

BIOMETHANE FICHE – Denmark (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 DENMARK (DATA FROM 2021)

- Energy balances (Eurostat) record production of 0.7 bcm of biogases, without distinguishing the type.
- Biogases make 32.4% of natural gas supply.
- 0.7 bcm of biogases are dominantly used to produce electricity, either in electricity only or CHP plants (96%).
- European Biogas Association (EBA) reports¹ 0.7 bcm of biogas produced in 2021 (22% in 129 biogas plants and 78% in 51 biomethane plants).
- In 2021, 25% of the natural gas in the Danish gas grid was biomethane. The Parliament has adopted formal conditions to increase biomethane production to substitute 100% of the Danish gas demand before 2030.
- Biomethane use in transport is emerging (< 1%), given the limited CNG (compressed natural gas) vehicle fleet.
- Natural & bio Gas Vehicle Association (NGVA Europe) reports² 100% supply of biomethane for transport at 17 CNG stations for Denmark in 2020.

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/>

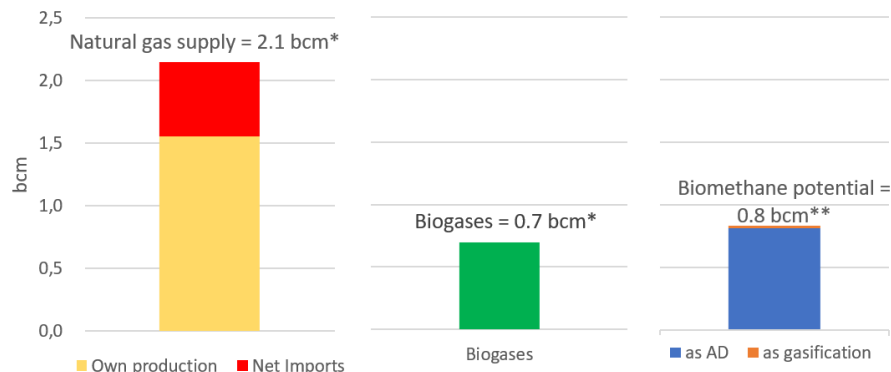


Figure 1 Comparison of current natural gas supply, biomethane production and potential in Denmark (2021) (sources: Eurostat: Energy Balances, 2022*; Guidehouse: Gas for Climate Report 2022**)

Biomethane has two production pathways:

- **Anaerobic digestion (AD)** produces biogas and digestate (fermented organic matter, similar to 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 AD³
 - Digestate contains phosphorus (0.2-1.5 kg/t) that is on the list of critical raw materials for the EU⁴.
- **Gasification** produces biogas and biochar (carbonized organic matter, similar to 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.

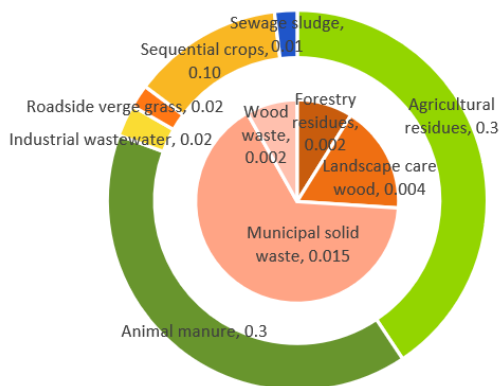


Figure 2 Biogas/biomethane potential in bcm, by feedstock for Denmark (inner pie gasification and outer circle AD) (source: Guidehouse: Gas for Climate Report, 2022)

Industry estimates Denmark's potential as 0.8 bcm, all based on AD by 2030 (Figure 2).

Considering the sustainable biomethane potential, Denmark could be a smaller biomethane market among the EU27 but significant in terms of meeting its own natural gas demand.

Denmark consumes 233 kt and 16 kt of nitrogen and phosphorus fertiliser⁵ that could be partially replaced by digestate.

In Denmark, Transportation & storage and Agriculture, forestry & fisheries are the two main GHG emission sources by economic activity with 72% (47 MtCO_{2eq})⁶, which can be tackled both by manure management in AD, application of digestate on soil (land management) and use of biomethane and biogenic CO₂ in transport and storage sector.

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.

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 \(europa.eu\)](https://eur-lex.europa.eu/eli/lex/52023pc0160/oj/2023/01/10/aut/doc/html)

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 \(europa.eu\)](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Greenhouse_gas_emissions_by_economic_activity,_2021_(thousand_tonnes_of_CO2_equivalents).png_-_Statistics_Explained_(europa.eu))

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

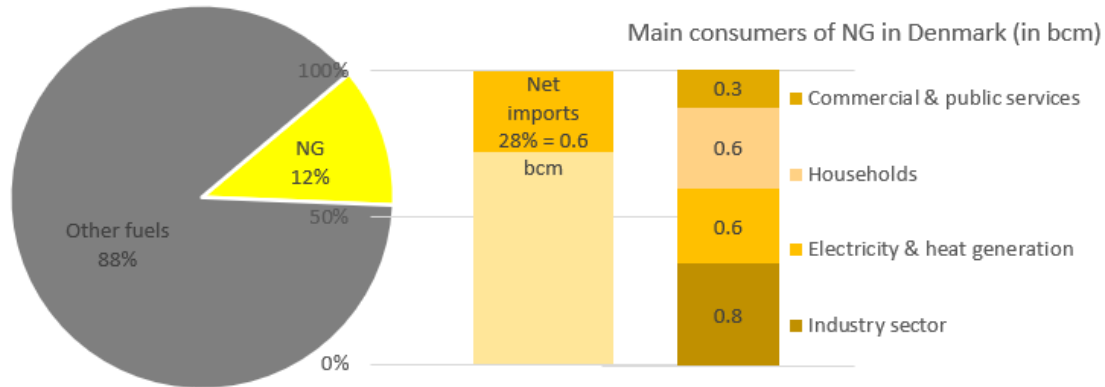


Figure 3 Natural gas share in total energy supply, origin and main consumers for Denmark (2021) (source: Eurostat: Energy Balances, 2022)

- NG makes 12% of the total energy supply (TES) of Denmark, out of which 28% (0.6 bcm) is imported.
- NG is used 100% for energy purposes.
- The main NG consumption sectors in Denmark are in Final energy consumption (84%): industry (38%) and households (30%) being the main consumers. Only 28% of NG is used for electricity production.

Key messages for biomethane in Denmark:

- Denmark has potential to replace 100% of the current NG imports with biomethane.
- Denmark is the leading MS in replacing NG consumption with biomethane, to reach 100% biomethane by 2030 with other measures to phase out NG consumption.
- Denmark has already very good biomethane action plan and could serve as a best practice example in biomethane policy making for small national biomethane markets.
- Although small biomethane market by size within the EU27, biomethane market has great impact on the supplying renewable gases and reaching full self-sufficiency at the national level.
- To have full effect of biomethane production on the green transition, biomethane production is to be linked with agri-food industry, to achieve short supply chains with feedstock supply and digestate use on land, renewable CO₂ and biomethane use in industry (ETS sector) or heavy-duty vehicles linked to the industry operation (transport sector).
- Denmark has infrastructure to start supplying biomethane to transport in the existing 17 CNG filling stations.