BiogasIN:
Sustainable biogas market development in Central and Eastern Europe

Final report

Editor:
Ana Kojaković, Energy Institute Hrvoje Požar

December 2012
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BiogasIN:
Sustainable biogas market development in Central and Eastern Europe

Publishable report
Based on the results of BiogasIN project

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## PROJECT FACT SHEET

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<tr>
<th>Title:</th>
<th>BiogasIN: Sustainable biogas market development in Central and Eastern Europe</th>
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</thead>
<tbody>
<tr>
<td>Coordinator</td>
<td>Energetski Institut Hrvoje Pozar (EIHP), Croatia</td>
</tr>
<tr>
<td>Partners</td>
<td>Wirtschaft und Infrastruktur GmbH &amp; Co Planungs Kg (WIP), Germany</td>
</tr>
<tr>
<td></td>
<td>European Biogas Association (EBA), Belgium</td>
</tr>
<tr>
<td></td>
<td>Fraunhofer Institute for Wind Energy and Energy System Technology (IWES), Germany</td>
</tr>
<tr>
<td></td>
<td>Centre for Renewable Energy Sources (CRES), Greece</td>
</tr>
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<td></td>
<td>Czech Biogas Association (CzBA), Czech Republic</td>
</tr>
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<td></td>
<td>Ekodoma, Latvia</td>
</tr>
<tr>
<td></td>
<td>Energoproekt JSC, Bulgaria</td>
</tr>
<tr>
<td></td>
<td>Development Agency Sinergija Ltd (Sinergija), Slovenia</td>
</tr>
<tr>
<td></td>
<td>Trinergi Grup Ltd (TG), Romania</td>
</tr>
<tr>
<td>Website:</td>
<td><a href="http://www.biogasin.org">www.biogasin.org</a></td>
</tr>
<tr>
<td>Duration:</td>
<td>01/05/2010 – 31/10/2012 (IEE Programme contract number: IEE/09/848/SI2.558364)</td>
</tr>
<tr>
<td>Budget:</td>
<td>1,508,188.00 Euro (EU contribution 75%)</td>
</tr>
<tr>
<td>Purpose and objective:</td>
<td>BiogasIN aims to create a sustainable biogas market in Central and Eastern Europe (CEE) by targeting the strongest framework barrier: high administrative barriers both in permitting and financing phases; this bottleneck was emphasised in many former European projects, and experiences. BiogasIN builds capacity among the public sector (national, regional and local governments and administrations responsible for permitting process of agricultural biogas plants). The objective is to create awareness, trust in the technology and the sensibility that biogas is a reliable energy, GHG and waste reduction technology for CEE. The credibility of biogas production technologies will increase the bankability of biogas projects and fasten the administrative permitting procedures. BiogasIN initiates close collaboration among all stakeholders and vertical and horizontal working groups or associations that will facilitate governments to tailor the biogas policy. Attitudes and drivers from different biogas stakeholders will be shaped via pan-European survey to facilitate development of biogas policy at EU and national level.</td>
</tr>
<tr>
<td>Key results:</td>
<td>Analyses of potential for biogas production from agricultural feedstock and related environmental and socio-economic benefits for 28 regions in seven target countries.</td>
</tr>
<tr>
<td></td>
<td>Recommendations for improvement of permitting procedures and financing of biogas projects, based on the in-depth analysis of the state of affairs in the seven target countries.</td>
</tr>
<tr>
<td></td>
<td>Information materials for the capacity building of administrative bodies, financing bodies and potential investors. Capacity building of 950 people active in the biogas market in the seven target countries.</td>
</tr>
<tr>
<td></td>
<td>Addressing the issues of biogas market, its status and development at the high level, through the implementation of 14 high level conferences in the seven target countries. Facilitation of dialogue among the policy makers, financing institutions and biogas investors in the form of interactive forums in the seven target countries. The focus of interactive forums was national biogas roadmap.</td>
</tr>
</tbody>
</table>
EXECUTIVE SUMMARY

The core of BiogasIN project is the removal of framework barriers for biogas sector development in the seven countries of Central and Eastern Europe (CEE): Bulgaria, Croatia, Czech Republic, Greece, Latvia, Romania and Slovenia.

Seven target countries of BiogasIN have significant potential for biogas production and utilization. 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 inadequate financing mechanisms. Even thought there is a favourable legislative framework and state support mechanisms in place, in the seven CEE countries addressed in BiogasIN project, the biogas market is developing with a slow pace and leaving a considerable part of the existing potential untapped.

With the goal to improve and simplify the permitting and financing procedures in CEE surveys were implemented among banks, project developers and authorities. The aim of the surveys was to capture the real experiences in implementation of biogas projects and to identify specific problems arising during the procedures.

One of the objectives of BiogasIN project was to provide support to the administrative bodies and to build their capacity in assessing biogas projects during the permitting procedures. In that respect, during the project implementation (2010-2012) in each of the seven BiogasIN target countries, two capacity building workshops for administrative bodies involved in permitting procedures were implemented. In addition, a technical document “Biogas Checklist for Administrative Bodies” was compiled. The purpose of the document is to provide a summary of most important issues with which administrative bodies are frequently confronted.

For a well functioning biogas market and achievement of renewable energy policy goals sustainable and well designed biogas projects are of crucial importance. Therefore, biogas investors were also addressed in BiogasIN. Throughout the project in each of the seven BiogasIN CEE target countries four capacity building events for investors were implemented. Two workshops were dedicated to permitting procedures, while the other two to the financing options for establishment of biogas plants. In addition to the information materials developed for the capacity building events, a technical document “Options for biogas plants” was prepared.

Policy makers on national and regional level were also addressed by BiogasIN because they may be the key actors in supporting implementation of biogas project and therefore market development. During the project implementation diverse activities addressing biogas policies were implemented. In the initial phase analysis of potential benefits arising from establishment of biogas plants in 28 regions in seven BiogasIN target countries (four in each country) were conducted and results were communicated with the regional policy makers. Many of the regional policy makers have acknowledged the information and supported BiogasIN initiation by signing a positioning paper declaring that they will promote and support development of biogas projects in their regions.
On the national level, in each of the seven countries, two high level conferences on biogas were implemented. The conferences were used to address the issue of biogas market on the high policy level, but also to inform the policy makers about the trends and developments across the EU. In addition, the participation of the policy makers, representatives of financial institutions and potential investors provided an opportunity for initiation of dialogue among all market stakeholders.

The outcomes of the capacity building implemented through BiogasIN are the following:

- 280 representatives from administrative bodies took part in 14 capacity building trainings for administrative bodies (2 events in each of the seven CEE target countries)
- More than 500 potential investors in agricultural biogas plants were educated on permitting procedures and financing options through 28 capacity building trainings for farmers/biogas investors in permitting procedure (2 events on permitting procedures and 2 on financing options in each of the seven CEE target countries)
- 160 representatives from financial institutions participated in 14 capacity building trainings for financing bodies’ staff (2 events in each of the seven CEE target countries)
- More than 200 biogas market stakeholders took part in 7 interactive forums (1 interactive forum in each of the seven CEE target countries)
- More than 900 people active in biogas policy making and in CEE biogas market participated in 14 high level conferences on biogas (2 events in each of the seven CEE target countries)
- 36 representatives of administrative bodies, financing institutions and potential investors from CEE countries took part in 2 study tours in Germany, Austria and Czech Republic
1 OVERVIEW OF BIOGAS MARKET IN CEE COUNTRIES

The core of BiogasIN project is the removal of framework barriers for biogas sector development in the seven target countries. Therefore, legislative frameworks in Bulgaria, Croatia, Czech Republic, Greece, Latvia, Romania and Slovenia have been analysed within the project. The extended financing and administrative procedures were identified as the major hurdles. With the goal to improve and simplify the permitting and financing procedures in CEE and especially in the target countries, surveys were implemented among banks, project developers and authorities. The aim of the surveys was to capture the real experiences in implementation of biogas projects and to identify specific problems arising during the procedures.

1.1 Permitting procedures and financing options

BULGARIA

General framework

The biogas market in Bulgaria is at the beginning of its development. There are several biogas plants integrated with wastewater treatment plants, but no agricultural installations. According to the analyses and surveys conducting within BiogasIN, significant potential for biogas production lays in agricultural waste as well as notable interest among farmers and investors for utilisation of this potential.

The use of renewable energy sources is regulated by Renewable and Alternative Energy Sources and Biofuels Act (RESBA), which was adopted in 2007 and updated in May 2011. The act regulates the implementation of renewable energy projects and guarantees the access the public electricity grid.

Administrative procedures

To build a biogas plant a building permit and an accession contract are necessary. The building permit can be obtained after the approval of the investment project and the conceptual design. The accession contract associates the energy producer (electricity or heat) and the transmission and distribution network. A preliminary contract is signed before the approval of the investment project. The actual accession contract is concluded after the approval of the investment project and issuing of the building permit.
**Financing options**

**State support**

A feed-in tariff system guarantees a preferential purchasing price for electricity from biogas for a period of 20 years. The tariff is defined on an annual basis by the State Energy and Water Commission and depends on the feedstock and the capacity of the plant. Feed-in tariffs for 2012 are indicated in Table 1.

<table>
<thead>
<tr>
<th>Feedstock</th>
<th>Installed power capacity</th>
<th>Tariff [BGN/MWh]</th>
<th>Tariff [€/MWh] *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal waste</td>
<td>up to 150 kW</td>
<td>243.4</td>
<td>124.4</td>
</tr>
<tr>
<td>Municipal waste</td>
<td>From 150 kW to 500 kW</td>
<td>234.09</td>
<td>119.7</td>
</tr>
<tr>
<td>Municipal waste</td>
<td>From 500 kW to 5 MW</td>
<td>226.14</td>
<td>115.4</td>
</tr>
<tr>
<td>Agricultural waste</td>
<td>Up to 500 kW</td>
<td>472.63</td>
<td>241.6</td>
</tr>
<tr>
<td>Agricultural waste</td>
<td>From 500 kW to 1.5 MW</td>
<td>452.14</td>
<td>231.1</td>
</tr>
<tr>
<td>Agricultural waste</td>
<td>From 1.5MW to 5 MW</td>
<td>402.66</td>
<td>205.9</td>
</tr>
</tbody>
</table>

* 1 BGN = 0.5113 € (fixed exchange rate)

**Support programmes and private financing**

Bulgaria has access to the European support instruments. In addition there is also Efficiency and Renewable Energy Credit Line (BEERECL) - a loan programme provided by the European Bank for Reconstruction and Development (EBRD) that aims the access to financing for industrial energy efficiency and small-scale renewable energy projects. The accessibility to favourable commercial loans for biogas projects is still limited in Bulgaria.

**CROATIA**

**General framework**

The biogas market in Croatia is in a take-off stage. Today, there are eight operating biogas plants, six digesting agricultural wastes and one digesting sewage sludge in a wastewater treatment plant with a total installed capacity of 8.635 MWel. In June 2012, there were 59 plants, with a total capacity of 85.04 MWel, inscribed in the national Registry of projects and installations using renewable energy sources and co-generation installation. The registered projects are in different phases of development. At least four biogas plants using agricultural feedstock are in the final stage of construction.

The production and use of energy from biogas is regulated by the Law on Electricity Market and five sub-laws which concern permitting procedures, acquisition of the status of privileged producer, tariff system for purchase of electricity from renewable energy sources and other relevant issues. In addition, legislation regulating land use planning and construction of new facilities are applicable.
**Administrative procedure**

The permitting procedure is divided in “Location, Construction and Operation Permits” and “Energy Permits”. Both comprise several permits under different responsible authorities.

Two ministries are involved in the permitting procedure: Ministry of Economy and Ministry of Environmental and Nature Protection.

**Financing options**

State support

A feed-in tariff system was established in 2007 and adapted in 2012. It guarantees a preferential purchasing price for electricity from biogas for 14 years. The tariff is based on the feedstock type and plant size, as illustrated in the following table.

<table>
<thead>
<tr>
<th>Feedstock</th>
<th>Installed power capacity</th>
<th>Tariff [HKR/kWh]</th>
<th>Tariff [€/MWh]*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy crops, waste/residues from agriculture and food processing industry</td>
<td>≤ 300 kW</td>
<td>1.3</td>
<td>173.3</td>
</tr>
<tr>
<td></td>
<td>&gt;300 kW ≤ 2 MW</td>
<td>1.2</td>
<td>160</td>
</tr>
<tr>
<td></td>
<td>&gt; 2 MW ≤ 5 MW</td>
<td>1.12</td>
<td>149.3</td>
</tr>
<tr>
<td>Landfill and WWTP gas</td>
<td>≤ 1 MW</td>
<td>0.53</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>&gt; 1 MW</td>
<td>0.53</td>
<td>54</td>
</tr>
</tbody>
</table>

* 1 HKR = 0.1333 € (average first half 2012)

The above showed tariffs are the fixed part of the feed-in tariff system. The new system of 2012 introduced a variable part as well, which is based on a measurable contribution to the local community, contributing to the development of economic activity, employment, development of public services and has to improve the quality of life ($P_{max}$) and can be up to 15% of the fixed part showed in the table above.

**Support programmes and private financing**

As a candidate to become Member State of the EU, Croatia has only access to some European support programmes (e.g. IPARD). Nevertheless, there are several support programmes provided by national and international institutions. These include programmes implemented by Environmental Protection and Energy Efficiency Fund, EBRD, KfW, etc.
Financing can also be obtained from commercial banks. At the moment the eight largest banks in Croatia are open to finance biogas projects under normal conditions as for other investments (traditional loan financing).

CZECH REPUBLIC

General framework

Czech Republic is within the top ten biogas producers in the European Union. In 2010, the number of plants is of 91 in agriculture, 57 in wastewater treatment plants and 61 in landfills. The combined installed power was 97 MWel and tendency is rising.

Implementation of biogas plant projects is regulated with several national laws and regulations. The framework conditions are set by the Act No. 180/2005: Coll. on use of energy from renewable sources and Act No. 458/2000: Coll. on business conditions and public administration in the energy sector and amending certain acts (so called Energy Act).

Administrative procedure

The permitting procedure in Czech Republic includes a number of administrative processes which regard integration of a biogas project into land use planning document and assessment of the biogas project. Building of a biogas plant can be initiated upon issuing of building permits and building acceptation. The procedure is depicted with the following scheme:

The average time of the complete permitting procedure for biogas plants is about 20 months. If the Environmental Impact Assessment (EIA) has to be included, the process can take up to 34 months.

Financing options

State support

A feed-in tariff and a green bonus system provide preferential purchase price for electricity from biogas. Producers can choose between one of the two support schemes. The Energy Regulatory Office determines the feed-in tariffs and the green bonuses on an annual basis. The prices may not be lower than 95% of the value of the year before. Prices are set in order to guarantee a

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Before publication of this Report, Czech Republic has announced important changed within the state support of biogas:

- The support scheme undergoes principal changes. The feed-in tariffs will be cancelled on the 1st January 2013. Only the Green Bonuses will remain, but at a considerably lower level.
- The 2020 targets for RES will be reached during the year 2013, resulting in cancelling the entire support schemes as early as on 2014.
return of investment within 15 years and are determined by the year of commissioning of the plant.

**Table 3: Feed-in tariff system in Czech Republic**

<table>
<thead>
<tr>
<th>Feed-in Tariffs</th>
<th>Green Bonuses</th>
</tr>
</thead>
<tbody>
<tr>
<td>One tariff independent of size and feedstock.</td>
<td>The producer sells electricity for the market price. In addition, he receives a premium (=Green Bonus) from the distribution system operator. The risk is higher compared to the fixed feed in tariff, but the revenue can also be higher.</td>
</tr>
<tr>
<td>Guaranteed for 20 years.</td>
<td>Guaranteed for 20 years.</td>
</tr>
<tr>
<td>Tariff 2011: 4120 CZK/MWh (163,8 €/MWh)</td>
<td>Green bonus 2011: 3070 CZK/MWh (122,8 €/MWh)</td>
</tr>
</tbody>
</table>

**Support programmes and private financing**

In addition to the European support instruments, there are several national support programmes, which include Rural Development Programme (RDP), Operational Programme Environment (OPE) and Operational Programme Enterprise and Innovations (OPEI) / Eco-energy. Three commercial banks support biogas investment through specialised programmes: Česká spořitelna a.s. (CS), Komerční banka, a.s. (KB) and GE Money Bank (GE).

**GREECE**

**General framework**

The Greek policy support to energy production from biogas initiated several years ago resulted in a developing market. In December 2011 the installed capacity of electricity generation from biogas-biomass plants was almost 45MW and the total electricity generation for 2011 reached 199.1 GWh. However, there is still a large potential for increasing biogas utilization especially using animal manure or organic waste. Nowadays new biogas projects are in the permitting pipeline and this step is a positive change toward wider biogas exploitation.

The laws regulating production of electricity from renewable energy sources and permitting procedures include Law 3468/2006 “Generation of Electricity using Renewable Energy Sources and high-Efficiency Cogeneration of Electricity and Heat and Miscellaneous Provisions (Official Gazette 129/A/06) and Law 3851/2010, “Acceleration the Development of RES to Combat Climate Change and other provisions regulating matters which fall under the competence of the Ministry of Environment, energy and Climate Change”. The later law entered into force on June 2010 to amend the legislation on renewable energy sources and particularly Law 3468/2006.
Administrative procedure

In Greece there are a number of required permits, issued by different responsible authorities. The general licensing procedure outline for RES and biogas projects in Greece is the following:

A simplified permitting procedure is applied for biogas plants with installed capacity below 1MW$_{el}$ (exempt from electricity generation licence) and those with capacity below 0.5MW$_{el}$ (exempt from environmental licence).

Financing options

State support

A feed-in tariff system guarantees a preferential purchase price for electricity generation from biogas for a period of 20 years (law 3851/2010). The tariff is based on the feedstock type and plant size (Table 4).

<table>
<thead>
<tr>
<th>Feedstock</th>
<th>Power</th>
<th>Tariff [€/MWh]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gases emanating from controlled rubbish burial dumps and from sewage treatment plants and biogases from biomass</td>
<td>≤ 2MW</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>&gt; 2MW</td>
<td>99.45</td>
</tr>
<tr>
<td>Biogas emanating from biomass (organic remnants of animal farming and of agricultural processed remnants and refuse)</td>
<td>&gt; 3MW</td>
<td>200</td>
</tr>
</tbody>
</table>

Support programmes and private financing

The main state financial-support instrument that provides substantial public subsidies to RES investment projects is the so-called “National Development Law” (Law 3908/2011). Development law covers all private investments implemented in Greece (dealing with all sectors of economic activity with some exceptions). Proposals for private investments can be submitted to the National Development Law twice a year.

The most common private financing of biogas projects in Greece include traditional financing, which can be obtained through commercial banks. There is also possibility to finance a project through ESCO model. Although this scheme is rather new in Greece, there are some biogas projects under development which use this model.
LATVIA

General framework

During the last five years Latvian biogas sector has been growing rapidly and steadily. It has been achieved due to existing feed-in tariffs and availability of grants for investments in biogas plants. According to the data provided by the Latvian Ministry of Economy, production of electricity from biogas in 2011 was more than 100GWh, which is more than twice the amount produced in 2010.

Latvian Biogas Association calculated that on 1st April 2012, the total installed biogas capacity in Latvia reached 37.6 MW_{el}. In June 2012 there were 35 biogas plants in operation: 34 using CHP and one where biogas is used for heat generation. In 2012, there were 20 to 30 new biogas plants under construction.

Administrative procedure

For an establishment of a biogas plant and sale of electricity for a preferential purchase price, nine different permits are necessary. Several ministries are involved in the permitting procedure for biogas plants.

<table>
<thead>
<tr>
<th>Permit for introduction of new capacities</th>
<th>Licence for energy generation, transmission, distribution or supply</th>
<th>Grid connection permit</th>
<th>EIA screening decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical regulations</td>
<td>Integrated pollution permit</td>
<td>Decision on electricity sale</td>
<td>Approval of tariffs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Construction permit</td>
</tr>
</tbody>
</table>

Until April 2012, 77 biogas plants have been granted the right to sell electricity in mandatory purchase for guaranteed feed-in tariff and 27 biogas plants out of them have started operation.

Financing options

State support

There are two regulations from the Cabinet of Ministers setting the feed-in tariff system in Latvia: Regulation No. 262 (from 16 March 2010) and Regulation No. 221.

<table>
<thead>
<tr>
<th>Table 5: Feed-in tariffs in Latvia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed-in Tariffs set by Regulation 262</td>
</tr>
<tr>
<td>The tariff is based on the plant size. After first 10 years, the feed-in tariff is decreased by 20%.</td>
</tr>
</tbody>
</table>
Support programmes and private financing

There are three State programs to support the investment in biogas plants. Support for energy production from agricultural and forestry origin feedstock operated under the Rural Support Service of the Ministry of Agriculture of Latvia, Climate Change Financial Instrument (CCFI) operated by the Ministry of Environmental Protection Regional Development and the support for biogas cogeneration plants financed through Cohesion Fund, which is operated by the Ministry of Economy.

The most common private financing method for biogas projects in Latvia is credits from private banks.

ROMANIA

General framework

The biogas market in Romania is one of the least developed in Europe. In 2009 only 1 GWh, equal to the supply of approximately 200 four-person households, was generated using biogas utilization. Produced energy is consumed on-site (until 2011 the already existing biogas plants did not obtain permits for grid connection). However, in Romania the policy makers support the use of the renewable energy sources (RES) including biogas. The use of biogas is also promoted in the present legislation and policy of Romania. Consequently the amount of produced electricity from biogas has more than doubled between 2008 and 2009.

Administrative procedure

In Romania there are several authorities responsible for permitting of biogas plants. A good example of all steps which have to be made during the present permitting procedure is shown with the following flowchart.

<table>
<thead>
<tr>
<th>Planning certificate</th>
<th>Site approval, solution study and connection approval</th>
<th>Environmental agreement</th>
<th>Authorisation agreement</th>
<th>Construction permit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closing connection contract and power up of the facility</td>
<td>Environmental permit</td>
<td>Electricity supply licence</td>
<td>Subscriptions for sale of electricity and green certificates</td>
<td></td>
</tr>
</tbody>
</table>
It remains to notice that the permitting authorities in Romania are not dealing specifically with biogas, or other renewable energy projects.

**Financing options**

**State support**

The main public support system in Romania is biding quota system and green certificates scheme. Table 6 includes description of the state support system for production of energy from biogas in Romania.

<table>
<thead>
<tr>
<th>Table 6: State support system for production of energy from biogas</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biding quota system</strong></td>
</tr>
</tbody>
</table>
| Applies during the operation time, but not more than 15 years.  
After 10 years, the scheme will be resend to the European Commission for further discussions and changes. | Up to 4 green certificates for 1MWh delivered (electricity and heat produced and delivered) are granted.  
The number of green certificates depends on the used technology and feedstock for generation of RES-E. |

Green certificates market in Romania is based on a mandatory quota mechanism that obliges all electricity suppliers to acquire a number of GC equal based on the imposed quota of electricity from RES, so if they do not reach the quota they have to buy from RES-E producers, at the GC market price (the law is specifying the minimum and the maximum values – 27...55€). The penalties for not fulfilling the binding quota are 110€ for each GC.

In case of electricity produced in cogeneration from renewable sources, the producers are obliged to choose either for this GC support scheme, or for another state aid scheme based on bonuses named „high-efficiency cogeneration promotion based on the useful heat demand” scheme – but this is not applicable for biogas since the legislative provisions for biomethane injection are not yet into force (the existing reference regulation, Government Decision 1215/2009 specifies only 3 fuel types – solid, gas from transportation grid, or gas from distribution grid).

**Support programmes and private financing**

There are two support programmes implemented on the national level: Sectoral operation programme "Increasing Economic Competitiveness" and “Program for increasing energy production from renewable sources”, through which a grant from the National Environmental Fund can be obtained.

The most common private financing method for biogas projects in Romania is by credits / loans from private banks, even if a private company is obtaining a non-reimbursable financial support for the development of its investment.
SLOVENIA

General framework

The Slovenian target is to create a sustainable biogas market for the future energy supply of the country. Between 2008 and 2009 the Slovenian electrical energy output from biogas increased by 59%. Thus more than 15,000 four-person households, equal to 68.8 GWh, can be supplied by biogas generated electricity. However, the Slovenian permitting procedure still needs some improvement to fasten the implementation of new biogas projects.

Administrative procedure

For the building and operating of a biogas plant in Slovenia several permits are required. They are illustrated with the following flowchart.

Financing options

State support

A feed-in tariff system guarantees a preferential purchase price for electricity from biogas for duration of 5 years. The tariff is based on the size and electrical power of the plant, as illustrated in Table 7.

Table 7: Feed-in tariffs in Slovenia

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>&lt; 50 kW (Micro)</td>
<td>B1, B2</td>
<td>118.72</td>
<td>41.84</td>
<td>160.56</td>
</tr>
<tr>
<td></td>
<td>C1, C2</td>
<td>139.23</td>
<td>-</td>
<td>139.23</td>
</tr>
<tr>
<td>&lt; 1 MW (Small)</td>
<td>B1, B2</td>
<td>111.75</td>
<td>44.56</td>
<td>156.31</td>
</tr>
<tr>
<td></td>
<td>C1, C2</td>
<td>139.23</td>
<td>-</td>
<td>139.23</td>
</tr>
<tr>
<td>1 - 10 MW (Medium)</td>
<td>B1, B2</td>
<td>96.18</td>
<td>45.24</td>
<td>141.42</td>
</tr>
<tr>
<td></td>
<td>C1, C2</td>
<td>129.15</td>
<td>-</td>
<td>129.15</td>
</tr>
</tbody>
</table>

* B1, B2: More than 75% of energy crops, biodegradable fraction of products, residues and waste
  C1, C2: More than 25% of municipal and industrial waste
The variable part of the tariff is adjusted annually or more frequently based on the forecast reference market prices of maize silage substrate. The total tariff may be completed by an operating support or by bonuses for high heat utilization (>15%) or high slurry/manure input (>30% or >70%).

Support programmes and private financing

The most important public support programmes in Slovenia are The Environmental Fund of the Republic of Slovenia and the Slovene Enterprise Fund (SEF). The Environmental Fund provides favourable credits for environmental and RES investments for companies and households, including biogas plants. On the other hand, the aim of the SEF is to improve the access to finance for different stages of development-commercial projects for micro-, small- and medium-sized companies in Slovenia. Public calls referred to biogas projects are also foreseen with this institution.

The most common financing provided by commercial banks for biogas projects are credits, which include traditional financing by loans or a classic finance with the characteristics of project financing.
1.2 Barriers for biogas market development in CEE countries

Even thought there is a favourable legislative framework and state support mechanisms in place, in the seven CEE countries addressed in BiogasIN project, the biogas market is developing with a slow pace and leaving a considerable part of the existing potential untapped. In order to identify the barriers for biogas market to take off in CEE countries, surveys among market stakeholders were conducted in Bulgaria, Croatia, Czech Republic, Greece, Romania and Slovenia. The surveys included administrative staff, biogas investors and bankers. The viewpoints of the respondents on the key barriers in permitting procedures and financing options are summarised in text boxes.

All survey participants stated that the permitting procedures represent a barrier for biogas market development in the CEE countries. Thereby, the main reason for inefficient permitting procedures seems to be lack of knowledge and experience among all stakeholders, apart from the stakeholders in Czech Republic. Along with this, changes in the legislation and unstable governmental policies towards the biogas energy signals unstable market and consequently higher risk for investments. Even in the countries which had favourable policy frameworks at the time of the surveys, such as Czech Republic and Latvia, the governmental support has decreased during the past 18 months. This had an impact on the market development. From the standpoint of a commercial bank, before supplying a long term loan to an investor with no records in the business he/she is developing, it is logical that either the proposed technology (business) is of the kind that guaranties revenues sufficient for dept repay, or that the investor provides equivalent collaterals and insurances. No or limited number of low interest credit lines and programmes provided by the governments and national banks, despite the ambitious national targets, is viewed a sign that biogas does not guarantee profitable business.

**Investors’ views on permitting procedures**
- The permitting procedure is a barrier for implementation of biogas projects.
- Obtaining all necessary permits is as difficult as, or even more than, securing external financing for the project.
- Employees of the relevant authorities lack technical capacity and are not able to help much in the permitting process in spite of being cooperative.
- There is a lack of easily accessible (general) information about permitting procedures.

**Investors’ views on financing options**
- Too high equity for loans;
- High value of security instruments;
- Too high interest rates;
- High investment costs;
- Biogas is a novelty for banks and they lack trust in biogas projects;
- Employees of the banks do not have experience in financing biogas projects;
- Current financial situation in the country;
- Lack of governmental support, stable and organised legislation;
- Lack of stability in the biogas sector.
The reasons for slow development of biogas markets (and reluctance of commercial banks to follow these investments) according to the bankers’ opinion are:

- Small size of investments;
- Unstable, weak and too few public incentives;
- Unstable legislative and tax framework;
- Relatively short history of biogas market;
- Investors’ reliability - new entities with no experience and financial records;
- Investors’ insufficient knowledge and experience with long term investment loans and this type of business activity;
- Too small equity ratio and weak insurance instruments offered by the investors;
- Long term feedstock contracts or adequate size of available land in case of feedstock self-supply are often critical points for ensuring bankability of projects.
2 SUPPORT TO ADMINISTRATIVE BODIES AND BIOGAS INVESTORS

Efficient implementation of inter-sectoral administrative permitting procedures, such as those for establishment of a biogas plant, requires in-depth understanding of all aspects of the technology proposed by the project assessed. In the case of biogas plants the relevant aspects include feedstock type, electricity production and use, heat production and use, use of digestate as well as environmental and safety issues.

One of the objectives of BiogasIN project was to provide support to the administrative bodies and to build their capacity in assessing biogas projects during the permitting procedures. In that respect, during the project implementation (2010-2012) in each of the seven BiogasIN target countries, two capacity building workshops for administrative bodies involved in permitting procedures were implemented. In addition, a technical document “Biogas Checklist for Administrative Bodies” was compiled. The purpose of the document is to provide a summary of most important issues with which administrative bodies are frequently confronted.

For a well functioning biogas market and achievement of renewable energy policy goals sustainable and well designed biogas projects are of crucial importance. Therefore, biogas investors were also addressed in BiogasIN. Throughout the project in each of the seven BiogasIN CEE target countries four capacity building events for investors were implemented. Two workshops were dedicated to permitting procedures, while the other two to the financing options for establishment of biogas plants. In addition to the information materials developed for the capacity building events, a technical document “Options for biogas plants” was compiled.

Technical documents “Biogas Checklist for Administrative Bodies” and “Options for biogas plants” are included in the following sections.
Biogas Checklist for Administrative Bodies

Dominik Rutz, David Güntert (WIP)

During the permitting procedure for a biogas plant, different permits have to be obtained by the biogas plant operator (investor), namely e.g. building permits including location-, construction- and operation permits, and energy permits including a grid connection contract and energy licence. In some countries the biogas plant operator has to apply for each single permit. Therefore, acquiring permits is often quite complicated and requires a lot of time in many countries. However, in other countries only one permit is enough for building and operating a biogas plant (see BiogasIN report: Kirchmeyr et al. 2010\(^2\)). Therefore, the recommendations explained in the following chapters may help to improve the existing permitting procedures.

Feedstock

A biogas plant can be operated by using different feedstock. The feedstock varies from energy crops such as maize silage to biodegradable wastes including sewage sludge and food waste. The choice of feedstock is influenced by availability, logistics and location of the feedstock, as well as by economic considerations. However, it is also affected by the legislation of the respective country which usually classifies feedstock types into different categories. For example sewage sludge and food waste fall under a different category than energy crops, and thus are treated differently. The first is categorised as waste and therefore falls under legislative provisions regulating waste management, whereas the former is an agricultural product. Consequently the legislation has to create a suitable framework for the permitting procedure. Important acts that regulate the classification of feedstock at European level are the Renewable Energy Directive 2009/28/EC (RED), Waste Framework Directive 2008/98/EC, and the Nitrate Directive 91/676/EEC. In these directives the legislative framework is given for all Member States, which have to transpose it into the national legislation. In many cases problems occur especially in co-digestion plants, since biogas feedstock is covered by provisions of different laws (e.g. laws and regulations on waste, agriculture, renewable energy, environmental protection). The following recommendations may help to solve these problems.

- Specific definition and classification of suitable feedstock for biogas production is needed, preferably summarised in one single legal document, such as a law, regulation/ordinance or technical guideline or standard.
- Clear legislative requirements on the treatment of hygienically sensitive waste such as food waste or parts of dead animals are needed (to be harmonised with Regulation No 1774/2002 EC of the European Parliament and of the Council of 3 October 2002 laying down health rules concerning animal by-products not

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intended for human consumption\(^3\)). Usually, either the sensitive waste has to be heated up to 70°C for one hour (pasteurisation) or the sensitive waste has to be treated using a combination of pressure of 3 bar and a temperature of 130°C for 20 minutes (pressure sterilisation). The use of hazardous biomass, slurries or manures of animals with health problems shall be prohibited if there is a risk of further spreading pathogens.

- Requirements and implementation of a sustainability certification scheme for feedstock shall be provided in case that biogas (bio-methane) is used in transport and thus has to comply with the RED. A practical guidance on how to implement a sustainability certification scheme is needed.
- Green and black lists (positive and negative lists), of supported or prohibited feedstock for biogas production, should be provided.
- The use of feedstock may be supported by different feed-in tariffs depending on the feedstock type, in line with the national circumstances and policy. Therefore clear regulations are needed.

**Electricity production and use**

The most common objective for operating a biogas plant is the electricity production. The electricity is usually generated in a Combined Heat and Power (CHP) station. The capacity of these CHPs usually varies between 50 kW\(_{el}\) and 1 MW\(_{el}\). The electricity is then used by the biogas plant operator himself or can be fed into the public grid. For feeding into the public electricity grid different basic conditions have to be fulfilled.

- The RED requests Member States to implement suitable legislation for priority access of renewable electricity in power grids. Thus, every biogas plant operator should be generally allowed by law to feed the generated electricity into the public grid. However, success of this prioritised access depends on details laid down in the legislation. In reality, often barriers for biogas plant operators still exist. Administrative bodies should help in facilitating grid access for biogas plants.
- Implementation of a feed-in tariff scheme for biogas electricity is recommended (see Renewable Energy Act in Germany). A feed-in tariff is generally preferable in comparison to green certificates since it guarantees more and longer securities for investors with fixed prices.
- The feed-in tariff may vary depending on the size of the plant and the used feedstock. An example is the Renewable Energy Sources Act (EEG) 2012 in Germany. According to this act, the feed-in tariff for a biogas plant up to 150 kW is 0.143 €/kWh, for a plant between 150 and 500 kW it is 0.123 €/kWh, for a plant of up to 5 MW capacity is 0.11 €/kWh and for a plant with less than 20 MW the feed-in tariff is 0.06 €/kWh\(^4\). Furthermore, the feed-in tariffs vary regarding the used feedstock classes and technologies for which the biogas plant operator can receive additional bonuses. A special category for biogas installations utilising 80% manure of up to 75 kW was introduced in 2012, with a

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feed-in tariff of 0.25 €/kWh. More details of the existing feed-in system of Germany and some other example countries is provided in the BiogasIN report of WP 3.1 “Permitting procedures for biogas projects in Austria, Germany, Denmark, The Netherlands and Italy”.

- If the biogas plant operator has to apply for a feed-in contract, a contract template provided by authorities may fasten and simplify the process. A contract may regulate the issues between the grid operator and the plant operator related to the grid access, feed-in tariff and payment modalities for fed-in electricity. It should also include general contractual information such as, the location of the plant and technical details about the biogas plant (capacity, feeding volume, etc.).

Heat production and use

A biogas plant generates on average about 35% electricity and 65% of heat. One third of this heat is usually used to heat the digesters in order to keep the microbiological process stable. The rest of the heat is often wasted into the atmosphere, but for environmental, efficiency and economy reasons, this heat should be also used.

The excess heat generated of a 250 kW el CHP plant, working on average 7,000 hours per year under full load, is about 2,000 MWh per year, which is equivalent to the annual heat demand of on average 100 households in Central Europe.

There are different options for the use of this excess heat. The suitability of these options depends on the different framework conditions, including existing heat customers, distances, technologies, and other issues. Concrete options for the heat use include for instance: district heating systems with a CHP unit close to the biogas plant, micro biogas grids with satellite CHP units close to heat consumers, drying facilities (woodchips, digestate, and cereals), industrial use, use in an Organic Rankine Cycle (ORC) or Stirling engine, etc. The selection of the options for waste heat use are often influenced by permitting procedures, as it is the case for the set-up of gas or heat pipelines.

To guarantee the use of the waste heat of biogas plants the following recommendations may help.

- Biogas plant operators should be mandated to use at least a certain percentage of the waste heat. In Germany for example 60% of the waste heat of a biogas plant has to be used (see Renewable Energy Sources Act (EEG) 2012²). Otherwise the biogas plant operator will lose the feed-in tariff of the current year. However, a mechanism must be introduced which protects the biogas plant operator from unexpected changes in the heat demand (e.g. if the heat demand of a heat consumer stops due to bankruptcy.)
- Permissions for the construction of biogas and heat pipelines should be facilitated in order to set-up biogas micro-grids or district heating systems.

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- If a CHP plant is set-up nearby a housing estate (satellite CHP), clear legislation and framework conditions are needed. This applies especially for emissions of noise, pollution and smell, as well as for safety issues.
- The permitting process for building a biogas plant including a drying plant or ORC plant should not be more difficult than the usual process.

Upgrading biogas to bio-methane and use

Instead of using the biogas directly at the biogas plant in a CHP, the biogas can also be upgraded to natural gas quality (called: biomethane). Thereby, certain quality requirements have to be guaranteed fulfilling country specific or international (e.g. ISO, CEN) quality standards for natural gas. Thus the bio-methane must usually consist of at least 96% methane. The upgrading is performed by using different chemical and physical methods. After the upgrading process the bio-methane can be feed into the natural gas grid or can be used as vehicle fuel. The following recommendations may help to fasten the permitting process of such a project.

- It should be generally allowed by law to feed bio-methane into the natural gas grid. This is so far not regulated on European level, however, in some European countries, such as in Germany legislation on biomethane grid injection has been recently introduced. In the initial phase of the set-up of the first biomethane injection plants in Germany no legislation existed. These first innovative plants were implemented in consensus with the involved parties such as biogas plant operator, natural gas grid operator and the authorities. Therefore, also authorities of other countries should facilitate biomethane grid injection, even if no specific legislation exists.
- The quality requirements for bio-methane need to be officially defined, which is usually similar or the same as for natural gas quality.
- Mandating the grid operators to allow grid injection may simplify such a project and help to develop a bio-methane market.
- Feed-in tariffs for bio-methane, like they exist for electricity feed into the electricity grid, may be beneficial to support the bio-methane market.

Use of digestate

Digestate is the material which remains in the biogas plant after the anaerobic digestion of biodegradable feedstock. The quality of the produced digestate depends highly on the used feedstock. The quality of the digestate is classified by chemical, biological and physical aspects. Chemical contamination of the digestate usually occurs in sewage sludge, which contains inorganic material (e.g. heavy metals) or certain quantities of antibiotics, disinfectants and hormones. Biological contamination may be caused by the presence of seeds or pathogens in the digestate. Consequently disease transmission between animals, humans and the environment could be caused. Physical contaminants can be non- or low-digestible materials such as stones, glass, plastic, wood, and sand. Most often these contaminants are found in household, food or garden waste. These physical contaminants can cause damage to the environment and consequently negative public perception of digestate as fertilizer.
The use of digestate for different applications depends on the feedstock material. A clear legislation on the classification of the feedstock materials and different digestate mixtures is needed. This shall include different options for how to use and sell digestate. For example, the case of digestate in Germany is regulated in the existing Fertiliser Act (§ 1 Nr. 2 DüMG) and the Fertilizer Ordinance (§5 (2)) of Germany.

Depending on the type of the digestate (e.g. from wastes as feedstock), the quality of the digestate has to be regularly controlled, if applied e.g. on agricultural fields as fertilizer. For example in Germany the so called Fertilizer Ordinance has to be fulfilled. For the controls different procedures are applied. Usually the biogas plant operators are controlled randomly and a representative of the responsible authority selects samples of the digestate which is then analysed in a laboratory. If the thresholds for digestate are not maintained, the biogas plant operator has to pay a fine.

Covering the digestate depot should be mandated by a legal document, such as a law, regulation/ordinance, or technical guideline or standard in order to reduce methane gas emissions which are contributing to the Greenhouse Gas effect (also see chapter “Environmental protection and emissions”).

For the use and sale of digestate, as well as for the application on agricultural fields, rules need to be in place, which consider the European legislation, such as the ABP Regulation; Nitrate Directive; Good Agricultural Practices (GAP), and Waste Framework Directive.

Environmental protection and emissions

A biogas plant releases different types of emissions into the environment. If not treated properly, these emissions may harm both the environment and the humans living around the biogas plant. Emission regulations have to be fulfilled in order to protect the environment and human well-being. In order to acquire public acceptance, the public has to be informed about the efforts for protecting the environment. To gain this understanding, the following recommendations may be helpful.

- Airtight covering of the digestate depot protects against high CH₄ (methane gas) emissions. Thereby, the neighbours are also protected from emitted odours. Thus, covering the digestate depot should be included in the permitting framework.
- The gas tightness of the leading gas system and pipes should be regulated.
- Emissions to water bodies (e.g. leakage of silage water from feedstock storage facilities) have to be avoided. Water related regulations have to be considered.

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7 http://www.lll.bayern.de/lab/duengung/organisch/13239/linkurl_0_7_0_1.pdf; 16.01.2012; 16:29
8 Regulation EC1774/2002 laying down health rules concerning animal by-products not intended for human consumption
9 Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources
For example, the minimum distance between continuous water courses (e.g. rivers) in Germany needs to be at least 50 m. Also the deepest component of the biogas plant should be at least one meter above the highest expected ground-water level (also see chapter “Safety regulations”).

- The combined heat and power station has to comply with noise regulations.
- A clear regulation on exhaust emissions from CHP plants is needed. This includes also formaldehyde emissions.
- Methane slip (emissions) from biogas upgrading plants producing bio-methane should be regulated.

Safety regulations

During the operation of a biogas plant several safety regulations have to be fulfilled. They include mainly aspects of fire and explosion safety and of health safety for workers.

The main component (40-70%) of biogas is methane (CH\textsubscript{4}). Although methane gas is a colourless, odourless and non-poisonous gas, it is dangerous to handle since it is flammable and explosive. Therefore several safety requirements are obliged for operating a biogas plant. The following recommendations may help to guarantee the safety around biogas plants and protection of the environment.

- A safety check before the start of the biogas plant operation has to be carried out by an official inspector of the authorities. Also regular controls of the protection schemes such as safety valves regarding gas tightness are necessary.
- The safety regulations have to be fulfilled by every person who is working directly at the biogas plant or nearby. Furthermore there have to be common warning labels on the biogas plant to make dangerous places visible. The meaning of these warning labels has to be well known by the operating staff of the biogas plant. To guarantee this training courses about work safety of a biogas plant are recommended. To implement such courses a clear framework is needed.
- All needed safety equipment such as fire extinguishers have to be at a certain place and in operative conditions. This has to be controlled regularly by official inspectors of the authorities.

Public participation

Like for many other renewable energy projects, public awareness and participation is an important factor for a successful project implementation. This is also valid for the construction of a biogas plant. Depending on their size and location it has to be decided to which extent the public has to be involved in the process of the project. For example, in Germany the “Federal Emission Control Act” (BimSchG) determines if public involvement is mandatory or not, depending on the plant size and type.

- A framework specifying whether the public has to be involved or not is needed. This framework shall also specify how the public is involved in the permitting process.
- There should be a fixed timeframe for informing the public about the project included in the permitting process.

**Concluding remarks**

Each biogas project is implemented under different circumstances and thus requires different types of permits, depending on the country-specific framework conditions. Therefore, the provided checklist about the permitting procedure of biogas plant may provide help to the administrative bodies and authorities of the partner countries in the BiogasIN project. However, this checklist shall only be a collection of different aspects and recommendations for the permitting procedure, is not exhaustive and can be continuously up-dated. Generally, authorities will have balance between on the one hand providing sound framework conditions for a permission process which is feasible in costs and time, and on the other hand not regulating the process too much so that regulations will become a barrier against further development.
Options for financing biogas plants

Dominik Rutz, Erik Ferber (WIP)

Financing by banks

Common financing methods are credits from private banks. As indicated in Figure 1 below, there are two main types of typical financing for biogas projects: traditional financing by loans and project financing. Figure 1 illustrates the different financing schemata of traditional loan financing and project financing:

![Figure 1: Distinction between traditional loan financing and project financing concepts](chart)

**Traditional loan financing**

Traditional loan financing is the most common way of receiving borrowed capital from banks. This form of financing is not just used for major investments, as they are regularly needed within biogas projects, but also covers many smaller private loans. The financier checks the financial background of the borrower in order to decide on the reliability and risk of the engagement. Of particular interest for financial institutes are securities in case the project fails. Such securities consist of estate, components of the biogas plant, private – and company asset, and all other assets that cover the loan sum. Furthermore the prospects of success of the project are analysed. The success is usually estimated by checking several criteria which influence the economy of the future biogas plant. For further information on these criteria for biogas loans, please also see the report “Criteria
to assess biogas investments: Guidelines for financing institutes and investors”\textsuperscript{11}. The estimated economy and risk of the plant influence the amount of the interest rate.

Once the loan has been provided, the borrower has to pay back a pre-defined monthly amortisation rate which consists of principal and interest rates. Often banks offer also a grace period which is usually one or two years during which the borrower only has to pay back the interest rate, but not the borrowed money.

The duration of loans for biogas projects as well as the number of grace years is strongly dependent on the prerequisites of each particular biogas project. However, regular loan periods are about 12 - 15 years and typically one or two grace years are granted.

A special form of traditional loan financing is low interest loans provided by national authorities or financing bodies. These loans are granted for investments in the renewable energy sector, such as biogas projects, and work as a market support programme in order to stimulate the renewable energy sector. Low interest loans are characterised by considerably low interest rates. The investor’s house bank can help accessing these loans. In Germany for example the KfW Bank (Kreditanstalt für Wiederaufbau) and the LfA Förderbank are providing low interest loans.

![Figure 2: Traditional loan financing scheme](image)

**Advantages and disadvantages**

+ Low administrative complexity.
+ Formation of a special legal company is not required.
+ Sufficient securities can be provided by estate and reduce the amount of the interest rate.

- Financial capacity to act is constrained, as private estate is charged.
- The investor is liable with private asset in case of project failure.

Project financing

Project financing is intended to finance a very particular investment which is repaid by its own cash flow. The financing bank makes its decision on the loan in the first place on the estimated cash flow of the project. In contrast to conventional loan financing, the financier usually has little or no access to private or company capital. In case of financing a biogas project, the financier’s investment is secured by the estimated cash flow of the plant selling electricity, the plant components and by the property of the plant site. Prerequisite to achieve project financing is the formation of a dedicated biogas project company.

Project financing provides considerably higher risks for financiers than conventional financing, since the loan can only be repaid when the project is operational. Therefore, banks are interested in minimizing potential risks. All aspects of the project are analyzed very carefully. This leads to increased administrative work for both parties. The investor has to prepare all project documentation in high detail. This procedure can be considerably time consuming.

Since biogas plants represent the main financial security for banks due to larger administrative efforts, usually only large scale biogas plants with an electrical equivalent of some megawatt (MW) are normally financed by project financing. Typical agricultural biogas plants (500 kWel or less) are rarely financed by this financing option.

Advantages and disadvantages

+ The investor is not liable with private asset in case of project failure.
+ The financial institute helps identifying and allocating potential week points of the project.
+ It does not matter, how many people join the project company. Thus, a consortium of farmers can jointly operate a biogas plant.
+ Capacity for further loans is not constrained, as private estate is not charged.
- High administrative complexity.
- A project company has to be founded.
- Not every bank provides the option of project financing.
- Interest rates might be higher.
- Usually applicable only for projects with an investment volume of some million Euro.
Leasing

Acquiring leasing partners is a frequently applied method for gathering equity capital for a biogas project. Leasing is characterised by the distinction of plant constructor (leasing company) and plant operator (lessee). The leasing company constructs and finances the plant by company capital or equity capital from leasing partners. Afterwards the company leaves the plant to the lessee who has to take the risks of operation. The lessee keeps all revenues from the operation of the biogas plant but has to pay leasing rates to the leasing company. After the contract expired, the lessee can either buy the plant corresponding to its residual value, or the leasing company has to remove it.

In most cases this option is only used for financing particular components of a biogas facility, e.g. for the combined heat and power (CHP) plant.
Advantages and disadvantages

+ Leasing partners provide expertise in biogas plant implementation and operation.
+ External investors have the opportunity to join the leasing company.
+ Farmers with low equity capital have the opportunity to operate a biogas plant.
- The leasing company does not have direct influence on the operation of the plant. Thus, success or failure of the project lies in “someone else’s hand” (lessee).
- After the contract expired, the biogas plant might have a considerable residual value, which makes removal uneconomic for the leasing company.

Biogas contracting

Contracting is a strongly emerging business model in some European countries, e.g. Germany and Austria. There exist different forms of contracting whereas the Energy Performance Contracting (EPC) is the original form. EPC is a contractual arrangement between the provider, normally a so called energy service company (ESCO), and the client. The ESCO implements and finances energy saving measures at the client’s property. Subsequently, the customer pays back contracting rates corresponding to the level of energy efficiency improvement. The ESCO guarantees that savings meet or exceed annual payments to cover all project costs usually over 7 to 10 years. The advantage of an ESCO is the availability of financial resources, expertise, and the minimised risk for the customer.

Newer forms of contracting also include energy contracting not only for energy savings, but also for energy supply. This is interesting especially for larger clients (e.g. public institutions, hospitals, schools, companies) who need larger amounts of energy (usually heat), but want to reduce risks and do not have the capacity to invest in own expertise to operate the energy plant.

Contracting for biogas plants (Figure 5) is also a relatively new development. Some project designers, plant manufacturers and in particular ESCOs (Energy Service Companies) offer biogas contracting. These companies (contractors) usually finance, construct and operate the whole biogas facility. The farmer only provides the piece of land on which the plant is constructed and signs a feedstock delivery contract with the contractor. The risk of plant operation but also all revenues from selling energy are kept by the contractor. The farmer gets the payment from feedstock delivery and from the lease of the property. Depending on the contract between the contractor and the farmer, heat from the biogas CHP plant may be utilized by the farmer (e.g. to heat the animal sheds, to dry woodchips, etc. Also a participation of the farmer on the profit of the plant can be content of the contract. In many cases, the farmer also provides labour for the daily operation of the plant (e.g. feedstock feeding). The large advantage is that the farmer reduces its risk in case of system failure and thus does not lose capital. Also the expertise on most efficient system design and maintenance is provided by the contractor.
Another form of biogas contracting is a normal energy contracting between the contractor (ESCO) and an energy client (Figure 6), as it was described above (e.g. public institutions, hospitals, schools, companies). In this case, the ESCO is responsible for delivering heat and / or electricity to the energy client. Depending on the required feedstock for the plant, the farmer is the feedstock provider. In this case the contract between the farmer and the contractor is a normal business contract.

Different forms of contracting can be combined with each other in order to achieve the most economically and ecologically reasonable solution for the customer. Thereby the characteristics between the different contracting models, but also between contracting and leasing can be fluent. Figure 5 and Figure 6 represent only schematic examples, other relationships are also possible.

**Figure 5:** Contracting between contractor and farmer

**Figure 6:** Contracting between contractor and energy client
Advantages and disadvantages:

+ The farmer does not have to invest company or private capital.
+ The farmer has a lower financial risk.
+ A professional biogas expert (contractor) is responsible for the operation and maintenance of the plant.
- The biogas plant remains property of the contractor for a pre-determined period, thus the farmer has no or only little influence on technical decisions.
- The farmer’s earnings are diminished by the contracting rates.

Investment funds

Another financing tool for biogas projects is an investment fund. An investment fund is a firm that combines money from several small investors. All of them are investing in one or more biogas projects. By that means equity capital for the construction and operation of a biogas plant is gathered. Benefits from biogas utilisation and the risks are shared among the investors corresponding to the consortium or joint venture agreement. Farmers can form a cooperative where each farmer has a share in biogas revenues proportionally to the provided substrate and its biogas yield.

Advantages and disadvantages

+ The farmer or plant operator does not have to take out a loan and charge estate.
+ The revenue share of each partner exactly represents the money he invested in the fund.
+ The plant operator must nor necessarily provide securities.
+ The investors’ confidence in renewable energy funds is continuously rising due to the good performance of such funds within the last years.
- Investors are regularly liable with all asset invested in the fund.
- Investors have no influence on the operation of the biogas plant.
- To participate in a renewable energy fund, a biogas plant operator has to undergo a complex application procedure in order to prove particular ecological criteria of the project.
Revenues from operating a biogas plant

The decision on granting a loan for biogas projects depends in the first place on the expected cash flow of the project. In order to secure an economically sustainable operation of a biogas plant, it is very important to calculate the revenues from its operation.

In most countries with a sound biogas market, feed-in tariffs for electricity produced from biogas plants are defined by law. These feed-in tariffs with their secured revenues over a long period of time represent a reliable security for financial institutions and the basis for economic calculations for the plant operator. Furthermore long term contracts covering heat utilization or biomethane injection in the natural gas grid increase the credibility of a biogas project.

Another way of refinancing a biogas plant investment is trading Green Certificates (also known as Renewable Energy Certificates, RECs). A green energy provider (e.g. biogas plant operator) is credited with one REC for every MWh of electricity produced from a renewable source. After the energy was fed into the grid, the certificate can be sold on the open market. Prices for the certificates depend on general electricity demand, the renewable energy resource from which the electricity was produced and the location of the facility. Revenues from selling RES are less calculable than revenues from a fixed feed-in tariff as the prices for RES are subject to fluctuation.

Economically and ecologically it is most advisable to sell heat produced by the CHP (combined heat and power plant) facility of the biogas plant. Utilisation of heat improves the overall efficiency of the plant drastically. If the heat can be sold to consumers, e.g. via a local heating grid, the biogas plant operator generates additional income. In contrast to electricity production from biogas, there are usually no fixed feed-in tariffs for heat produced by biogas plants, as it is the case in Germany. The
revenues from heat supply are usually subject to the contractual agreement between plant operator and heat consumer.

A minor part of the income from the operation of a biogas plant can be generated from the utilisation of digestate (residual material from the digestion process). Digestate can be sold as a fertiliser or used at the own farm as mineral fertilizer substitute. Digestate is rich in nitrogen, phosphorus, potassium and micronutrients and can be applied on soils just like liquid manure with lower odor emission after application. This makes it a demanded bio-fertiliser.

Finally, in case the biogas plant is designed for the digestion of bio-waste (e.g. catering waste, organic municipal waste, industry waste) the plant operator may get also a tipping fee. However, the use of waste materials in a biogas plant usually requires special plant design and experience with its (pre-)treatment. Furthermore, additional legal requirements regarding digestion conditions and the utilization of the produced digestate have to be considered.

Concluding remarks

Biogas projects can be financed by many different options. Each financing model has particular advantages and disadvantages for the investor and the financing bodies. However, each biogas project is implemented under different circumstances and may require a special form of financing. It is very important for a successful implementation and operation to select the correct financing option for the regarding project. Different financing options can be also combined in order to achieve the most sustainable financing structure. It has to be assessed very carefully, which revenues can be expected from the operation of the biogas plant previously to the implementation of the project.
3 RECOMMENDATIONS FOR POLICY MAKERS

Bulgaria, Croatia, Czech Republic, Greece, Latvia, Romania and Slovenia have significant potential for biogas production and utilization. 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 inadequate financing mechanisms.

The objective of the BiogasIN project was to address all relevant biogas market stakeholders, especially policy makers on national and regional level, because they may be the key actors in supporting implementation of biogas project and therefore market development. During the project implementation diverse activities addressing biogas policies were implemented. In the initial phase analysis of potential benefits arising from establishment of biogas plants in 28 regions in seven BiogasIN target countries (four in each country) were conducted and results were communicated with the regional policy makers. Many of the regional policy makers have acknowledged the information and supported BiogasIN initiation by signing a positioning paper declaring that they will promote and support development of biogas projects in their regions.

On the national level, in each of the seven countries, two high level conferences on biogas were implemented. The conferences were used to address the issue of biogas market on the high policy level, but also to inform the policy makers about the trends and developments across the EU. In addition, the participation of the policy makers, representatives of financial institutions and potential investors provided an opportunity for initiation of dialogue among all market stakeholders.

The following sections include summaries of documents prepared in the course of the project: “Highlights of biogas benefits in 28 target regions”, “National Biogas Roadmaps” and “Financing mechanisms for biogas projects in Central and Eastern Europe”.

Highlight of biogas benefits in 28 target regions

Konstantinos Sioulas (CRES),
with contribution of Biljana Kulišić and Veljko Vorkapić (EIHP), Ilze Dzene (EKODOMA),
Jan Stambasky (CzBA), Larisa Lovrenčec and Stanislav Sraka (RA Sinergija), Libert
Yavachev (Energoproekt), Mihai Adamescu (Trinergi Grup)

Introduction

Biogas is an energy carrier which can be used for several energy applications (eg. electricity generation, heat production, combine heat and power production, transport fuel, injection to the natural gas grid). Biogas exploitation is already a well known technology in countries like Germany, Austria and Denmark, but only a few agricultural plants are in operation in Central and Eastern Europe. Nowadays, it is evident that biogas can contribute to several sectors, namely:

- Environment (eg. Climate change),
- Energy (eg. energy security, local source),
- Agriculture (eg. sustainable cultivation and animal breeding),
- Society (eg. employment enhancement, rural development)

GHG savings

The EU as a whole is committed to reduce its emissions by 8% during the period 2008-2012 compared to 1990 levels. This target is shared between the Member States under a legally so-called binding «Burden Sharing Agreement», which sets individual emissions targets for each Member State. The ten New Member States that joined the EU in May 2004 have also ratified the Kyoto Protocol, but with their own Kyoto targets between 6% and 8%. All BiogasIN target countries have to reduce their emissions by 8% below the base year emissions, except Croatia which has 5% reduction and Greece which is allowed to increase their emissions by 25%.

According to the latest Summary European Union greenhouse gas (GHG) inventory report of 2010, total GHG emissions, without LULUCF, in the EU-27 decreased by 11.3 % between 1990 and 2008 (627 million tonnes CO₂-equivalents). Emissions decreased by 2.0 % (– 99 million tonnes CO₂-equivalents) between 2007 and 2008. Emissions in 2008 for the EU-27 were 12.3% lower than emissions in the base year. The overall greenhouse gas emissions in CO₂-equivalents (excl. LULUCF) in 2008 amounted for 4,939.7 million tonnes. All target countries and regions have a significant GHG emission savings. According to BiogasIN assessment about 4,543.14 kt CO₂-equivalents can be saved, which represents the 0.8% of the total GHG emissions of the BiogasIN target countries for the year 2008.

Potential emissions savings for each target country are presented in the following table.
Table 1: Potential GHG savings in 7 CEE countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Potential emission savings (ktCO2-eq per year)</th>
<th>GHG emissions in CO2-eq (excl. LULUCF), 2008 (ktCO2-eq)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria (Veliko Tarnovo, Haskovo, Stara Zagora, Jambol)</td>
<td>775.44</td>
<td>73,500</td>
</tr>
<tr>
<td>Croatia (Međimurska, Osječko-baranjska, Varaždinska, Vukovarsko-srijemska županija)</td>
<td>194.75</td>
<td>31,132</td>
</tr>
<tr>
<td>Czech Republic (Central Bohemia, Moravian-Silesia, South Moravia, South Bohemia)</td>
<td>1,300.55</td>
<td>141,400</td>
</tr>
<tr>
<td>Greece (Larissa, Preveza, Aetolia-Acarnania, Elvia)</td>
<td>587.78</td>
<td>126,900</td>
</tr>
<tr>
<td>Latvia (Valmeria, Aluksane, Madona, Gulbene)</td>
<td>46.69</td>
<td>11,900</td>
</tr>
<tr>
<td>Romania (Buzau, Vrancea, Giurgiu, Teleorman county)</td>
<td>1,059.03</td>
<td>145,900</td>
</tr>
<tr>
<td>Slovenia (Pomurska, Savinjska, Gorenjska, Spodnje posavska region)</td>
<td>578.9</td>
<td>21,300</td>
</tr>
</tbody>
</table>

Best Agricultural practice

Digestate has improved fertiliser efficiency due to homogeneity and higher nutrient availability. Utilization of digestate as fertilizer can replace the use of mineral fertilizers and has at least agricultural, economic and environmental dimension. The Nitrates Directive (Directive 91/676/EEC) requires a number of measures concerning the protection of waters against pollution caused by nitrates from agricultural sources. One of the main measures is that the amount of total nitrogen (N) in organic manures applied to the land, including by the animals themselves, and that brought onto the farm, shall not exceed 170 kg N/ha/year. In the 28 selected regions the best agricultural practice for manure management (Nitrate Directive) result in artificial fertilizers savings of 135,721 t/yr (Urea-Ammonium Nitrate) with a monetary value of about 39.3 M€/yr.

Following the initial calculation of the potential savings on artificial fertilizers based on livestock manure digestion (biogas potential production from biowaste is excluded from this study), some additional assessments were made based on energy crops digestion wherever possible (see methodology in chapter 5.2).

The following table summarises the results for the 28 regions.
<table>
<thead>
<tr>
<th>Country</th>
<th>Bulgaria</th>
<th>Croatia</th>
<th>Czech Republic</th>
<th>Greece</th>
<th>Latvia</th>
<th>Romania</th>
<th>Slovenia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urea Ammonium Nitrate savings; manure digestion, 30% N, [t]</td>
<td>11,658</td>
<td>863</td>
<td>37,976</td>
<td>44,031</td>
<td>2,351</td>
<td>27,066</td>
<td>11,776</td>
</tr>
<tr>
<td>Land needed for energy crops production, [ha]</td>
<td>12,148</td>
<td>40,427</td>
<td>93,935</td>
<td>12,986</td>
<td>19,114</td>
<td>86,218</td>
<td>21,192</td>
</tr>
<tr>
<td>Total energy-crops-based digestate quantity [t]</td>
<td>103,184</td>
<td>1,188,633</td>
<td>2,324,227</td>
<td>381,825</td>
<td>561,989</td>
<td>2,534,994</td>
<td>623,097</td>
</tr>
<tr>
<td>Potential Installed power [MW]</td>
<td>5.16</td>
<td>59.47</td>
<td>116.30</td>
<td>19.11</td>
<td>28.12</td>
<td>126.84</td>
<td>31.18</td>
</tr>
<tr>
<td>Potential production [GWh]</td>
<td>41</td>
<td>476</td>
<td>930</td>
<td>153</td>
<td>225</td>
<td>1,015</td>
<td>249</td>
</tr>
<tr>
<td>Urea Ammonium Nitrate savings; energy crops digestion, 30% N, [t]</td>
<td>2,194</td>
<td>25,278</td>
<td>49,429</td>
<td>8,120</td>
<td>11,952</td>
<td>53,911</td>
<td>13,251</td>
</tr>
<tr>
<td>Total Savings, Urea Ammonium Nitrate, [EUR]</td>
<td>4,007,091</td>
<td>7,562,135</td>
<td>25,284,489</td>
<td>15,086,228</td>
<td>4,137,608</td>
<td>23,424,857</td>
<td>7,239,933</td>
</tr>
<tr>
<td>Total investments related to the energy crops digestion, [EUR]</td>
<td>16,211,604</td>
<td>186,750,236</td>
<td>365,167,384</td>
<td>59,989,843</td>
<td>88,296,124</td>
<td>398,281,819</td>
<td>97,896,946</td>
</tr>
</tbody>
</table>

**Energy production**

The EU set a series of demanding climate and energy targets to be met by 2020, known as the "20-20-20" targets. These are:

- A reduction in EU greenhouse gas emissions of at least 20% below 1990 levels
- 20% of EU energy consumption to come from renewable resources
- A 20% reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency.

In January 2008 the European Commission proposed binding legislation to implement the 20-20-20 targets. Binding national targets for renewable energy aim to lift the average renewable share across the EU to more than double of the 2006 level (20% by 2010 instead of 9.2% in 2006). The national targets range from a renewable share of
10% in Malta to 49% in Sweden. The targets will contribute to decreasing the EU’s dependence on imported energy and to reducing greenhouse gas emissions.

Renewable will play a crucial role to meet the EU binding 2020 targets and biogas is one of them. In 2009 8.3 Mtoe of primary energy produced in the EU from biogas and 25.2 TWh of electricity. In the 28 target regions 0.883 Mtoe of energy can be produced from biogas and the electricity generation from the biogas theoretical potential (using 100% livestock manure in a CHP plant) amounted to 2,389GWh or 9.5% of the electricity generation in 2008 in the EU.

The following table summarises the results for the 28 regions:

<table>
<thead>
<tr>
<th>Country</th>
<th>Bulgaria</th>
<th>Croatia</th>
<th>Czech Republic</th>
<th>Greece</th>
<th>Latvia</th>
<th>Romania</th>
<th>Slovenia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biogas potential using livestock manure in mono digestion, GWh</td>
<td>1,144</td>
<td>388</td>
<td>2,177</td>
<td>654</td>
<td>237</td>
<td>2,153</td>
<td>831</td>
</tr>
<tr>
<td>Electricity production potential (only electricity generation), GWh</td>
<td>458</td>
<td>155</td>
<td>871</td>
<td>261</td>
<td>95</td>
<td>861</td>
<td>332</td>
</tr>
<tr>
<td>Heat production potential (only heat generation), GWh</td>
<td>1,087</td>
<td>369</td>
<td>2,068</td>
<td>621</td>
<td>225</td>
<td>2,045</td>
<td>789</td>
</tr>
<tr>
<td>Electricity production potential (in cogeneration), GWh</td>
<td>360</td>
<td>122</td>
<td>686</td>
<td>206</td>
<td>75</td>
<td>678</td>
<td>262</td>
</tr>
<tr>
<td>Heat energy production potential (in cogeneration), GWh</td>
<td>669</td>
<td>227</td>
<td>1,273</td>
<td>382</td>
<td>139</td>
<td>1,259</td>
<td>486</td>
</tr>
<tr>
<td>Potential energy from biogas in gross final consumption, %</td>
<td>1.8</td>
<td>0.4</td>
<td>0.8</td>
<td>0.2</td>
<td>0.4</td>
<td>0.4</td>
<td>1.3</td>
</tr>
<tr>
<td>Biogas energy share in national renewable targets in 2020, %</td>
<td>11.5</td>
<td>2.0</td>
<td>6.3</td>
<td>0.8</td>
<td>1.1</td>
<td>1.1</td>
<td>5.2</td>
</tr>
<tr>
<td>Biogas energy share in national biogas target in 2020, %</td>
<td>18.4</td>
<td>48.4</td>
<td>68.2</td>
<td>3.0</td>
<td>41.1</td>
<td>14.0</td>
<td>54.9</td>
</tr>
<tr>
<td>Number of households supplied with electricity (generated in cogeneration)</td>
<td>103,580</td>
<td>29,533</td>
<td>201,464</td>
<td>48,061</td>
<td>31,751</td>
<td>481,572</td>
<td>60,277</td>
</tr>
<tr>
<td>Number of households supplied with final energy</td>
<td>133,324</td>
<td>30,306</td>
<td>139,310</td>
<td>46,259</td>
<td>12,057</td>
<td>169,677</td>
<td>47,236</td>
</tr>
</tbody>
</table>
Socio-economic issues

The socio-economic benefits of biogas exploitation in the 28 target regions are summarised in the following table:

<table>
<thead>
<tr>
<th>Country</th>
<th>Bulgaria</th>
<th>Croatia</th>
<th>Czech Republic</th>
<th>Greece</th>
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<th>Romania</th>
<th>Slovenia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity production potential (in cogeneration), GWh</td>
<td>360</td>
<td>122</td>
<td>686</td>
<td>206</td>
<td>75</td>
<td>678</td>
<td>262</td>
</tr>
<tr>
<td>Installed capacity (MW)</td>
<td>48.35</td>
<td>16.52</td>
<td>92.13</td>
<td>27.67</td>
<td>10.07</td>
<td>91.06</td>
<td>35.05</td>
</tr>
<tr>
<td>Number of biogas plants (installed capacity of 0.5MW)</td>
<td>97</td>
<td>33</td>
<td>184</td>
<td>55</td>
<td>20</td>
<td>182</td>
<td>70</td>
</tr>
<tr>
<td>Number of people employed</td>
<td>151-919</td>
<td>52-314</td>
<td>288-1,750</td>
<td>87-526</td>
<td>32-191</td>
<td>285-1,730</td>
<td>110-666</td>
</tr>
<tr>
<td>Investment cost, M€</td>
<td>151.8</td>
<td>51.9</td>
<td>289.3</td>
<td>86.9</td>
<td>31.6</td>
<td>285.9</td>
<td>110</td>
</tr>
</tbody>
</table>

Biogas projects still need high investment costs and the revenue comes mainly from the pricing tariff system for electricity production for RES. The theoretical total installed capacity was assessed to 320.85 MW and the necessary investment cost is about €1.007 billion.

In the case of small farm scale plants the part time employment of the farmer can give benefits and parallel new income opportunities. The implementation of biogas plants can increase direct or indirect the jobs during the all project phases and lifetime and for the needs of BiogasIN projects it was assessed that about 640 new small biogas plants (0.5MW each) can be located in the selected areas creating a range of about 1,000-6,100 new jobs. In Germany the employment in biogas sector in 2008 reached to 7,300 jobs (4,000 jobs in the O&M sector and 3,400 to the biogas plants development, Federal Ministry for the Environment, Nature Conservation and Nuclear Safety). Today, about 5,000 biogas facilities are in operation in the German countryside.

Biogas exploitation falls in line with the aims of the Directive 2009/28/CE for the further penetration of RES in the European energy mix by 2020, but also meets the objectives of the environmental legislation like Directive 1993/31/EC on the landfill of waste and Directive 2008/98/EC on waste. In the case of small agricultural biogas plants biogas utilization contribute to rural development as well (56% of the population in the EU-27 living in rural areas, which cover 91% of the territory). Central and Eastern European countries, with still substantial agriculture sectors, can benefit from biogas development. For that, streamlining the permitting and financing procedures is requirement.
Financing mechanisms for biogas projects in Central and Eastern Europe

Henning Hahn, Asya Jentsch (IWES)

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.

Error! Reference source not found. 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 1: Types of renewable energy financing mechanisms

<table>
<thead>
<tr>
<th></th>
<th>Direct</th>
<th>Quantity-driven</th>
<th>Indirect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Regulatory</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investment-focused</td>
<td>Investment incentives</td>
<td>Tendering system for investment grant</td>
<td>Environmental taxes</td>
</tr>
<tr>
<td></td>
<td>Tax credits</td>
<td></td>
<td>Simplification of authorisation procedures</td>
</tr>
<tr>
<td></td>
<td>Low interest/Soft loans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generation-based</td>
<td>(Fixed) feed-in tariffs</td>
<td>Tendering system for long-term contracts</td>
<td>Connection charges, balancing costs</td>
</tr>
<tr>
<td></td>
<td>Fixed premium system</td>
<td>Tradable Green Certificate system</td>
<td></td>
</tr>
<tr>
<td><strong>Voluntary</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investment-focused</td>
<td>Shareholder programmes</td>
<td></td>
<td>Voluntary agreements</td>
</tr>
<tr>
<td></td>
<td>Contribution programmes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generation-based</td>
<td>Green tariffs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Bagwitz et al. (2007)

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.
**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.
**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 producer 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).

**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.

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.

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.

**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.

### 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.

### 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 with the following figure.

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).

**Prices for electricity produced from biogas**

An overview about prices for each kWh\textsubscript{el} generated from agricultural biogases in the analyzed countries is given in Figure 2. Italy with up to 28 ct/kWh\textsubscript{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.
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 gains higher prices than sewage gas or landfill gas. Prices for electricity produced from landfill and sewage gas are 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 of the feedstock for biogas plants to 70 kilometers resp. 100 kilometers. Austria and Germany are additionally providing premiums for the production of biogas 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 the following table.

**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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<tbody>
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<td>Germany</td>
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Figure 2: Overview about prices for electricity from biogas

Source: BMU 2012, Sioulas et al. 2011, Hahn et al. 2010
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<thead>
<tr>
<th>Country / Payment Differentiation</th>
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<th>Sewage gas, landfill gas, agricultural biogas</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.

![Figure 3: Guaranteed price duration for electricity from biogas in the analyzed countries](source)

**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 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 incentives</th>
<th>Tax incentives</th>
<th>Low interest/Soft loans</th>
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<td>Germany</td>
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Source: Hahn et al. 2010, Sioulas et al. 2012, BMU 2012,

**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.

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.

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.
Following the different studies and surveys, the main bottlenecks of the permitting and financing procedures could be identified for Bulgaria. In order to improve the conditions for biogas projects and to enhance reaching the 2020 targets the following can be recommended:

**Administrative procedures**

Administrative procedures are still long and complex in Bulgaria, delaying projects and discouraging investors. To achieve a clear and simple procedure, encouraging the development of the biogas market, the following actions are recommended:

- Capacity building for authorities: general information about biogas, benefits and potential, examples of operating plants
- Simplify the permission procedure: concentrate the procedure in “one stop shop” where all information and necessary documentation are available at one point
- Clear distribution of the responsibilities among the authorities
- Provide a guideline “Permitting procedure for biogas projects”, including all required permits, conditions and the necessary documents to receive them, costs, number of days/weeks to obtain the permits and the responsible body
- Revise costs for permitting permits, they should not be an obstacle for project development

**Financing procedures**

Access to biogas project financing is still difficult in Bulgaria, building a major hurdle for the development of biogas projects. To improve the access to investment capital, the following actions are recommended:

State:

- Provide a guideline: “Financing of biogas projects” including national and international support instruments, national banks and their products for biogas project financing

Banks:
- Capacity building for the bank management board: current situation of the biogas market in Europe, general information about biogas process, benefits and potential, examples of successful biogas project financing.
- Capacity building for bank employees: banks should have at least one specialist for RES projects who is also well informed about biogas aspects. A training program for these specialists should focus on the current situation of the biogas market in Europe, general information about biogas process, evaluation criteria for biogas project loan applications and risk parameters. This training may be continuous (once a year) in order to follow technological or legal evolution.
- Creation of a designated department for RES/biogas and development of new financing products (revise actual required equity capital and interest rates).
- Communication of possibilities and conditions for biogas project financing (information sheet, guideline, ...)

Project developers:
- Capacity building for project developers: general information about biogas process, available technology, plant design, economic evaluation and administrative and financing procedures (e.g. how to apply for a bank loan)

Other recommendations
- Promotion of the benefits of biogas production to the society in order to create a friendly environment for biogas projects.
- Establishment of a biogas association, which can help farmers and investors with guides throughout the project.

CROATIA

Following the different studies and surveys, the main bottlenecks of the permitting and financing procedures could be identified for Croatia. In order to improve the conditions for biogas projects and to enhance reaching the 2020 targets, the following can be recommended:

Administrative procedures

Administrative procedures are still slow and inefficient in Croatia, delaying projects and discouraging investors. To achieve a clear and simple procedure, encouraging the development of the biogas market, the following actions are recommended:

- Capacity building for authorities: general information about biogas, benefits and potential, and examples of operating plants.
- Simplify the permission procedure: concentrate the procedure in “one stop shop” where all information and necessary documentation are available at one point. In particular, the permit for the grid connection should be simplified.
- Clear distribution of the responsibilities among the authorities
- Authorities should hire staff to have more capacity to evaluate demands and improve conditions for employees
- Provide a guideline “Permitting procedure for biogas projects”, including all required permits, conditions and the necessary documents to receive them, costs, number of days/weeks to obtain the permits and the responsible body.

**Financing procedures**

Access to biogas project financing is still difficult in Croatia, building a major hurdle for the development of biogas projects. To improve the access to investment capital, the following actions are recommended:

**State:**
- Provide a guideline: “Financing of biogas projects” including national and international support instruments, national banks and their products for biogas project financing

**Banks:**
- Capacity building for the bank management board: current situation of the biogas market in Europe, general information about biogas process, benefits and potential, examples of successful biogas project financing
- Capacity building for bank employees: at least one specialist for RES projects who is also well informed about biogas aspects. A training program for these specialists should focus on the current situation of the biogas market in Europe, general information about biogas process, evaluation criteria for biogas project loan applications and risk parameters. This training may be continuous (once a year) in order to follow technological or legal evolution.
- Creation of a designated department for RES/biogas and development of new financing products (revise actual required equity capital and documents)
- Communication of possibilities and conditions for biogas project financing (information sheet, guideline, …)

**Project developers:**
- Capacity building for project developers: general information about biogas process, available technology, plant design, economic evaluation and administrative and financing procedures. The importance of a guarantee for long-term feedstock supply should be underlined.

**CZECH REPUBLIC**

Following the different studies and surveys, the main bottlenecks of the permitting and financing procedures could be identified for Czech Republic. In order to improve the conditions for biogas projects and to enhance reaching the 2020 targets, the recommendations can be summarised as follows:
Administrative procedures

Administrative procedures are still long and complex in Czech Republic delaying projects. To achieve a clear and simple procedure, encouraging the development of the biogas market, the following actions are recommended:

- Capacity building for authorities: general information about biogas, benefits and potential, and examples of operating plants
- Simplify the permission procedure: concentrate the procedure in “one stop shop” where all information and necessary documentation are available at one point
- Clear distribution of the responsibilities among the authorities
- Provide a guideline “Permitting procedure for biogas projects”, including all required permits, conditions and the necessary documents to receive them, costs, number of days/weeks to obtain the permits and the responsible body.

Financing procedures

Access to biogas project financing in Czech Republic is better than in the other target countries. Though, the access to investment capital can still be improved:

Banks:

A few banks have introduced specific energy efficiency loans and their employees are well informed about financing options for biogas projects: GE money, Raiffeisen, Erste Bank CZ, Investment Bank. They also offer guidelines on how to finance biogas projects. Though, loan conditions and other banks’ settings may still be improved:

- Information of bank management board in order to raise trust in biogas projects: current situation of the biogas market in Europe, examples of successful biogas project financing, loan conditions in European countries with an established biogas market (Germany, Austria)
- Capacity building for bank employees: at least one specialist for RES projects who is also well informed about biogas aspects. A training program for these specialists should focus on the current situation of the biogas market in Europe, general information about biogas process, evaluation criteria for biogas project loan applications and risk parameters. This training may be continuous in order to follow technological or legal evolution.
- Revise the necessity of the actual high required equity capital and interest rates

Project developers:

- Capacity building for project developers: general information about biogas process, available technology, plant design, economic evaluation and administrative and financing procedures (e.g. how to apply for a bank loan). In particular, the importance of a guarantee for long-term feedstock supply should be underlined.
Other recommendations

- Promotion of the benefits of biogas production to the society in order to create a friendly environment for biogas projects and improve public attitude towards biogas and other RES projects.

GREECE

Following the different studies and surveys within BiogasIN project, the main bottlenecks of the permitting and financing procedures could be identified for Greece. In order to improve the conditions for biogas projects implementation and to enhance reaching the 2020 targets, specific recommendations are:

Administrative procedures

Administrative procedures are still long and complex in Greece, delaying projects and discouraging investors. To achieve a clear and simple procedure, encouraging the development of the biogas market, the following actions are recommended:

- Capacity building for authorities: general information about biogas, benefits and potential, and examples of operating plants
- Simplify the permission procedure: concentrate the procedure in “one stop shop” where all information and necessary documentation are available at one point
- Clear distribution of the responsibilities among the authorities
- Provide a guideline “Permitting procedure for biogas projects”, including all required permits, conditions and the necessary documents to receive them, costs, number of days/weeks to obtain the permits and the responsible body.

Financing procedures

Access to biogas project financing is still difficult in Greece, building a major hurdle for the development of biogas projects. To improve the access to investment capital, the following actions are recommended:

State:

- Provide a guideline: “Financing of biogas projects” including national and international support instruments, national banks and their products for biogas project financing

Banks:

- Capacity building for the bank management board: current situation of the biogas market in Europe, general information about biogas process, benefits and potential, examples of successful biogas project financing
- Capacity building for bank employees: banks should have at least one specialist for RES projects who is also well informed about biogas aspects. A training program for these specialists should focus on the current situation
of the biogas market in Europe, general information about biogas process, evaluation criteria for biogas project loan applications and risk parameters.
This training may be continuous (once a year) in order to follow technological or legal evolution.
- Creation of a designated department for RES/biogas and development of new financing products (revise actual required equity capital and interest rates)
- Communication of possibilities and conditions for biogas project financing (information sheet, guideline, …)

Project developers:
- Capacity building for project developers: general information about biogas process, available technology, plant design, economic evaluation and administrative and financing procedures (e.g. how to apply for a bank loan)

Other recommendations
- Promotion of the benefits of biogas production to the society in order to create a friendly environment for biogas projects and achieve public acceptance.

LATVIA
Following the different studies and surveys, the main bottlenecks of the permitting and financing procedures could be identified for Latvia. In order to improve the conditions for biogas projects and to enhance reaching the 2020 targets, specific recommendations are:

Policy framework
- Develop a new, long term, stable proposal for biogas support where biogas contribution will be foreseen not only in electricity generation sector, but also in heating and cooling (RES-H) and in transport (RES-T) sectors
- Introduction of requirements regarding heat use efficiency for existing and future biogas plants
- Creation of an inter-disciplinary working group from representatives of all three ministries involved in the biogas sector in order to solve the biogas issue in a global way (instead of considering it from the perspective of each separate field)
- Fast liberalisation of the natural gas grid
- Third party access for biomethane injection should be guaranteed
- Development of a legislative framework for biomethane injection, distribution and use
- Introduction of new tax policy for calculation of transport taxes and decreasing other costs for the cars using biomethane, in order to be able to use biomethane in transport
- Improvements in the feed-in tariff system:
1) Cancelling of decisions for biogas project developers that has not been able to build and start operate their plants according to deadlines;

2) To reconsider the amount of support provided with the feed-in tariff taking into account other related costs and incomes (e.g., the direct payments for farmers, exemption from taxes, etc.) and by comparing them to other European countries

- Creation of a list of priority substrates, where waste products and by-products from industry are given the highest priority. This will help to limit cultivation of energy crops and will decrease the land competition with traditional agricultural productions

- Develop requirements for digestate management and use

- Set up manure management requirements for newly constructed farms and mention anaerobic digestion as one of the options

- So far the draft Energy Strategy 2030 for Latvia foresees only waste incineration. Source separation must be integrated into the strategy in order to use the organic fraction of the solid municipal waste for anaerobic digestion

- Develop and mobilise local research capacity in the field of biogas and cooperation between scientists and biogas industry. Closer cooperation will allow developing local production of biogas equipment or individual components of biogas plants.

**Administrative procedure**

- Strengthen the feed-in tariff regulation by introducing new amendments that will ensure timely construction of biogas plants and putting them into operation

- Clear settings regarding compliance with the land use plan, building requirements, environmental requirements and putting into operation of plants

- Support for biogas should be targeted mainly for renewable electricity production or biogas use in transport. The access to gas grid should be facilitated.

- Show the experience of operating biogas plants in Latvia that prove the reliability of biogas as sustainable energy source. Successful biogas projects are demonstrating that optimal technical solution and project structure gives economically feasible result and is benefit for all involved parties (farmers, banks, local government and society in general).

**Financing procedure**

- State support in form of grants should be targeted to biogas investments that are concerned with raising energy efficiency of the plant and facilitating the use of biogas in district heating systems (RES-H) or in transport (RES-T). This approach will help to avoid having uncontrolled impact on electricity tariff for the energy end users.

- It is necessary to facilitate cooperation among biogas producers and heating companies. The first step in this direction would be taking off the 9% profit cap in tariff calculation methodology and to allow purchase heat from third parties at unlimited low price.
- Change of the support condition of the Rural Support Service program: a part of the investment (e.g. a satellite cogeneration plant) should be accepted in areas with more than 5000 inhabitants
- Part of the grid connection costs should be covered by the grid operator or from other sources instead of everything to be paid by the biogas producer
- New biogas loan program in state owned bank would be a solution to keep the outflow of the capital lower
- Trainings for bank employees and experts regarding biogas issues: Demonstrating the various aspects of biogas production and use, pointing out the criteria for evaluating the biogas project loan applications
- Inform biogas project developers and potential biogas producers (farmers) about the financing possibilities. Emphasize the project aspects that are considered by banks when evaluating the loan applications

ROMANIA

Following the different studies and surveys, the main bottlenecks of the permitting and financing procedures could be identified for Romania. In order to improve the conditions for biogas projects and to enhance reaching the 2020 targets, the following can be recommended:

General framework

- unstable legislative framework related to electricity and RES (included biogas) and lack of proper detailing
- inertia on the reorganization of the agricultural sector, and thus on biogas (which has a very slow development)
- unbalanced development of renewable energy sector, focusing on technologies quickly profitable

Administrative procedure

Administrative procedures are still long and complex in Romania, delaying projects and discouraging investors. To achieve a clear and simple procedure, encouraging the development of the biogas market, the following actions are recommended:

- Capacity building for authorities: general information about biogas, benefits and potential, and examples of operating plants
- Simplify the permission procedure: concentrate the procedure in “one stop shop” where all information and necessary documentation are available at one point
- Clear distribution of the responsibilities among the authorities
- Provide a guideline “Permitting procedure for biogas projects”, including all required permits, conditions and the necessary documents to receive them, costs, number of days/weeks to obtain the permits and the responsible body.
- Revise costs for permitting permits; they should not be an obstacle for project development.
**Financing procedure**

State:

- Provide a guideline: “Financing of biogas projects” including national and international support instruments, national banks and their products for biogas project financing
- To improve the investment conditions into the biogas plants (special funds, feed in tariffs and other supports)

Banks:

- Capacity building for the bank management board: current situation of the biogas market in Europe, general information about biogas process, benefits and potential, examples of successful biogas project financing
- Capacity building for bank employees: banks should have at least one specialist for RES projects who is also well informed about biogas aspects. A training program for these specialists should focus on the current situation of the biogas market in Europe, general information about biogas process, evaluation criteria for biogas project loan applications and risk parameters. This training may be continuous (once a year) in order to follow technological or legal evolution.
- Creation of a designated department for RES/biogas and development of new financing products (revise actual required equity capital, interest rates and documents). Shorten negotiation procedure
- Communication of possibilities and conditions for biogas project financing (information sheet, guideline, ...)

Project developers:

- Capacity building for project developers: general information about biogas process, available technology, plant design, economic evaluation and administrative and financing procedures (e.g. how to apply for a bank loan)

**SLOVENIA**

Following the different studies and surveys, the main bottlenecks of the permitting and financing procedures could be identified for Slovenia. In order to improve the conditions for biogas projects and to enhance reaching the 2020 targets, specific recommendations are formulated in the following chapters.

**General framework**

- Adapt Energy Strategy to favour biomass exploitation
- Support the local development of biogas technology

**Administrative procedure**

Administrative procedures are still long and complex in Slovenia, delaying projects and discouraging investors. To achieve a clear and simple procedure, encouraging the development of the biogas market, the following actions are recommended:
- Capacity building for authorities: general information about biogas, benefits and potential, and examples of operating plants
- Simplify the permission procedure: concentrate the procedure in “one stop shop” where all information and necessary documentation are available at one point
- Clear distribution of the responsibilities among the authorities
- Authorities should hire staff to have more capacity to evaluate demands
- Provide a guideline “Permitting procedure for biogas projects”, including all required permits, conditions and the necessary documents to receive them, costs, number of days/weeks to obtain the permits and the responsible body
- Revise costs for permits; they should not be an obstacle for project development
4 CAPACITY BUILDING FOR BIOGAS MARKET STAKEHOLDERS

The aim of BiogasIN project was to support development of a sustainable biogas market in Central and Eastern Europe (CEE) by targeting administrative barriers both in permitting and financing phases. Based on the lessons learned from previous projects and characteristics of biogas markets in countries with well functioning markets capacity building of key stakeholders was recognised as an effective tool for fulfilling the aim of the project. In that respect BiogasIN focused a number of activities in building the capacity among the public sector (national, regional and local governments and administrations responsible for permitting process of agricultural biogas plants), financial sector (representatives of development and commercial banks) and potential and existing biogas investors (farmers and developers).

The objective was to create awareness, trust in the technology and the sensibility that biogas is a reliable energy, produced with a technology that contributes to the GHG and waste reduction. The credibility of biogas production technologies will increase the bankability of biogas projects and fasten the administrative permitting procedures. In addition, BiogasIN initiated close collaboration among all stakeholders and vertical and horizontal working groups or associations that will facilitate governments to tailor the biogas policy.

This was achieved by a large-scale capacity building campaign, which encompassed 56 capacity building trainings for target audience, 7 interactive forum events, 14 high level conferences and 2 biogas study tours. Analyses and surveys implemented at the initial phase of the project were used as a baseline for development of information materials and for streamlining discussion among the biogas market stakeholders. Each capacity building event was targeted for a specific audience as to provide possibility to focus on the issues most relevant for the respective stakeholder group. These events as well as the high level conferences, where all stakeholder groups were represented were used as a “preparation” for an open discussion between different stakeholders during the interactive forum. The focus of the interactive forums was national biogas roadmap. In this was all stakeholder groups were given the opportunity to raise their concerns and to contribute to national biogas policy development.

The materials used in the capacity building events included best practice examples and overviews of the state of affairs in CEE countries. The best practice examples were developed by the project partners from the countries with developed and sustainable biogas markets, while the country specific materials were developed by partners from seven CEE target countries. The following guidelines and information materials are available:

- Best practice examples for biogas permitting;
- Best practice examples for biogas financing options;
- Information material for farmers/investors;
- Information material for administrative bodies;
- Biogas checklist for administrative bodies;
- Information material for financing bodies;
- Criteria to access biogas investments;
- Booklet on possibilities of financing a biogas investment.
All materials are available in English and the national languages of the project partners on the BiogasIN Project website: www.biogasin.org.

The outcomes of the capacity building implemented through BiogasIN are the following:

- 280 representatives from administrative bodies took part in 14 capacity building trainings for administrative bodies (2 events in each of the seven CEE target countries)
- More than 500 potential investors in agricultural biogas plants were educated on permitting procedures and financing options through 28 capacity building trainings for farmers/biogas investors in permitting procedure (2 events on permitting procedures and 2 on financing options in each of the seven CEE target countries)
- 160 representatives from financial institutions participated in 14 capacity building trainings for financing bodies’ staff (2 events in each of the seven CEE target countries)
- More than 200 biogas market stakeholders took part in 7 interactive forums (1 interactive forum in each of the seven CEE target countries)
- More than 900 people active in biogas policy making and in CEE biogas market participated in 14 high level conferences on biogas (2 events in each of the seven CEE target countries)
- 36 representatives of administrative bodies, financing institutions and potential investors from CEE countries took part in 2 study tours in Germany, Austria and Czech Republic

At the high level conferences and the study tours the policy makers and biogas market stakeholders from CEE countries had the opportunity to learn more about the state of biogas markets and the experience in the EU countries with developed biogas market as well as in other CEE countries.
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