

Developing the market for natural gas and biogas as a vehicle fuel on a regional level (MADEGASCAR)

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Abstract

Although natural gas as a car fuel is a more environmentally clean alternative to gasoline or diesel and gas is considerable cheaper and much safer than other fuels, costumers are still suspicious of alternative fuels and vehicles. The main reasons are a lack of awareness and information on the consumer side, as well as a low information and acceptance level among car dealers and service stations. Therefore the MADEGASCAR project directly addresses major barriers by specific actions.

The project MADEGASCAR (**M**arket **d**evelopment for **g**as driven **c**ars including supply and distribution of biogas), co-funded by the Intelligent Energy Europe programme of the European commission, aims at developing the market for natural gas vehicles by addressing target groups at the demand side (private car owners, fleet managers) as well as strengthening the supply and distribution infrastructure for Compressed Natural Gas (CNG) and Natural Gas Vehicles (NGVs) municipalities, car dealers, owners of fuel stations, natural gas and biogas suppliers) in 10 participating partner countries.

The Unique Selling Point of the MADEGASCAR project is deployment in several regional areas instead of sole basic research. Country specific action plans, which are developed and implemented in the project, will have direct impact on regional markets but also affect car manufacturers and national regulations, resulting in long term changes.

The main ambition of the MADEGASCAR project is to increase the number of gas vehicles in the partner regions by 50%.

Natural gas and biogas as a vehicle fuel

NATURAL GAS VEHICLES IN EUROPE

Today there are about 7 million motor vehicles powered by natural gas worldwide. The International Association of Natural Gas Vehicles (IANGV) estimates that the share of NGV's regarding the overall vehicle fleet will grow as the fuel providers are interested in building up a comprehensive network. In Europe, Italy with 433,000 and the Ukraine with 100,000 vehicles in 2007 have the largest fleets and in many countries the fleets are developing rapidly.

Italy, for example, the "country of natural gas" has seen a rise in the NGV numbers in the past couple of years, due to a clear decision by the main car manufacturers to go into the NGV business. Urban buses, running on CNG are also proving successful in Italy and spread over almost 50 towns. Refuelling stations have grown from 370 at the end of 2001 to more than 520 by now. Thanks to the government and to the support of local authorities it seems that the chicken and egg cycle has been broken by the filling stations.

NATURAL GAS AND BIO-METHANE AS A VEHICLE FUEL

Natural gas is one of the cleanest fossil fuels consisting primarily of methane. It is widely available all over the world. In its compressed form (CNG) it can be used as a vehicle fuel.

Biogas is a mixture of gases formed during the natural breakdown of organic materials and consists of a mixture of



Figure 1. Powered by CNG

bio-methane CH_4 (60% - 70%) and carbon dioxide CO_2 (30% - 40%) and minimal amounts of contaminants such as hydrogen sulphide H_2S . Separating out the carbon dioxide and the contaminants from the biogas leaves bio-methane. Chemically this is the same as natural gas. It can be dried and then fed into a natural gas grid, or pressurised for use as a vehicle fuel.

Environmental aspects

Natural gas vehicles (NGVs) are generally very clean in terms of air quality emissions.

NGVs reduce exhaust emissions of:

- Carbon monoxide (CO) by 70 percent
- Non-methane organic gas (NMOG) by 87 percent
- Nitrogen oxides (NO_x) by 87 percent
- Carbon dioxide (CO_2) by almost 20 percent below those of gasoline vehicles

Furthermore the supply of natural gas is provided via a wide network under the subsurface – millions of tank truck kilometres can therefore be saved. When bio-methane replaces natural gas, the CO_2 emissions can nearly be avoided at all, because bio-methane is “ CO_2 neutral”.

Economical aspects

NGVs are characterised by higher purchase costs but on average lower fuel costs. Compared with a petrol car the NGV is approximately 3,000 Euro more expensive. For that reason many gas suppliers or countries grant financial subsidies to compensate the additional costs.

Despite low petrol and diesel prices at this time (December 2009), the price of natural gas is still, referring to the average fuel prices in 2008, up to 50% cheaper than petrol and diesel in some European countries. The price of natural gas is bound to the oil prices, but with a time delay of approximately 5 months. Therefore the direct comparison of prices can sometimes be confusing.



Figure 2. Safe Refuelling

Safety and fuelling

Refuelling of NGVs is safer than refuelling of petrol or diesel, while it takes about the same amount of time. It is secured that the natural gas is not able to leak (evaporate) during the fuelling process. Even in accidents natural gas vehicles, despite all rumours, do not explode and, in this respect are safer than diesel or petrol cars.

Gas fuelling stations are available all over Europe. In some countries like Italy or Germany the gas fuelling station network is nearly covering the whole country. Some countries, for example Austria, are expanding their gas fuelling station network very quickly. In contrast a few countries, Slovenia for example, do not even have one gas fuelling station. The best way to find out is to visit one country's national natural gas vehicle information website or the website of the International Association for Natural Gas Vehicles (www.iangv.org).

The MADEGASCAR project

Although natural gas as a car fuel is a more environmentally clean and cheaper alternative to petrol or diesel, customers are still suspicious of alternative fuels and vehicles. The main reasons are a lack of awareness and information, as well as a low information and acceptance level among car dealers and service stations. Therefore MADEGASCAR's main focus lies on the transfer of information to spark the interest in natural gas vehicles and to lull any constraints. Major barriers will be directly addressed by specific actions within the project.

MADEGASCAR (Market development for gas driven cars including supply and distribution of biogas) is an IEE-funded project. The project lasts for 30 months (until January 2010) and has an overall budget of 1.4 million Euros.

15 partners from 10 European countries in very different development stages regarding this topic participate in the project. Therefore the actions plans will be adapted to the countries' specific development stage.

MADEGASCAR will:



Figure 3. The MADEGASCAR logo

- identify barriers and success factors for the integration of biogas/natural gas in the fuel supply chain by doing regional feasibility and case studies
- foster concrete applications on the supply and the demand side
- raise awareness of the possibilities of gas as a fuel among gas suppliers, fuel station owners and car dealers
- raise awareness and provide information to consumers
- plan for an extended infrastructure for gas fuelling stations
- increase significantly the number of gas driven cars in the participating regions by addressing direct fleet contacts

In general and in the long run the project aims to create acceptance and a positive attitude towards natural gas and biogas fuelled cars in Europe. MADEGASCAR will also enable mutual learning between key actors of European regions and establishing long-term partnerships for business opportunities and market development. Regional initiatives for biogas supply for transport and the promotion of gas driven cars in a regional context will be generated.

What is special about this project?

- Networking of local and regional key actors which will act as promoters in the future.
- Market and implementation oriented focus: e.g. incentive programs, awareness raising, providing of information and advice for fleet owners and car dealers
- Substantial know how and experiences exist in the project consortium and the project partners want to serve as an example and play a leading role in the development of gas driven vehicles in their regions.

ADDRESSING BARRIERS – REMOVE BY ACTION

The following major barriers have been identified and will be addressed by the actions in the project:

Lack of awareness and information on the consumer side

There is a huge lack of awareness and information on the consumer side about gas driven cars. More information is needed on the types of available cars, their handling and their advantages. Also the economic and environmental benefits should be made clear for potential consumers at first sight. It is an important objective of the project to raise the information level of consumers and fleet owners and support them in their buying decision process.

Low information level among car dealers and service stations

and a lack of acceptance there

In order to overcome the lack of acceptance for these new technologies, special trainings for car dealers and service stations have to be developed. Information (e.g. about market situation, advantages of NGVs etc.) will be given to show them that gas cars are a future market opportunity.

Lack of gas fuelling stations

People don't buy gas driven cars as long as the fuel stations are not there, and on the other hand companies do not invest into gas fuel stations as long as the market is not there (hen-egg problem). Within MADEGASCAR studies and plans will be elaborated in cooperation with the relevant market actors to identify the best ways for the infrastructure expansion according to the regional needs.

No supply and distribution infrastructure to integrate biogas into the fuel cycle

There are basically two ways of bringing biogas to the customers, either to build special fuel stations on its own to deliver the biogas separately or to feed it into the natural gas network where possible. In general, there is not much experience on that. In the project the strategy, adjusted to the regional conditions, will be worked out and suitable biogas power plants will be identified. Relevant actors and investors will be brought together to explore this potential.

Narrow range of natural gas vehicles offered by the automotive industry

Although improving, there are not enough gas cars models on the market. An up to date overview of models on offer for private customers as well as for companies is needed and will be published on the MADEGASCAR website.

Legal barriers in some countries / regions

In some countries and regions also legal barriers exist. E.g. there is no access to underground car parks. These and other barriers will be identified and brought to the attention of the governments in order to be removed.

THE MADEGASCAR NETWORKS

Networking is an important part of the project, to get target groups and important stakeholders on different levels connected to the project and to each other.

- **Regional networks** with the addressed target groups and other important decision makers and stakeholders will be set up and used as regional reference groups for the project.
- **A European wide network** will be established by the partners including the regional networks as an extension of the project partnership. This will create the opportunity for direct contacts between organisations and companies and establish new business relations. This will support small and medium sized firms that at the moment only are working on a regional or national market and help them to establish on the European market.
- **Long lasting partnership between the participants** in the project will be established and work as a platform for knowledge exchange and business contacts even after the end of



Figure 4. Parcel service running on CNG in Styria, Austria

the contract. The project has the aim to transfer knowledge from more experienced partners to the less advanced countries or regions where the development of i.e. gas infrastructure and biogas production needs to be improved. MADEGASCAR is a potential starting point and a possibility to kick-start the development in these regions.

Regional development will also put pressure to incorporate the idea of alternative fuels into governmental programs. Define and support the market penetration and set concrete goals for successful implementation. This gives the project a potential go give a long-term impact

The MADEGASCAR partners and their actions

MADEGASCAR has a consortium of 15 partners from 10 countries (Austria, Bulgaria, Czech Republic, Germany, Lithuania, Poland, Slovenia, Spain, Sweden and the United Kingdom). The partners consist of nine European energy agencies, two consultancy companies, one energy institute as a state science institution and one technology application centre, focusing on environmental management. Two industry partners are focused on natural gas supply and on research, design and development of biogas plants. As in some countries more than one partner acts within the project, each partner has focused on market implementation activities in a specific region or province.

COUNTRY FACTS, PRELIMINARY RESULTS, FURTHER PLANS: THE MADEGASCAR REGIONS

Austria: Styria

The number of gas fuelling stations in Austria is increasing fairly rapidly. In 2010 approximately 200 fuelling station should be available nation-wide. Although many financial grants are available, the number of natural gas vehicles is lagging behind. The Styrian MADEGASCAR partners Graz Energy Agency and Steirische Gas Wärme GmbH want to raise the share of NGVs with specific marketing activities, whereas the main focus lies on direct fleet contacts. The Graz Energy Agency is providing a tailor made advice package for all interested parties. The cost

saving potential as well as the emissions reduction of natural gas vehicles in comparison to regular petrol or diesel cars is demonstrated.

Austria: Lower Austria

The government of Lower Austria, the largest province in Austria, associates the market development of natural gas vehicles with their goals for alternative fuels, but until now there were no specific action programmes or efforts to raise the awareness among consumers. 16 gas fuelling stations are basically located around the urban agglomeration of Vienna, a province-wide coverage is far.

The Austrian Energy Agency has therefore, together with the government of Lower Austria, established a consortium of stakeholders from the bio-methane and compressed natural gas (CNG) sector with the overall goal to increase the use of natural gas and bio-methane as a vehicle fuel and to increase the number of CNG filling stations in Lower Austria. Common activities in the upcoming year will include the production of information material and the offer of training courses for gas filling station owners as well as for car dealers. This educational measure ensures that relevant information will be passed on to costumers. Furthermore, the Austrian Energy Agency will directly contact fleet managers, and, in addition to general information, offer a fleet management tool which helps estimate and compare energy demand, CO₂ reduction, environmental effects and cost effects of using natural gas and bio-methane compared to petrol and diesel.

Bulgaria: Eastern Bulgaria

Some 45,000 vehicles are running on CNG in the country, according to estimations by mid of 2008, and the number is growing. As a major stimulus behind the decision for conversion is considered the cost per 100 km ride, which is approximately 4 Euro. There are 31 Bulgarian cities offering CNG fuelling stations, of which there are 65 in the whole country.

As a major target and partner institution of BoRAEM, the Bulgarian MADEGASCAR partner, the municipality of Bourgas did meanwhile announce the purchase of ten modern CNG busses TEDOM C12 G for its public transport fleet. Due to the networking efforts of BoRAEM nine organizations decided to participate in a regional group of stakeholders interested in CNG issues. They present a variety of interested parties – educational establishments, energy agencies, municipalities, public transport providers and civil society associations. Ongoing communication of BoRAEM with potential partners is expected to bring more content and value to the emerging network node.

Czech Republic: Prague

The Czech Republic's government has already defined very concrete targets for the use of natural gas in the transport sector. The goal is to increase the share of natural gas in total motor fuel consumption at least by 10% point until 2020. At present, however, there are according to the records of the Czech Gas Association about 170 buses, 280 personal cars and 10 other vehicles which run on natural gas. By 2013, over 100 new gas filling stations should be built around the country. In order to support these goals, SEVEN, the Czech MADEGASCAR partner, plans to increase the information and awareness raising



Figure 5. Fiat Punto Natural Power for MADEGASCAR

activities and has furthermore elaborated, together with a regional network, a marketing strategy for the area of Prague with the primary goal to focus on the use of bio-methane.

Germany: Berlin-Brandenburg

With approximately 55,000 NGVs, Germany is one of the “leading” natural gas vehicle countries in Europe. Nevertheless marketing activities and the provision of information have to continue. As of mid-2009 it is planned to introduce the first home refuelling appliances in Berlin-Brandenburg. Furthermore, a certain share of bio-methane will be offered at all GASAG supplied NGV filling stations in Berlin as of mid-2009. A bio-methane plant in Rathenow, Brandenburg, is currently under construction and is scheduled to start operations early 2009. A CO₂ analysis of the bio-methane offered is currently being performed by Berliner Energieagentur GmbH, the German MADEGASCAR partner, in order to certify the environmental benefit of the product.

Lithuania: Vilnius

At the moment there are only a handful of NGVs in Lithuania. The first compressed natural gas (CNG) filling station in Lithuania was officially opened on 21st October 2008. It is located in the Vilnius region on the Vilnius public transport vehicle fleet territory. The station has slow and fast filling components that allow filling of 100 buses during 4 hours. This station is one of biggest in East European countries and is a first significant step towards the development of CNG in transport in Lithuanian regions. As a result of the activities of network partners, headed by MADEGASCAR partner Lithuanian Energy Institute, articles about this innovation will now be regularly published in regional newspapers.

Poland: Podkarpacka and Malopolskie

Approximately 1.500 natural gas vehicles and 30 gas fuelling stations are nowadays present in Poland. The Polish MADEGASCAR partners Podkarpacka Energy Agency and the EC BREC Institute for Renewable Energy Ltd want to boost the developments with several specific marketing activities. The Podkarpacka Energy Agency has formed a regional network with

all relevant stakeholders and as a first step identified the lack of a legal framework and a low level of interest and know-how in this topic. Another main focus lies on direct fleet contacts.

Slovenia: Maribor

Until now there are no cars using natural gas or bio-methane as a vehicle fuel in Slovenia and neither is there any gas fuelling station in the country. Gas suppliers and the government are not very interested in the topic and there do not exist any national activities to enforce the use of natural gas as a vehicle fuel.

Thanks to MADEGASCAR partner Energap, the municipality of Maribor could be motivated to start a pilot project with a CNG bus in the city of Maribor. The local gas company will therefore even provide the necessary gas for free. In addition, Energap will raise the awareness and provide relevant information to customers by establishing a website, newsletters and a CNG leaflet.

Spain: Aragon, Castilla and León

Although the conditions for natural gas vehicles are well developed in Spain, the provinces of Aragon, Castilla and León have a need to catch up. The Spanish MADEGASCAR partner Fundacion San Valero has therefore established a regional network with 21 partners with different profiles. The consortium consists of regional authorities, energy companies/gas suppliers, gas filling owners, non-profit organisations and vehicle manufacturers.

Together a work plan for common and main on-going activities was elaborated with the main goal to foster the implementation of biogas/natural gas fuel, to increase the number of biogas/gas natural vehicles for public fleets and to assess the possibility of implementing biogas/natural gas buses in a protected natural park.

Sweden: Mälardalen

Sweden is the most developed country in terms of the recycling and use of biogas as vehicle fuel. It is interesting to note that cities like Linköping and Stockholm amongst others, have developed their NGV gas supply solely from biogas, since no natural gas supplies are available. In most other markets it is the CNG vehicles and infrastructure that provides a lead in to use of CBG as a fuel in Sweden.

The MADEGASCAR partner, MALARnet, has spun a lot of new activities which aim to secure the commitment to increase the use of bio-methane as a vehicle fuel in the region of Mälardalen.

One of the most successful activities performed has been the possibility to cooperate with FIAT, which has provided the project with the opportunity to display a Fiat Punto Natural Power, at all meetings, conferences and exhibitions. Thanks to this, the project has been able to show a NGV to several thousands of people in the region.

Sweden: South Sweden

As an outcome of the now well-established regional network, Biogas South, a co-operation between Skåne Energy Agency and the three major gas suppliers in the region (E.ON Gas, Lunds Energi and Öresundskraft) has been established with the aim of running a market campaign for gas-driven vehicles.

The main target groups of the campaign are municipalities, car dealers and fleet owners. An important part of the campaign is to inform and inspire car dealers on how to promote their gas cars.

United Kingdom: Somerset, Organic Power Ltd.

The United Kingdom was once one of the first countries to adopt natural gas vehicles, but has very few gas vehicles at present. The country is now in need of catching up. There is growing interest for the NGV option and there are government programmes to promote both anaerobic digestion and gas refuelling stations, albeit on just a token level at present.

The Organic Power Ltd., developer of a new system for anaerobic digestion and running a bio-methane fuelling station in Somerset, is a partner in the MADEGASCAR consortium and tries to raise the profile of bio-methane and natural gas

amongst the public. Organic Power exhibited at major public events and study days are held regularly.

Further information

For further information please visit the MADEGASCAR website (www.madegascar.eu), where you can find various interesting project deliverables as well as the latest developments in the project partner countries.

References

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