BIOGAS BASICS

EBA
European Biogas Association

INTRODUCTION

Biogas starts being acknowledged worldwide as the most upfront technology for upgrading waste to valuable fertiliser and renewable energy. This success relies on several key advantages:

- Biogas is **directly applicable in numerous sectors** such as in heating and cooling, in electricity production, in transport or even in the chemical industry
- **The biogas production process is mature and resilient:** it can make use of a great variety of substrates
- Biogas is an **'all-rounder'**: it can provide energy all year long with no intermittency
- Biogas is a **silver bullet in agriculture for mitigating methane emissions**, the second most harmful GHG after CO_2
- **Biogas turns organic waste and residues into valuable products**, allowing for nutrient recycling and energy production locally

Despite its advantages and significant production potential, biogas is however still widely unknown to the general public. The EBA secretariat decided to draft this 'Biogas Basics' booklet to help interested readers to explore the fundamentals of all aspects related to biogas, be it technical, political, environmental, or even economical, in an easy and enjoyable way. We wish you an enjoyable and insightful read as well as a nice journey in the world of renewable energy!

The EBA Secretariat

FUN FACTS

Biogas is the **third fastest growing renewable energy source in the world**, following photovoltaic solar and wind power (period 1990 to 2015)

17,500+ biogas installations were installed in Europe end of 2016, along with **500+ biomethane units**

Renewable electricity produced from biogas amounts to roughly **6% of the total renewable electricity generation** in Europe

If all current produced biogas were to be upgraded and injected in the gas network, it would represent **4% of the total natural gas consumption in Europe**

The scaling up of **renewable gas could save up to € 138 billion by 2050** in the EU by 2050 (roughly equivalent to about € 600 per EU household per year)

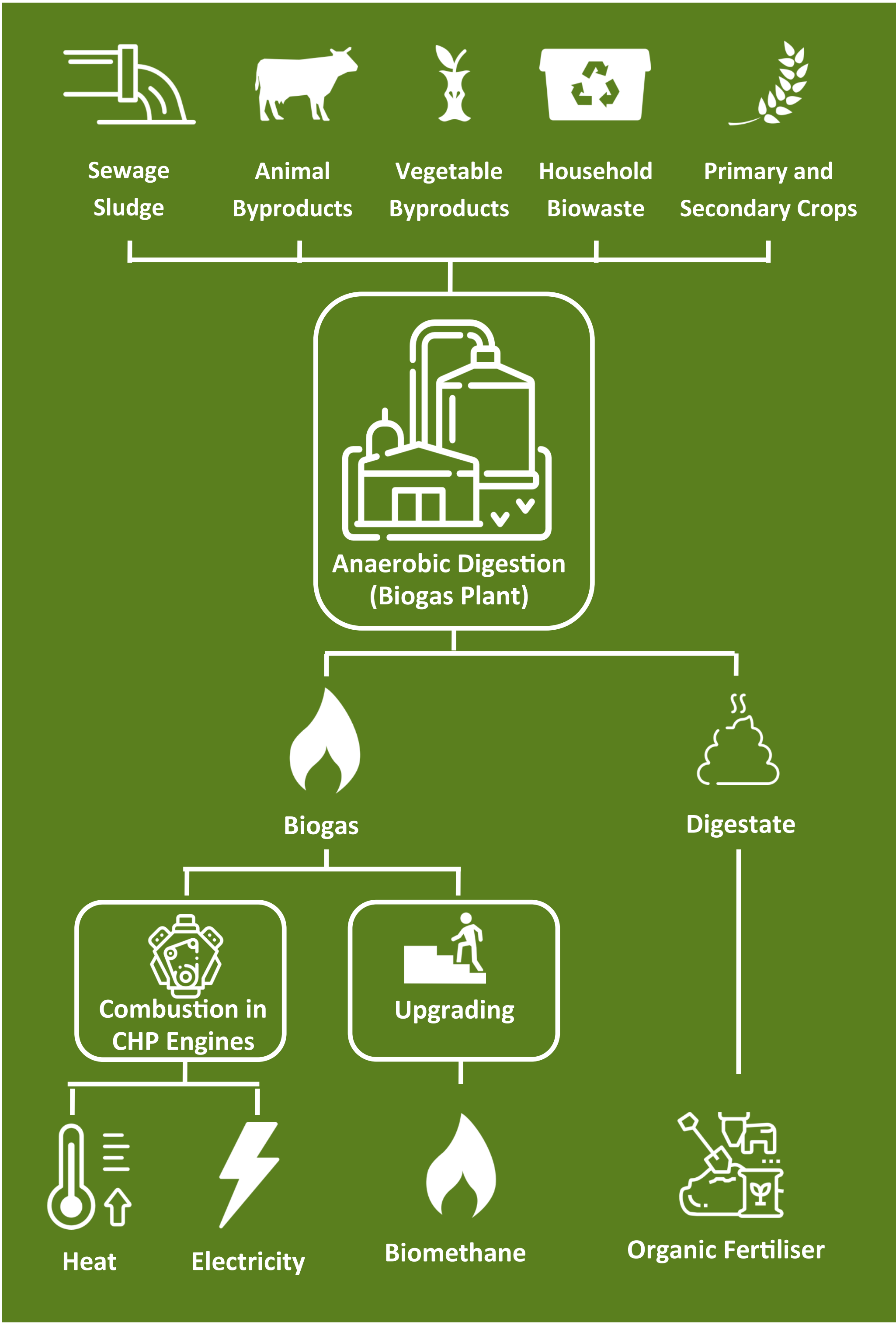
Electricity production from biogas can reach **GHG savings of 240%** compared to EU fossil fuels!

BIOGAS

Biogas is a gas mixture composed mainly of methane (CH_4) and carbon dioxide (CO_2), along with water and other trace gases. It results from a **natural degradation process** of biomass performed by a large variety of micro-organisms taking place in the absence of oxygen, a process referred to as **anaerobic digestion**. Industrial anaerobic digestion can **process a wide range of biomass varieties** including sewage sludge, animal and vegetable by-products, household biowaste and primary or secondary crops. The 'bio' aspect of biogas refers to its biological production process and renewable (biomass) origin, in opposition to 'natural gas' which is of fossil origin.

END-PRODUCTS

A typical biogas plant converts biogas in a Combined Heat and Power unit (CHP) to produce **electricity** and **heat**. The electricity is then injected into the existing grid, while heat is often used locally such as in a district heating system or on site. The share of methane in biogas can also be increased to reach the methane concentration in natural gas, a process known as biogas upgrading. The purpose is to inject the newly produced **biomethane** in the local gas grid. The remaining of the degraded biomass, referred to as **digestate** can be recovered as a by-product and applied as organic fertiliser allowing substitution of conventional fertiliser and nutrient recovery.


Sewage Sludge
Animal Byproducts
Vegetable Byproducts
Household Biowaste
Primary and Secondary Crops
Anaerobic Digestion (Biogas Plant)
Biogas
Digestate
Combustion in CHP Engines
Upgrading
Heat
Electricity
Biomethane
Organic Fertiliser

ELECTRICITY

Most of Europe's current biogas production is utilized in a CHP unit for electricity generation. The European electricity from biogas production amounted to more than 65 TWh in 2017, the **equivalent of the yearly electricity consumption in Austria**. After being produced, electricity from biogas is directly injected into the local electricity grid.

Relevant EU policy
EU Directive on Electricity Market Design

HEAT

In a typical biogas plant, heat is recovered from the exhaust stream of the CHP engine to be converted into useful thermal energy. Biogas can also be directly used in a boiler to produce heat or steam, but this application is less frequent. The total heat production in Europe was 8 TWh in 2015, of which 84% was recovered heat from CHP units. Various local applications are possible, such as district heating systems (Trebon, Czech Republic), outdoor pools (Hirschau, Germany), aquaculture (Affinghausen, Germany), greenhouses (Evesham, United Kingdom), spa and saunas (Tauern Spa, Austria), digestate drying (Marcon, Italy) and many other ways.

Relevant EU policy
EU directive on Heating and Cooling

ORGANIC FERTILISER

Digestate is the remaining part of the degraded biomass after biogas production: it is stable organic matter rich in various nutrients (N, P, K). Depending on the feedstock used for biogas production, **digestate can be directly usable as organic fertiliser in the same way raw animal slurries are spread on fields in agriculture**. Digestate can also be further upgraded to recover high quality mineral nutrients. Digestate use as organic fertiliser displays multiple advantages: it allows reuse of nutrients and substitutes mineral fertiliser of fossil origin. Compared to raw manure, digestate is also sanitised thanks to the biogas production process neutralising most of the pathogens of the original feedstock such as bacteria and crop diseases. Digestate homogeneity and density also allow for faster penetration in the soil compared to raw manure, making nutrients more easily accessible to plants in the soil. If unfit for agricultural purposes, digestate can be further processed and used as a raw material for industrial processes.

Relevant EU policies

EU Waste Framework Directive

EU Fertiliser Regulation

A BIT OF HISTORY

Before reaching industrial maturity in developed countries, the biogas production process had been widely used around the world: there is evidence of biogas production going centuries back, e.g. the Chinese dome digester and the Indian floating dome. In Europe, anaerobic digestion for biogas production was first implemented in wastewater treatment plants, and since the 80ies for the treatment of industrial wastewater and stabilisation of residues and municipal solid waste. It was only in the 90ies that the potential energy contribution from agricultural feedstocks was truly recognised, leading to the sky-rocketing development of the sector.

BIOMETHANE

Apart from conversion to electricity in a CHP unit, biogas can be upgraded to biomethane. **Upgrading** is the process of separating unwanted components in biogas such as CO2 to increase the total methane content and meet **natural gas standards**. The produced biomethane can consequently be injected into the existing gas grid and be used in all commonly known natural gas applications, with virtually no effect on the existing infrastructure, as its composition is very close to natural gas.

Biomethane represents one of the most flexible renewable energy carriers as it can be produced throughout the whole year with no intermittency, it is directly applicable in numerous sectors (heating and cooling, transport, chemical industry) and can be easily and cost-efficiently stored for long-term periods.

DID YOU KNOW?

There are already 15 European countries producing biomethane, as well as 11 national biomethane registries working on establishing a European biomethane market, including Germany, France, Italy and the United Kingdom.

ERGAR

The **European Renewable Gas Registry**, or ERGaR, is an international non-governmental & non-profit organisation **working on enabling a biomethane market across Europe**. In order to do so, ERGaR developed the 'ERGaR RED" scheme, a documentation system allowing registration mechanisms and mass balancing of biomethane consignments. The ERGaR RED voluntary scheme has been submitted for recognition by the European Commission. The evaluation process is ongoing. ERGaR expects to start the operation of the ERGaR RED scheme through a hub connecting the participating national biomethane registries in 2019. The final objective of ERGaR is to contribute to establishing a single European biomethane market by reducing administrative barriers to the cross-border movement of biomethane along the European natural gas network.

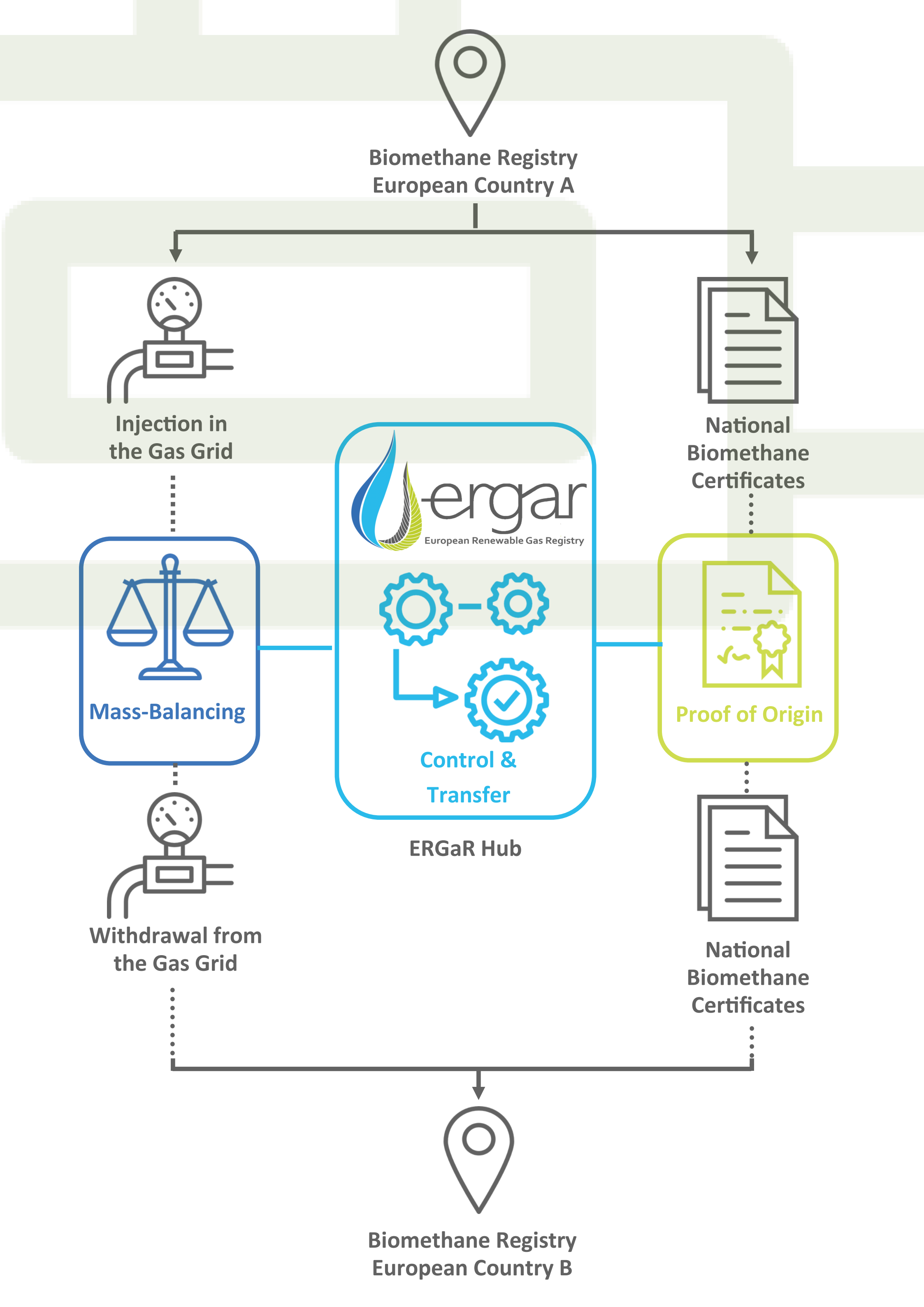
DID YOU KNOW?

An ERGaR Proof of Origin (PoO) is a document including all information related to the biomethane consignment required by the the importing countries. It is attached to a Proof of Sustainability (PoS), certifying sustainability requirements of the EU Renewable Energy Directive have been fulfilled.

BIOMETHANE TRADING

The transfer of biomethane consignments across Europe is not widely available yet but the European Renewable Gas Registry (ERGaR) is working to make it a reality in coming years. The transfer will then be based on the ERGaR RED voluntary scheme: the scheme will be operated as a hub with connections to all national biomethane registries willing to participate. National biomethane registries are the issuing bodies of biomethane certificates (Proofs of origin or Guarantees of Origin) for biomethane consignments with export destinations.

The administration of biomethane movements through Europe by the ERGaR scheme is based on a mass balancing system and will thus preclude double sale or double counting. A system of audits and independent inspections secures the accuracy and reliability of the data transferred cross -border within the ERGaR system.

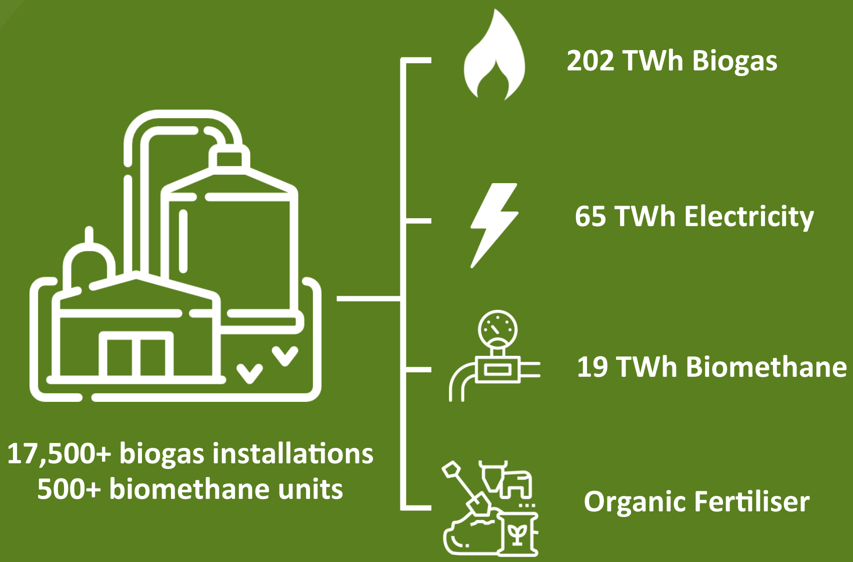


Biomethane Registry
European Country A
Injection in
the Gas Grid
National
Biomethane
Certificates
ergar
European Renewable Gas Registry
Mass-Balancing
Control &
Transfer
Proof of Origin
ERGaR Hub
Withdrawal from
the Gas Grid
National
Biomethane
Certificates
Biomethane Registry
European Country B

INDUSTRY DEVELOPMENTS

The biogas industry kicked-off in the 90ies in Europe: the biogas production went from 8 TWh in 1990 to more than 200 TWh in 2017. 65 TWh of electricity were produced by 17,783 biogas plants across Europe in 2017, which amounts to roughly 6% **of the renewable electricity generation in Europe**. The total installed electric capacity of CHP units running on biogas is more than 10 GW in Europe, the equivalent of 10 nuclear plants. Biogas production shows the advantage of being fully decentralised and without nuclear risks.

Compared to the biogas sector, biomethane (upgraded biogas) is still doing baby steps. However, the sector has been experiencing exponential growth in Europe over the past few years, and has reached 540 biomethane installations by the end of 2017, with a biomethane production of 19 TWh. Recently, biomethane tends to be fostered over electricity from biogas since it can be injected into the existing gas grid, making it easier to transport and thus broadening its possible end-uses. Countries like France, Italy, Germany, Sweden and the United Kingdom are currently leading the development of the sector.



DID YOU KNOW?

In January 2018, the EBA (in coordination Gas Infrastructure Europe) released a map of the registered biomethane installations across Europe, including information about their feed-in capacity, substrate use and upgrading processes. You can find the biomethane map 2018 online on EBA's website, and order a physical copy for free.

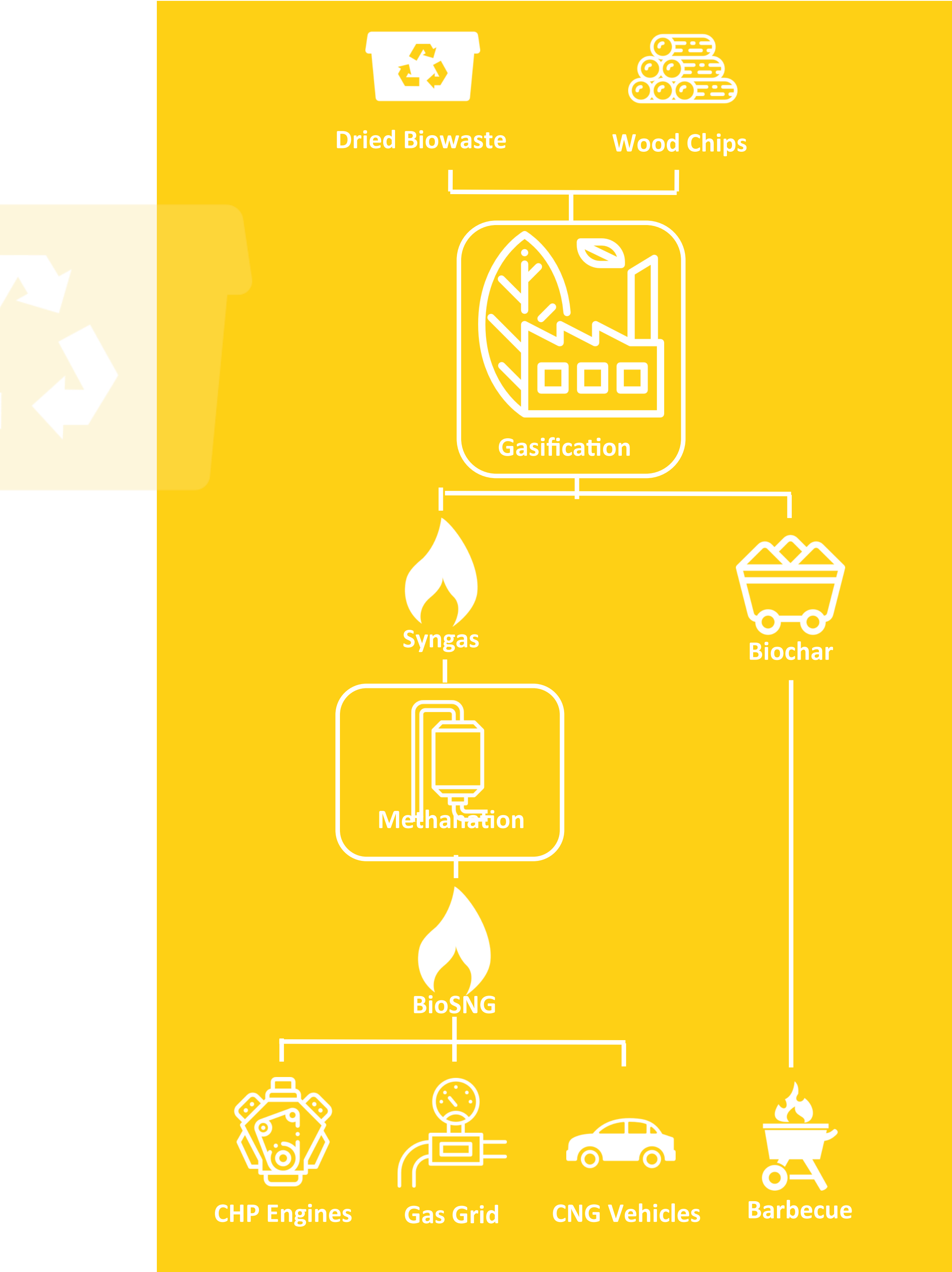
BIOMASS GASIFICATION

Biomass gasification is a high-temperature process in which solid biomass (wood chips, dried biowaste, etc) is converted into a gaseous product (**syngas**) and a solid product (**biochar**). Much alike biogas, syngas can be combusted for heat and power production or can be converted into various fuels such as bio-Synthetic Natural Gas (**bioSNG**) via a methanation step. BioSNG, as biomethane, is a product comparable to natural gas which can be injected into the existing gas grid and used in known gas applications.

Biomass gasification displays various advantages: it is quicker (a few seconds, excluding substrate pre-treatment) and can be scaled up more easily, meaning the economy of scale is important. Multiple projects are being developed in Europe including GAYA in France or AMBIGO in the Netherlands. Biomass gasification is expected to play a major role in the transition from fossil to renewable gas in Europe, alongside anaerobic digestion and power-to-methane.

DID YOU KNOW?

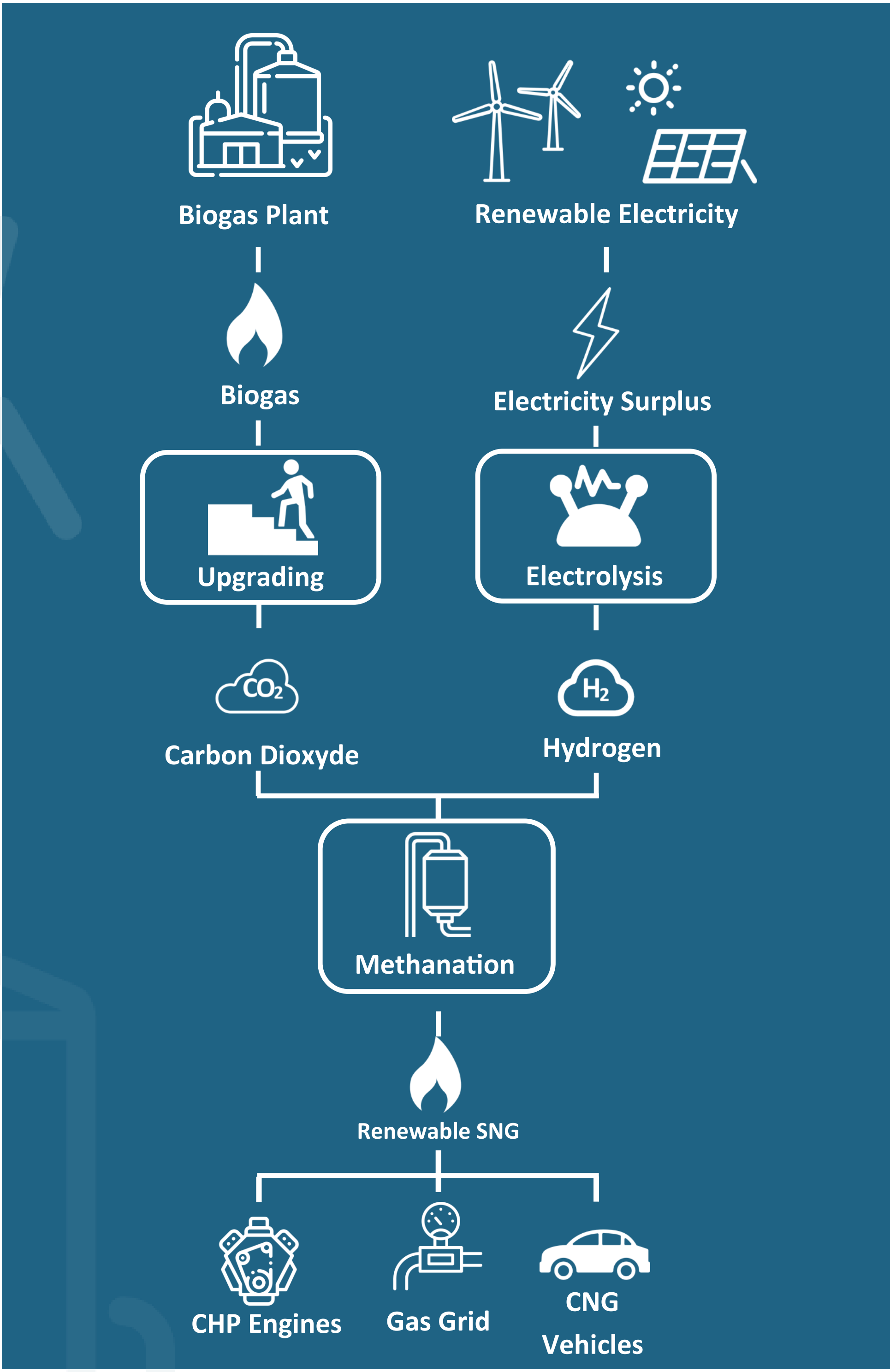
Biochar resulting from the biomass gasification process is a high quality by-product usable in a variety of applications, including barbecue fuel.


Dried Biowaste
Wood Chips
Gasification
Syngas
Biochar
Methanation
BioSNG
CHP Engines
Gas Grid
CNG Vehicles
Barbecue

POWER-TO-METHANE

Power-to-Methane (P2M) is the process of converting renewable electricity surplus into a gaseous form, in this case methane. Standard P2M production processes use renewable electricity surpluses to hydrolyse water and create **hydrogen** during a process called '**electrolysis**'. The produced hydrogen is then **methanised** via a biological process to produce renewable Synthetic Natural Gas (**SNG**). Renewable SNG, much alike bioSNG, is chemically comparable to biomethane (resulting from anaerobic digestion) and natural gas.

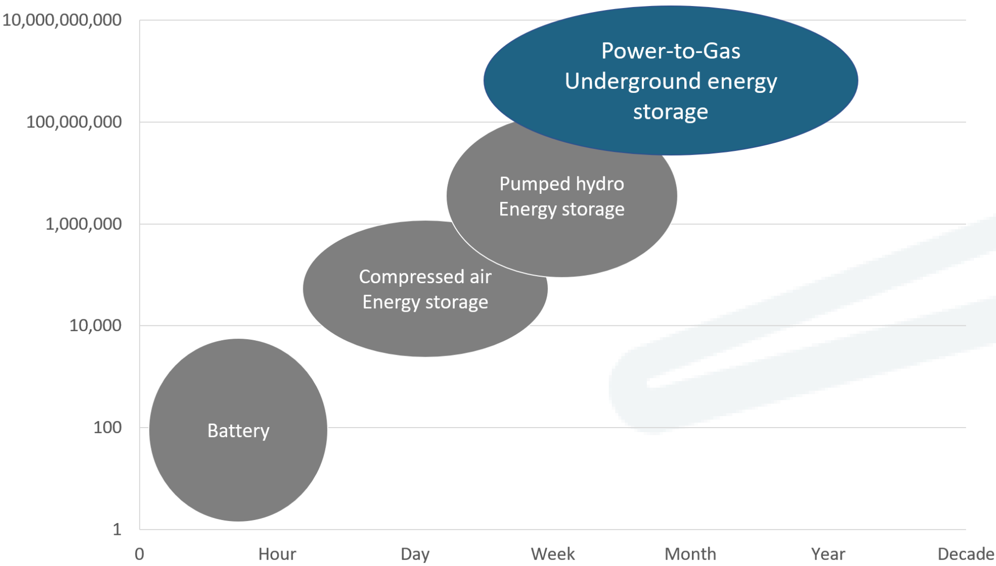
Power-to-Methane **integrates the electricity and gas sectors harmoniously**: existing CO_2 streams (such as from the biogas upgrading process) are used to methanise renewable electricity surplus, making it easily storable. Moreover, P2M smooths the inherent variability of renewable electricity production from solar and wind industries, avoiding costly investments aiming at strengthening the existing electricity grid. Various EU projects work on developing this promising technology, such as the Biocat Project operated by Electroachaea in Denmark.


Biogas Plant
Renewable Electricity
Biogas
Electricity Surplus
Upgrading
Electrolysis
CO_2
H_2
Carbon Dioxyde
Hydrogen
Methanation
Renewable SNG
CHP Engines
Gas Grid
CNG Vehicles

RENEWABLE ENERGY STORAGE

With the ever-growing production of renewable electricity, it is expected that significant storage capacity will be needed shortly. Electricity storage, for example in batteries, is however expensive and limited. Energy storage in a gaseous form can overcome this issue: gas is frequently and cheaply stored in large volumes, especially while using underground storage. **The use of P2M processes would allow storage of significant amounts of energy in a cost-efficient way**. The gas grid allows an efficient and affordable distribution of this stored energy to industry and households.

Electricity storage capacity (kWh) and duration of various technologies



METHANE VS HYDROGEN

Conventional power-to-methane processes produces hydrogen via water electrolysis, making use of renewable electricity surplus which can then be methanised. Methane rather than hydrogen use is to be fostered due to several reasons:

- **biomethane can be used as such in already existing infrastructures with virtually no changes needed**, as it is a product chemically almost identical to natural gas. Significant injection volumes of hydrogen into the gas grid might corrode the existing grid and provoke damages;
- **hydrogen** is the smallest molecule on Earth, which makes it **more difficult to store** compared to methane;
- **methane displays a higher energy density than hydrogen**, meaning that lower pressure is needed to store the same amount of energy;
- **biomethane production via P2M uses existing CO_2 streams to methanise hydrogen**, providing a more versatile energy carrier. This principle is known as Carbon Capture and Use (CCU).

Both hydrogen as biomethane are needed for Europe to succeed in its energy transition. Hydrogen is most reasonably applied for specific industries (such as the steel industry) and can be mixed with methane in the existing gas grid to a certain extent.

DID YOU KNOW?

Given the current biogas production (and the associated CO_2 production), 213 TWh of renewable electricity could be methanised via P2M technology. This roughly represents the electricity consumption in Spain.

SUSTAINABILITY

SUBSTRATE USE

Anaerobic digestion for biogas production is a mature process which can use diverse types of substrates (including household biowaste, energy crops, sewage sludge and agricultural waste) and can thus easily adapt to local conditions. As such, substrate use for biogas production is very diverse across Europe and reflects national specificities. Additionally, bio-SNG and renewable SNG can be produced from biomass gasification and Power-to-Methane. **Depending on local conditions and technological pathways, biogas and biomethane production can thus greatly help local communities to produce their own energy and become energy self-sufficient**.

DID YOU KNOW?

One cow produces roughly 10 tons of manure a year, which can produce up to 1 MWh of biogas.

CLIMATIC PERFORMANCE

The environmental impact of biogas is particularly good and can **easily reach 80% GHG savings compared to EU fossil fuels**, depending on the substrate and technology used. Biogas production avoids methane emissions into the atmosphere from agricultural by-products traditionally left to rot on the field such as manure. As such, biogas can play a key role to mitigate GHG emissions in agriculture, especially methane emissions - the second most important GHG after CO2. Electricity from biogas and biomethane based on manure can respectively reach up to 220% and 240% GHG savings compared to EU fossil fuels.

CIRCULAR ECONOMY

Digestate, the remaining of the degraded biomass after the biogas production process, is rich in nutrients and can be used as organic fertiliser in agriculture. As such, **it saves GHG emissions related to mineral fertiliser production, commonly based on fossil energy, and allows for nutrient recovery**. With this, digestate use is a perfect example of circular economy.

Biogas also helps mitigating GHG emissions from landfills: the organic fraction of landfill waste, when rotting, releases methane into the atmosphere. This landfill gas, a form of biogas, can be captured and utilized in a CHP unit to produce electricity and heat, mitigating GHG emissions in a cost-efficient way. Landfill gas capture and use is a common practice across Europe, especially in the UK, France, Italy and Scandinavia.

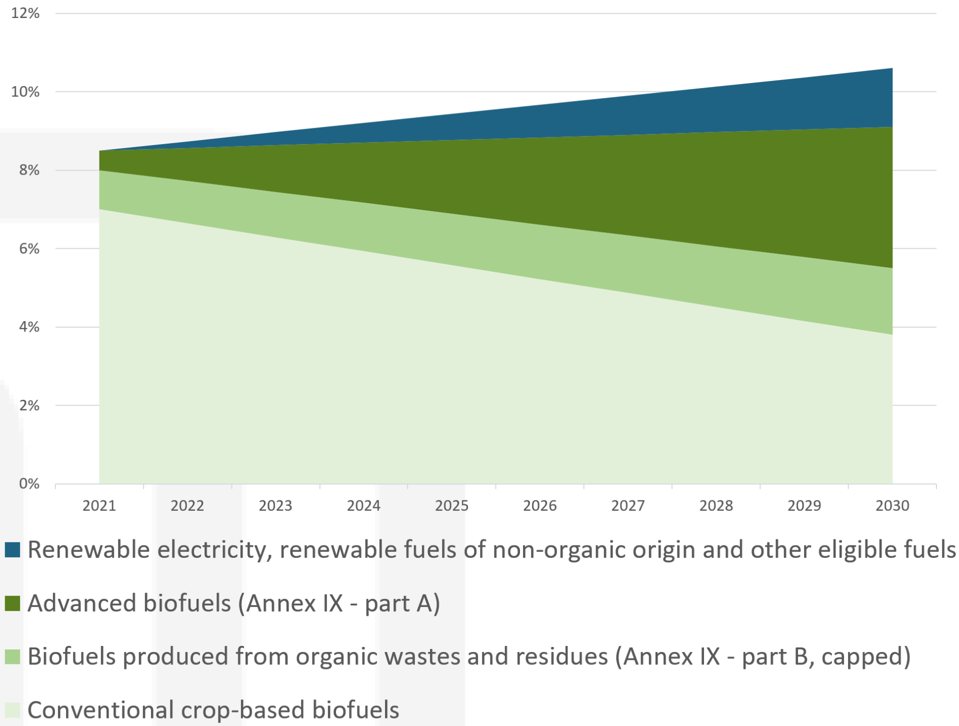
TRANSPORT

Transport is one of the only sectors in the EU which saw its emissions rise compared to 1990 level and turns out to be one of the hardest sectors to decarbonise. Today, it still represents a quarter of Europe's GHG emissions, a majority of which originates from road transport.

Biomethane can play a role in transport decarbonisation, as it can directly be used in existing car engines running on natural gas (CNG cars). In addition, biomethane use as a fuel in CNG cars can **contribute to improving air quality** in cities, with ultra-low levels of particulates and a massively reduced nitrogen oxides (NOx) emissions. In marine transport, gas engines help reduce sulphur oxides (SOX) emissions in the atmosphere.

However, transport decarbonisation is still a long way to go in Europe: most EU vehicles run on fuels from fossil origins such as petrol and diesel, with less than 1% fuelled by natural gas. To ensure sustainability and to decarbonise the transport sector further, the new European Renewable Energy Directive proposes an increase in advanced biofuels and renewable electricity use, with a decrease on conventional biofuels (crop-based). Advanced biomethane production to be used as fuel is thus likely to thrive in the next few years.

Share of renewable energy supplied for final consumption in the transport sector (Renewable Energy Directive II)



DID YOU KNOW?

Blending just 20% of renewable gas with natural gas reduces GHG emissions by nearly 40% compared with petrol for passenger cars.

ECONOMICS

PRODUCTION COSTS

Renewable energy is capital intensive, and biogas is no exception. Biogas production costs vary widely depending on the feedstock cost, size of the installation, **end-product and support scheme set in place in the country of production. Estimates for biogas and biomethane production range from € 40 to € 120 per MWh while bio-SNG from biomass gasification ranges between € 70 and € 80 per MWh**. When processing organic waste, biomethane can already be competitive with fossil fuels in certain niche markets. Notice that biofuels will remain more expensive than fossil fuels unless the costs of mitigating climate change, such as adequate carbon pricing, are included in fossil fuels costs. Other solutions include higher gate fees, easier access to feedstock, and more efficient production plants.

SUPPORT SCHEMES

Support schemes are required to stimulate technical progress and help renewable energy in becoming market competitive with existing technologies based on fossil sources. **The approaches used to promote biogas include Feed-in tariffs (FiT), Feed-in Premiums (FiP), Green Certificates (GC) and various tax incentives/exemptions**, depending on each European country. FiT are currently fostered for biogas promotion, but this is rapidly shifting to more flexible support schemes such as FiP.

EMPLOYMENT

The biogas sector displayed a turnover of **€ 6.9 billion** in all EU Member States and provided **63,950 jobs**, roughly 6% of all jobs in the renewable energy sector in 2015. The German market displays the most developed biogas industry, with 45,000 jobs and a turn-over of € 2.3 billion.

BIOGAS DONE RIGHT

Numerous initiatives flourished to drive the costs of biogas and bio-SNG production down and avoid land-use displacement. A remarkable one is the 'Biogas Done Right' approach developed by the Italian Biogas Association: based on an optimised sequential cropping scheme in Italy, **sustainable production of biogas without ILUC effect** has been demonstrated and could be applied in other large parts of Europe.

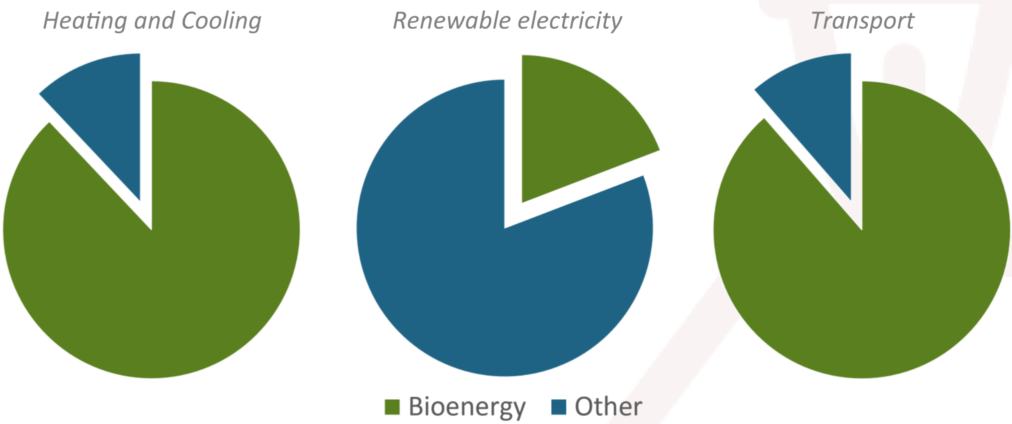
ON GAS AND ELECTRICITY

Full electrification of all European energy sectors is neither financially nor technically feasible by 2050. In addition to the difficulty of implementing a full-electric solution in some industrial processes, more and more analyses show the need to combine the development of renewable electricity with renewable gas to ensure cost-effectiveness for the European energy transition. Indeed, the existing gas infrastructure has already been paid for and can both distribute and store gas of renewable origin efficiently. Furthermore, renewable gas can tackle the problem of intermittent electricity production from wind and solar by allowing cheap and easy energy storage via power-to-methane. All in all, as the energy system progresses towards full decarbonisation, a **mix of technologies is necessary to keep the energy system sustainable**, secure, reliable, affordable, socially acceptable and environmentally friendly.

OUTLOOK

THE ROLE OF BIOENERGY

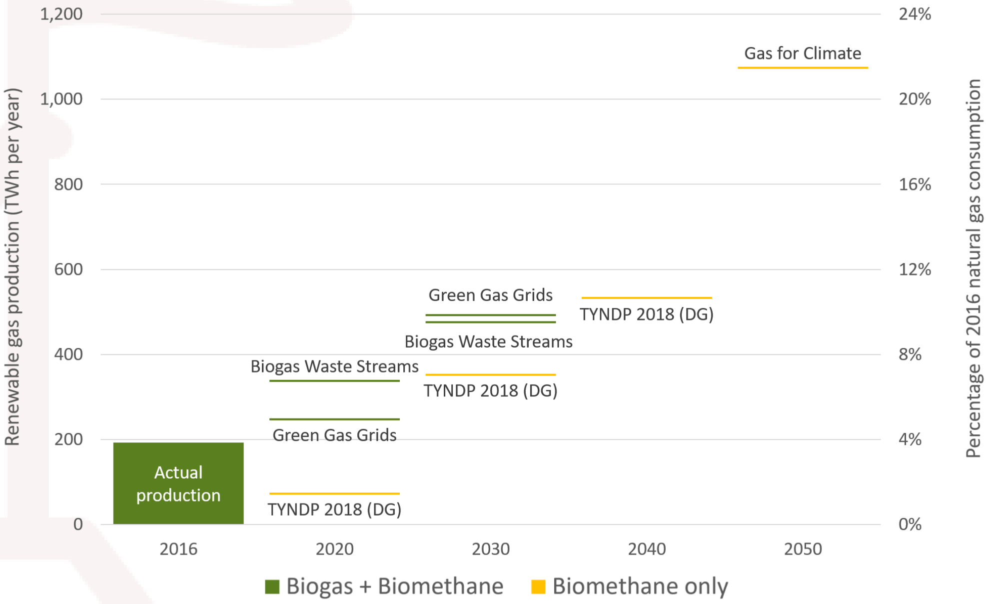
The importance of bioenergy in the European energy transition cannot be overstated: in 2015, bioenergy represented 88% of the renewable heating and cooling sectors and 89% of renewable fuels. As such, **bioenergy is a key player in the renewable energy sector and crucial in the energy transition**.



Share of bioenergy in various European sectors

THE POTENTIAL OF BIOGAS

Biogas thrived in the 00ies, with a slowed down growth rate since 2014. The current biogas production amounted to more than 200 TWh by end of 2017, which if upgraded to biomethane would have represented 4% of the gross inland gas consumption in the EU. **EBA estimates that renewable gas can reach 10% of EU's current natural gas consumption by 2030** (roughly 500 TWh), a potential confirmed by a recent study from CE Delft. The Gas for Climate initiative estimates that 1,072 TWh of sustainable biomethane can be produced by 2050, representing roughly 22% of current natural gas consumption. Potentials for Power-to-Methane are not included and may significantly increase the European renewable gas production by 2050.



DID YOU KNOW?

*In 2018, bioenergy could have covered all European energy needs for 43 days. This means that from November 19th until December 31st, Europe can theoretically rely on bioenergy to be fuelled. This is known as the **European Bioenergy day**.*

DEFINITIONS

Biofuel: liquid fuel for transport produced from biomass (RED II)

(Advanced) biofuel: biofuels produced from feedstocks listed in part A of Annex IX (RED II) - in other words, from biomass other than food/feed crops while meeting the EU sustainability regime under the legislation in force (SGAB – 2017)

Biogas: gaseous fuels produced from biomass;

Biomass: biodegradable fraction of products, waste and residues from biological origin from agriculture, including vegetal and animal substances, forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of waste, including industrial and municipal waste of biological origin

Biomethane: upgraded biogas meeting natural gas standards (see 'Upgrading')

Digestate: stable organic matter rich in various nutrients, remaining part of the degraded biomass after the biogas production process

(Biomass) Gasification: high temperature process converting dried biomass such as ligno-cellulosic material in syngas and biochar.

Greenhouse gas: gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere and clouds. This property causes the greenhouse effect.

Indirect Land Use Change (ILUC): process occurring when the cultivation of crops for biofuels, bioliquids and biomass fuels displaces traditional production of crops for food and feed purposes. This additional demand may increase the pressure on land and can lead to the extension of agricultural land into areas with high carbon stock such as forests, wetlands and peat land causing additional greenhouse gas emissions (RED II)

Ligno-cellulosic material: material composed of lignin, cellulose and hemicellulose such as biomass sourced from forests, woody energy crops and forest-based industries' residues and wastes (RED II)

Methane: colourless, flammable hydrocarbon gas (CH_4), major component of natural gas.

Power-to-Methane: smart grid concept whereby electricity (preferably surplus renewable electricity) is converted to methane for storage purposes.

Primary crops ('starch-rich crops'): crops comprising mainly cereals (regardless of whether only the grains are used, or the whole plant, such as in the case of green maize, is used), tubers and root crops (such as potatoes, Jerusalem artichokes, sweet potatoes, cassava and yams), and corm crops (RED II)

Secondary crops ('non-food cellulosic material'): feedstocks mainly composed of cellulose and hemicellulose, and having a lower lignin content than ligno-cellulosic material; it includes food and feed crop residues (such as straw, stover, husks and shells), grassy energy crops with a low starch content (such as ryegrass, switchgrass, miscanthus, giant cane), cover crops before and after main crops, ley crops, industrial residues (including from food and feed crops after vegetal oils, sugars, starches and protein have been extracted), and material from biowaste. Ley and cover crops have to be understood as temporary, short-term sown pastures comprising grass-legume mixture with a low starch content to get fodder for livestock and improve soil fertility for obtaining higher yields of arable main crops; (RED II)

Substrate: a substance or surface that an organism grows and lives on and is supported by

Upgrading: process of separating unwanted components in biogas (such as CO_2) to increase the total methane share and meet natural gas standards

SOURCES

1. Biogas Handbook
2. CE Delft – Biogas waste streams
3. EBA - NGVA joint report on Renewable Gas in Transport 2018
4. EBA Position on EU's heating & cooling policy
5. EBA Statistical Report 2018
6. ECOFYS 2017 – Assessing the case for sequential cropping to produce low ILUC risk biomethane
7. EU observer 2016
8. European Commission – Clean transport, Urban transport. Alternative fuels for sustainable mobility in Europe, European Commission
9. Eurostat – Renewable energy statistics
10. Gas for Climate
11. IEA – Renewables information
12. IEA – Task 37 2018 green gas
13. JRC Bioenergy pathways iii
14. JRC data portal
15. SGAB 2017

RENEWABLE GAS NOMENCLATURE

For vulgarisation purposes, 'renewable SNG' (resulting from Power-to-Methane), 'bioSNG' (resulting from biomass gasification) and 'biomethane' (originating from anaerobic digestion) are all labelled as 'biomethane' in EBA publications when their differences are not relevant to the topic addressed.

INTERESTED IN BECOMING A MEMBER OF THE EBA?

Founded in 2009, the European Biogas Association (EBA) is the **leading association in the field of biogas and biomethane production** covering the anaerobic digestion, gasification and power-to-gas industries. Committed to the active promotion of the deployment of sustainable biogas and biomethane production and use throughout Europe, EBA has created a **wide network of established national organisations, scientific institutes and companies in Europe and beyond.**

For more information on membership advantages, please contact us at:

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