The BIOMASTER Project: Biomethane Use in Transport

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IN THIS PRESENTATION

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Who is ISIS

- Research and consultant Institute founded in 1971
- Consolidated experience in energy efficiency, sustainable mobility, territorial systems, environmental sustainability
- 20 members staff with multidisciplinary background in engineering, statistics, economics, politics and informatics
- Long story of collaboration at national (Ministries, Regions, Provinces and Municipalities) and international level (European Commission, World Bank, European Bank of Investments, foreigner Ministries, Regions and Municipalities, etc.)
- Specialised skills in coordination of projects, analysis of and support to policies, impact assessment, evaluation of policies and technologies energy efficiency, monitoring of participation processes to policies.
INTRODUCTION

Biomethane ...?
What is Biomethane?

- Biomethane is produced through the **digestion process** when bacteria break down organic material into methane, carbon dioxide, water and other impurities (siloxanes, sulphur dioxide, hydrogen nitride)

- The methane can either be used to generate **electricity** and **heat** or in its upgraded form as **fuel** or injected into **natural gas grids**

- Residual digestion–based products may be used as **fertilizer** or **compost**

Source: Biogasmax Project - [www.biogasmax.eu](http://www.biogasmax.eu)
Design: FGM-AMOR
Why Biomethane?

- **Diverse, abundant** and **self-supplying** feedstock: sewage sludge, municipal bio-waste, residues and crops from the agro-food sector

- **Unique combination** of low-carbon, low-emissions, low-noise transport

- Biogas production to **improve environmental efficiency** of waste treatment processes

- **High productivity** per hectare of biogas from crops, decreasing competition for arable land

- Upgraded biogas **similar to natural gas**:
  - CNG infrastructures and vehicles can be used
  - Natural gas can be complementary in security of supply
  - Upgraded biogas can be injected in and transported by the natural gas grids
Supplies are unlimited …

Source: CIVITAS TRENDSETTER Project – www.civitas.eu
Design: FGM-AMOR
Supplies are unlimited ...
BIOMASTER

The project
Project Summary

BIOMASTER is a project of the Intelligent Energy Europe Programme

- **17 partners, 5 Country members, 4 application sites**
  - Małoposka Region (PL)
  - Norfolk County (UK)
  - Skåne Region (SE)
  - Trentino (IT)

- **36 months duration (01 May 2011 – 30 April 2014)**

- **Around EUR 1,700,000,00 EU co-funding**

- **Uptake of biomethane production, distribution and use in vehicles**

- **“Well-to-wheel” partnership, with set-up of local networks**

- **Studies, analysis, training, seminars, conferences, dissemination, publications, events, meetings**

www.biomaster-project.eu
Who we are ...

- **Malopolska Region, Poland**
  - AGH-UST – AGH University of Science and Technology
  - MSWM – Municipal Services and Waste Management Company of Crakow
  - PGNiG – PGNiG Energia S.A.

- **Norfolk County, United Kingdom**
  - NCC – Norfolk County Council
  - NCS – Norse Commercial Services Ltd
  - NGG – National Grid Gas plc

- **Skåne Region, Sweden**
  - LUENERG – Kraftringen produktion
  - Regskane – Region of Skåne
  - AB SEA-SE – Kommunförbundet Skåne

- **Trentino Region, Italy**
  - ACSM – ACSM S.p.A.
  - CRF – FIAT Research Centre SCPA
  - CRPA – Research Centre on Animal Production
  - DE – Group Dolomiti Energia
  - FEM – Edmund Mach Foundation

- **ISIS** – Institute of Studies for the integration of Systems, Italy (coordinator)
- **FGM-AMOR** – Austrian Mobility Research, Austria
- **TTR** – Transport & Travel Research Ltd, United Kingdom
Małopolska, Poland

About Małopolska
Małopolska is a region in southern Poland with an area of 15,108 km$^2$ and 3,267,731 inhabitants. The region's economy includes high technology, banking, chemical and metallurgical industries, coal, ore, food processing, and spirit and tobacco industries. The most industrialised city is Kraków, which is also the capital of Małopolska.

Activities within BIOMASTER are ...
• Guidelines on methods and sources of biogas production & upgrading
• Feasibility study analysing the financial, technological economic, environmental and safety conditions to inject biomethane into the gas grid
• Fleet development strategy to reach new vehicles adapted for the use of biomethane and use of biomethane in the vehicles currently powered by CNG
• Set up of regional and national network
Norfolk County, United Kingdom

About Norfolk
Norfolk is a low-lying county in the East of England. The county town is Norwich. Norfolk is the fifth largest ceremonial county in England, with an area of 5,371 km² and 850,800 inhabitants. Over 20% of employment in the county is in the agriculture and food industries.

Activities within BIOMASTER are ...
- Study on the design, finance, supply, site selection, and planning requirements to include a biogas production plant at waste processing centres
- Guide for farmers/landowners, aimed at preparing them to take advantage of market opportunities that may arise
- Feasibility study on the scope of the grid injection equipment and the connecting pipeline
- Engineering design study of the planned installation.
- Fleet development strategy to reach new vehicles adapted for the use of biomethane and use of biomethane in the vehicles currently powered by CNG
- Set up of regional and national network
Skåne, Sweden

About Skåne
Skåne (Scania) is the southernmost province of Sweden with an area of 10,939 km² and 1,228,815 inhabitants. Malmö is administrative centre of Skåne County. There 45 biogas plants in operation and about 33% of biogas is upgraded to biomethane. It is injected to the natural gas grid at 5 injection points and mostly dedicated for transport use. There are 25 public filling stations and some 15 bus depots stations. About 5,000 personal cars and 700 buses run either on pure biomethane or mixed biomethane/natural gas.

Activities within BIOMASTER are ...
- Business models for 6 future biogas plants in the region
- Business plan on modalities to inject biomethane into the regional or national gas grid both on a small versus large scale
- Analysis and suggestion of the potential to develop the gas filling infrastructure and also the developing a strategy on how to build new gas filling stations the coming years
- Suggesting a temporary national legal framework enabling the use of biomethane in dual fuel biomethane vehicles such as heavy trucks and tractors
- Define a public procurement strategy for biomethane vehicles
- Set up of regional and national biogas and biomethane network
Trentino, Italy

About Trentino
Trentino, with its capital Trento, is an autonomous province of Italy with an area of 6,207 km² and 533,394 inhabitants (year 2012). The province is divided into 217 municipalities. Agriculture and tourism are key activities. Currently there are 5 biogas plants in operation and another one under construction (all for CHP). In Trentino 85% is covered by the gas grid, there are 7 CNG filling station, 14 CNG buses (in Trento) and 3,900 CNG private vehicles.

Activities within BIOMASTER are ...
- Feasibility study to evaluate the best technology, planning, financing and location of one anaerobic digestion facility on the local site
- Business plan on modalities to inject biomethane into the regional or national gas grid both on a small versus large scale
- Analysis of the different uses of biomethane that would be produced
- Evaluation of the technological, economical and safety aspects of a local filling station
- Set up of regional and national network
BIOMASTER

Objectives and challenges
The biomethane chain we work on ...

Source: Biogasmax Project - www.biogasmax.eu
Design: FGM-AMOR
Our ambitions are ...

- To **prove biomethane for transport** as operational and viable option in spite of the existing regulatory and fiscal barriers

- To **overcome the impasse** by bringing the key components of the biomethane chain into a joint initiative, stimulating investments, removing non-technological barriers and mobilising actions for biomethane uptake
The targets towards we work ...

• **Boost** the biomethane economy and identify solutions to the common barriers in the view to implement practical action plans

• **Contribute** to strategic energy security, renewable energy, environmental and harmonization targets

• **Conduct** an initial market assessment to identify the current technical, economic and social barriers to the development of biomethane market

• **Define** a common platform as a basis for widespread market development of biomethane as a renewable transport fuel

• **Evaluate** environmental and economic processes and impacts to assess the cost-effectiveness of biomethane market

• **Disseminate** the project findings to the main target groups and the key actors of the biomethane chain and potential multipliers
Challenges to work on ...

EU Level

- **Directive 2009/28/EC**: 10% of transport fuel from renewable sources
-需欧洲生物甲烷标准
- Promote and facilitate injection of biomethane into **natural gas grid**
- **Digestate** to replace **artificial fertilisers**
Challenges to work on ...

Local and National Level

- Avoid market distortion of green certificates system for power and heat
- Legislation to secure investments for production, refuelling infrastructure, etc.
- Simplified permissions for building of biogas plants and connection with the gas grid
- Economic incentives for vehicles and fuels
- Security of energy supply from local resources instead of fossil fuel dependency and import
- Increase and optimise the bio-waste collection, treatment and recycling
- Adapt/build gas grid for injection and increase gas filling stations
Challenges to work on ...

**Business Level**

- Improve *range* and *energy efficiency* of gas vehicles (storage and engine)
- Increase *availability* of vehicle models
- Investments in driver *trainings* for gas vehicles
- Higher frequency of vehicle *maintenance*
- Comprehensive *service contract* for vehicles
We try to tackle these challenges by ...

- Commitment of a “well-to-wheel” partnership along the biomethane chain within the project
- Set-up of networks by involving additional local and national stakeholders beyond the official partners
- Addressing
  - Potential for total production and use
  - Available distribution modalities (with special focus on biomethane grid injection)
  - Legal, organisational and financial barriers
What we want to achieve ...

- 4 detailed feedstock assessments, action plans for biogas production and upgrading, strategies for residual product management and strategies to boost biomethane use in vehicles

- 4 regional networks established, one in each BIOMASTER region

- 16 additional regional networks, 4 in each BIOMASTER country

- Additional networks in 5 countries others than the partners ones

- Quantifiable progress towards a cumulative target of:
  - 12 new biomethane production plants in the partner regions
  - 4 biomethane grid injection points
  - 630 vehicles operating on biomethane
  - 54 new biomethane filling stations
Focus on Regional Networks

- Activities of regional networks in the project sites: regular meetings, regional seminars, national conferences, interaction with other existing networks

- Multiplier effect for the creation of similar networks in other areas of project regional countries (4 X 4 = 16): transfer of information, news and project documents, invitations to events of the project, joint organization of two workshops

- Replication effect with networks in 5 countries others than the partners ones, with organisation of workshops as kick-off step and visible milestone for their development. BIOMASTER will regularly inform the main stakeholders in those countries on the activities and results providing them the main products, such as reports, brochures, newsletters, fact-sheets etc.
Results so far …

- 4 detailed **feedstock assessments** in the 4 BIOMASTER sites
- 4 strategies for residual product management in the 4 BIOMASTER sites
- 4 **regional networks** established, one in each BIOMASTER site
- 8 other regional networks in each partner country (1 in Italy, 1 in UK, 4 in Sweden, 2 in Poland)
- 3 rural biogas plants, 1 new public filling station, **652** new CNG personal vehicles (Skåne)
- Feasibility study for a biogas plant (Trentino), feasibility studies for grid injection in Malopolska, Norfolk, Skane and Trentino
- **Communication products** (newsletters, factsheets, postcard, website, folder).
CRF Survey of Trentino CNG Vehicle Users

<table>
<thead>
<tr>
<th>Sample</th>
<th>Online Survey</th>
<th>Filling Stations</th>
<th>Bus Stations</th>
<th>On paper questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Users</td>
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<td>X</td>
<td></td>
<td></td>
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<tr>
<td>TTSPA Drivers</td>
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<tr>
<td>DE Drivers</td>
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</tbody>
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- Methane is not considered more dangerous than a standard fuel by almost 70% of people
- The fuel saving is the main reason for which users purchase a CNG car
- The main reasons of not satisfaction for CNG users are refueling procedure and driving range (more than 30%)
- The percentage of people knowing biomethane is really high especially among the web respondents (67%)
Norse Survey of Norfolk CNG Vehicle Users

- Lack of enough **filling stations** as main problem
- More than **90%** in favor of alternative fuels (including biomethane) by bus operators
- **Better information** on technical aspects needed (fuel costs, vehicle costs, emissions)
• **General satisfaction** of NGV drivers with their cars and the infrastructure for CNG/biomethane in the Helsingborg region

• Happy with the **low environmental impact** from their car, especially when using biomethane

• Almost **no difference** in the driving experience when running on biomethane compared to CNG

• NGV’s drivers relatively happy with the **number** of filling stations

• For people not using NGV the **lack** of filling stations is one of the main reasons
AGH-UST Survey of Malopolska CNG Vehicle Users

Q16: For which reason did you buy a CNG/biomethane car?

- Incentives: 30%
- Economic aspects: 25%
- Environmental aspects: 20%
- It's not my car - I only use it: 15%
- No: 10%

Q24: If biomethane available in your region, it would be an incentive to buy a CNG vehicle?

- Yes: 71%
- No: 29%

Q12: In general, are you satisfied with your car?

- Greatly: 1%
- Yes: 24%
- Moderately: 65%
- No: 10%

- Limited number of filling stations as main problem

- More 80% satisfied/moderately satisfied with the fuel economy (for 60% saving of 20-40% in fuel costs)

- About 60% satisfied with their NGVs: dissatisfaction due to limitations to parking, drive comfort and size of the boot

- More 86% knows biomethane and is interested in buying a biomethane vehicle

- CNG vehicles chosen primarily for economic/incentive reasons
## Conclusions

### Survey on Perception of natural gas/biomethane Site Comparison

<table>
<thead>
<tr>
<th>About CNG/Biomethane.....</th>
<th>Trentino</th>
<th>Skåne</th>
<th>Norfolk</th>
<th>Malopolska</th>
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<tbody>
<tr>
<td>Biomethane: is it already available?</td>
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<td>🌻</td>
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<td>Methane: is it already available?</td>
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<td>Fuel Consumption</td>
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<td>Driving Satisfaction</td>
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<td>Vehicle general perception</td>
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<tr>
<td>Filling stations Satisfaction</td>
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Amendment of RES Directive

On March 2012 the EU Commission adopted the Proposal COM(2012) 595 final for a Directive amending the RES Directive in the view, among others, to limit at 5% the contribution that biofuels produced from certain food and feed crops (with a risk of Indirect Land use Change, emissions) make towards the attainment of the targets in the Directive itself (10%), so providing incentives to biofuels produced, among others, from waste and agricultural residues.
CEN/TC 408 “Project Committee - Biomethane for use in transport and injection in the natural gas grid” Mandate M/475

- **M/475 Mandate**: to CEN for standards for biomethane for use in transport and injection in natural gas pipelines
- **Object**: Biomethane for use in transport and injection in natural gas pipelines
- **Directive**: 2009/28/CE Promotion of the use of energy from renewable sources
- **Aim**: Development of the use of biomethane
- **Needs**: Specifications (parameters and values) for the biomethane
- **Origin**: European Commission – DG Energy (Dr. Kyriakos Maniatis)

Clean Power for Transport package

- On January 2013 the EU Commission adopted the Communication COM(21013) 17 final on “Clean Power for Transport: A European alternative fuels strategy” and the Proposal COM(2013) 18/2 for a Directive on the deployment of alternative fuels infrastructure which provide an important accent, among others, on biomethane.

- The package aims to facilitate the development of a single market for alternative fuels for transport in Europe. In particular it defines a comprehensive policy framework for the development of alternative fuels, with binding targets for the necessary infrastructure build-up, including common technical specifications (in order to solve the “chicken and egg” dilemma) and appropriate information to transport fuels to consumers (through fuel labelling at refuelling points and on vehicles).
Chicken/Egg Dilemma (1)

• **Gas distributors** and **OEMs** need a certain number of **drivers** to develop fuelling infrastructure and make new vehicles available.

• But **users** need fuelling stations and available methane vehicles…

• First **vehicles** or **stations**?

How to solve the problem???
Chicken/Egg Dilemma (2)

• The introduction of clean and energy-efficient vehicles in the market should be accompanied by the parallel build-up of refuelling infrastructures

• Intervention of public authorities: the purchasing policies for cleaner vehicles in captive fleets (also through green joint procurements) and the corresponding build-up of fuelling facilities in order to create the critical mass to influence market prices and industry choices against the limited number of vehicles models and their higher costs

• Moreover public bodies improve their environmental image by providing the right example to citizens
Whom to contact ...

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Thank you for your attention!