The potential of biomethane for the energy transition

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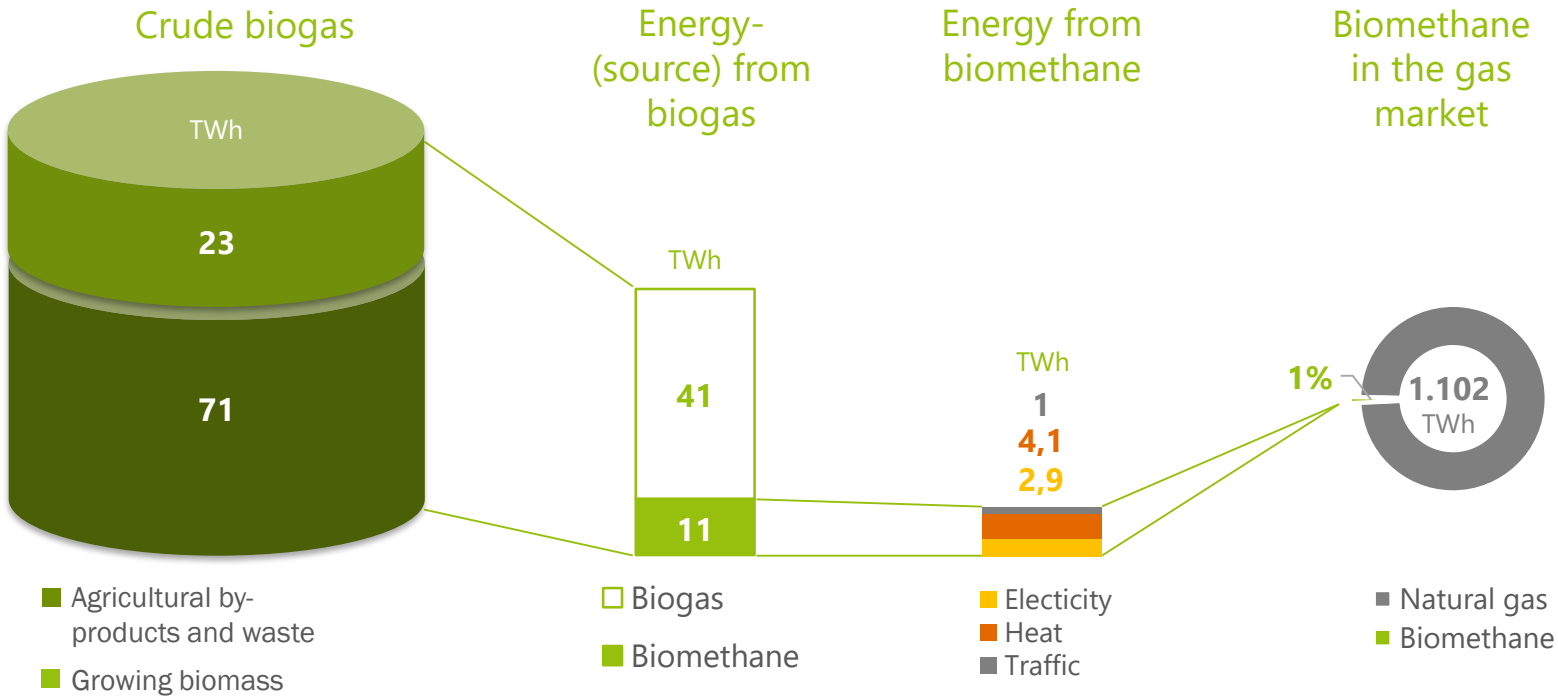
"Biomethane In Germany and France: General conditions, potentials, challenges"

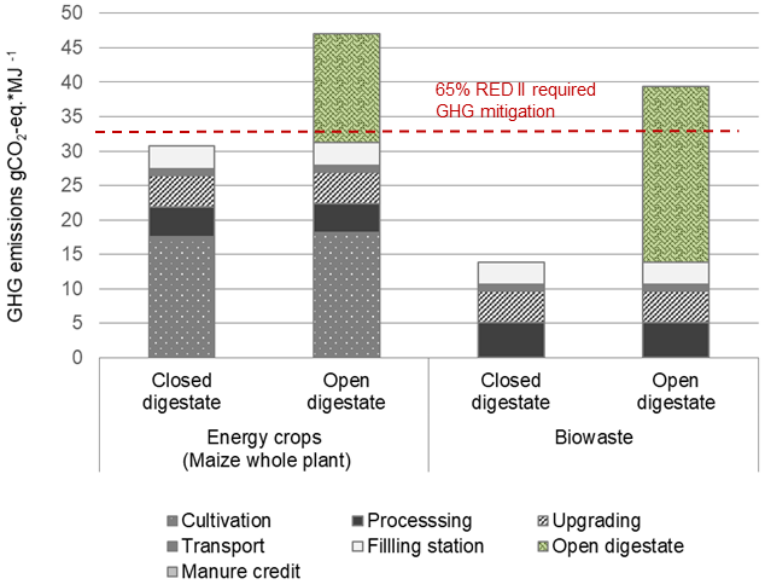
The potential of biomethane for the energy transition

Biomethane from Biogas 2021



Data: AGEE Stat (2022): Time series on the development of renewable energies in Germany; Daniel-Gromke, J. et al. (2017): Current Developments in Production and Utilization of Biogas and Biomethane in Germany, 10.1002/cite.201700077

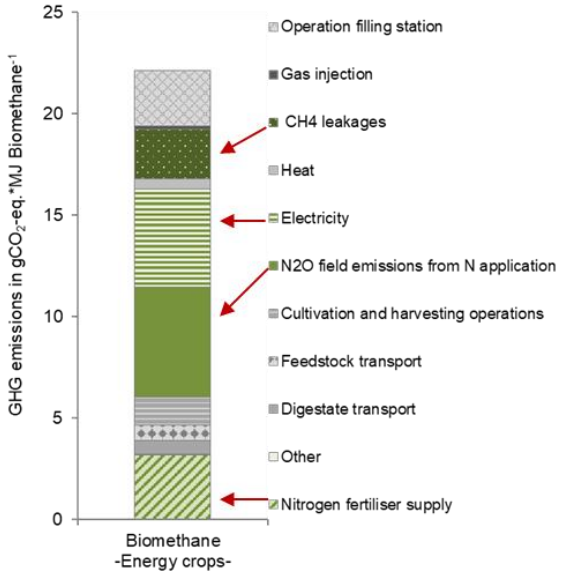
GHG savings



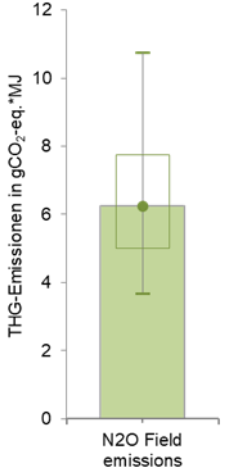
- Wide range of GHG emissions for biomethane
- Dependent on a variety of factors: used feedstock, operation management, etc.
- GHG savings of biomethane compared to fossil comparator of 17 - 202% possible in transport sector (RED II default values).
- High GHG savings possible through the use of residues, waste materials and animal excrements (over 100% savings)

Source: [European Commission (2018): DIRECTIVE (EU) 2018/ 2001 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL - on the promotion of the use of energy from renewable sources 2018]; [Majer, Stefan; Oehmichen, Katja (DBFZ); Kirchmeyr, Franz (AKB); Scheidl, Stefanie (EBA) (2016): Calculation of GHG emission caused by biomethane.]

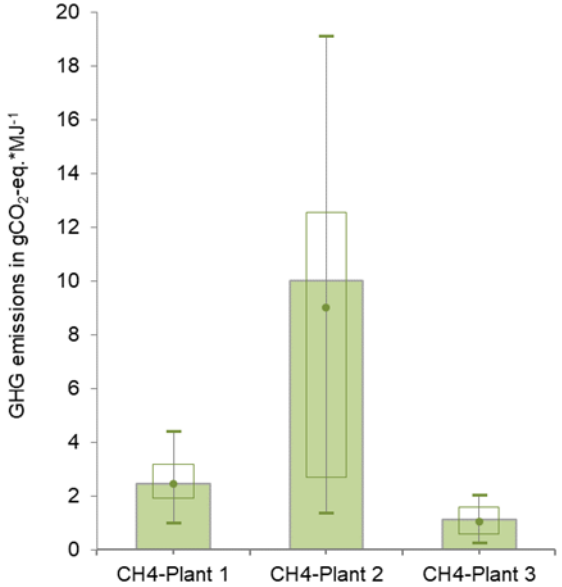
Sustainability certification



Major drivers of GHG emissions



N_2O - field emissions



CH_4 emissions from leakages, etc..

Source:: Westerkamp, Tanja; Reinelt, Torsten; Oehmichen, Katja; Ponitka, Jens; Naumann, Karin (2014): ClimateCH4. Climate effects of biomethane. DBFZ-Report. Leipzig: DBFZ (DBFZ-Report, 20); Daniel-Gromke, Jaqueline; Rensberg, Nadja; Denysenko, Velina; Barchmann, Tino; Oehmichen, Katja; Beil, Michael et al. (2020): Options for existing biogas plants until 2030 from an economic and energy perspective;

Influential factors I

Raw material availability

Increased demand of substrates or land for feed or food respectively.

Medium- and long-term increase in demand from industry (material use)

Market Environment & Decarbonization

Rising prices for electricity and heat increase incentives for biomethane

Rising demand on the road to climate neutrality

Technologies

Further development of technologies for the gasification of lignocellulose

Cost reduction for biomethane processing (economic efficiency of small plants)

Influential factors II: Funding tools (Selection)

Electricity

Renewable Energies Act

- From 2023 tendering of 600 MW/a
- 19.37 ct/kWh
- "highly flexible": max. 10 % p.a. plant utilization
- "H2-ready": cost-effective conversion to hydrogen

Traffic

Greenhouse gas quota

- -25% greenhouse gases for fuels by 2030
- Sub-quota for advanced biofuels including biomethane from waste
- ➢ Double counting in case of overfulfillment

Energy tax (EnStG):
Reduced tax rate

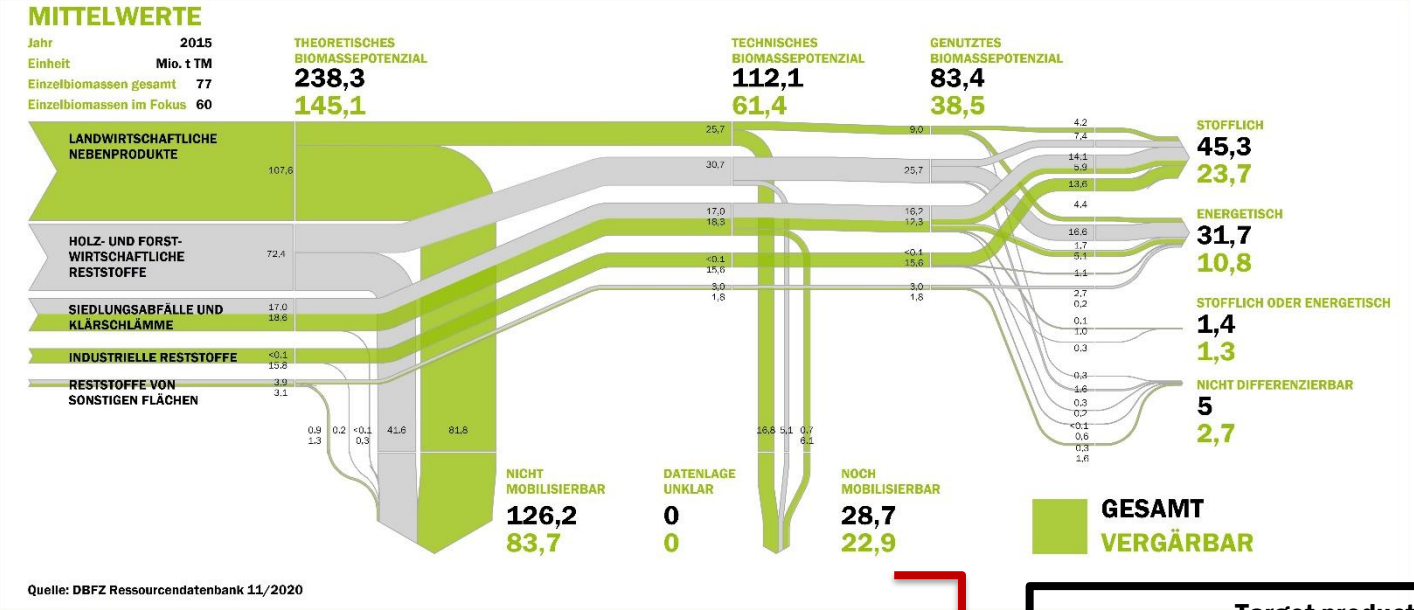
Heat

- Bonus for cogenerated electricity (CHP)
- 10-20 % investment subsidy for biomass heating system (BEG)
- Minimum share of renewable heat in new buildings

Intersectoral

- GHG emissions from biomass rated as zero in national emissions trading
- Exemption from gas grid feed-in fees (GasNEV)

Raw material potential: Fermentable biomass potential in Germany

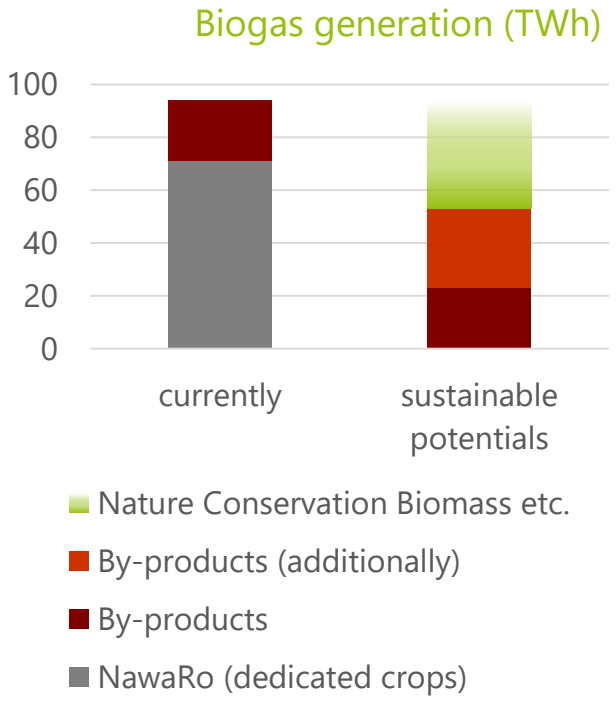


Source: Brosowski et al. (2016), DOI 10.1016/j.biombioe.2016.10.017; Brosowski et al. (2019), DOI 10.1016/j.biombioe.2019.105275;
Brosowski et al. (2019), https://www.fnr-server.de/ftp/pdf/berichte/22019215.pdf

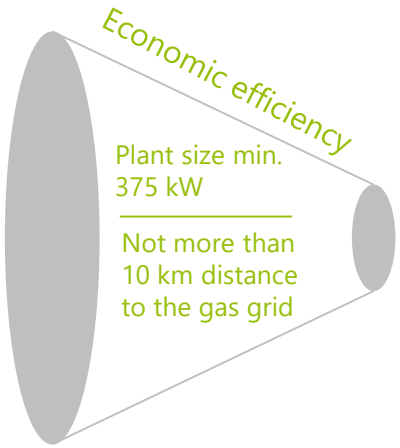
Target product „Biomethane“

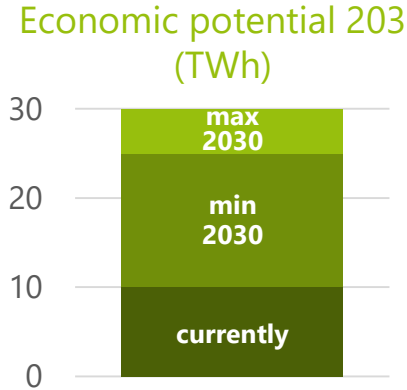
97 - 279 PJ (27 -77.5 TWh)

Raw material potentials: sustainable substrates



Source: DBFZ Resource database (2021)





Source: Matschss et al. (2020): doi 10.1186/s13705-020-00276-z

Potentials: SNG and biomethane with H2

Opportunities :

- Methanation technically mature, demo plant operation (Werlte) already for several years
- Sustainable CO2 utilization
- (steam) gasifier for synthesis gas production available as turn-key plants
- Existing infrastructure from gas network (pipelines, LNG tankers, etc.) to end user.

Challenges :

- Only sustainable if green hydrogen is used
- Competes with direct H2 utilization
- Dependence on price for biogenic raw materials but also indirectly dependent on the price for electricity due to H2 demand - Economic reference is the price for natural gas → follow similar price developments

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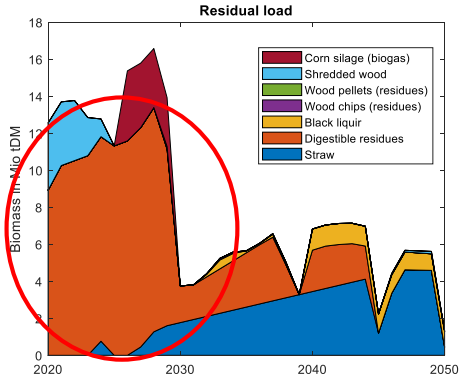
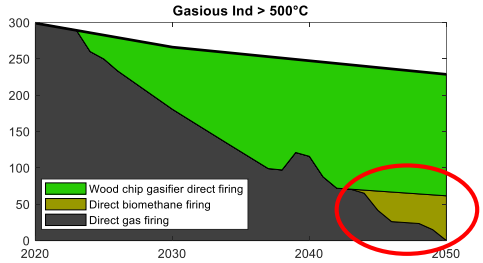
2020 — Fermentable residues — 2050

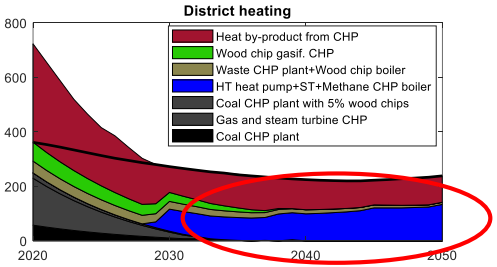
Biogas plants

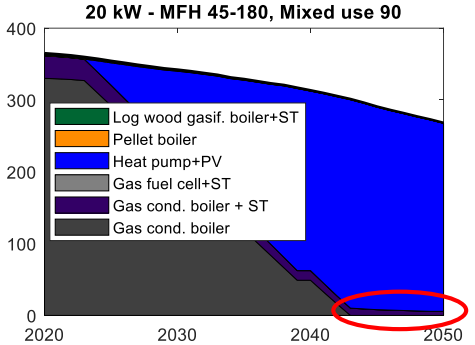
Biomethane applications

- High-temperature industry
- District heating
- Buildings (Gas heaters)









Conclusion on the role of fermentable residues:

- Crucial role towards climate neutrality from 2045 onwards.
- Biomethane is used flexibly in a wide variety of heat sectors that are difficult to decarbonize.

[SoBio - Scenarios of an optimal energetic biomass use until 2030 and 2050; DBFZ 2022]

Discussion: areas of application & political control

- Current dominance of biomethane electricity subsidies - level playing field needed for all applications.
- Subsidies for waste biomethane in contradiction to waste prevention goal → better GHG pricing of waste emissions or regulatory law (e.g. obligation to ferment manure).
- For biomethane in Germany, the transfer of the REpowerEU targets does not make sense (target: tenfold increase).
- Biomethane is not only an energy carrier but rather a renewable and highly integrable carbon source for the chemical sector.
- In order to efficiently develop the potential role, resource base and fields of application, a biomethane strategy is required.

Conclusion

- Subordinate but important role of biomethane in the energy sector, among others
- High GHG reduction possible with use of residual and waste materials
- Potentials exist for conversion of raw material base to 'land-neutral' cultivated biomass
- Biomethane potential can be tripled by 2030
- To be given greater consideration in the future: Biomethane as a feedstock in the chemical industry

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