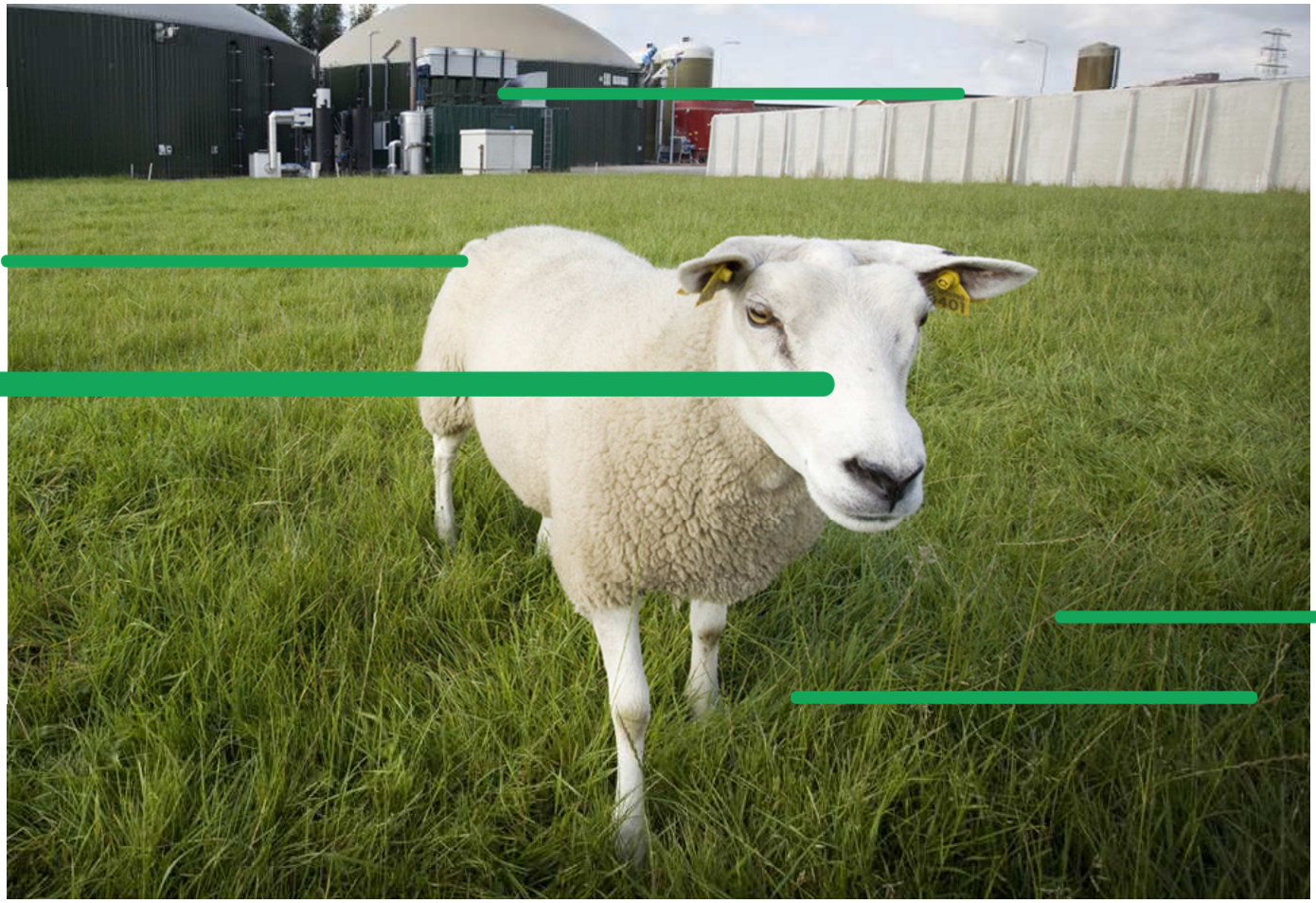
GREEN GAS GRIDS



Guidelines for development of biomethane feed-in projects

– Aspects of management, technology and project financing

WP 2 / D 2.4

April 2013

INTELLIGENT ENERGY EUROPE
FOR A SUSTAINABLE FUTURE

Authors: Sabine Strauch, Ulrike Ehrenstein

Contact: Fraunhofer UMSICHT

Research Group Biogas technology
Osterfelder Strasse 3

46047 Oberhausen, Germany

www.umsicht.fraunhofer.de

Note on legal topics

The Biomethane Guide for Decision Makers has been created within the project GreenGasGrids supported by the Intelligent Energy - Europe programme (contract number IEE/10/235/S12.591589).

Webpage: www.greengasgrids.eu

THE GREENGASGRIDS PROJECT PARTNERS

German Energy Agency - dena (Germany)

Fraunhofer UMSICHT (Germany)

Austrian Energy Agency (Austria)

Energetski Institut Hrvoje Požar -EIHP (Croatia)

Agence de l'Environnement et de la Maîtrise de l'Energie - ADEME (France)

Renewable Energy Agency – REA (UK)

University Szdeged (Hungary)

European Biogas Association

Consorzio Italiano Biogas (Italy)

Agentschap NL (The Netherlans)

Krajowa Agencja Poszanowania Energii – KAPE (Poland)

Slovenská Inovacná Eneregetická Agentúra - SIEA (Slovakia)

Natural Gas Vehicle Association - NGVA

TABLE OF CONTENTS

GENERAL GUIDELINES FOR DEVELOPING BIOMETHANE FEED-IN PROJECTS

This document is intended to support project developers, and it aims in providing ideas for a risk management when planning and implementing biomethane feed-in projects. The guidelines are divided in three categories that address management, technical and financial aspects.

The list of topics does not claim to be exhaustive. However, it covers relevant issues and questions a project developer has to deal with during the development and planning process for the purpose of project risk assessment and developing a risk mitigation strategy. In the awareness that there are wide differences regarding the existing national legal framework, regulations and permit requirements, the guidelines are framed in general terms and set out as recommendations. However, the principles of an energy efficient, sustainable and economically well managed project implementation remain applicable everywhere.

Aspects of Management

Cooperation and partnering can facilitate project ignition and planning.

Which co-operations and partners may be of strategic importance? Especially partners from the following fields should be considered:

- Municipal / regional government
- Feedstock suppliers
- Local gas grid company
- R&D organisations
- Biomethane users (e. g. fuel stop, CHP operator)

Which type of enterprise models are available and which legal status is appropriate regarding aspects of

- Legal capacity
- Risk management
- Participation of additional shareholders like companies or residents?

A fundamental requirement for a long term plant operation is a secured feedstock supply.

Is your feedstock supply based on own resources or is it dependent on feedstock supplier(s)?

Which contract durations are reasonable (long-/ medium-/ short term) for balancing security and flexibility?

Is the plant technology flexible enough to handle changing feedstock and to process different types of substrate with divers parameters e.g. regarding dry matter content, contaminants / packaging residues?

Identify specific biomethane demand in your region / country.

Are there natural gas mobility projects?

Are there CHP operators that may be interested in using biomethane?

Are there special requirements the production chain has to fulfil to open specific markets (e.g. certification)?

Don’t underestimate the process of obtaining licences and permits.
Get in contact with the responsible authorities at an early stage of the project. Determine carefully which permits are needed.
Which obstacles or objections can be expected and how can these be overcome?
Is your foreseen time schedule realistic?
Will public consultation be required?
Will an environmental impact assessment be required?

A realistic time schedule helps to prevent from collisions between opposed interests.
How long is the period for project approval usually?
What are the time-determining project development steps?

Gain public acceptance and think about participation models
How will the public be informed about the action (e. g. press release, personal discussions, civil dialogue, inauguration party)?
How will potential reservations and fears on the construction be handled?
How does the public benefit from the project (e. g. financial participation models, biomethane supply, local added value, tax earning for the community)? Are these facts communicated?

Technical aspects

The search for an appropriate site location has to consider infrastructural, organisational but also land planning aspects.

Evaluate the chosen site location regarding the following issues:

o available feedstock sources today and in the future

o developed infrastructure for transport and logistics

o short transport distances for substrate supplyo distance to appropriate gas connection point

o acceptance of residents

Are all aspects of regional planning considered?

Is it probable that permits will be given for biomethane production at this site location?

Use state of the art technology for biogas production that suits your purpose.

Which substrates shall be fermented? Which gas yield is expected?

Is the plant flexible to process changing substrate qualities and to ensure a biological stable fermentation?

Is the plant design appropriate to efficient biogas production? Pay attention to the following:

o Does substrate pre-treatment offer chances to increase gas yield?

o Avoid gas losses by e.g. smart gas storage management, covered digestate storage tanks, high quality membrane for gas storage roof

o installing appropriate measurement equipment to control and monitor the relevant process parameters (e.g. pH, flow rate, main gas components)

Keep an emergency gas flare at the site to avoid gas emissions during unscheduled maintenance periods.

Biogas upgrading technology has to be evaluated in detail.
Is biogas upgrading really the most efficient solution or are there appropriate heat sinks available that can be supplied by micro biogas grids or district heating systems?
Which upgrading technology is available? Which supplier offers supply and service in your country? Which company is experienced and has best references?
Which gas pre-treatment is required by the chosen upgrading technology? Think about issues such as required redundancy and warranty.
Temperature can affect plant efficiency significantly. Is the plant designed in respect of the existing climate conditions?
Do the mode of operation and the substrate composition might cause fluctuating gas quality (e. g. variable methane content, impact concentrations of trace gases and impurities)? Is the plant designed to operate smoothly and reliable under these conditions?
Is the overall energy efficiency satisfactory? Does the upgrading technology suit the grid requirements in terms of gas quality, product pressure?
Is lean gas treatment required?

Consider both investment and operating costs when developing the grid injection concept.
Which gas requirements exist (pressure, gas quality, heating value, range of the parameters, gas stream)?
How far away is the grid connection point?
Is adjustment of heating value necessary? Which methods are possible (e.g. injection as additive or replacement gas / adding LPG / creating specific calorific value area / REKO)?
Intend a cooperative joint development of the grid connection concept together with the gas grid operator.

Operation and maintenance, process monitoring and skilled staff ensure the profitability and smooth operation of your biomethane project.
Is the maintenance concept elaborated?
Do clear processes and responsibilities exist?
Is skilled technical staff available to conduct scheduled and unscheduled maintenance?
Are regular safety and educational trainings scheduled?
Are there regular checks to determine emissions (also from covered digestate storages) scheduled?
How is the plant efficiency (substrate input, electricity consumption vs. output) be evaluated? How are the data received from the measurement equipment processed and used for short / medium and long term process monitoring concept

Pay attention to a well organised disposal of digestate and consumed resources.
How can the digestate be used? Pay attention to nutrient balance and ground water protection issues. Is digestate processing (e.g. solid-liquid-separation, composting) necessary?
Are you informed about nutrient limits, storage requirements to be fulfiled?
Pay attention to a well organized disposal of used operating resources (e.g. waste water, oil, amines) according to the applicable regulations.

Quality of plant management can be increased to a significant extent by networking and sharing information.
Partners for know how exchange might be o Biogas / biomass associations o Operators of pioneer plants o R&D organisations
Which upgrading technology is available (supplier, service, references)?

Financial aspects

Work out a fully auditable feasibility model and a realistic business plan.

To what amount are the capital expenditures (CAPEX) costs added?

- Project development and obtaining licenses
- Biogas production
- Biogas upgrading
- Grid connection
- Plant monitoring equipment
- Unforeseen

To what amount do the operational expenditures (OPEX) sum up?

- Substrate supply
- Labor and spare parts for scheduled and unscheduled maintenance
- Expenses for biomethane trade / certification
- Finance service (interest)
- Administration
- Unforeseen

Does the business plan contain sufficient reserve for unforeseen additional costs (e.g. additional requirements on behalf of the permit?

To which extend does a project delay (e.g. delayed grid connection) influence your business plan?

Is there any cost sharing foreseen regarding expenditures for grid connection?

Is there financial support / funding available?

Choose an experienced financing institute.

Is your financing partner experienced in financing biogas projects?

Be well prepared for negotiating with your financing partner.
Which mode of financing is appropriate (e.g. loan/ project financing /leasing of assets)?
Negotiating with financing institute may take time periods of several months. Therefore contacting the financing partner at an early stage of the project is advisable.
Are all required documents prepared? o Feedstock supply contracts o Biomethane sales contract o Offer of the equipment supplier o Grid connection contract o Business plan o Permits / licenses o O&M contracts / concept o Insurances

GLOSSARY

CAPEX	Capital expenditures
CHP	Gas engine for cogeneration of heat and power
Digestate	Nutrient rich residues from processed biogas substrates; suitable to be used as fertilizer
OPEX	Operational expenditures
R&D	Research and Development
REKO	Electronic monitoring of calorific value
WP	Work package