BIOMETHANE FICHE – Belgium (2021)

BIOMETHANE PRODUCTION, POTENTIALS AND PATHWAYS

Biomethane is upgraded (purified) biogas to the quality of natural gas (methane). Currently, biogas is dominantly used for the production of electricity and heat in CHP plants.

Biogas/biomethane is 100% of domestic origin and has cross-sectoral effects.

Upgrading of biogas in the EU started in 2011. In 2021, total biomethane production in the EU27 was 3.5 bcm. REPowerEU has biomethane as one of the short and medium-time measures to reduce natural gas imports by boosting biomethane production to 35 bcm by 2030.

BIOGAS / BIOMETHANE IN BELGIUM (DATA FROM 2021)

- Energy balances (Eurostat) record production of 0.3 bcm of biogases, without distinguishing the type.
- Biogases make 1.6% of gas supply.
- 0.3 bcm of biogases are used to produce electricity, either in electricity only or CHP plants (60%), whereas Final energy consumption (39%) had industry (16%), agriculture & forestry (12%) and commercial & public services (11%) as consumers.
- Biomethane in transport is not recorded in the Energy Balances.
- European Biogas Association (EBA) reports[1] 0.28 bcm of biogas produced in 2021 (95% in 189 biogas plants and 5% in 8 biomethane plants).
- Natural & bio Gas Vehicle Association (NGVA Europe) reports 174 CNG stations for Belgium in 20222. There were 3,769 CNG filling stations in the EU27 in 2022.

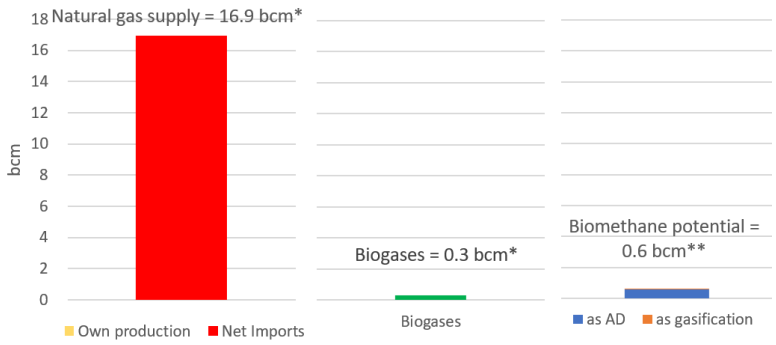


Figure 1 Comparison of current natural gas supply, biomethane production and potential in Belgium (2021) (sources: Eurostat: Energy Balances, 2022; Guidehouse: Gas for Climate Report 2022**)*

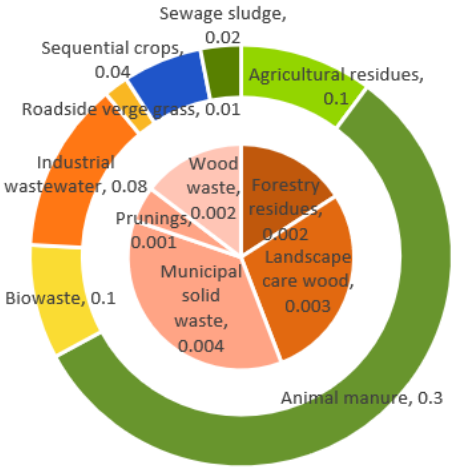
[1] EBA Statistical Report 2022 | European Biogas Association

[2] https://www.ngva.eu/medias/2510-biocng-in-2020-new-data-proves-rapid-growth-of-biomethane-in-transport/

Biomethane has two production pathways:

- **Anaerobic digestion (AD**) produces biogas and digestate (fermented organic matter, like slurry) as a local source of nutrients and GHG emission mitigation option for land management.
  - Macro and micro nutrient composition of digestate depends on the feedstock used for AD[3]
  - Digestate contains phosphorus (0.2-1.5 kg/t) that is on the list of critical raw materials for the EU[4]**.**
- **Gasification** produces biogas and biochar (carbonized organic matter, like charcoal) as a land-based carbon removal option (IPCC, 2019) and soil amendment.

To maximize the multisectoral value of biomethane, byproducts must be recognized and valorized.



Industry estimates Belgium's potential as 0.6 bcm by 2030, mostly related to AD (Figure 2).

Considering the sustainable biomethane potential, Belgium represents a minor biomethane market at EU27 but with a major national multisectoral impact.

In 2018, Belgium consumed 148.3 kt and 6 kt of nitrogen and phosphorus fertiliser[5] that could be partially replaced by digestate.

Manufacturing is the dominant GHG emission source by economic activity with 42% (34.6 $MtCO_{2eq}$)[6] in Belgium, which can be tackled boosting biomethane production and biogenic CO_2 use.

Figure 2 Biogas/biomethane potential in bcm, by feedstock for Belgium by 2030 (inner pie gasification and outer circle AD) (source: Guidehouse: Gas for Climate Report, 2022)

About 4% (~15.8 bcm) of the total natural gas supply in EU was used for non-energy purposes, dominantly for synthesizing nitrogen-based fertilizers, in addition to the energy input needed to support the production process. Combining biomethane production with a strong support of using digestate as a local source of nutrients would have multiple benefits for the reduction of natural gas imports.

NATURAL GAS (NG) SUPPLY AND CONSUMPTION OF BELGIUM (2021)

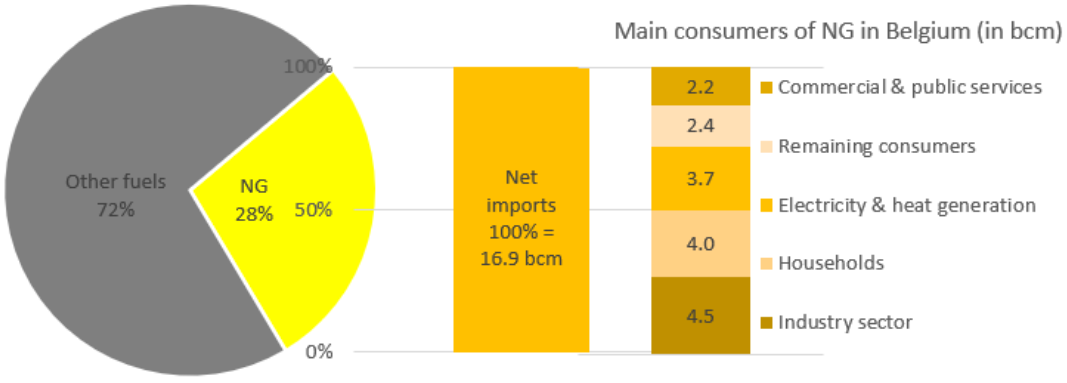


Figure 3 Natural gas share in total energy supply, origin and main consumers for Belgium (2021) (source: Eurostat: Energy Balances, 2022)

[3] As a rule of thumb, 1 ton of digestate contains 2.3-4.2 kg of N; 0.2-1.5 kg of P and 1.3-5.2 kg of K.
[4] EUR-Lex - 52023PC0160 - EN - EUR-Lex (europa.eu)
[5] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Agri-environmental_indicator_-_mineral_fertiliser_consumption#Analysis_at_country_level
[6] File:Greenhouse gas emissions by economic activity, 2021 (thousand tonnes of CO2 equivalents).png - Statistics Explained (europa.eu)

- NG makes 28% of the total energy supply (TES) of Austria, out of which Belgium, out of which 100% (16.9 bcm) is imported.
- NG is used 93% for energy purposes and 7% for non-energy purposes (synthetic fertilizers, chemicals).
- The main NG consumption sectors in Belgium are distributed among the sectors with similar shares: industry (27%), households (24%) and production of electricity either in electricity only or CHP plants: 22% (in transformation input).

Key messages for biomethane in Belgium:

- Belgium has ability to replace about 3.5% of current NG consumption (imports) with biomethane.
- Belgium has infrastructure to start supplying biomethane to transport in the existing 170 CNG filling stations.
- Full effect of biomethane in the green transition would be framing support schemes around livestock and meat and dairy industry to reduce carbon footprint of meat and dairy products as well as GHG emissions from agriculture.
- Combining manure based biomethane with sequential cropping and digestate use to store carbon in the soil and feedstock (like the BiogasDoneRight concept in Italy) and biogenic CO_2 use in agri-food production would add to simultaneous GHG emissions reductions in the top three highest GHG emitting sectors by air emissions in Belgium.
- Given the feedstock profile, a ripple effect would be created by pairing biomethane production with the industrial wastewater treatment facilities to achieve short supply chains with biogenic CO_2 and biomethane use in industry (ETS sector) or heavy-duty vehicles linked to the industry operation (transport sector).
- Well-developed natural gas grid gives an advantage to inject biomethane in the grid, with several small ADs clustered around one biomethane upgrading unit.