementation of new biogas plants in the near future, whereas indirect instruments focus on improving long-term framework conditions. Beside regulatory instruments, voluntary approaches for the support of biogas plants are mainly based on the residents’ willingness to pay premium rates for green electricity. Another important classification criteria is weather the instrument addresses price or quantity, and weather it supports investment or generation.

Table 1 provides a classification of financing mechanisms for renewable energies followed by a description of the most important mechanisms and practical examples from European countries.

<table>
<thead>
<tr>
<th>Table 1: Types of renewable energy financing mechanisms</th>
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<td>Generation-based</td>
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</table>

2.1. **Regulatory price-driven financing mechanisms**

Generally, price-driven financing mechanisms support generators of renewable energy with a subsidy per kW installed capacity or with a fixed payment per kWh produced and sold. There are two major strategies: Investment focused and generation based strategies that are briefly explained within the following sections.

2.1.1. **Generation based**

Generation based mechanisms offer financial support through fixed regulated feed-in tariffs or a fixed premium that is additionally paid on top of the electricity price.
Fixed payment scheme – Feed-in tariffs

One of the national instruments mostly used to promote biogas production is the feed-in tariff system. It is a very efficient instrument in case the tariffs are sufficiently high and the period of the guaranteed price is long enough. Then feed-in tariffs can accelerate investments in renewable energy technologies and biogas plants.

Usually feed-in tariffs are based on the generation costs of each renewable technology. Technologies such as wind power, for instance, are awarded a lower price per kWh, while higher prices are offered for technologies such as photovoltaic and biogas, because of their higher production costs.

In addition, feed-in tariffs often include a tariff degression, a mechanism according to which the price (or tariff) decreases over time. This is done in order to track and encourage technological cost reductions, but also to achieve a fast development of renewable energies during the first years. The goal of feed-in tariffs is to offer cost compensation to renewable energy producers, providing the price guaranty and long-term contracts that help to finance renewable energy investments and guarantees a calculability of the financial risks.

The feed-in tariff system in Germany is the main legislative driver for attracting investments and for creating financing opportunities in biogas plants since it ensures revenues for 20 years. Although originally intended to be the only compensation of generators, feed-in tariffs provide also premiums. For example since the beginning of 2012 generators of electricity who have been selling their electricity on the market receive a premium. Premiums are also available for the digestion of materials with low energy contents or for an efficient utilization of energy from biogas in CHP plants with extensive waste heat utilization concepts.

The most recent development regarding feed-in tariffs is the so-called breathing cap, which was introduced for photovoltaic (PV) in Germany. The programed tariff degression is linked to the deployment in the year before: tariffs go down more quickly if new installations met a defined installment target.

Fixed premium system

The difference between feed-in tariffs and premiums is that the total feed-in price is fixed, however for a premium system the amount to be added on the electricity price is fixed. For the owner of a biogas plant, the final price for a produced kWh is less predictable within a premium system than under a feed-in tariff system, because of the volatile electricity prices. Nevertheless, electricity producers obtain incentives to adjust their production to price signals from the market that leads to a more demand oriented energy production.
Premiums on the electricity price are the major means of supporting electricity from biogas in the Netherlands. The amended German EEG in 2012 has also implemented a premium system for biogas plant operators who are selling the produced electricity directly on the market.

### 2.1.2. Investment focused

Investment focused mechanisms provide financial support through investment subsidies, soft loans or tax credits, usually depending on the installed generating capacity.

**Investment incentives**

In general, the initial investment in biogas plants is very high and requires adapted financing tools especially during the implementation period where no revenues through the operation of a biogas plant can be achieved. Investment incentives or investment subsidies offer up-front payments whose amount depends on the total installed capacity.

In Germany, investment subsidies were granted up to 40% of the initial investment for the implementation of biogas plants on federal state level to accelerate the development of a regional biogas market during its early stage of development (Hahn et al. 2010).

**Tax incentives (credits)**

Biogas project developers can also be supported by different tax exemptions or deductions - e.g. exemption from environmental taxes such as taxes on carbon dioxide emissions, exemption from value-added taxes on renewable electricity sales etc. Accelerated depreciation is also an example of tax incentives (Jacobs 2009). In this case, renewable energy producers claim bigger tax deductions in the first years of the life of an asset (e.g. equipment needed for the biogas project such as fermenter, heating system, pumps and stirrer etc.). This increases the after-tax revenues of a biogas project developer in the initial phase of the biogas plant operation (Batlle et al. 2012).

In the Netherlands, for instance, the amount of self-consumed electricity from renewable energies is free of tax (BMU 2012).

**Low interest/soft loans**

Additionally, soft loans are offered across a variety of administrative scales. Loans with low interest rates and/or long payment periods are important financing incentives guaranteeing financing possibility both for the initial project phase and during the whole duration of a biogas project. Soft loans are available in some countries by national or international banks. These loan programs offer attractive below-market interest rates and long repayment periods.

In Germany, for instance, loans with low interest rates are provided by the KfW banking group. Investors in biogas projects can apply for such a soft loan for up to 40% of the amount of necessary initial investment (Hahn et al. 2011).
2.2. **Regulatory quantity-driven financing mechanisms**

**Quantity-driven** financing mechanisms are based on governmental decisions on the desired level of electricity generation of different renewable energy sources (RES). Policy makers set a desired quota or goal, usually with a target date, to encourage the market penetration of RES (Haas 2011b). The most important strategies are green certificates and tendering systems.

**Green certificates**

A system with tradable green certificates aims to guarantee a certain share of renewable energy sources at the energy supply system (Schweighofer et al. 2006). In comparison to a price-driven instrument the system does not provide a fixed price for each kWh generated energy.

The quota is set by a regulatory authority and is generally valid for the whole country. Every kWh electricity produced from RES is awarded with tradable certificates and a separate market is established for these certificates.

To ensure an overall acceleration for the development of renewable energies the number of certificates is differentiated among the different renewable energy technologies. Thus, high cost technologies are provided with more certificates for the same amount of electricity in comparison to technologies with lower production costs (IEA 2011; Batlle et al. 2012). For biogas in Italy for example the number of certificates depends on the type of feedstock as well as the biogas plant size (BMU 2012).

Several countries use green certificates as a mean to make the support of green electricity generation closer to the market instead of more bureaucratic investment support and feed-in tariffs. Such national trading schemes are used in e.g. Romania, Poland, Sweden, the UK and Italy.

**Tendering system**

Call for tenders are launched for defined amounts of capacity. The provider with the lowest offer will be selected and receives a guaranteed tariff for a specified period of time.

In Latvia for instance, tenders are one of the instruments used to support renewable energy according to a quota annually defined by the government. Operators of biogas plants are obliged to participate in calls for electricity produced from biogas.

2.3. **Voluntary approaches**

Voluntary approaches are mainly based on the willingness of the residents (consumers) to pay premium rates for green energy. Investment focused voluntary approaches are for instance shareholder programs, donation projects and ethical input. But they can also be generation based such as green electricity tariffs, with and without labeling.
2.4. **Indirect financing mechanisms**

Besides financing mechanisms that directly address the support of biogas or renewable energy plants, there are other financing mechanisms that can have an indirect impact on the implementation of renewable energy plants. Most important are:

- Eco taxes on electricity produced from fossil sources
- Taxes/permits on CO2-emissions
- Removal of taxes previously given to fossil and nuclear generation

These measurements make renewable energy more competitive on the market.

Indirect financing measurements also include the institutional support of the deployment of RES and biogas plants, such as site planning, easy connection to the grid and the operational conditions of feeding electricity into the system.
2.5. **International support instruments**

Besides national support systems also international support systems are available in the BiogasIN countries. The available support systems are similar for most BiogasIN countries, except Croatia, which is not yet member of the EU and therefore not eligible for all European programs. The key instruments for supporting the biogas sector are listed below (EU member states are eligible for these programs):

- **The Cohesion Fund** is a European structural instrument promoting projects involving environment and trans-European transport networks. It applies to EU member states with a Gross National Income (GNI) of less than 90% of the EU average and finances up to 85% of eligible expenditure of projects.

- **The European Agricultural Fund for Rural Development - EAFRD** finances rural development programmes in Member States in line with the rural development plans submitted by each country. Covered period: 2007 – 2013.

- **LIFE+** is a financial instrument promoting environmental projects. The objective is to contribute to the implementation, updating and development of EU environmental policy and legislation by co-financing pilot or demonstration projects. It finances up to 50% of the total eligible project costs and is open to public or private bodies, actors or institutions registered in the EU.

- **The 7th Framework Programme** is a European cooperation programme aiming to stimulate and improve links between industry and research within a transnational framework. It supports scientific researches, dissemination of information and exchange activities. Covered period: 2007 – 2013.

- **The Competitiveness and Innovation Framework Program (CIP)** encourages the use of information technologies, environmental technologies and renewable energy sources (Covered period: 2007 – 2013). Specific subprograms of the CIP contributing to the biogas sector are:
  - Entrepreneurship and Innovation Programme: provides investments for development of innovative environmentally friendly technologies. It specifically targets SMEs, companies with high growth potential and traditional micro-businesses and family firms.
  - Intelligent Energy – Europe Programme (IEE): supports improvements in energy efficiency, the adoption of new and renewable energy sources, greater market penetration for these energy sources, energy and fuel diversification, an increase in the share of renewable energy and a reduction in final energy consumption.
  - **ELENA** (European Local Energy Assistance) is a technical assistance facility, financed through IEE. It provides technical support to public entities (for investments with minimum amount of 6 m €). ELENA covers a share of the cost for technical support that is
necessary to prepare, implement and finance the investment programme, such as feasibility and market studies, structuring of programmes, business plans, energy audits, preparation for tendering procedures.

- **The Western Balkans Sustainable Energy Direct Financing Facility (WeBSEDFF)** is an investment facility, established by the European Bank for Reconstruction and Development (EBRD). It provides debt financing for renewable energy and industrial energy efficiency projects to SMEs in the Western Balkans.

An indirect way of supporting biogas projects is providing funds to banks in target countries for on-lending for biogas projects. Several such support systems exist:

- **The Western Balkans Private Sector Support Facility**: An on-lending system established by the EBRD to improve long term finance for investments in energy efficiency and renewable energy projects in the private sector. The program supports on one hand investments by SMEs to improve competitiveness and sustainability in preparation for EU accession; on the other hand investments in energy efficiency and renewable energy.

- **The Turn Around Management (TAM) and Business Advisory Services (BAS) Program**: These two programs of the EBRD aim to help private enterprises to adapt to the demands of a market economy. TAM has a broad approach focusing on substantial managerial and structural changes within companies. BAS supports projects with narrowly defined objectives and a rapid payback. TAM projects have been undertaken in 28 countries from central Europe to central Asia and Russia's Far East.
3. Current biogas financing mechanisms in Europe and the BiogasIN countries

This chapter gives an overview about the current biogas financing mechanism in Europe and the “BiogasIN countries”, mainly relying on country specific information which was compiled in the project “BiogasIN”.

In the following financing mechanisms all countries are characterized by the:

- support instruments
- price level for electricity generated from biogas
- differentiation into different price categories
- digression rate for price guaranteed for electricity producer from biogas
- as well as by their guaranteed payment period

Furthermore, an overview about country specific investment focused financing mechanisms is given.

3.1. Support instruments in the EU

In general EU member states support the development of biogas plants and RES with feed-in tariffs, feed-in premiums, investment grants and tax incentives. The number of EU countries using feed-in systems has increased steadily to 24. Most of the EU member states use feed-in systems as main support instrument; some as support instrument for certain renewable energy technologies (Ragewitz et al. 2012). Recently also member states with quota systems has introduced feed-in tariffs in combination with their quotas. An overview about support mechanisms in EU countries is given in Figure 1.
The use of feed-in premiums has been increasing across Europe during the last years. Currently, the Czech Republic, Denmark, Estonia, Finland, Germany, Italy, the Netherlands, Slovakia, Slovenia and Spain use feed-in premiums in combination with other support instruments or as the main support tool for renewable electricity (Ragewitz et al. 2012).
3.2. Prices for electricity produced from biogas

An overview about prices for each kWh\(_{el}\) generated from agricultural biogases in the analyzed countries is given in Figure 2. Italy with up to 28 ct/kWh\(_{el}\) guarantees the highest price among the “BiogasIN countries”. The lowest price is paid in Germany, but this is only valid for a part of the electricity produced through biogas plants with a capacity of more than 5 MW installed capacity.

![Graph showing prices for electricity from biogas](source)

Source: BMU 2012, Sioulas et al. 2011, Hahn et al. 2010
Electricity prices guaranteed for the electricity produced from biogas in the BiogasIN countries vary depending on different factors. In general a basic price is guaranteed depending on the biogas plant size and its installed electrical capacity. Furthermore, electricity produced from agricultural biogas gain higher prices than sewage gas or landfill gas. Prices for electricity produced from landfill and sewage gas is not considered in Figure 2.

Germany, the Netherlands and Romania have different prices for different agricultural feedstock types, such as manure and energy crops. In order to ensure a high efficiency for the utilization of the produced biogas premiums are paid for the use of waste heat in Germany, Denmark, Austria, Latvia and Romania. Italy and Austria limit the transport distinction of the feedstock for biogas plants to 70 kilometers resp. 100 kilometers. Austria and Germany are additionally providing premiums for the production of biomethane that is used as vehicle fuel or in heat controlled cogeneration units in a very efficient way. An overview about the different criteria influencing the price for electricity from biogas is shown in Table 2.

### Table 2: Criteria influencing the price for electricity produced from biogas

<table>
<thead>
<tr>
<th>Country / Payment Differentiation</th>
<th>Installed capacity</th>
<th>Sewage gas, landfill gas, agricultural biogas</th>
<th>Type of agricultural feedstock</th>
<th>Waste heat utilization</th>
<th>Feedstock transport distance</th>
<th>Biogas upgrading</th>
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Figure 3 gives an overview about the guaranteed price duration for electricity generated from biogas. All countries guarantee prices between 12 to 20 years. In order to give investors in biogas plants sufficient planning and investment security the guaranteed price duration is recommended to be at least 15 years.

![Bar chart showing guaranteed price duration for electricity from biogas in the analyzed countries]

Source: BMU 2012, Sioulas et al. 2011, Hahn et al. 2010
3.3. **Investment based financing instruments**

Investment focused instruments complement the generation based instruments and provide financial support for the initial investment in biogas plants. Studies within the project have shown that all BiogasIN countries provide investment incentives for the initial investment for biogas plants (Table 3).

Tax incentives and low interest loans available for biogas investments from national banks are also granted in most of the countries. The loan programs usually have attractive features such as below-market interest rates and long repayment periods.

Table 3 gives an overview about biogas investment based financing mechanism.

### Table 3: Overview about biogas investment based financing mechanisms

<table>
<thead>
<tr>
<th>Financing instruments/country</th>
<th>Investment based financing instruments</th>
<th>Investment incentives</th>
<th>Tax incentives</th>
<th>Low interest/Soft loans</th>
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<tr>
<td>Germany</td>
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Source: Hahn et al. 2010, Sioulas et al. 2012, BMU 2012,
4. **Recommendations for a successful support of biogas projects**

Central and Eastern European countries have a great potential for biogas production due to its huge agricultural sector. Figure 4 compares the biogas production of European countries from 2010 with the target production for 2020, according to the NREAPs. Additionally, the red bars indicate the countries' biogas potential for 2020. The potentials are calculated by AEBIOM, considering a biogas production through 50% of available manure and energy crops from 5% of the arable land of each country.

![Figure 4: Biogas production in 2010, potentials and targets for 2020](image)

**Source:** modified after EBA 2011; AEBIOM 2009; Beurskens et al. 2011

Surveys and discussions on capacity building events as well as interactive forum confirmed that a lack of financing mechanisms but also permitting procedures are the major hurdles for the development of a successful biogas market development in CEE countries despite of the still untapped biogas potentials. Many problems are common in all countries. This chapter summarizes the main problems and provides recommendations for a successful support of biogas plants.

The basic concept of all financing mechanisms for biogas plants is to try and overcome the existing barriers to its market development. The success of policy for biogas is linked to their
ability to surmount these economic and non-economic barriers. Based on a survey among biogas plant operators, investors and authorities the identified key barriers in the analyzed countries are shown in Table 4.

Table 4: Identified main barriers in the BiogasIN target countries

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Description</th>
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<tr>
<td>Economic and market</td>
<td>High investment costs</td>
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<td>High cost of capital due to high perceived risk</td>
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<td>Limited access to finance</td>
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<td>Regulatory and Administrative</td>
<td>Unstable policy and legal framework</td>
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<td>Number of authorities and inefficient permitting procedures</td>
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<td>No priority grid regulation for electricity from biogas</td>
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<td>Non-economic</td>
<td>Lack of skilled labor</td>
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<td>Lack of skilled labor (e.g. for planning and installation)</td>
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<td>Lack of information</td>
<td>Lack of knowledge about biogas benefits and support mechanisms among</td>
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<td>authorities, bank employees and project developers</td>
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<tr>
<td>Biogas supply chain</td>
<td>Uncertainty ensuring feedstock capacity and areas for the digestate application</td>
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Investors in biogas plants look for stable national support systems, clear and fast permitting procedures as well as access to financing possibilities. Obtaining permissions and bank loans in the CEE countries are still long, complex and expensive processes.

Thus, the following general recommendations as outcomes from this project can be given for a successful biogas development:

- **The continuity and long term investment stability** of any implemented biogas financing mechanism is a key criteria for a stable biogas market development as well as for reaching the RE-targets.
- Most of the European success stories to support RES during the past were driven by **feed-in tariffs**. Feed-in tariffs are a very efficient instrument provided that the tariffs are sufficiently high and the period of the guaranteed price is long enough to enable a repayment of the invested capital. Thus, a guaranteed price for more than 15 years is recommended.
- **Grid and administrative barriers** need to be removed.
- **Guidelines for financing biogas projects** including a list of available national and international support instruments need to be established.
- **Capacity building** is needed for a better understanding of the biogas technology for financing institutes, administrative bodies and biogas plant developers.
- **Establishment of information campaigns** to highlight the benefits from biogas to the society in order to gain confidence in the technology.
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