GEODE FACT SHEET

Biogas and Biomethane

Introduction

Decarbonised and renewable gases already play a vital role in Europe's energy system. However, as we transition to carbon neutrality, that role will grow in scale and importance and help tackle some of the toughest decarbonisation challenges we face.

Today, approximately 190 TWh[1] of biogases provide power, heat and are a direct replacement for natural gas across the system. As gaseous energy is storable, it supports the deployment of intermittent renewable generation, and as biogas is produced from organic material it plays a wider role in sustainable waste management, water treatment and land management. It is also a "baseload" energy source which is produced all year round and has huge potential for further growth. Estimates suggest that the volume of biogases generated across Europe could more than double by 2030 and reach over 1000 TWh per year by 2050[2].

Delivering this will support the decarbonisation of sectors such as heavy industry, heating and transport but will require an EU policy framework that further promotes the production and market uptake of renewable and decarbonised gases.

In common with many renewable electricity generation technologies, biogas is a naturally distributed energy source. Distribution System Operators (DSOs), as the facilitators of the uptake of biomethane, will play a key role in maintaining the liquidity and interoperability of Europe's gas market, while ensuring decarbonisation comes at minimal cost. To achieve Europe's increased climate targets, an enabling framework encouraging the injection of biomethane and its interaction with other renewable gases – in particular hydrogen – as well as integration with the electricity system is needed. This fact sheet sets out GEODE's recommendations to fulfil the potential for biomethane and biogases.

Source: Evida

[1] According to European Biogas Association figures presented at the 35th European Gas Regulatory Forum, the production of biogas (raw biogas included) was 193 TWh in 2019: https://ec.europa.eu/info/sites/default/files/energy_climate_change_environment/events/presentations/02.02_mf35_presentation-eba-perspective_of_renewable_gas_producers-lukas__0.pdf

[2] Ibid

POLICY & REGULATORY RECOMMENDATIONS

With an enabling framework focusing on injecting upgraded biomethane into the European gas grids, biomethane can replace natural gas in several sectors, which are otherwise difficult to decarbonise. Biomethane relies on existing technology and has relatively low upfront costs, so can support near term progress at reasonable expense. The following policy recommendations will help expedite the development of biomethane:

- An **EU framework for renewable gases** which includes a European target for renewable gases to support the Fit for 55 vision.
- Energy policy which actively **supports biomethane and biogas production**, recognising the role it can play in decarbonising a range of sectors. National policy should consider the relative strategic benefits of biomethane and biogases to determine the right levels of support, and whether incentives may also be required to support existing biogas plants converting to supply biomethane to the gas grid.
- Distribution networks regulation that recognises the growth in biomethane and leads to more **decentralised gas production**, meaning investment is required to ensure capacity is provided for new developers. This could include facilities to move biomethane from lower pressure to higher pressure parts of the grid at times of low demand, and changes to grid operation. **European standards should be developed** to support this activity.
- Energy policy that supports and recognises the environmental benefits of biomethane for the **local circular economy**, in addition to the renewable energy produced. Biogas and biomethane production is often decentralised through plants located in rural areas and contribute to the local circular economy by using waste from agriculture, industries and households and afterwards as a farm field fertiliser.
- **Innovation**, good planning and legal framework conditions that **support synthetic methane**. Synthetic methane offers a reliable zero carbon option for sectors which may not have others, e.g. chemical industries which use methane as feedstock rather than fuel. If coupled with carbon capture, utilisation and storage (CCUS) it can potentially deliver negative emissions. However, synthetic methane is an underdeveloped market which needs significant support to develop at scale. In this regard, the challenge is not just financial – policy also needs to consider where the synthetic methane will come from, e.g. competing uses for bioenergy and waste resources.
- **Sustainable hydrogen should be further developed** in parallel with the development of the biogas and biomethane sectors, including blending hydrogen with biomethane in the gas grids. This can help create a market for hydrogen which solves the “chicken and egg problem” when implementing new technologies and products. The transition towards a future where hydrogen has a significantly bigger role will therefore be supported using synthetic methane, which again can replace natural gas in the existing gas grids.
- **Policymakers and national regulatory authorities** working with the DSOs to plan for biomethane, hydrogen blending and hydrogen conversion to ensure a strategic plan is in place for each region, depending on the potential supply and demand in that area.
- Developing enhanced **Guarantees of Origin** for biogas and biomethane enabling market development by creating value for consumers, and ultimately reducing the public incentives required.
- Dedicated policy support for **carbon capture, utilisation and storage** for biomethane and biogas production which will ultimately realise additional climate benefits.
- Taking a **whole life cycle approach** to biogas in transport, i.e. using the ‘well to wheel’ rather than the ‘tailpipe’ method ensuring that the benefits of biogas are reaped as a vehicle fuel.

[3] European Committee for Standardisation (CEN), EN 16723-1:
https://standards.cen.eu/dyn/www/f?p=204:110:0::::FSP_PROJECT:59781&cs=193AB741DC4F3AE4584E03DE130F55D78

Definition (including synthetic gases)

Biogas is generated from organic material and consists of 50-75% methane and 25-50% CO_2. It can be directly combusted to generate electricity and heat or purified to replace natural gas in the gas grid as biomethane. This is done through 'upgrading' technology which removes the carbon dioxide and ensures that the gas meets the European specifications for biomethane injection in the gas network.[3]

In terms of gas quality, biomethane offers the same versatility of use as natural gas because it can completely cover the demand for space heating and industrial uses while also be compressed (CNG) or liquified (LNG) for transport uses. CO_2 from the biomethane upgrading process can also be captured and stored and/or utilised to realise further climate benefits.

Synthetic methane, meanwhile, can be injected in the same way as biomethane meaning existing distribution infrastructure does not need upgrading. Synthetic methane can also be produced with the same quality as natural gas and biomethane meaning that plants can operate and inject synthetic methane continuously. Furthermore, by using the CO_2 from biogas plants, synthetic methane will contribute to the climate neutrality targets.

Next steps for biomethane

While natural gas plays a central role in Europe's energy system, where it is used for space heating, transportation, industrial purposes and electricity generation, biogas and synthetic methane are the future. They will be crucial for making the European gas sector renewable and are important in sectors where electrification and other renewable alternatives are difficult to implement. Their production also supports wider environmental goals, including resource and water management and sustainable farming, in the 'circular economy.'

Estimates from the biomethane industry suggest that the volume of biogas produced across Europe could double by 2030 and increase to five times today's level by 2050. This would play a significant role in meeting Europe's climate neutrality goals, supporting the development of hydrogen and delivering near term progress on emissions reduction using existing technology. Developing carbon capture technology within the biogas and biomethane sector can also bring additional emissions reduction benefits.

This "green" transformation of the gas sector will inevitably bring with it challenges, but these challenges are easily resolved. One for example is the need for gas production to be decentralised – currently, today's system is centralised. While this may seem like a tall order, it is simply solved through greater cooperation between gas DSOs and TSOs. And, while biogas plants would also need to be located in the distribution grid to provide increased gas tracking and monitoring in form of calorific value, Wobbe Index and levels of oxygen, this would not be difficult to implement.

A further challenge is gas quality. Our current system uses single injection points which result in uniform gas quality. For biomethane, however, several injection points will be needed which can result in varying gas qualities. These multiple injection points can also lead to an excess of biomethane in local distribution grids because production and consumption are not balanced locally. However, one solution to this is inserting a reverse flow plant where the excess biomethane is compressed and sent to the transmission grid. And, although reverse flow plants bring with them odorant issues, this is resolved easily by increasing gas flow surveillance and improving European standards.

[3] European Committee for Standardisation (CEN), EN 16723-1:
https://standards.cen.eu/dyn/www/f?p=204:110:0::::FSP_PROJECT:59781&cs=193AB741DC4F3AE4584E03DE130F55D78

Fit for 55 in 2030 and Renewable Gases

Europe's gas sector will play a central role in delivering the 55% net emissions reduction target for 2030 which EU leaders have agreed. Biomethane is vital to this because it can be delivered now using existing technology, with no changes for gas users. An EU framework for renewable gases is required which includes a European target for renewable gases to support the Fit for 55 vision.

Source: Evida

How biomethane and hydrogen can work together

Given the scale of reaching climate neutrality, both biomethane and hydrogen are needed now to green the gas sector, but so too is synthetic methane. Injecting synthetic methane into the existing gas infrastructure will create a demand for hydrogen while also producing a focus on developing biomethane and synthetic methane as a facilitator for developing a European hydrogen system and market. Blending hydrogen into the methane grid will also bring about such change.

Importantly, the existing gas network can transport green energy cost efficiently while connecting important parts of the value chain, leading to a smooth and quick transition towards renewable alternatives. Supporting the gas DSOs to develop and operate a hydrogen sector based on existing infrastructure will also leverage existing skills and expertise as well as the physical assets of the grid.

Policymakers and national regulatory authorities should work with grid companies to plan for biomethane, hydrogen blending and hydrogen conversion to ensure a strategic plan is in place for each region, depending on potential supply and demand in that area.