Examples for financing of biogas projects in Germany, Austria, The Netherlands, Denmark and Italy

D.3.2.1, WP3

IEE Project ‘BiogasIN’

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November 2010

This Project (Contract No. EIE/07/214) is supported by:
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1. Introduction

The implementation of biogas projects requires three preconditions: good and stable legislative framework conditions, easy and transparent permitting procedures, as well as access to financing. If one of these three preconditions is weak or not given, the biogas project risks failure. In Europe, these preconditions are very good in countries like Germany and Austria. In other countries there is still considerable effort needed to improve them.

The present report provides an outline for financing conditions and procedures in the top 5 EU countries with developed biogas market for agricultural biogas plants: Germany (about 5000 agricultural biogas plants), Austria (320 biogas plants), Denmark (about 22 co-operated and 60 farm scaled biogas plants), the Netherlands (about 90 agricultural biogas plants) and Italy (150 farm based biogas plants). The graph on the next page illustrates the energy production of biogas in Europe.

This report serves as overview of good practices for biogas financing in countries with developed biogas markets. More precisely, this report shall assist policy makers and financing bodies in the BiogasIN countries: Bulgaria, Croatia, Czech Republic, Greece, Latvia, Romania and Slovenia to develop good framework conditions for biogas financing.

The BiogasIN project is supported by the “Intelligent Energy for Europe Programme” by the European Commission and aims to create a sustainable biogas market in Central and Eastern Europe (CEE): Bulgaria, Croatia, Czech Republic, Greece, Latvia, Romania and Slovenia. Core of BiogasIN is the removal of framework barriers in CEE: high administrative barriers both in permitting and financing phases.

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D.3.2 Best practice examples for financing biogas projects

Figure 1: Primary energy production of biogas in Europe in 2007 [EurObserv'er]

Legend: 
- Landfill gas
- Sewage sludge gas
- Other biogas (decentralised agricultural plant etc.)
2. Basics of financing biogas projects

The initial investment for a biogas plant is generally very high and it usually requires the application of sound financing tools. The following list includes the investments and costs for a typical agriculture biogas plant:

- Costs for planning: engineering costs, costs for permits, taxes, certificates, etc.
- Costs for equipment (investment costs): technical equipment, buildings, storage facilities, infrastructure, grid connection, etc.
- Costs for feedstock
- Operation and maintenance costs: personnel, spare parts, repair, material, digestate management etc.
- Costs of financing: interest, fees, etc.

The following list describes the revenues of biogas projects:

- Electricity and heat sale/savings
- Public subsidies
- Green certificates
- Revenues from tipping fees in biogas plants for waste
- Revenues from sales of digestate as organic fertiliser
- Savings from manure management (disposal fee)

Depending on the size of the biogas projects and the feedstock type, typical investors in biogas plants are single farmers, several farmers jointly investing in one biogas plant, and industry. In some cases also other investors are involved, such as e.g. municipalities or waste companies.

Financing bodies will finance biogas projects depending on the expected financial performance compared to the project risks and depending on the credit worthiness of the investor. In general, profitability of investment in biogas project strongly depends on availability of the national supporting scheme (either as feed-in tariff or green certificates) and assurance that the project in question will be eligible to benefit from the support system at the operational phase.

Due to the high capital costs, usually debt capital is required for the implementation of biogas projects. Furthermore, equity capital of 20-30% of the total capital cost is usually required. In some countries, it is possible to receive a certain amount of project funding from public sources or to obtain low-interest credits. Public sources should be considered and included in the calculation/financial planning process. Subsidies for biogas plants can be received for various fields of interest: agriculture, regional development, renewable energy projects, environment, structural funds, etc.
Common financing methods are **credits from private banks**. As indicated in Figure 2 below, there are two main types of typical financing for biogas projects: traditional financing by loans and project financing.

![Diagram of financing methods](image)

**Figure 2: Traditional loan financing and project financing concepts**

For **traditional financing** the credit history of the company or investor (e.g. farm) plays an important role. On the one hand, the liability of the company depends on the assets of the biogas plant and, on the other hand, of the company which is in many cases the farm. Decisions of the financing bodies depend upon the annual financial statements of the company. This is the typical financing tool for single farmers investing in biogas projects.

In the framework of the **project financing**, the biogas project itself is regarded as legal entity (Figure 2). This tool is often used for projects in which several shareholders are involved (e.g. several farmers). Main criteria of this future oriented concept are rates of return and success of the project. Decisions regarding loans are based on the assets and the cash-flow of the biogas project. The predictability of the cash-flow is thereby the important parameter/criteria, depending on following factors:

- Technology of the project
- Location of the project
- Contracts of electricity and heat sale
- Availability and price of feedstock material
- Legislation and insurance
- Qualification and knowledge of the operator

Due to the good and predictable framework conditions, this cash-flow based concept is widely applied, for instance, in Germany.
Another financing tool is **investment funds**. An investment fund involves money from several small investors. All of them are investing in one biogas project. Costs and benefits are shared between the investors upon 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 and methane content.

Another financing option would be the cooperation with **energy contractors**. A contractor is usually a company specialised in biogas production. The type of cooperation with these contractors is manifold.

Finally, a biogas plant or dedicated equipment can be **leased**. The leasing company and the biogas plant operator are concluding a leasing contract. This may include whole biogas plants or the cogeneration unit, only. Leasing of cogeneration units is widely applied.

All above financing options could be combined and form some kind of derivative tailored for targeted niche of investors.
3. Financing of biogas projects in Germany

In Germany, the good framework for implementing biogas projects has contributed to the installation of about 5000 agricultural biogas plants and of many industrial biogas plants (including wastewater treatment plants and landfill sites) with an electrical capacity of about 2 000 MW. Good financing opportunities were an important milestone for this success. Prerequisite for the development of financing opportunities were the following issues:

- Development of good policies for biogas project development including the introduction of feed-in electricity tariffs
- Availability of a sound biogas industry with mature technical concepts and technologies (including turn-key plants) creating confidence by banks and investors
- Calculability of the financial risk of biogas projects due to stable policies, legislation, and due to the accumulated knowledge about biogas in Germany.

In Germany, typical investors in biogas plants are single farmers, several farmers jointly investing in one biogas plant, municipalities, energy utilities, waste companies, and industry. The size of the biogas project and the feedstock type influences the capital costs which usually ranges from 2 500 to 6 000 €/kW. The average electrical size of biogas plants in Germany is about 400 – 500 kW. Thus, capital costs are usually too high for financing with equity capital only, and thus, financing concepts usually include a large percentage of debt capital.

3.1. Support tools in Germany

As described above, the general framework conditions in Germany are very suitable for biogas projects and include various support mechanisms, which enable the application of several financing tools.

The main legislative driver for renewable energy development in Germany is the Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz, or EEG), promoting the development of renewable energy sources with an electricity feed-in tariff scheme. The latest version of the EEG was issued in 2009. It includes a feed-in tariff scheme for biogas. Grid operators must pay a government-specified feed-in tariff for 20 years to biogas plant operators supplying electricity to the grid. This feed-in tariff includes a basic tariff which ranged from 0.1167 to 0.0779 €/kW_{el} in 2009 depending on the size of the biogas plant. It also includes several bonuses for several issues, such as for dedicated energy crops, CHP, technologies, manure, and formaldehyde. Furthermore, there is an annual digression of 1% of the tariff for newly installed plants. The introduction of the EEG was the main driver for attracting investment and for creating financing opportunities, since it ensures revenues for 20 years. This framework makes biogas projects in Germany calculable.
D.3.2 Best practice examples for financing biogas projects

Table 1: Electricity feed-in tariffs in Germany 2009 (€ct/kWh$_{el}$)

<table>
<thead>
<tr>
<th>€-ct/kWh$_{el}$</th>
<th>Basic tariff (2009)</th>
<th>Bonus for energy crops</th>
<th>Bonus for CHP</th>
<th>Technology bonus</th>
<th>Bonus for manure</th>
<th>Formaldehyde bonus</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 150 kW$_{el}$</td>
<td>11.67</td>
<td>7</td>
<td>3</td>
<td>up to 2</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>&lt; 500 kW$_{el}$</td>
<td>9.18</td>
<td>7</td>
<td>3</td>
<td>up to 2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>&lt; 5 MW$_{el}$</td>
<td>8.25</td>
<td>4</td>
<td>3</td>
<td>up to 2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>&lt; 20 MW$_{el}$</td>
<td>7.79</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Apart from the EEG, several national and regional subsidies and low interest loans support biogas financing in Germany. One of the main subsidy programs on national level is given by kfw bank (kfw Bankengruppe) which provides low interest loans. For private investors kfw loans are only provided indirectly through private banks.

On the federal state level, support depends on the current political framework and is subject of continuous changes. Subsidies up to 50% and up to 150 000 € for the investment were given by dedicated federal states to stimulate the market. Today limited (direct) subsidies are provided by federal states only. For instance North Rhine-Westphalia is supporting biogas projects in the “progress.nrw” program.

Another increasing opportunity to gain revenues from biogas production in Germany is the sale of upgraded biogas to natural gas quality (biomethane) through the national natural gas distribution network. In Germany currently about 40 biomethane injection plants are installed. The price of grid-injected biomethane is not guaranteed like the fixed electricity feed-in tariff. It depends on market prices of natural gas and the sale as “green energy”. The last version of the regulation on access to the natural gas grid (Gasnetzzugangsverordnung; GaNZV) from 2010, allows biomethane producers to inject biomethane into the natural gas grid and regulates the costs for the grid access: For grid access in less than 1 km distance, 75 % of the costs (for the grid access) has to be paid by the grid operator, 25% (up to 250 000 €) by the biogas plant operator.
3.2. Financing tools in Germany

Investors in Germany have several opportunities to receive assistance in financing biogas projects by several private consulting and technology companies specialised in financing and leasing of biogas projects, but also by specialised staff of banks and credit institutes.

According to several banks in Germany equity capital of 20-30%, is required for sound financing of biogas projects. The most common financing method in Germany is credits from private banks including both, traditional and project financing. Due to the good and predictable framework conditions of the EEG in Germany, the cash-flow based project financing is widely applied.

Generally, many banks in Germany are well prepared to finance biogas projects and usually have dedicated experts. Most house banks of farmers are familiar with this topic and will provide assistance in biogas projects. Examples for active banks in biogas financing are Umweltbank AG, DZ Bank, DKB Deutsche Kreditbank, and Hypovereinsbank. Several banks are providing online questionnaires for future biogas investors. These questionnaires are used to assess the frameworks of the projects and to initiate the communication between banks and investors.

Links to financing questionnaires of banks and companies in biogas projects are:

- Umweltbank (bank): [http://www.umweltbank.de/kredit/index_projektfinanzierung.html](http://www.umweltbank.de/kredit/index_projektfinanzierung.html)


A few projects were realised with investment funds, only. Examples are the „Biogasfonds Hünxe“ of the Aufwind Schmack Betriebs GmbH & Co. Hünxe Biogas KG, the „Biogasfonds Sachsen-Anhalt“ of the ABO Wind Biogas Sachsen-Anhalt GmbH & Co. KG or the „Biogasfonds Deutschland“ of the BEV BioEnergie GmbH & Co. KG.

Also the application of energy contracting in the field of biogas production is currently not often applied. On the other hand, leasing of cogeneration units is widely applied in Germany.

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1An example for a credit request form, based on the German form of the Umweltbank AG, is attached in the Annex.
4. Biogas plant financing in Austria

Since the turn of the millennium there has been a large growth in the building of new biogas plants in Austria. But from 2005 this development has decreased due to the unfavourable conditions of the EEA (Ökostromgesetz or Eco-electricity Act). The stop-and-go policy of this law led to a decrease in investments and was detrimental to the planning phase for biogas plants. Today about 320 biogas plants with an electrical capacity of 76 MW are installed. Furthermore 8 biogas plants have been built for the production of biomethane, including upgrading systems for feed-in into a natural gas net or for the use of biomethane as petrol.

Besides good financing opportunities, other prerequisites are important for the development of a sound biogas market:

- Development of stable policies for biogas project development
- The introduction of feed-in electricity tariffs with a stable long term strategy
- Best practice plants and a good backing through the population
- Calculability of the financial risk of biogas projects due to stable policies, legislation, and due to the accumulated biogas knowledge.

Typical investors in biogas plants are single farmers, groups of farmers jointly investing in one biogas plant, municipalities, energy utilities, waste companies and the industry. The average electrical size of biogas plants in Austria is about 250 kW_{el}.

The size of the biogas project and the feedstock type furthermore influence the capital costs which in Austria usually range from 4 500 to 7 000 €/kW_{el}. Capital costs are usually too high to be financed using equity capital only, and thus, financing concepts usually include a large percentage of debt capital. The diagram below shows the specific investment costs of several plant sizes.
Figure 3: Investment costs of biogas plants with agricultural feedstock [€/kWel] (Source: Austrian Compost&Biogas Association)

4.1. Support tools in Austria

At the moment the prerequisites for new biogas plants are not very favourable in Austria due to low feed-in tariffs and volatile feedstock prices for corn silage. Since 2005, investors have reacted conservatively to investing in new biogas plants due to unsafe framework conditions.

The EEA encourages production via feed-in tariffs and via investment subsidies and a new scheme was being prepared in 2009. This includes a feed-in tariff scheme for biogas. The table below shows the current feed-in tariffs for biogas. The tariff is guaranteed for 15 years as from the beginning of the feed-in remuneration. Austria’s feed-in tariff depends on the facility size and ranges in 2010 from 0.13 to 0.185 €/kWh. Furthermore, an additional bonus of 2 €ct/kWh for combined heat and power generation (CHP) is possible.

Table 2: Feed-in tariffs for electricity production from biogas in 2010

<table>
<thead>
<tr>
<th>capacity</th>
<th>tariff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Until 250 kW</td>
<td>18.5 Cent / kWh</td>
</tr>
<tr>
<td>Until 500 kW</td>
<td>16.5 Cent / kWh</td>
</tr>
<tr>
<td>Over 500 kW</td>
<td>13.0 Cent / kWh</td>
</tr>
</tbody>
</table>

- Facilities up to 250 kW must use a share of 30% manure
- By use of non agricultural feedstock, the feed-in tariff will be reduced by 20 percent
- Additionally CHP bonus of 2 Cent / kWh when certain efficiency criteria are fulfilled

Along with the EEA, the main subsidy program on a national level is implemented through the Federal Ministry Agriculture, Forests, Environment and Water Management (BMLFUW) and managed by the “Kommunalkredit Public Consulting GmbH” which provides investment subsidies. The “Umweltförderung im Inland” covers mainly the heating sector with enterprises being the target group. In the field of biogas the following plants or plant sections are promoted in Austria.

- Biogas plants for the production of biomethane including upgrading systems for biogas for grid injection or using as petrol
- Biogas plants which use biogenic feedstock and residues (min. 50% heat use)
  - the subsidy can only be used when the biogas plant is not listed as eco electricity facility and the feed-in tariff is used
  - Otherwise only the heat distribution grid for the used waste heat can be promoted
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- The share of biogenic feedstock and residues must have a minimum of 95% of the fuel heat input

The complete environmental relevant investment costs have to be at least of EUR 10,000. The feedstock has to be captured regional. The transport distance of the feedstock is limited by 100 km.

The standard is 25% of the environmental relevant costs. An additional sustainability charge of 5% is possible. The subsidy is only granted when the biogas plant is not listed as an eco electricity facility and the feed-in tariff is used, otherwise only the heat distribution grid for the used waste heat can be promoted.

The environmental relevant costs are additional costs to reach higher standards of environmental protection which are required due to EU community law and EU environmental policy.

For reference, the investment costs of a technically comparable investment have to be considered. As far as the promoted technology using or is producing energy from renewable the reference costs based on fossil fuels or conventional feedstock. The “Kommunalkredit Public Consulting GmbH” has a list of those technologies that have to be used as reference for the major investment eligible technologies.

The opportunity to gain revenues from the sale of upgraded biogas to natural gas quality (biomethane) through the national natural gas distribution network is currently under discussion and will be promoted in the near future.

Whether from federal state or local level, support depends on the current political framework and is subject of continuous changes. At a local level, municipalities or cities also have some possibilities for implementing energy measures. The federal states have a further promotion opportunity through technology subsidies within the eco electricity act.

Biogas plants with a maximum capacity of 100 kWel have an average promotion quota of approx. 25 to 40% of the environmentally relevant total investment costs. Biogas plants with a maximum capacity of 250 kWel have an average promotion quota of approx. 20 to 30% of the environmentally relevant total investment costs. Biogas plants with a maximum capacity of 500 kWel have an average promotion quota of approx. 5% to 10% of the environmentally relevant total investments. Each time only the relevant investments for heat production were promoted.

4.2. Financing tools in Austria

There are several opportunities for financing biogas projects in Austria.

- private consulting and technology companies specialised in financing and leasing of renewable energy projects

- financing and leasing by specialised staff of banks and credit institutes.

An equity capital of 20-30% of the capital costs should be possible for a good financing performance. Generally, many banks in Austria are well prepared to finance biogas projects and usually have dedicated experts. Most house banks of farmers are familiar with this topic and will provide assistance for biogas projects. Energy contracting in the field of biogas production is currently rarely applied.
For credit approvals, all permissions and a valid supply contract with the Austrian settlement centre for green electricity (OeMAG) have to be submitted. After that the profitability will be calculated.

The financing costs are calculated using the **WACC-approach** (Weighted Average Cost of Capital). It will be assumed that investment subsidies reduce the equity. Therefore, the type of financing will be influenced by the amount of the investment subsidies.
5. Financing of biogas projects in the Netherlands

The Dutch biogas market comprises today about 90 biogas plants running on feedstock from agriculture. Electricity and upgraded biogas from biogas plants are mainly promoted in the Netherlands through price regulation in terms of bonus payments. Biogas plants in the Netherlands receive incentives depending on the source of the produced biogas and the utilisation of the waste heat. Projects where the use of waste heat is involved in the concept, or the CO₂ is used for greenhouses, are supported by the government with better incentives. Renewable energy projects become eligible for subsidies, if they use innovative new technology. Thus, subsidies are rarely granted for biogas projects. Furthermore electricity from biogas plants is exempted from fiscal regulation mechanisms, such as tax allowances for writing off investments in installation generating electricity from renewable sources.

Typical investors in biogas plants are single farmers, groups of farmers jointly investing in one biogas plant, municipalities, energy utilities, waste companies and the industry.

The biogas market in the Netherlands has developed due to the financial stimulus through the previous MEP-programme (Financial stimulation of renewable energy production in the Netherlands). Since 2008, the SDE-programme (Besluit stimulering duurzame Energie – Incentive for sustainable energy production) is in place which provides a bonus payment for electricity produced from biogas plants. The development of biogas plants decreased rapidly when the SDE programme came into force with its strongly limited budget for bonus payments. Nowadays only 30% of the applicants for the bonus payment receive financial support from the SDE scheme.

The following sections aim to give an overview of the legal aspects concerning the available means of promotion for biogas projects as well as commonly available financing tools and their conditions in the Netherlands.

5.1. Support tools in the Netherlands

As described above, the main support tool in the Netherlands is the SDE-Programme, promoting the development of renewable energy sources through price regulation in terms of a bonus payment. The bonus payment is granted to renewable energy plant operators and aims to compensate the difference between the market price for electricity from fossil resources and electricity from renewable sources. The bonus payments for electricity from biogas plants are valid for a maximum period of 12 years.

Subsidies are granted only to a limited annual amount of the allocated SDE-fund. If the accumulated amount of the subsidies exceeds the limited funds, no subsidies can be granted. Subsidies will be granted according to the date of submission of the application.

The payment scheme guarantees a fixed bonus paid to the operator from the commissioning of the biogas plant onwards. The subsidy is the difference between the base tariff and the correction price, which corresponds with the actual energy price the producer receives. The base amount is based on the average cost price of biogas or electricity from biogas, which is determined by the Minister of Economic Affairs. The correction price is determined by the Minister of Economic Affairs at the beginning of each year and finalised at the end of each year.

The feed-in base tariff for electricity from biogas in 2010 is for:
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- Co-digestion of animal manure 0.165 €/kWh; with waste heat utilization up to 0.193 €/kWh
- Digestion of other biomass 0.158 €/kWh
- Digestion of green household waste 0.129 €/kWh; with waste heat utilization up to 0.149 €/kWh
- Landfill gas and water treatment/ sewage sludge 0.059 €/kWh

The feed-in tariff for upgraded biogas depends on the type of substrate that is used to produce biogas. For the year 2010 the tariff is as follows:

- Digestion of green household waste 0.465 €/Nm³
- Digestion of other biomass 0.583 €/Nm³
- Landfill gas 0.218 €/Nm³
- Sewage sludge 0.218 €/Nm³

The feed-in tariff for electricity contains a correction price of 0.047 €/kWh. The correction price for upgraded biogas is 0.208 €/Nm³ independent of the origin of the renewable gas. This corresponds with the energy price the producer receives for his produced renewable energy on the energy market.

The state bears the funding costs. The fund for all kinds of renewable energies promoted by the SDE-Programme has increased from 1.459 m€ in 2008 to 1.958 m€ in 2010.

Besides price regulation through the SDE-Programme, biogas projects in the Netherlands are also supported by subsidies through the EOS-Programme (Besluit EOS: demo en transitie-experimenten - Order on the Allocation of Grants). The EOS-Programme came into force in 2004. It provides subsidies for research, development and market research projects in the field of renewable energy sources with a maximum grant being 40% of the total investment.

All technologies used in the generation of electricity from renewable sources in the Netherlands are eligible for subsidies from the EOS-Programme. Furthermore subsidies are only granted to companies and not to private individuals. The subsidies for the EOS Programme are funded by the budget of the Netherlands Ministry of Economic Affairs.

5.2. Financing tools in the Netherlands

In the Netherlands, the Rabobank supports the financing of about 75% of all installed biogas plants. Besides the financing through Rabobank, investors in biogas projects may receive assistance in financing their biogas projects from private consulting companies, credit institutes and private banks. The lifetime of a loan for a biogas project depends on the guaranteed subsidy period.

The success of Rabobank, or Green Finance, a Rabobank Group, in financing biogas plants is partly due to the Green funds scheme, a tax incentive scheme of the Dutch government which is only available for capital intensive investments such as large scale biogas plants. Green financing enables investors to finance green projects less expensively, by offering a lower interest rate (1-2% lower) for environmentally-friendly investments.

The Dutch Greentech Fund will invest in promising Dutch technology start-ups developing innovative technologies or processes that make the chain from raw material to end product more sustainable. Among other factors, the focus here is on bioenergy. The fund will invest a maximum
of 2.5 million in a business in the form of a minority stake. The share of the financial support depends on the project and will be fixed with approval of financing.

Furthermore, it is a common financing method in the Netherlands to finance biogas plants with credits from private banks including both traditional and project financing without any special conditions for biogas projects.
6. Financing of biogas projects in Denmark

Danish biogas market recognises biogas production as an independent business activity, in contrast to national biogas markets. Namely, it is often the case that a farmers’ cooperative is based as non-profit company for production of biogas in co-digestion with manure and bio-waste (common ratio 80:20 in favour to manure). The rationale of the cooperative is application of best agricultural practice in terms of manure management where biogas production is perceived as a tool for manure management. The produced biogas is sold to energy producer that utilised biogas either for heat purposes (usually district heating) or in cogeneration for simultaneous production of electricity and heat. In 1988, Danish government has provided Biogas Action Programme which was focused on the construction and monitoring of biogas plants, information activities and R&D work construction. It included a 40% investment grant for development of centralised biogas plants (farmers’ cooperatives) with CHP and a financing scheme with long term, low interests indexed loans. The programme was closed in 2002 but significantly boosted development of Danish biogas market in terms of both quality and quantity.

In the last decade the development of biogas projects in Denmark was very low due to the lack of an adequate legal framework for biogas plants. But this changed as the Danish feed-in tariff scheme was substantially improved in February 2008 through the VE-Lov. (Lov on fremme af vedarende energi No. 1392/2008 - Law on promotion of Renewable Energies). Today the biogas market in Denmark comprises about 80 installed agricultural and approximately the same amount of industrial biogas plants with a rising tendency.

Typical investors for large scale biogas plants in Denmark are consortiums of farmers organised in cooperation with a limited liability company or a private limited liability company. Other typical organisation models are independent foundations or consumer (heat consumer) cooperations with limited liability. Biogas plants owned by municipalities were used in the past but are actually not common. Investors in small scale biogas plants are normally single farmers.
6.1. **Support tools in Denmark**

The main legislative driver for renewable energy development in Denmark is the **VE-Lov. (Lov on fremme af vedarende energi No. 1392/2008 - Law on promotion of Renewable Energies)**, promoting renewable energies through a feed-in tariff scheme, which was substantially improved in 2008. Biogas plant owners in Denmark receive a variable bonus for the production of electricity, paid on the top of the market price. The sum of the bonus and the market price is capped by a certain statutory maximum depending on the date the plant was connected to the national power grid system. If the market price exceeds the total amount specified by statutory law, the exceeding amount will be deducted from future bonus payments.

Since February 2008, all biogas plants receive either a total of about 10 c€/kWh\(^2\) or an additional payment of about 5.4 c€/kWh when biogas is used together with natural gas for the generation of electricity. The tariff will be adjusted with 60% of the price index increase. Upgraded biogas is rewarded with about 40.30 c€/m\(^3\) methane. Furthermore, the sale of waste heat which occurs through the production of electricity is exempt from energy and CO\(_2\) taxes. This framework is a good legal basis for planning the financing of biogas projects.

6.2. **Financing tools in Denmark**

In Denmark, the financing of biogas projects includes biogas plants owned by farmers, and centralised co-digestion biogas plants owned by groups of farmers or heat consumers, which is very special for Denmark.

In Denmark, during the last two decades, consumer-owned and municipality-owned CHP (Combined Heat and Power) plants have delivered a significant share of the national power production. Also the majority of district heating loops are predominantly owned by the inhabitants of the community. This gives control to the people and ensures that energy is distributed to the communities at fair prices. Such systems are often used as non-profit ownership models to the direct benefit of the involved municipalities and are supported through attractive governmental investment grants, loans with very low interest rates and municipal guarantees. The Danish central authorities strongly support the development of district heating through measures, which combine the advantage of strong regulation and controlled use of market forces.

Thus the main financing instrument used to finance centralised biogas plants is to finance them in connection with a district heating system, where the waste heat of the CHP plant is utilized to supply private households. In Denmark 60% of all private households are connected to a district heating system. Biogas plants which are connected with a Danish district heating system are legally regarded as being a part of it and therefore receive the same financial and legal support.

Most companies finance their investments in district heating systems by international credits at lowest market interest rate. Banks compete to offer the best conditions as long as they can see that the security is high. And the security for such projects in Denmark is high, due to the following points:

- A stable national energy policy

---

\(^{2}\) exchange rate in July 2010: 1 Euro = 7.4446 DKK; 1 DKK = 0.134326 Euro
• Municipalities guarantees for loans
• Consumers are obliged to remain connected and to pay at least the fixed tariffs
• Proven technology with long life time

Therefore other private investors offer no real competition.

Biogas projects are also financed by means of index-regulated annuity loans, guaranteed by the municipalities. These loans are low interest loans with indexation, which secure the investor against inflation through a re-evaluation of the unpaid debts according to the inflation rate. The pay-back period is normally more than 20 years.

Before 2002 most of the biogas projects in Denmark also received supplementary government subsidies, representing up to 40% of the investment costs of the project. But this changed when the Biogas Action Programme which has supported biogas projects with investment grants and a financing scheme with long term, low interests indexed loans was closed.

Single farmers finance biogas plants through credits from private banks including both traditional and project financing. For them it is currently not easy to finance biogas projects, because of high credit prices. Credits from private banks for financing biogas projects do not offer any special conditions. Most biogas plants established during the last 10 years in Denmark are actually farm scale plants.
7. Biogas plant financing in Italy

In order to achieve the objectives laid down in the Kyoto Protocol on the subject of promoting the production of electricity from renewable sources, Italy has implemented European Directive 2001/77. This directive has now been replaced with European Directive 2009/28/CE, but it is still the only benchmark for possible comparisons.

In 2008 the ratio in Italy between gross renewable production and internal gross electricity consumption (which takes the foreign balance into account) was 16.5% (www.gse.it). Gross production from renewable sources amounted to 17.5% of total gross production. Among the different renewable energy sources, biogas reached a production level of 1,599.5 GWh in Italy in 2008, equivalent to about 2.75% of gross production from renewable energies.

Figure 4: Regional distribution of percentage of gross final energy production from biogas in 2008
About 80% of this production derives from the recovery of biogas from municipal waste landfills. The remainder comes from about 150 biogas plants located on farms. About 40 of these agricultural biogas plants are simple, low-cost plants made by laying a plastic cover over a slurry storage tank.

Thanks to the renewable source incentive system, interest in the co-digestion of slurry with energy crops and agro-industrial waste has grown in Italy during 2009 and 2010.

At present, several new plants have started up and many are under construction and/or in the planning stage. It is estimated that there will be more than 300 biogas plants on agricultural biomass by the end of 2010.

7.1. **Support tools in Italy**

In Italy, the national energy services company (GSE) is implementing the renewable source energy production incentive scheme. The scheme involves two alternative incentives according to the electricity producer's request:

- the issue of Green Certificates;
- an all-inclusive flat rate (only for plants that produce less than 1 MW):

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>Rate (c€/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biogas and biomass, excluding liquid biofuels with the exception of pure vegetable oils traceable through the integrated administration and control system laid down in European Council Regulation (EC) No. 73/2009 of 19 January 2009</td>
<td>28</td>
</tr>
<tr>
<td>Landfill gas, sewage gas and liquid biofuels with the exception of pure vegetable oils traceable through the integrated administration and control system laid down in European Council Regulation (EC) No. 73/2009 of 19 January 2009</td>
<td>18</td>
</tr>
</tbody>
</table>

In order to receive the incentive, the producer must apply to the GSE for RES (Renewable Energy Source) plant certification. In particular, newly built, upgraded, partially or totally renovated or reactivated plants using renewable sources that came into operation after 1 April 1999 may be certified as RES plants.

Italian Law No. 99 of 23 July 2009 definitively established that it is possible to combine incentives, without being obliged to prove the origin of the biomass. In other words, a biomass plant owned by

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3 [http://www.gse.it/attivita/Incentivazioni Fonti Rinnovabili/Servizi](http://www.gse.it/attivita/Incentivazioni Fonti Rinnovabili/Servizi)
D.3.2 Best practice examples for financing biogas projects

a farm, or operated in connection with an agricultural, food, farming or forestry company may combine the all-inclusive fixed rate, after it comes into commercial operation, with other public incentives with advance capitalization not exceeding 40% of the cost of investment.

In 2009 and 2010, capital grants were made available in Italy with the aim of promoting the installation of biogas plants. Some of these grants (Italian National Institute for Agricultural Mechanization grant, 2010; www.enama.it) required an innovative design (from the view of technology and/or organizational model) as a condition of eligibility; others required integration with digestate nitrogen abatement systems (Lombardy Regional Government grant).

7.2. Financing tools in Italy

There are several opportunities for financing biogas projects in Italy.

- private consulting and technology companies specialised in financing and leasing of renewable energy projects
- financing and leasing by banks and credit institutes.

According to several banks in Italy equity capital of 20-30% of the capital costs is required for sound financing of biogas projects. The most common financing method in Italy is credits from private banks including both, traditional and project financing.

Generally, many banks in Italy are well prepared to finance biogas projects and usually have dedicated experts. Most house banks of farmers are familiar with this topic and will provide assistance in biogas projects.
## References

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Title</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rabobank Group</td>
<td>Green Finance, <a href="http://www.rabobank.com">www.rabobank.com</a></td>
<td></td>
</tr>
</tbody>
</table>
Contacts

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kirchmeyr@european-biogas.eu
www.european-biogas.eu
Annex

Appendix 1: Questionnaire for biogas plant credits from Umweltbank AG, Germany

Example for a Credit Request Form
(based on the request form of the Umweltbank AG, Germany)

1. Applicant

<table>
<thead>
<tr>
<th>Full name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Street, postal code, city</td>
<td></td>
</tr>
<tr>
<td>Telephone</td>
<td>Fax</td>
</tr>
<tr>
<td>Cell phone</td>
<td>eMail - Address</td>
</tr>
</tbody>
</table>

Profession  o Farmer  o Employee  o Self-employee  o Other: _________________________

The operation and technical controlling of the plant is supervised by the following person:

<table>
<thead>
<tr>
<th>Name</th>
<th>Relation to plant operator (e. g. son, long-time employee etc.)</th>
<th>Expertise in the field of biogas (e. g. by training, internship etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please name your motivation for constructing of a biogas plant:
Which changes in your business do you expect?
2. Planned biogas plant

**Type of installation:**

- Plant for dedicated energy crops in conformity of EEG: **o yes**  **o no**

**Utilisation of heat:**  
- **o no**  
- **o yes**  

<table>
<thead>
<tr>
<th>Utilisation of heat</th>
<th>consumer of heat</th>
<th>kWh/a</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>o no</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>o yes</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Technical details:**

- **o** Purchase of a turn-key facility provided by the manufacturer: __________________________
- **o** Purchase of a facility composed of equipment from different suppliers. Name of planner of the overall concept: __________________________________________

**Construction management is done by:**  
- **o** applicant  
- **o** planner  
- **o** ________________

**Fermenters and storage facilities:**

<table>
<thead>
<tr>
<th>number</th>
<th>manufacturer</th>
<th>design (e.g. concrete, steel etc.)</th>
<th>capacity per unit [m³]</th>
<th>already existing</th>
</tr>
</thead>
<tbody>
<tr>
<td>slurry storage</td>
<td></td>
<td></td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>silo for feedstock</td>
<td></td>
<td></td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>main fermenter</td>
<td></td>
<td></td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>secondary fermenter</td>
<td></td>
<td></td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>digestate storage</td>
<td></td>
<td></td>
<td></td>
<td>o</td>
</tr>
</tbody>
</table>

**Stirring technology:**

<table>
<thead>
<tr>
<th>number of stirrers</th>
<th>type of stirrers</th>
<th>manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Combined heat and power plants:**

<table>
<thead>
<tr>
<th>number</th>
<th>manufacturer</th>
<th>kW per unit</th>
<th>guaranteed efficiency</th>
<th>design</th>
</tr>
</thead>
</table>
|        |              |             |                        | **o** gas engine  
|        |              |             |                        | **o** pilot injection engine |
D.3.2 Best practice examples for financing biogas projects

| o gas engine | o pilot injection engine |

**Micro-biology:**

- Biological control and operation:
  - o by plant operator
  - o with support of manufacturer
  - o laboratory contract with ___________________________________________________

**Location:**

- exact address (street, postal code, city) as well as plot number

- land owner (Name, Address)

- Entries in the land register of the plant location (e.g. land charge, right of way, etc.)

**Existing buildings:**

- o No
- o yes: __________________________________________

**Access to public streets:**

- o No
- o yes

**Available agricultural land and number of animals of the applicant:**

<table>
<thead>
<tr>
<th>total area (ha)</th>
<th>percentage of own property</th>
<th>percentage of leased property</th>
</tr>
</thead>
<tbody>
<tr>
<td>arable land</td>
<td></td>
<td></td>
</tr>
<tr>
<td>grassland</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>species</th>
<th>number</th>
<th>type of animal breeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>animals</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Feedstock:**

<table>
<thead>
<tr>
<th>type</th>
<th>supplier</th>
<th>available amount/year (t)</th>
<th>price/t in Euro</th>
<th>cost per year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td></td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 3. Cost and financing plan

**Cost for**

<table>
<thead>
<tr>
<th>Item</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td>planning</td>
<td></td>
</tr>
<tr>
<td>CHP plant</td>
<td></td>
</tr>
<tr>
<td>fermenter</td>
<td></td>
</tr>
<tr>
<td>stirring technology</td>
<td></td>
</tr>
<tr>
<td>electronic components</td>
<td></td>
</tr>
<tr>
<td>liquidity reserve</td>
<td></td>
</tr>
<tr>
<td>other</td>
<td></td>
</tr>
<tr>
<td>=sum of costs</td>
<td></td>
</tr>
</tbody>
</table>

**Financed by**

<table>
<thead>
<tr>
<th>Item</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td>equity capital</td>
<td></td>
</tr>
<tr>
<td>incentives, support</td>
<td></td>
</tr>
<tr>
<td>own resources</td>
<td></td>
</tr>
<tr>
<td>other loans</td>
<td></td>
</tr>
<tr>
<td>loans by Umwelt Bank</td>
<td></td>
</tr>
<tr>
<td>=sum of financing</td>
<td></td>
</tr>
</tbody>
</table>
### D.3.2 Best practice examples for financing biogas projects

#### Explanation of cost and financing plan:

1) **Other costs**

<table>
<thead>
<tr>
<th>other costs caused by</th>
<th>costs in Euro</th>
</tr>
</thead>
<tbody>
<tr>
<td>- interest rate during construction phase</td>
<td></td>
</tr>
<tr>
<td>- charges, additional costs</td>
<td></td>
</tr>
<tr>
<td>- costs of first substrate charge</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

2) **Origin of equity capital**

3) **Incentives**

<table>
<thead>
<tr>
<th>incentive donors</th>
<th>submission date</th>
<th>date of approval</th>
</tr>
</thead>
</table>

4) **Own labour contribution**

<table>
<thead>
<tr>
<th>type of labour</th>
<th>value in Euro</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

5) **Other loans**

<table>
<thead>
<tr>
<th>loan provider</th>
<th>interest rate</th>
<th>planned payback date</th>
</tr>
</thead>
</table>

**Construction timetable:**

<table>
<thead>
<tr>
<th>starting date of construction</th>
<th>finalisation date of construction</th>
</tr>
</thead>
</table>
4. Required documentation

For the credit application the Umweltbank requires the following documents (copies are sufficient). Personally signed exemplars are just required for "confidential personal information". Required forms can be downloaded at www.umweltbank.de under the heading of "Formulare". Please provide additional information by informal attachments.

**Type of documents:**

<table>
<thead>
<tr>
<th>Personal documentation in case of natural person / companies constituted under civil law is:</th>
<th>attached</th>
<th>submission date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confidential personal information according to the forms (each shareholder)</td>
<td>o</td>
<td></td>
</tr>
<tr>
<td>Last three income tax returns (each shareholder)</td>
<td>o</td>
<td></td>
</tr>
<tr>
<td>Last three payslips (each shareholder) or last three annual balance sheets</td>
<td>o</td>
<td></td>
</tr>
<tr>
<td>Tabular CV (in case of civil law association: only executive director)</td>
<td>o</td>
<td></td>
</tr>
<tr>
<td>Company contract</td>
<td>o</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Personal documentation in case of legal person (private limited partnership, limited company, corporation, etc.)</th>
<th>attached</th>
<th>submission date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last three balance sheets as well as recent business analysis</td>
<td>o</td>
<td></td>
</tr>
<tr>
<td>Tabular CV of the executive director</td>
<td>o</td>
<td></td>
</tr>
<tr>
<td>Confidential personal information of the executive director</td>
<td>o</td>
<td></td>
</tr>
<tr>
<td>Abstract of the commercial register</td>
<td>o</td>
<td></td>
</tr>
</tbody>
</table>

**Project documentation**

<table>
<thead>
<tr>
<th>Land register map (including plot identification and subscription of the plant)</th>
<th>o</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Recent certificate of title of plant location</td>
<td>o</td>
<td></td>
</tr>
<tr>
<td>Leasing contract (in case the applicant is not the land owner)</td>
<td>o</td>
<td></td>
</tr>
<tr>
<td>Insurance offer (machinery breakage, business interruption, public liability)</td>
<td>o</td>
<td></td>
</tr>
<tr>
<td>Details of the cost – and financing plan</td>
<td>o</td>
<td></td>
</tr>
<tr>
<td>Offers for all relevant parts of the plant</td>
<td>o</td>
<td></td>
</tr>
<tr>
<td>Contract of heat delivery and heat quantity (in case of heat utilization)</td>
<td>o</td>
<td></td>
</tr>
<tr>
<td>Economic efficiency calculation</td>
<td>o</td>
<td></td>
</tr>
<tr>
<td>Commitment of grid access by electricity distributor</td>
<td>o</td>
<td></td>
</tr>
<tr>
<td>Building permission, respectively BlmschG – permission</td>
<td>o</td>
<td></td>
</tr>
<tr>
<td>Substrate delivery – and contracts for sale of digestate</td>
<td>o</td>
<td></td>
</tr>
</tbody>
</table>