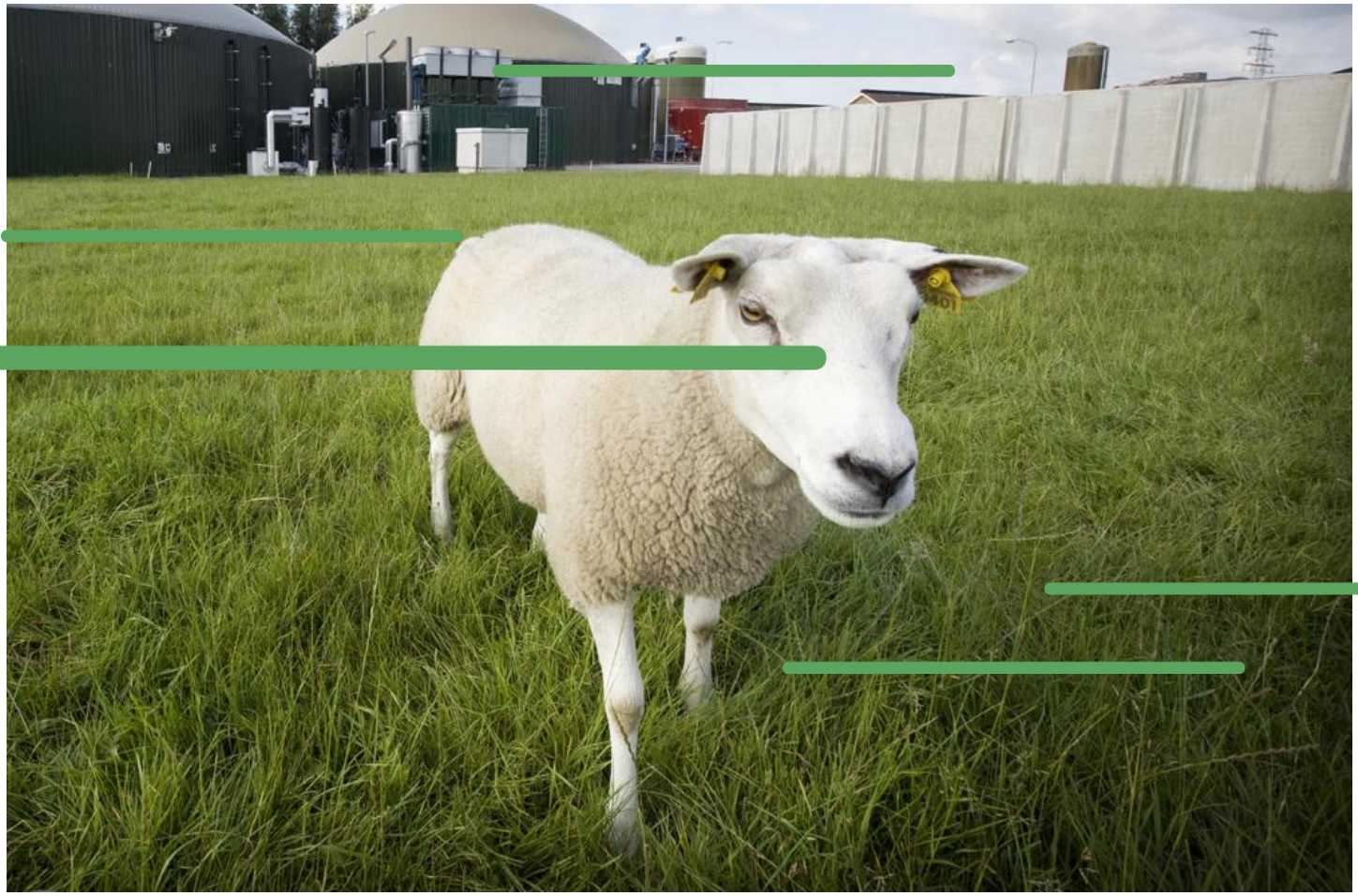
GREEN GAS GRIDS

Co-funded by the Intelligent Energy Europe Programme of the European Union

AUSTRIAN ENERGY AGENCY



DEMONSTRATION PROJECTS – BEST PRACTICE APPROACH - REPORT

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Table of Contents

1. Introduction

GreenGasGrids is a 3-year European project funded by the Intelligent Energy for Europe (IEE) programme with the aim to boost the European bio-methane market. The project will run until mid of 2014 and is coordinated by the German Energy Agency Dena. The project's consortium consists of 13 European partners, including national energy agencies, scientific institutions as well as industry associations involved in bio-methane, natural gas and renewable energy. Within the project, various publications provide decision-makers and project developers with support for setting up bio-methane strategies and efficient projects.
This paper summarises practical aspects for the development of bio-methane projects which especially arise when starting the very first project in a country – a bio-methane demonstration project. It completes the publication "Bio-methane Guide for Decision makers" (see www.greengasgrids.eu).
A demonstration project often faces hurdles such as the following:

- Few experience in relation to the intended implementation of new technology
- Low data availability in case of usage of unusual substrate compositions (mixtures)
- Undeveloped legal framework
- Unknown licensing procedures
- Poor established service network of technology providers
- Inexperienced operators
- Refusal of injection by gas grid operators/gas storage facility operators
- Missing acceptance by regulatory authorities in relation to incentive schemes
- Etc.

Despite these barriers and obstacles, the demonstration project is of great importance since the technology will be represented a certain time only by this project and therefore it influences the reputation of the technology greatly. Therefore, a best-practice approach, meaning thoughtful planning and implementing is essential to pave the way for further diffusion of bio-methane technology. Financial support on regional, national or EU level can ease the process and overcome some financial hurdles.
In order to:

- Provide practical experience in terms of project:
- Development
- Finance
- Construction and
- Operation.
- Gain deeper insights in the decision making processes in particular dealing with:
- Financing
- Subsidy schemes

- Find out what kind of hurdles occur in the process.

it was decided to conduct structured interviews with:

- Project developers (EU-MS and third countries)
- Project operators
- Plant constructors

and to compile the report dealing with the mentioned hurdles respectively solutions.

2. Approach towards and processing of structured interviews

The approach to the structured interviews was such that a questionnaire (see ANNEX I) was developed, subsequently consulted with the partners of the GreenGasGrids project and afterwards sent to the interviewees.
Subsequently the relevant stakeholders in Austria were contacted and the interviewer succeeded to execute 3 interviews (the names of the interviewees are available but thought for internal usage only).

- 1 interviewee represented an Austrian association (umbrella association) which helps biogas/bio-methane plant operators in relation to planning issues, financing issues, acquaintance with authorities and operation of plants
- 1 plant constructor and subsequent plant operator in Austria and neighbouring countries
- 1 project developer – active in the EU-MS and CIS, supported by financial adviser.

A specific Austrian perspective was avoided as much as possible. Of course there might be here and there some specifics of the Austrian perspective – which is, as any other market, impacted by the specific regulations, the availability of substrata, etc. Nevertheless, we believe that most of the results are in the other EU-MS in effect the same as in Austria.

3. Resource availability and handling of substrata

In relation to resource availability and handling of substrate the summarized outcome is as follows:
All of the interviewees (3) are of the opinion that sustainability of substrata is key for the successful development and operation of biogas/bio-methane plants, thus it is extremely important for future developments to leave in large parts the atmosphere of competition with food production. In other words, it has to be ensured that:

- Scientists and companies even increase their efforts in developing techniques for a better use of substrates like straw, catch crops and other biodegradable residues from agriculture and also from source separated collection of municipal waste.
- Waste laws and regulations provide for a higher collection rate of separated biodegradable waste and their subsequent usage in the energy and organic fertilizer production

- Only such substrata are used which are not in competition with food industry and – in addition - are also not perceived to be in competition with food industry;
- Good rationales are used to rebuild trust from politicians, media, etc.
- The biogas/bio-methane industry is dealt with in the energy strategy of the country concerned.

In relation to these statements it doesn't matter whether the project is being developed in the EU-MS or neighbouring third countries.
It turns out that it starts to become more and more difficult to get contracts for delivery of substrata signed of a length which is needed to fulfill the relevant requirements of financing institutions. In other words, there is a mismatch of guaranteed substrata supply (length of period) and the duration of financing instruments. This is true for operators which do not produce their own substrata but purchase substrata on the market. This tendency is amplified in the "waste to energy" sector, because "waste" supplier realize the value of their products now stronger than in earlier days. Subsequently the collecting areas are growing and logistic requirements are becoming more and more complex and costly.

4. Focus on product

In relation to the question on which product the project developer should focus on, the interviewees are of the opinion that, mostly due to the efficiency requirements related to the generation of electricity and the requested usage of the heat (CHP) – which otherwise were lost - the market for biogas will decrease whereas the market for bio-methane in the CHP sector might – under certain preconditions – increase. Of course there is a need to materialize the full potential of bio-methane – in particular by entering additional markets which enable reaping of economies of scale, size and scope (more details see below).

5. Subsidy schemes

Concerning the subsidies schemes there is no common view among the interviewees. Basically the producer of bio-methane:

- Would like to avoid the perception being beneficiaries of subsidies, on the other hand they do know that without taking all externalities of ordinary energy generation into consideration;
- Bio-methane as a fuel for electricity generation cannot compete in price with electricity produced by fossil fuels, huge hydropower plants etc. without subsidies.

So it makes sense to provide incentive schemes – besides feed in tariffs - which match the specific regional/national circumstances (mostly given nowadays anyway) – like for example obligations for minimum requirements for the use of energy from bio-methane in new and renovated buildings in order to be entitled to receive related grants from the government for the construction and renovation of (apartment) dwellings.
Within this framework competition among bio-methane producers should take place in order to increase productivity within the bio-methane sector.

There is definitely a need for guaranteed subsidies scheme which match the financing requirements – all the more when it comes to application of new technologies for the bio-methane production and or application.
Investors and owners of bio-methane plants regard:

- Amendments of the legal frameworks – in terms of subsidies schemes - which do have an impact on the bio-methane plant within the foreseen life span as a "no go"
- Thus a stable and transparent framework for subsidies is inevitable.

It is pretty much the same for the regulatory framework in terms of guaranteed feed in possibility, quality requirements, like heating value, hydrogen content, CO2 content etc.
In terms of R&D activities it is recommend to bundle forces – lead by a neutral institution like the relevant Ministry – in order to achieve, within a properly managed framework, the highest value for money.

6. Technology to be applied

According to the experience and the thereon based opinion of the interviewees, the currently used technologies are well known. Of course there is a need to further increase and extend R&D activities -which should not be restricted to the technology as such but also to market developments (where to use bio-methane) and concerted activities, like coordination within the vertical value chain (for example with car producers to develop the proper types of car at the right time and the right place, with the filling station operators - initiated by the proper political goals and efficiently administered by the relevant authorities). For the sake of completeness it has to be mentioned that when bringing R&D achievements onto the market in particular financial support might be requested and should be provided.
There are no strait forwarded answers to these questions but dependent on the specific case. The application of the proper technology depends on the:

- Substrata;
- Quality of the substrata;
- Whether there is a need for disinfection
- Etc.

– so on the process requirements.
In relation to the efficiency of the plants one can say that improvements of efficiencies are appreciated but of course the final decision on which technology – or better - which product of which producer will be applied - again depends on the concrete project. In other words, if the project requires high efficiency, thus enables the materialization of the project, the relevant technology will be applied.
What one can say, is that the plants as such have to work on:

- A stable basis;
- Using equipment which requires low maintenance - linked with high availability rates and
- That there is also a need to keep the costs of spare parts low,

thus a project operator tries to use equipment of the same manufacturer in different plants – if reasonable.

In relation to the appearance of the plant it can be stated, that usually the plants are located aside of residential areas, thus do not directly conflict with interests of neighbours. Nevertheless, a nice appearance for sure supports public acceptance of the plant.
In terms of R&D activities, the interviewees recommended to follow and support – including financial support - developments which:

- Directly, like the second generation of biogas production technology, or
- Indirectly, like power to gas if bio-methane plants could serve as a CO2 source

could support faster progress of the bio-methane sector.

7. Business model

In order to avoid editing business confidentialities, several statements of the interviewees have to be reflected on a more abstract level.
Basically the projects are assessed on a "stand alone" basis. The criteria – used for the economic feasibility are:

- Net Present Value
- Internal Rate of Return
- Pay Out Time
- Finance Plan

taking the impacts on the tax basis, thus the taxis to be paid, into consideration.
Concerning realization of the projects, engineering procurement and construction contractors are the preferred choice – all the more the newer, thus riskier, the applied technology is.
In addition it can be stated that the riskier the technology, the more there is a need for very experienced and at the same time potent engineering, procurement and construction contractors.
This approach is continued when contracting O&M services. There is a request, in particular from the debt capital providers – to go for the relevant insurances in order to lower the risks the project is exposed to.
In case of inability of loan repayments certain rights of the project operators are ceded to debt capital providers. Debt capital providers are – in case of smaller projects – in favour of participation of the substrata providers in the project via an equity holding in the special purpose vehicle or at least in favour of diversification of risks by increasing the number if substrate providers to a proper size.

8. Annex I (questionnaire)

The following questions were asked within the framework of the structured interviews.

QUESTION 1

SUBSTRATA

Availability and handling of substrata in terms of:

- Volumes, amount
- Requested quality of substrata
- Sustainability of availability of substrata and avoidance of competition with food production
- Availability of sufficient amounts of water/liquids needed for the substrata
- Relevant legislative basis
- Cost/opportunity cost in case of own substrata
- Collecting area; logistic requirements
- Possible digestion period determined by kind of substrata
- Number of potential providers in the long run; length of contract and price stability respectively reasonable links to price/tariffs of products
- Availability of alternative/replacement substrata
- Immission burden caused by substrata (noise, odour, dust etc.)
- Acceptance by the stakeholders/surrounding population
- Potential utilisation of the digestate in terms of:
    - Stocking requirements (length, quality etc.)
    - Logistic needs

QUESTION 2

PRODUCT

Which product should be produced:

- Biogas or
- Bio-methane

AD BIOGAS

- Availability of feed in tariffs for electricity using biogas as fuel in the generation process in terms of:
    - Guaranteed amount (fixed or indexed)
    - Guaranteed length of period for the feed in tariff
- If overall efficiency requirements in order to be granted the feed in tariff:
    - Usage of waste heat possible and if so what are the preconditions in terms of:
        - Price for the waste heat; indexation, any (other) constraints

- Does the contract for selling waste heat correlates with the economic life time of the project
- Costs for the extension of the system to allow for usage of waste heat
- Costs for maintenance including management of spare parts etc.
- Impact on the choice of the site (higher cost of property, environmental hurdles, acceptance by surrounding population)
- Additional hurdles, constraints etc. in case of crossing plots for the pipelines needed for the transport of heat

  - Usage of cold (generated by the waste heat) possible and if so what are the preconditions in terms of:
    - Price for the cold; indexation, any (other) constraints
    - Does the contract for selling cold correlates with the economic life time of the project
    - Costs for the extension of the system to allow for usage of cold
    - Costs for maintenance including management of spare parts etc.
    - Impact on the choice of the site (higher cost of property, environmental hurdles, acceptance by surrounding population)
    - Additional hurdles, constraints etc. in case of crossing plots for the pipelines needed for the transport of cold

AD BIO-METHANE

- Availability of adjusted feed in tariffs for electricity using bio-methane as fuel in the generation process in terms of:
  - Guaranteed amount (fixed or indexed)
  - Guaranteed length of period for the feed in tariff
- If overall efficiency requirements in order to be granted the feed in tariff:
  - Usage of waste heat possible and if so what are the preconditions in terms of:
    - Price for the waste heat; indexation, any (other) constraints
    - Does the contract for selling waste heat correlates with the economic life time of the project
    - Costs for the extension of the system to allow for usage of waste heat
    - Costs for maintenance including management of spare parts etc.

        - Impact on the choice of the site (higher cost of property, environmental hurdles, acceptance by surrounding population)
        - Additional hurdles, constraints etc. in case of crossing plots for the pipelines needed for the transport of heat
    - Usage of cold (generated by the waste heat) possible and if so what are the preconditions in terms of:
        - Price for the cold; indexation, any (other) constraints
        - Does the contract for selling cold correlates with the economic life time of the project
        - Costs for the extension of the system to allow for usage of cold
        - Costs for maintenance including management of spare parts etc.
        - Impact on the choice of the site (higher cost of property, environmental hurdles, acceptance by surrounding population)
        - Additional hurdles, constraints etc. in case of crossing plots for the pipelines needed for the transport of cold
- Availability of feed in tariffs for bio-methane injected into the grid in terms of:
    - Guaranteed amount (fixed or indexed)
    - Guaranteed length of period for the feed in tariff
- Preconditions for feed in tariffs for bio-methane injected into the grid in terms of:
    - Quality requirements in terms of heating value, hydrogen, CO2 content, dust, siloxane, water content, min. and max. pressure etc.
    - Eventually quantity requirements
- Impact on the choice of the site because of the need to inject in a bigger network (so potentially not in small distribution grids)

QUESTION 3

PLANT

- What is the commonly agreed on proven or best available technology (BAT) – if any – in terms of:
    - Efficiency of the plant;
    - Emissions (noise, odour, dust, methan etc.)
    - Consumption of auxiliaries
    - Investment Cost – life cycle cost
    - Change/replacement of substrata
    - Maintenance
    - Security of operation

- Reliability
- Availability (hours/year)
- Upgrading technology of biogas
- Cleaning of biogas
- Drying of biogas
- Space/land requirement
- Appearance

- Where is research and development heading at in terms of:
  - Efficiency of the plant;
  - Emissions (noise, odour, dust, methan and other exhaust gases etc.)
  - Investment Cost – life cycle cost
  - Change/replacement of substrata
  - Maintenance
  - Security of operation
  - Upgrading technology of biogas
  - Cleaning of biogas
  - Drying of biogas
  - Space/land requirement
  - Appearance
- Is scalability of the plant given

QUESTION 4

BUSINESS MODEL

- What kind of criteria are used for the assessment of the project, like:
  - Net Present Value
  - Internal Rate of Return
  - Pay Out Time
  - Finance Plan
  - Cost Utility analysis
  - Sensitivity analysis
- Assessment of the project on a stand-alone basis or in the context of all other investments in the company in the relevant period
- Do you take the impacts of the project on the tax basis of the company into consideration
- Do you intend the supplier of the substrata to become a shareholder in the SPV? If so what percentage?

- What kind of securities for loans etc. are needed – if any - respectively which securities are accepted. What is the percentage of regular consideration of the market value of the securities?
- How much equity is needed in terms of debt to equity ratio?
- Debt Service Cover Ratio (DSCR) requirement?
- Debt Reserve Account requirement?
- What kind of insurance is requested?
- How to minimize technical risks requirements (EPC and O+M contracts)
- Requirements in relation to feedstock contracts (length, max. price fluctuations, indexation, should the feedstock supplier become a shareholder of the SPV)?
- Risk mean variation in terms of minimum number of feedstock suppliers as a function of size of the plant?
- Duration of the loan as a function of the technical lifetime of the plant?
- Are there cessions of rights of the owner(s) in favour of the bank(s) requested
- Is there a need for forfeiting of SPV shares in favour of the bank(s) required
- Is there a need for forfeiting of accounts receivable, subsidies, revenues generated by feed in tariffs in favour of the bank(s) needed
- Who and what is requested in terms of:
    - Assessment of the general contractor
    - Service agreements
    - Concept of the plant
    - Assessment of the infrastructure in relation to substrata, logistic needs
    - Assessment of the process, operation and maintenance schedules
    - Construction supervision

  related to technical risks
- Who and what is requested in terms of:
    - Assessment of the SPV, contracts and required permissions
    - Connection to the public electricity and or gas network
    - Engineering, Procurement and Construction (EPC) as well as Operation and Maintenance contracts
    - Fulfillment of the environmental requirements

related to legal risks