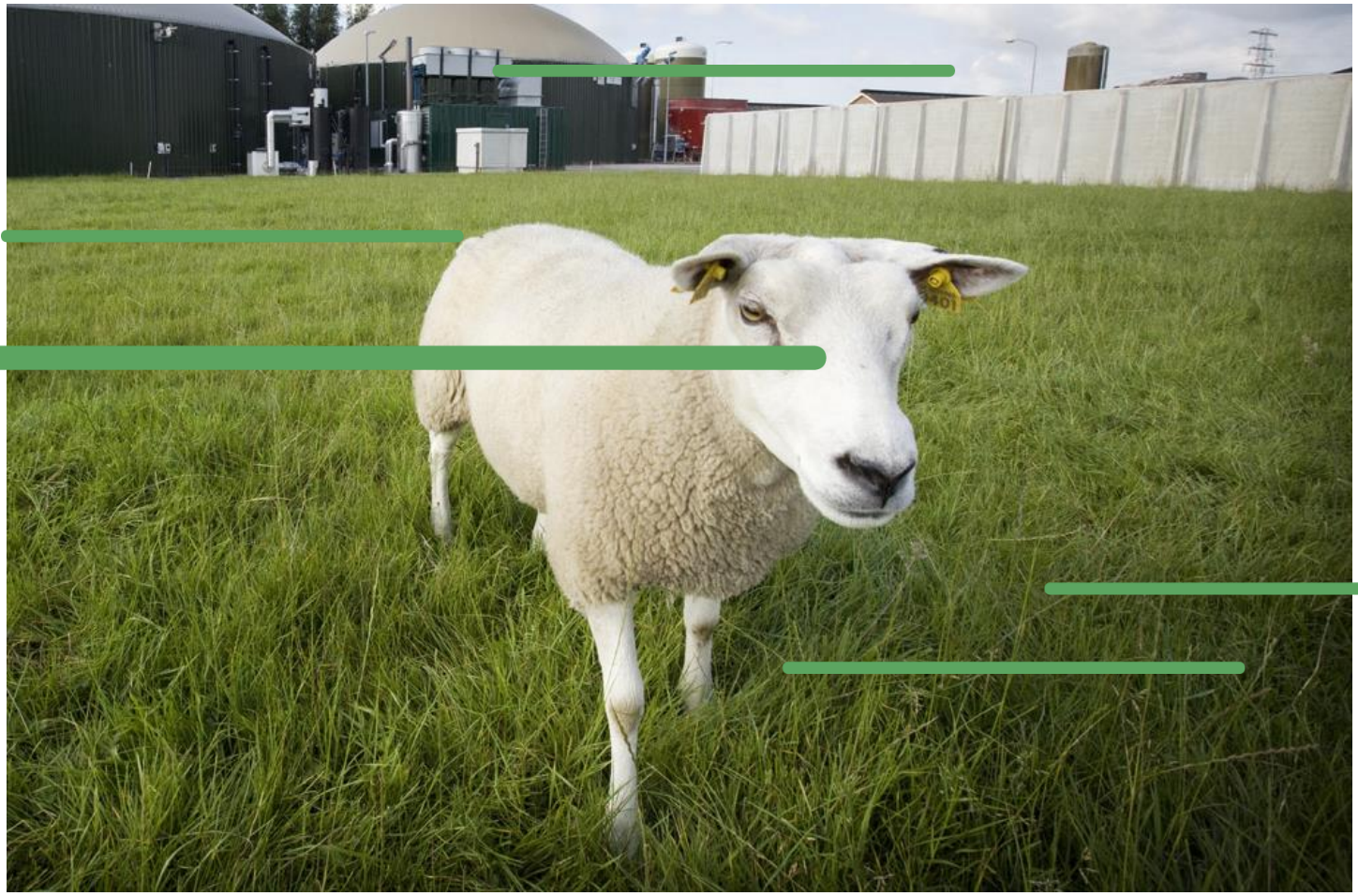
GREEN GAS GRIDS



Workshop on Development of Biomethane

05 March 2013
Villa Modigliani, Paris

Arthur Wellinger

INTELLIGENT ENERGY EUROPE

Development of Biomethane in Europe – Legislation, Injection and Trade

Programme

10:00	Welcome	Arthur Wellinger EBA
10:05	Short presentation of the GGG project	Alexandra Lermen DENA
10:20	Status of biomethane as a vehicle fuel: potential and specific needs	Matthias Svensson, SGC Jaime Alamo, NGVA
10:50	Biomethane data bank: Best practice - financial guidelines - future trends	Joachim Krassowski, Fraunhofer Umsicht
11:20	Development of standards and legislation • Measures to reduce GHG emissions • Biomethane Standards: What is the status?	William Mezzullo, REA Jacques Dubost, GDFSuez
14:00	Biomethane injection in France : • National Working Group, laws, tariffs and developments • Guarantee of origin	Olivier Théobald, ADEME Robert Marton, GrDF
14:50	Practical applications • From source separation to biomethane • Development of UK's LNG and CNG network	Pierre Grandjean, Biomethane Forbach John Baldwin, REA
15:30	International trade of biomethane: Status and developments	Jenny Fulton, Biogasrat
15:50	Closure	Arthur Wellinger

Welcome and Market Overview

Arthur Wellinger from the European Biogas Association (EBA) welcomed the approx. 50 participants (access was limited due to room availability) to the workshop and gave a short overview on the workshop programme.

Alexandra Lermen – project manager – of the German Energy Agency, gave an introductory overview on the project in general and focused afterwards on the market situation. She particularly pointed to the unique opportunity of biomethane as a joker among the renewable energies with its flexibility in production from different input materials, the storability, and the efficiency and highlighted the multiple opportunities for its tailor made utilisation.

According to the actual figures over 200 upgrading plants were already in operation, thereof 102 in Germany, 39 in Sweden and 18 in The Netherlands.

152 of all plants were connected to the natural gas grid. Besides the large chances of biomethane, she discussed also the challenges. As major market obstacles she cited the long planning procedure, the low demand due to the limited number of gas vehicles and the high investment cost of upgrading plants.

Status of biomethane as a vehicle fuel

Matthias Svensson from the Swedish Gas Center and Jaime de Alamo from the European Natural Gas Vehicle Association (NGVA) shared this contribution.

Matthias Svensson focused on the production and the potential of biomethane in transport. The sources for biogas are quite impressive ranging from sewage sludge over municipal solid waste, landfills, agricultural wastes and energy crops to by-products from industry. The biomethane potential of EU-27 would allow the operation of over 2 million city buses. This includes biomethane from gasification of wood to SNG that can be upgraded to natural gas quality like biogas. The forerunner country for biomethane as transport fuel is Sweden with a share of 57% in gas powered vehicles followed by Switzerland with 21% and Finland with 18%. He stressed the fact that biomethane powered vehicles massively reduce climate gas emission as well as local pollution (PM, NO_x, aldehydes, carcinogens) and substitute fossil fuels.

Jaime de Alamo reported on the progress of CEN TC 408 where GreenGasGrids is participating through EBA and NGVA. In 2010 the Commission has given a specific mandate (M475) to CEN for the development of:

a) A European standard for a quality specification for biomethane to be used as a fuel for vehicle engines;
b) A Technical Specification or European Norm for a quality specification for biomethane to be injected in natural gas pipelines.

The CEN technical experts should consider whether it is possible and desirable for the proper functioning of the market to develop only one European Standard addressing the requirements of both applications.

Because the biomethane quality for vehicle fuel is closely related to the quality of natural gas – which has not been defined so far – the discussion cannot be split into two CEN TCs. The work of CEN/TC 408 was therefore extended and addressed also the issue of CNG (Compressed Natural Gas) as a fuel, and blends of fossil CNG with biomethane under the TC umbrella.

In order to allow an efficient work three internal expert groups were created within the framework of the TC 408:
• EG1: bio-content determination
• EG2: NG/biomethane as a fuel
• EG3: grid injection specification

Although the work of the CEN group is approaching the end (7 out of 10 meetings were held) a number of parameters are still discussed. Some are biomethane specific like Siloxanes/Silicon, hydrogen or heating value (resp. methane content); others are general to all gases like content/water dew point, Hydrogen Sulphide, Oxygen or compressor oil & particles (droplets).

In parallel, CEN TC408 is collaborating with CEN/TC 234/WG 11 who is working on the general NG grid specifications. Hence, all parameters that are not specific for biomethane, are defined by this group.

Biomethane data bank:
Best practice - financial guidelines - future trends

Joachim Krassowski presented the survey on biomethane project financing that Fraunhofer Umsicht did within the GGG project. The survey was addressed to project developers and financing institutes. It was ddistributed as an online questionnaire. 10 replies from 6 countries were used for the analysis. Loan financing most common instrument applied, i.e. provision of a loan to an operating company, followed by project financing, i.e. direct financing of a given biomethane project. Less frequent were leasing contracts and investment funds involving money from several minor investors. Only in one case there was a support by a capital grant. As was pointed out already by several former biogas projects, the time period for financing negotiations was usually pretty extended, up to one year.

The presentation included also alternative ways of biomethane production like gasification of ligneous material producing synthesis gas (SNG) composed mainly of carbon monoxide, hydrogen and methane. This gas is upgraded by a methanation process over a catalyst to biomethane. The process is applied in six different places throughout Europe in scales of 10 to 32 MW_{th}.

The newest option under test is the so called power to gas where excess electricity from wind or PV is used for electrolysis to produce hydrogen. This is fed into a digester where together with the CO_2 of the fermentation process microbial methane is formed that can be upgraded for grid injection.

Measures to reduce GHG emissions

Along the biomethane supply chain **William Mezzullo** identified five areas where emissions, i.e. GHG production could be reduced: Feed stock production, harvest and transport, storage, AD and biomethane production.

Feed stock production is by far the highest potential emitter followed by biogas upgrading. Chemical fertiliser is the major source of emission due to the fact that huge amounts of oil are used for the fertilizer production. Using digestate instead reduces the GHG-emissions by 50% however; the problem of N_2O formation is still not solved just by changing the fertiliser. N_2O might cover up to 32% of total emission. Best agricultural practice is the only solution with proper timing of application and proper equipment (drilling). If well done, N_2O emission can be reduced by more than 80%.

Emission during storage can be completely avoided if all holding tanks are covered. Emission during digestion might be as high as 6% unless tightness of rubber membranes are controlled on a regular basis.

Methane emission during upgrading was quite common until a few years back. Since Germany has introduced strict regulations on maximum emission of 0.1%,

the technology has improved considerably. Today, either appropriate upgrading technologies are used emitting less than 0.1% or the off gas goes directly into oxidation either in a special low calorific CHP or into a Regenerative Thermal Oxidizer (RTO).

Overall, with best available technology emission from biomethane production is not a problem anymore even when iLUC factors are considered.

Biomethane Standards: What is the status?

Jacques Dubost from GDF SUEZ is the leader of the French team within CEN TC408. He explained in more detail than de Alamo the structure of the mandate and the CEN group led by Erik Büthker from Holland with the secretary Charles-Pierre Bazin de Caix from the French standardization bureau AFNOR. Explicitly he mentioned the large participation in that group with 17 countries and 7 European Associations including EBA and NGVA Europe.

The major work is on the definition of a gaseous fuel supplied to the grid connected natural gas filling stations that has to meet the methane number (defining the knocking of engines, equivalent to the octane number for liquid fuels) requirements specified by CEN/TC 234/WG 11.
The group decided to include also High Methane Number grade fuel, for dedicated fuel delivery infrastructures (that may or may not be connected to the grid) will be specified by CEN/TC 408.

Biomethane injection in France : national Working Group, laws, tariffs, developments and guarantee of origin

Olivier Théobald from ADEME presented the French situation. The ministry of energy has formulated objectives and rules towards 2020 also for biogas. According to their plans electricity and heat from CHPs should be quadrupled and the heat production should increase by a factor of 6 from biogas.

Because the heat utilisation is sometimes limited the ministry also promotes biomethane injection. In Art. 19 of the environmental law called "Grenelle 1" they decided

- ✓ Creation of an "Heat Fund"
- ✓ Eligibility of biomethane injection projects

And in Art. 92 of the law on National Commitment to the Environment, called "Grenelle 2" they laid down a

- ✓ Guarantee purchase tariff for feed-in biomethane
- ✓ Contracting a producer with any supplier
- ✓ Compensation of suppliers for their biomethane purchases
- ✓ Designation of a buyer of last resort
- ✓ Mechanism of GoO

The compensation of the suppliers is important to initiate the market. It means that in case suppliers cannot sell biomethane at a higher price, the government will compensate them for the difference to the natural gas price.

A Road Map has been defined based on ministerial targets (2009) between 3 and 9 TWh/y from biomethane in 2020. Prospective scenarios for 2030 and 2050 (ADEME, 2012) include 15Mtoe of gas in transport including 50% of biomethane (40 TWh/y).

The FiT for biomethane is composed of several parameters including capacity and origin and substrate of the biogas produced. It varies from 64 to 125 €/MWh HHV.

Actually there are two upgrading plants in operation and one under construction. However, GrDF received 396 applications, thereof 291 are progressing.

Robert Marton from GrDF gave more details on the GoO mechanism. In December 2012 GrDF has been appointed by the government for a first period acting as registry. They defined that a certificate covers one MWh, indicates production site and date of production and mentions substrates for the biogas production.
A GoO has a lifespan 2 years. There is a strict control that double counting is avoided by checking the statements against the gas network data.

The Register is available to a few actors only like gas companies, administrative authorities and the GoO manager of GrDF. They have created a website to register biomethane formation, transfer and redemption (utilization). It includes also the reporting. The cost for the system was approx.. 60'000 €. GrDF receive 16cts per GoO, i.e. they have to sell a large number of certificates to compensate for the investment.

From source separation to biomethane

Pierre Grandjean from Sydeme, Forbach presented one of the two biomethane injection systems operated in France. Sydeme covers a region with 385,000 inhabitants covering 2500 km^2. They collect mixed household waste, restaurant waste and some liquid wastes from industry. The household waste is mechanically separated into biowaste, cardboard and paper and residual waste. They separate between 55 and 85 kg of biowaste per person and day yielding a total amount of 45,000 tons per year. The biowaste is treated in a solid waste digester (Kompogas) producing 5.5m Nm^3 of biogas per year. 800,000 m^3 thereof goes into a 2-step membrane gas upgrading unit (Air Liquide) the remainder is used for heat and power production. he off-gas from upgrading. 14% of methane is "lost" with the off-gas in the first step of upgrading and is used in the CHP. The off-gas from the second step is recycled.

The biomethane produced (4,000 MWh/a) is fed into the gas grid. The CHP produces 10,900MWh electricity and 12,400 MWh of heat per year that is distributed in by a district heating system. 100% of the net energy is used all year round.)

UK Natural Gas for Vehicles Brief

John Baldwin presented UK's first commercial scale biomethane to grid project with an upgrading capacity of 500 m^3/hr. It is a 3-stage membrane system from Air Liquide. The gas is produced by the Rainbow Farm's AD plant.

So far no fuelling station in the UK is selling pure biomethane. The gas is fed into the grid and the certificates are sold. Only the largest gas fuelling station in Crewe sells a mixture of 20% biomethane and natural gas however, the 20% are covered by certificates. Gasrec is the only provider of liquid biomethane produced in their own upgrading system at SITA's Albury landfill site, Surrey (4,000 tonnes liquid biomethane pa).

Baldwin discussed the question why the UK is the worst gas vehicle market in the EU. He named a number of factor that laid to the current situation:

- Break-up of British Gas leading to no support by a gas company
- Low taxation for diesel for buses and so that the bus market is not available
- No OEMs making right hand drive vehicles
- MAN bought UK truck manufacturer ERF, closed the UK manufacturing plant and stopped making the CNG tractor
- The only OEM Tractor Product from 2002 – 2012 was the MB Econic available at low bhp only. When UK fixated the need of 10bhp/tonne weight, Econic's market came to a halt.
- UK Govt has supported alternative fuels:
- LPG, Biofuels, H2, now electric
- Has given on-going fuel duty derogation like LPG but no long term position
- H2 and Electricity get zero duty due to supposed zero carbon but Biomethane pays full NG duty

Actually the UK goes for HDV not for cars for several reasons, i.e. gas can be fed into and distributed through 10bar systems that are new and tight. Low pressure distribution systems e.g. to car filling stations are old and often leaking pipes.Leakage might be as high as 10% or more.

Long distance gas trucks are fueled with LNG. Eight LNG filling stations are placed strategically along the major highways. They are operated by Chive Fuels, the Hardstaff Group, BOC, Bio-LNG and GasRec Ltd.

Biomethane trade – status quo and perspectives

Jeni Fulton presented the state of the art of biogas trade from the view of Biogasrat, an association working closely together with GGG. She categorized the countries producing or importing biomethane into closed and open markets depending on the recognition of the green property of biomethane by importing countries and whether imported biogas counted towards national quotas. She identified Germany and Switzerland as closed markets, Finland, Denmark. The Netherlands, Poland and the Czech Republic as open market whereas Belgium, UK, France and Italy were considered as undefined.

As major hurdles for an open biomethane market she identified the protectionism of some countries, e.g. through import restrictions like in Germany and Austria, the lack of cross-border regulations, the issue of feedstocks and the missing economy (the German-Dutch pilot project has been cancelled).

On the other hand she recognized that some countries have substantial biomethane targets like Denmark, Germany, Holland, Sweden and the UK.

Great hope is given to the new, ambitious Commission targets for renewable transport (proposed directive (COM (2013) 18/2) asking for:

- Increase in electric, hybrid, hydrogen and CNG cars
- Compressed Natural Gas (CNG) covering 5% of the EU's vehicle fleet, or 10 million vehicles by 2020 (ten-fold increase from current levels)
- 10% of this volume is sourced from biomethane, i.e. 94 bm^3 by 2020
- Significant incentives for domestic biomethane producers

The fuel market could be attractive for biomethane: 1 kg CNG retails at €1,015. This equates to 7,8 ct/kWh. Or biomethane can be sold for the natural gas price (€24/MWh approx.) plus the certificate buyout price (€60/MWh in Germany). UK, eligible for an additional 20p/kg subsidy at the pump, bringing the total price to 9,59 ct/kWh (CNG price plus biomethane surcharge.