BIOMETHANE FICHE – Croatia (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 CROATIA (DATA FROM 2021)

- Energy balances (Eurostat) record production of 0.11 bcm of biogases, without distinguishing the type, whereas national sources report 0.12 bcm[1]
- Biogases make 4.1% of natural gas supply.
- 0.11 bcm of biogases are used to produce electricity, either in electricity only or CHP plants (99%).
- No records of biomethane production.
- Biomethane use in transport is not recorded.
- CNG Europe reports 4 CNG stations for Croatia, out of 3,769 in the EU27, in 2022[2].

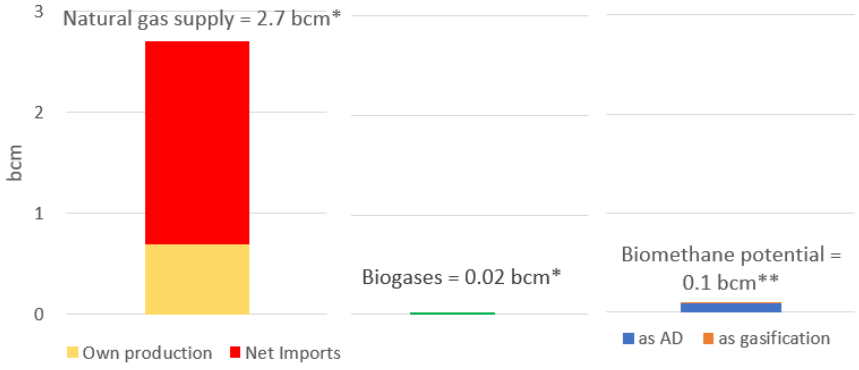

Figure 1 Comparison of current natural gas supply, biomethane production and potential in Croatia (2021) (sources: Eurostat: Energy Balances, 2022; Guidehouse: Gas for Climate Report 2022**)*

[1] Croatian Ministry of economy and sustainable development: Energy in Croatia 2021 / Energija u Hrvatskoj 2021 https://mingor.gov.hr/o-ministarstvu-1065/djelokrug-4925/energetika/energetska-politika-i-planiranje/energija-u-hrvatskoj/5330

[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 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.

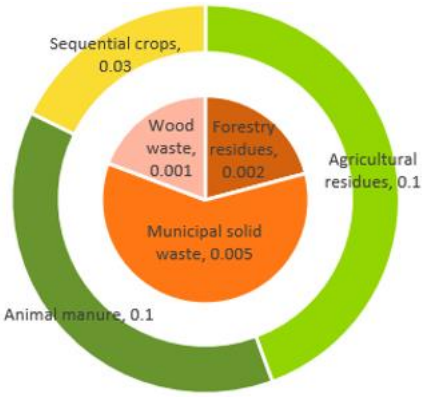

Figure 2 Biogas/biomethane potential in bcm, by feedstock for Croatia (inner pie gasification and outer circle AD) (source: Guidehouse: Gas for Climate Report, 2022)

Industry estimates Croatia's potential as 0.23 bcm, dominantly on AD by 2030 (Figure 2).

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

Croatia consumes 99 kt and 15 kt of nitrogen and phosphorus fertiliser[5] that could be partially replaced by digestate.

Manufacturing, Other services, water supply & construction with Agriculture, forestry & fisheries are the 3 main GHG emission sources by economic activity with 70% (12.3 $MtCO_{2eq}$)[6], which can be tackled both by boosting biomethane production and use close to the industry with biogenic CO_2 use, manure management in AD and inclusion of digestate in land management.

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 CROATIA (2021)

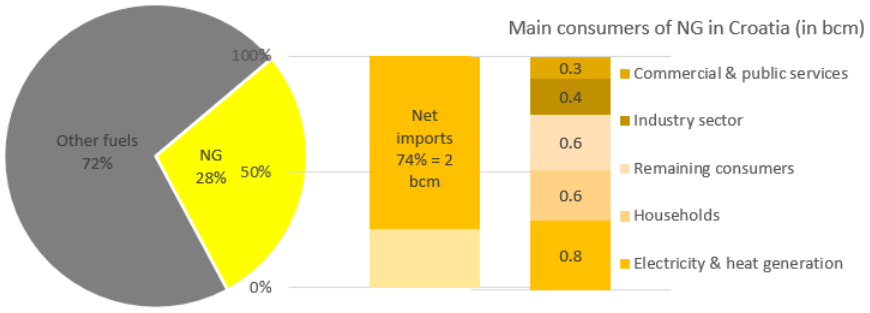

Figure 3 Natural gas share in total energy supply, origin and main consumers for Croatia (2021) (source: Eurostat: Energy Balances, 2022)

[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 Croatia, out of which 74% (2 bcm) is imported.
- NG is used 89% for energy purposes and 11% for non-energy purposes (synthetic fertilizers).
- The main NG consumption is electricity production (32%), either in electricity only or CHP plants, followed by households (22%) and industry (15%) from the final energy consumption.

Key messages for biomethane in Croatia:

- Croatia has ability to replace about 5% of current NG imports with biomethane.
- Croatia currently deploys 20% of its sustainable biomethane potential.
- Current number CNG filling stations are not sufficient to have a larger uptake of biomethane in transport.
- A programme to repower biogas CHP plants to biomethane, either as a single upgrading unit or a cluster with a centralised upgrading unit close to a NG pipeline injection, industry use (ETS sector) or industry vehicle fleet (transport sector).
- Transition from food & feed feedstock to sequential cropping and digestate use (like the Italian BiogasDoneRight concept) to increase the impact on GHG emission savings and green transition of already existing biogas plants.
- Developing business models to decarbonise meat and dairy sector with biomethane production and use, digestate use (a local source of nutrients either for feed grow or soil), and biogenic CO_2 in industry (e.g., cheese packaging, carbonated drinks) would aid to reduce carbon footprint of the meat and dairy products.
- Croatia could additionally reduce NG import dependency by including its major synthetic fertiliser production capacities in improvement and marketing of digestate, or extract of macro-nutrients for bio-fertilisers.