

BIOMETHANE FICHE – Estonia (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 ESTONIA (DATA FROM 2021)

- Energy balances (Eurostat) record production of 0.02 bcm of biogases, without distinguishing the type.
- Biogases make 4.6% of natural gas supply.
- 0.02 bcm of biogases are used mostly in transport (65%) and for electricity production, either in electricity only or CHP plants (20%).
- European Biogas Association (EBA) reports¹ that 0.02 bcm of biogases come from 12 biogas plants (23%) and 6 biomethane plants (77%). All biomethane in Estonia is compressed towards Bio-CNG and used in the transport sector. The Bio-CNG is particularly used by passenger vehicles, public transport, buses, and trucks. In Estonia, there are 5 municipalities of which public transportation buses run either fully or partly on Bio-CNG.
- CNG Europe reports 23 CNG stations for Estonia, out of 3,769 in the EU27, in 2022².

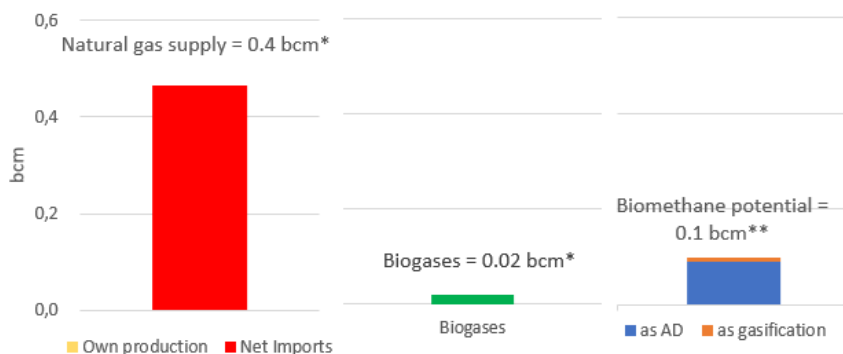


Figure 1 Comparison of current natural gas supply, biomethane production and potential in Estonia (2021) (sources: Eurostat: Energy Balances, 2022*; Guidehouse: Gas for Climate Report 2022**)

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

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.



Industry estimates Estonia’s sustainable biomethane potential as estimated at 0.1 bcm from AD by 2030 (Figure 2).

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

Estonia consumes 41.5 kt and 4.8 kt of nitrogen and phosphorus fertiliser⁵ that could be partially replaced by digestate.

Electricity, gas, steam & air conditioning supply is the main GHG emission source by economic activity with 48% (5.8 MtCO_{2eq})⁶ in Estonia, which can be tackled both by boosting biomethane production and use.

Figure 2 Biogas/biomethane potential in bcm, by feedstock for Estonia (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 ESTONIA (2021)

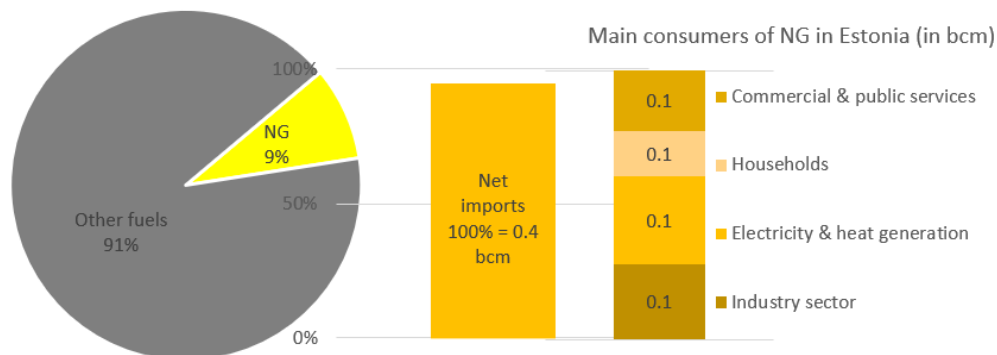


Figure 3 Natural gas share in total energy supply, origin and main consumers for Estonia (2021) (source: Eurostat: Energy Balances, 2022)

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 \(europa.eu\)](https://eur-lex.europa.eu/eur-lex.do?uri=CELEX:52023PC0160:EN)

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))

- NG makes 9% of the total energy supply (TES) of Estonia, out of which 100% (0.4 bcm) is imported.
- NG is used 100% for energy purposes.
- The main NG consumption sectors are production of electricity (29%), either in electricity only or CHP plants, and industry (25%) and commercial & public services (20%) from the final energy consumption.

Key messages for biomethane in Estonia:

- Estonia has ability to replace about 25% of current NG consumption (imports) with biomethane.
- Estonia currently deploys 20% of its sustainable biomethane potential.
- Estonia is a good practice example of a small country benefiting from national biomethane market development.
- A programme to repower biogas CHP plants to biomethane, either as a single upgrading point or a cluster with a centralised upgrading unit close to a NG pipeline injection, industry use (ETS sector) or heavy-duty vehicles linked to the industry operation (transport sector).
- Given the natural gas system, a supporting scheme that promotes clustering of several AD units with a centralised biogas to biomethane unit would benefit from the economies of scale.
- Developing business models to decarbonise meat and dairy sector with biomethane production and use (either in on-farm filling stations to run the delivery trucks or injection to the natural gas pipeline), digestate use (a local source of nutrients either for feed grow or soil), and biogenic CO₂ in industry (e.g., cheese packaging, carbonated drinks) would aid to reduce carbon footprint of the meat and dairy products.
- Sustainable biomethane potential could be increased by using digestate as a local source of nutrients.
- Estonia has infrastructure to start supplying biomethane to transport in the existing 23 CNG filling stations.