# BIOGAS AS A PARTIAL SOLUTION FOR ENERGY SHORTAGES WITHIN A EUROPEAN GAS GRID INFRASTRUCTURE

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## Introduction

Natural gas consumption across Europe is very dependent on fossil fuel imports which mainly comes from Russia channelling through the Ukraine. Natural gas is used for multiple applications starting from cooking, domestic- and commercial heating purposes, heat and electricity production via combined heat and power systems, and finally to fuel supply for the mobility sector. The current gas price per unit measured in kWh, is in comparison with raw and -heating oil as well as petro chemical fuels which are very environmental and competitive.

The beginning of the Ukraine crisis in November 2013 and the separation of the semi Island Crimean Peninsula has had an impact on causing tensions in negotiations about future gas prices. Also, delivery and supply security which is a vital component of a solid functional industrialised economy has been discussed. In 2014, 53% of fossil fuels were imported to Europe with the major share of 39% of gas imports coming from Russia, one of the major suppliers of natural gas.

Natural gas supply is a crucial part of the world's economy and cannot be neglected. Biogas production from renewable energy sources like anaerobic digestion plants and landfill sites have a huge potential in producing emission free and carbon neutral biogas. This will subsequently increase fuel security, develop job creations in the biogas area, will help in achieving national binding renewable energy 2020 targets and supporting waste management plans. This will also encourage farmers to use more bio-fertiliser from digested feedstocks as well as arranging better phosphorus and nutrient management which will have a positive impact on the surface water table.

## Materials and Methodology

Decreasing gas reserves, along with increased demand by commercial and domestic gas users, create a growing dependence on energy imports from outside the EU and therefore, there is concern about the security of future supply. In addition, environmental concerns are being discussed more prominently in both public and political discourse. Biogas/biomethane represents a significantly under-utilised source of indigenous and renewable energy that can play a very important role for Europe in helping to meet the renewable energy targets 2020 for heat, transport and electricity and also help guarantee supply.

Biomethane which originates from a diluted form called "biogas" comes mainly from anaerobic digestion or landfill sites. This gas has to be treated, cleaned, purified and dried. The final end-product which is called biomethane has an equivalent calorific value as that of natural gas. The same product contains mainly methane but can surprisingly enough have various names depending on origin and state of gas (gaseous or liquid).

- CNG ⇨ Compressed Natural Gas (coming from fossil fuel sources)
- CBG ⇨ Compressed Biomethane Gas (coming from renewables)
- LNG ⇨ Liquefied Natural Gas (coming from fossil fuel sources)
- LBG ⇨ Liquefied Biomethane Gas (coming from renewables)
- Power to gas ⇨ Electricity produced Gas (coming from mainly renewable energy sources)

Methane, which after purification is the same end-product as gaseous coming from biomethane and natural gas, can also be synthetically produced from photovoltaic and wind energy generation, for example electrolysis technology such as that used by Audi in co-operation with ETOGAS GmbH in Germany.

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## Results and Conclusions

In order to inject methane into the German gas grid system, it has to comply with several requirements which describes the chemical composition, Wobbe Index, Calorific value, sulphur content, level of odourisation etc. Those very defined requirements are described in the information leaflet G 260 published by Deutscher Verein des Gas- und Wasserfaches e.V. (DVGW). Every country has its own rules and gas grid requirements therefore regulations cannot be generalised and assessed according to the geographical locations. In the Netherlands, they are using low gas (L-gas) which is also used for small local grid systems in the western part of Germany but energy heating characteristics are totally different and Germany only imports from the Netherlands. The Irish gas grid has at present no own gas grid regulations and is using the British gas standards as references point.

Biomethane production from renewables has the potential to deliver all the above mentioned environmental benefits, as well as strengthening fuel supply in a moderate way and contributing towards price stabilisation and the creation of additional jobs. Biomethane can be used for direct gas grid injection, transported via gas mobile units from isolated anaerobic digestion sites and used in the transportation sector.

There are several transportation options in distributing locally produced biomethane. It can be compressed and sold off onsite in the form of vehicle fuel, injected to the local gas network or liquefied, which is called liquefied natural gas, and transported for distances above 400 km by shipping containers in supply to LNG filling stations.