BIOMETHANE FICHE – The Netherlands (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 THE NETHERLANDS (DATA FROM 2021)

- Energy balances (Eurostat) record production of 0.5 bcm of biogases, without distinguishing the type.
- Biogases make 1.4% of natural gas supply.
- 0.5 bcm of biogases are used to produce electricity, either in electricity only or CHP plants (66%). Final energy consumption (33%) records agriculture & forestry (13%), industry (12%) and commercial & public services (9%).
- Biomethane use in transport is not recorded.
- The European Biogas Association (EBA) reports[1] 0.45 bcm of biogas produced in 2021 (50.8% in 260 biogas plants and 49.2% in 71 biomethane plants). Almost 20% of Dutch biomethane was used in transport in 2021. This share is expected to grow significantly in the years ahead as the country is investing heavily in Bio-LNG production. With planned 10 new Bio-LNG plants in 2022- 2025, the Netherlands might become one of the leading producers of Bio-LNG in Europe.
- CNG Europe reports 177 CNG stations for the Netherlands, out of 3,769 in the EU27, in 2022[2].

[1] EBA Statistical Report 2022 | European Biogas Association

[2] CNG Europe | Map of Natural Gas Vehicle (NVG) Compressed natural gas (CNG) filling stations in Europe, Mappa Stazioni di rifornimento di metano, Landkarten Methantankstellen erdgastankstellen

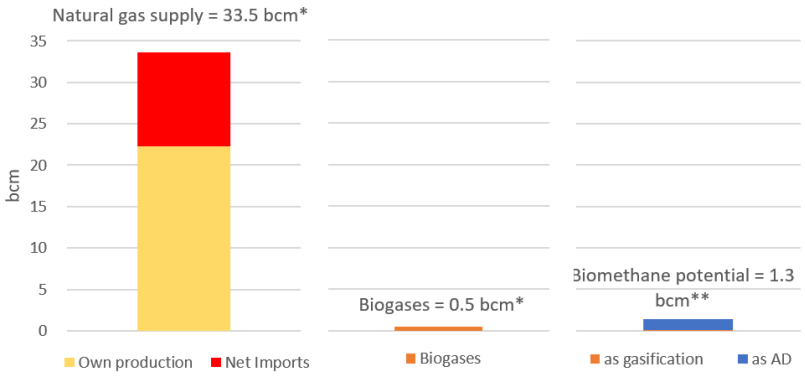

Figure 1 Comparison of current natural gas supply, biomethane production and potential in The Netherlands (2021) (sources: Eurostat: Energy Balances, 2022; Guidehouse: Gas for Climate Report 2022**)*

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 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, 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.

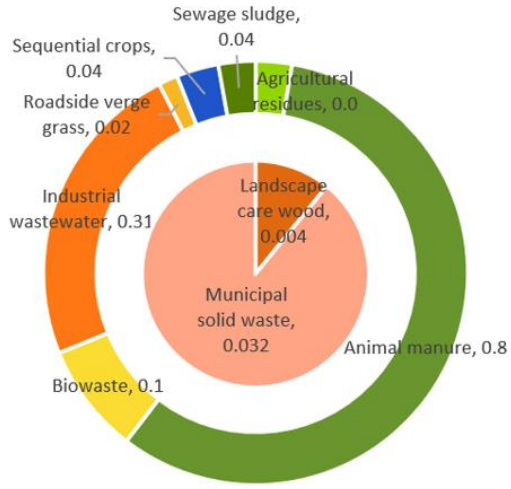

Figure 2 Biogas/biomethane potential in bcm, by feedstock for The Netherlands (inner pie gasification and outer circle AD) (source: Guidehouse: Gas for Climate Report, 2022)

Industry estimates the Netherlands's sustainable biomethane potential as 1.34 bcm (1.3 bcm from AD and 0.04 from gasification) by 2030 (Figure 2).

The Netherlands represents a MS with a moderate sustainable biomethane potential in terms of contribution to the overall 2030 target but with strong national benefits from a developed biomethane market.

The Netherlands consumes 220 kt and 6 kt of nitrogen and phosphorus fertiliser[5] that could be partially replaced by digestate.

In the Netherlands, Manufacturing and Electricity, gas, steam & air conditioning supply are the main GHG emission sources by economic activity with 52% (78.5 $MtCO_{2eq}$)[6], which can be tackled both with integrating biomethane production and use as well as biogenic CO_2 use in agri-food industry (ETS and non-ETS sectors).

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)
[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)

NATURAL GAS (NG) SUPPLY AND CONSUMPTION OF THE NETHERLANDS (2021)

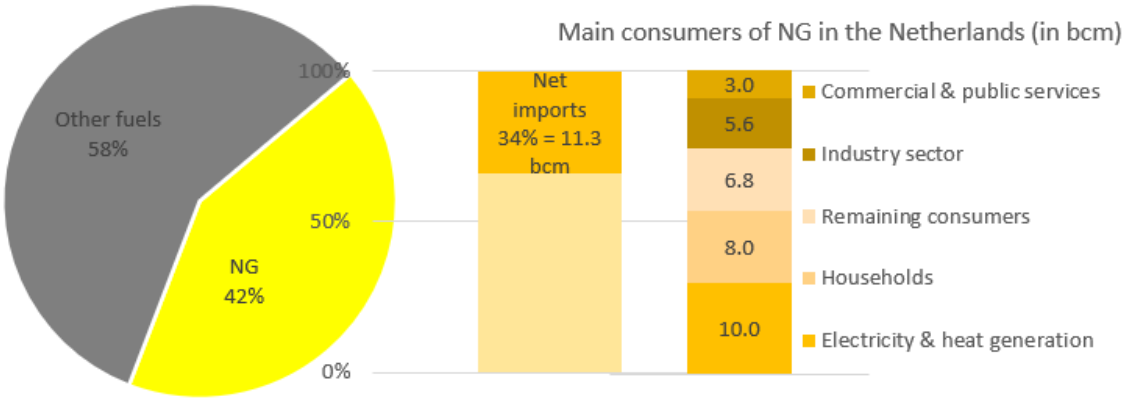

Figure 3 Natural gas share in total energy supply, origin and main consumers for The Netherlands (2021) (source: Eurostat: Energy Balances, 2022)

- NG makes 42% of the total energy supply (TES) of the Netherlands, out of which 34% (11.3 bcm) is imported.
- Roughly, NG is used 91% for energy purposes and 9% for non-energy purposes (synthetic fertilizers and chemicals).
- The main NG consumption sectors are well distributed among production of electricity, either in electricity only or CHP plants, (30%) and households (24%) and industry (17%) in the Final energy consumption (57%).

Key messages for biomethane in The Netherlands:

- The Netherlands has ability to replace about 12% of current NG imports with biomethane.
- Measures to develop national biomethane production and use could serve as a good practice example.
- 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).
- To have full effect of biomethane production on the green transition, biomethane production support is to be linked with the agri-food industry along the value chain to avoid transportation costs and feedstock loss, with local digestate application (non-ETS sector), biogenic CO_2 and biomethane use in industry (ETS sector).