Supply and utilisation of biogas and natural gas in SPAIN

- An overview of the present situation, norms & legislation and available vehicles

D2.2.5

Contents

Introduction

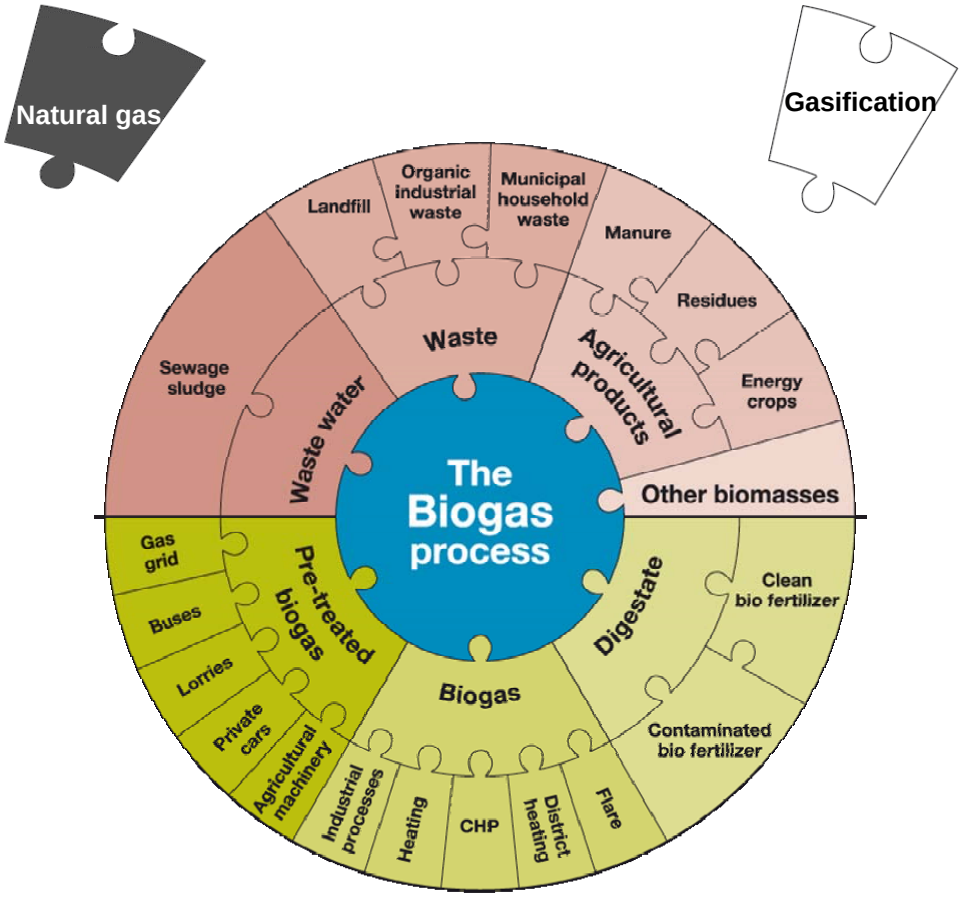
Biogas and natural gas are very clean energy sources, when combusted the amount of particles, NO_x, CO etc are lower than most other fuels. Biogas is also a renewable fuel. If petrol or diesel is replaced with biogas produced from manure, the CO_2 emissions can be reduced with up to 180 % . The MADEGASCAR project aims at improving the conditions for a growing market for gas driven cars and light transport vehicles (NGVs) and also increase the supply of biogas and natural gas for these vehicles.

To expand the market for supply and use of gas as a fuel for vehicles it is of high importance to understand the present situation of use and supply of gas. This text sums the present situation of supply, treatment & distribution and the final use of biogas and natural gas in the region.

One chapter deals with norms and legislation. This chapter concern laws around biogas production plants, distribution of biogas and natural gas, and the use of methane gas in vehicles. The current management control measures that are used in the region to support gas vehicles are also summed in this chapter.

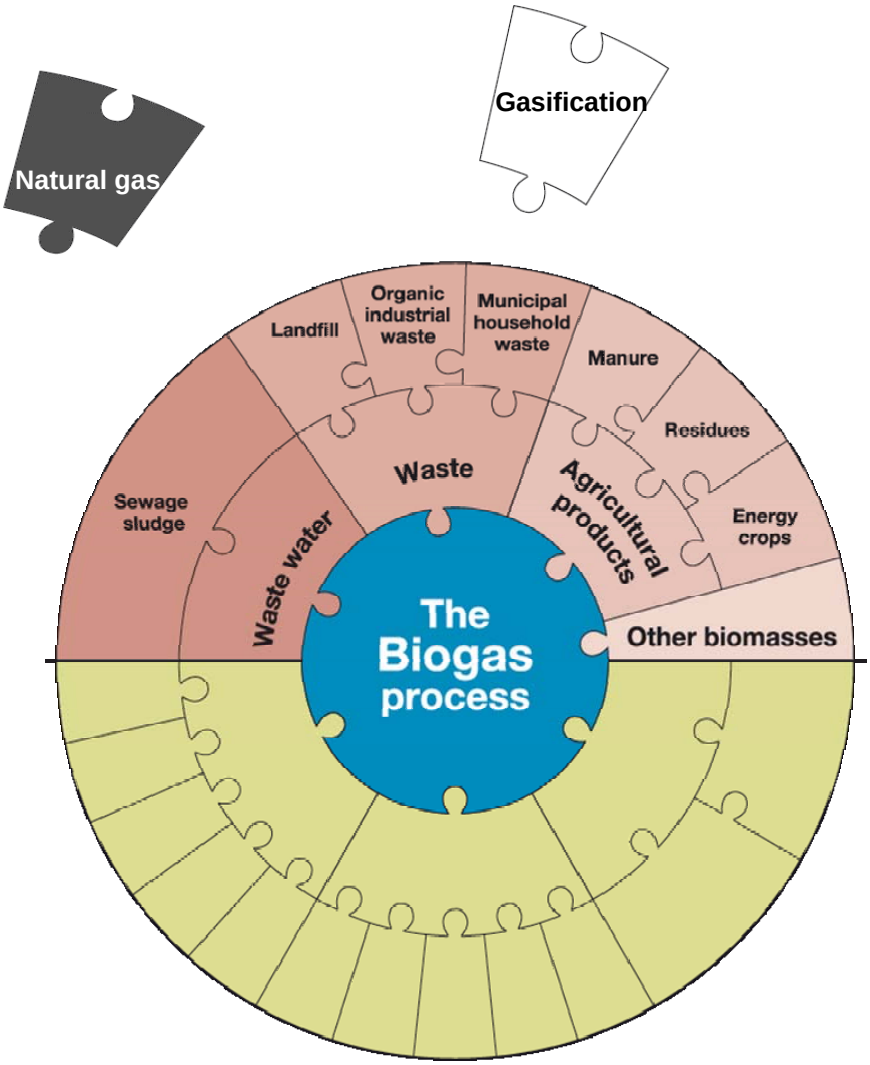
The use of LPG as vehicle fuel is also of interest for the MADEGASCAR project because of the possibility to convert these vehicles to propulsion with methane.

This text also contains an overview of the range of available NGVs in the region.



Supply

This section handles the present supply situation of biogas, natural gas and bio methane (gasification) in the region.



Biogas production plants

Background

In Spain, implementation of biogas production planta has a smaller extent than in the rest of Europe. Biogas production is focused in the aim of reducing the environmental impact of wastes. Usually is not focused as a profitable source of energy. The biogas is used to generate electric energy that is introduced in the electric grid. Also biogas is burned and used to generate heat. In some cases exploitation is done in cogeneration plants. Implementation on industrial scale will depend on environmental requirements and energy prices. Also there is a widespread idea thinking that is a problematic tecnology and not sufficiently tested.

Wastes origin in livestock activities, slimes of purifying plants, organic parts of urban wastes and industrial effluents. Biogas generation from industrial effluents is extended in beer, sugar, alcohol etc industries. Especially we have to mention manures, cause if they are not adequately treated, they can produce serious problems of contamination due to nitrates. In addition to the nitrates problem, we have to emphasize that methane elimination is absolutely needed, because of its powerful greenhouse effect. In this area, biogas generation from livestock wastes is having strong competition in manure effluents drying with natural gas in order to reduce the mass and volume of wastes. This technique is being object of grants and needs less inversion but has a very small energetic efficiency.

Then main biogas production is done by degassing landfills of urban solid waste. At the moment there are few anaerobic digestion cases.

Present situation

Because of the scattered production, is difficult to compile detailed information about the production of biogas.

Biogas consume in Spain has incresed in 2005 to 152 MW (571 GWh, 185 ktep). To this digits we have to add 35.8 ktep from thermal issues. Energetic exploitation of biogas has increased above expected, and even in 2003 objectives from Plan PP for 2010 were surpassed.

Waste Water

- ¿?__ Waste water plants digests the sludge in biogas reactors
- 3222 toe in total production per year
- ¿?__ GWh is flared per year

Waste

- ¿0?__ Co-digestion plants
- 177438 toe in total production per year
- ¿?__ plants upgrades the biogas to natural gas quality
-

Agricultural products

- ¿?__ biogas plant
- 3875 toe per year

Industrial effluents

- 1798 toe

Future perspectives

Are there any activities planned in the near future? Is there anything that should be regarded in future?

Biogas production is fomented from the central government and the regional ones.
Objectives of the new Energetic Plan for Renewable Energies (PER) are to install additional 94 MW (592 GWh) in 2010 and arrive to 455 ktep.

Improvement of efficiency in the processes of production of biogas.
Develop of systems of codigestión of biodegradable residues.
Optimization and improvement of processes of purification and cleanliness of the biogas.
Develop of systems for the injection of the biogas in the grid of natural gas.
Improve in the efficiency of engines.

Bio methane (gasification)

Background

Gasification is not extended, because of no demand. Low production.
It used in research and development of biogas fuel cells, and biogas reforming to obtain hydrogen.

Present situation

- Low production.
- It used in research and development of biogas fuel cells, and reforming to obtain hydrogen

Future perspectives

Optimization and improvement of processes of purification and cleanliness of the biogas.
Develop of systems for the injection of the biogas in the grid of natural gas.

Natural gas

Background

Well implanted technology. Widely used in industries, and final consumers.

Present situation

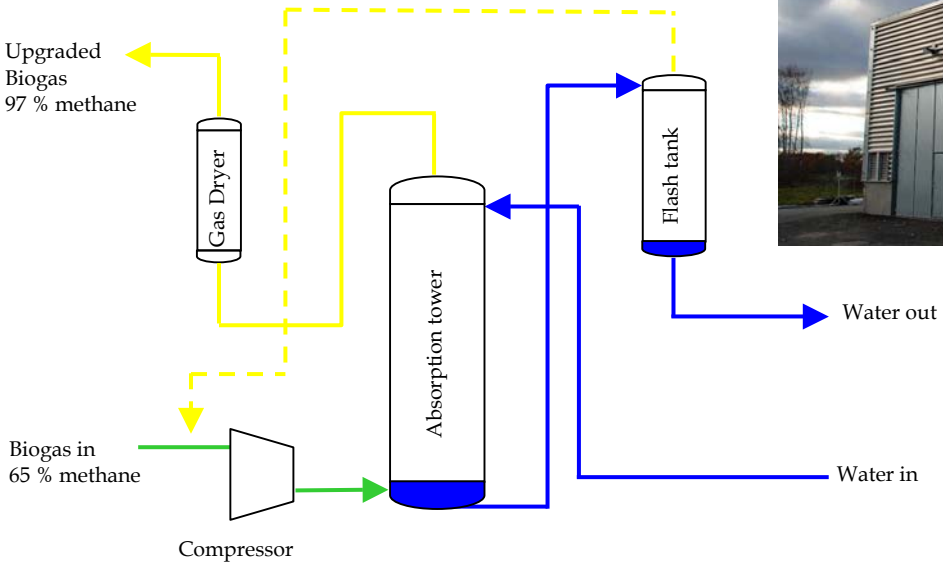
- 8 gas companies delivers natural gas within the region
- The Energy value of the gas is 10,23-13,23 kWh per Nm^3
- The total number of costumers in the region is 581898
    - Aragón: 170.894
    - Castilla y León: 349.500
    - La Rioja: 61.504
- The amount of sold/used gas is 391.435GWh/year

Future perspectives

Gas Natural SDG has created gnAuto division to promote the use on GNV

Treatment and distribution

This section handles the present situation of biogas treatment plants and distribution systems for biogas and natural gas in the region. The number of gas fuelling stations will also be found in this section.



Treatment of biogas (upgrading)

Background

Only as experimental or pilot plants. Low production, not for commercial use.

Future perspectives

Optimization and improvement of processes of purification and cleanliness of the biogas.
Develop of systems for the injection of the biogas in the grid of natural gas.

Gas grid

Background

Regulated, due to the control the natural monopoly character of grids. The main country grid is managed by ENAGAS
The transport of natural gas is articulated in six principal axis:

- Mediterraneo: Barcelona-Cartagena
- Central: Pais Vasco- Huelva
- Ruta de la Plata: Oviedo-Almendralejo
- Valle del Ebro: Tibissa-Haro
- Al Andalus gasoducto de Extremadura: Tarifa-Badajoz
- North-Nordeast: Santander-Tuy

Present situation

Local biogas grid:

Only in big cities.

Large (regional) gas grid:

Use the country grid.

Future perspectives

Extension of the distribution network to satisfy increasing demand.

Non grid transportation

Background

N/A. Non grid transportation of natural gas is not used. All natural gas inside the country is transported by pipelines.

Gas filling stations

Background

This is the main problem to promote the use of GNV, there are only nine gas filling stations in Spain, and only one for public use.

In the region Aragón/La Rioja/Castilla y León , the gas filling stations are used only in fleets of metropolitan buses, or waste collecting trucks.

Present situation

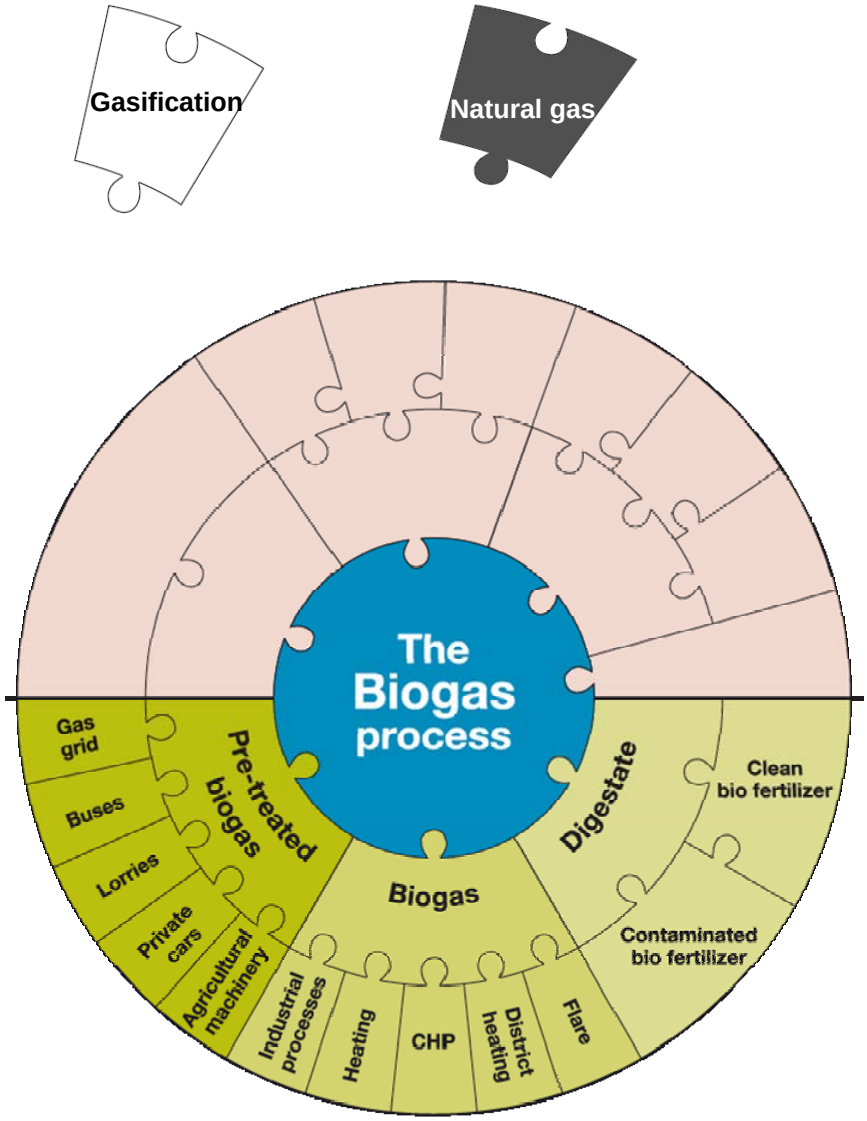
- 2 filling stations in the region
- 0 filling stations are provided with 100% biogas.
- 0 home filling stations

Future perspectives

Create one public gas filling station in Zaragoza (Aragón) with the cooperation of Opel España, Gas Natural and Zoilo Rios S.A.

Utilisation of biogas and natural gas

This section sums the use of biogas and natural gas in the region. The focus lays on use of gas for vehicles, but the use in fixed applications as heating and CHP will also be ventilated to get a better overview of the entire gas market.



Utilisation of upgraded biogas and natural gas in vehicles

Background

No upgraded biogas is used, only natural gas.

Present situation

- 0 personal cars in
- 762 buses
- 545 heavy duty vehicles
- 317,9 GNm^3 Natural gas

Future perspectives

GNV is viewed like a high potential market in Spain.
Biogas production is fomented from the central government and the regional ones.

Biogas for non transport applications

Background

The biogas produced is used to generate electric energy that is introduced in the electric grid. Also biogas is burned and used to generate heat. In some cases exploitation is done in cogeneration plants.

Present situation

Power generation:

972 Gwh (2006)

District heating:

N/A

Future perspectives

Biogas production is fomented from the central government and the regional ones.
Objectives of the new Energetic Plan for Renewable Energies (PER) are to install additional 94 MW (592 GWh) in 2010 and arrive to 455 ktep.
Coordinate biogas producers and develop systems for the injection of the biogas in the grid of natural gas.

LPG

Background

LPG is used only when the grid of natural gas is not available. LPG distributors are promoting the use on LPG in vehicles.

Norms and Legislation

Gas Transport:

- Pressure Equipment Directive (97/23/EC), Properties, Handling, Storage, Safety,
- Simple pressure vessels (87/404/EC)
- Transportable Pressure Equipment Directive (1999/36/EC TPED)
- Transportable gas cylinders- 93/42/EEC
- Directive 99/92 EC ATEX 137A
- Directive 94/9/EC ATEX 100

Explosive gas atmospheres

- **EN 60079-10,** Electrical apparatus for explosive gas atmospheres. Part 10: Classification of hazardous areas
- **EN 1127-1:1997** , Explosive atmospheres – explosion prevention and protection –Identifies thirteen different ignition sources, which are separated in two groups, one with the ones more relevant for the industrial gases
- **EN 13463-1**, Non-electrical equipment for potentially explosive atmospheres – Part 1: Basic methods and requirements
- **EN 26184-2:1991** Explosion protection systems - Part 2 : Determination of explosion indices of combustible gases in air (ISO 6184-2:1985)No89/106/EEC

The **EN standard** gives more detailed information concerning protective requirements for equipment in different zones:
http://ec.europa.eu/enterprise/newapproach/standardization/harmstds/reflist/atex.html

- Real Decreto Legislativo 1/2008, Law for the Evaluation of Enviromental Impact of new projects. BOE 23, de 26 de enero de 2008.
- Real Decreto 1.700/2003 about the use of biofuels
- Orden ITC/3860/2007, Revision of electric tariffs. BOE 312, de 29 de diciembre de 2007. BOE 183, de 1 de agosto de 2007.
- Real Decreto 661/2007, Regulatoin of the production of electricity in special regime. BOE 126, de 26 de mayo de 2007.
- Real Decreto 2818/1998, about production of electric energy by renewable sources.
- Real Decreto 2366/1994 about production of electric energy by instalaciones hidráulicas de cogeneración y otras abastecidas por recursos y fuentes de energía renovables. BOE. Núm. 23 de 27 de enero de 1995
- Orden de 12 de abril de 1999 , por la que se dictan las instrucciones técnicas complementarias al reglamento de puntos de medida de los consumos y tránsitos de energía eléctrica. BOE núm. 95 de 21 de abril de 1999.
- Orden de 17 de diciembre de 1998 por la que se modifica la de 29 de diciembre de 1997, que desarrolla algunos aspectos del Real Decreto 2019/1997, de 26 de diciembre, por el que se organiza y regula el mercado de producción de energía eléctrica. BOE núm. 310 de 28 de diciembre de 1998
- Orden de 3 de febrero de 1998 por la que se aprueba el modelo 560 de declaración-liquidación para la determinación del ingreso del impuesto sobre la electricidad. BOE núm. 30 de 4 de febrero de 1998

Control measures

Supply

The Normas de Gestión Técnica de Politica Energética y Minas, specify the quality propierties of the natural gas

Treatment and distribution

The Normas de Gestión Técnica de Politica Energética y Minas, specify the quality propierties of the natural gas. Nothing related to biogas.

Utilisation of biogas and natural gas

The only control measures are the regulation about the environmental impact of vehicles.

Available vehicles

Personal cars

Make:	Opel
Model:	Zafira 1.6 16v
Car Body:	Monovolume
Rated Output:	69 kW
Fuel capacity:	
Action range:	
CO_2 emissions	
Passengers:	
Kerb Weight	

Make:	Volkswagen
Model:	TOURAN 2.0 MAN. 5V
Car Body:	Monovolume
Rated Output:	80 kW
Fuel capacity:	
Action range:	
CO_2 emissions	
Passengers:	
Kerb Weight	

Light transport vehicles

Make:	Fiat
Model:	Multipla MY 1.6 16v Dynamic
Load volume:	
Load weight:	
Rated engine output:	68 kW
Fuel capacity:	
Action range:	
CO_2 emissions	
Gross vehicle weight:	

Make:	Opel
Model:	Combo 1.6 16v
Load volume:	
Load weight:	
Rated engine output:	69 kW
Fuel capacity:	
Action range:	
CO_2 emissions	
Gross vehicle weight:	

Make:	Volkswagen
Model:	Caddy 5/7 plazas 2.0
Load volume:	
Load weight:	
Rated engine output:	80 kW
Fuel capacity:	
Action range:	
CO_2 emissions	
Gross vehicle weight:	

MADEGASCAR

MADEGASCAR - market development of gas driven cars, is a project which aims at developing the market for gas driven vehicles – natural gas and biogas fuelled vehicles. Strengthening the supply and distribution infrastructure of biogas and natural gas to fuel vehicles is also a goal for the project.

Intelligent Energy - Europe

Intelligent Energy - Europe is the EU's tool for funding action to improve the conditions for energy saving and the use of renewable energy sources in Europe

FUNDACION SAN VALERO

The San Valero Foundation is a non-profit organisation founded in 1953 being the "technical training" its main intervention ambit in collaboration with the business world. It is pioner in being quality-certified in ISO 9002 and in environment (ISO 14000). It is the promotor of the first private University in its Region (Aragón –Spain).

It has been awarded with different international recognitions linked to the projects and training actions it has promoted, in particular in the Environment field, the New Technolgoies of Information and Comunication (NTIC) and the Innovation applied to Industry. from its International Department, it has participated and promoted in different projects under EU programmes such as Life, ADAPT, LEONARDO DA VINCI, I+D Framework Programme, IEEA

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