The potential of biomethane for the energy transition

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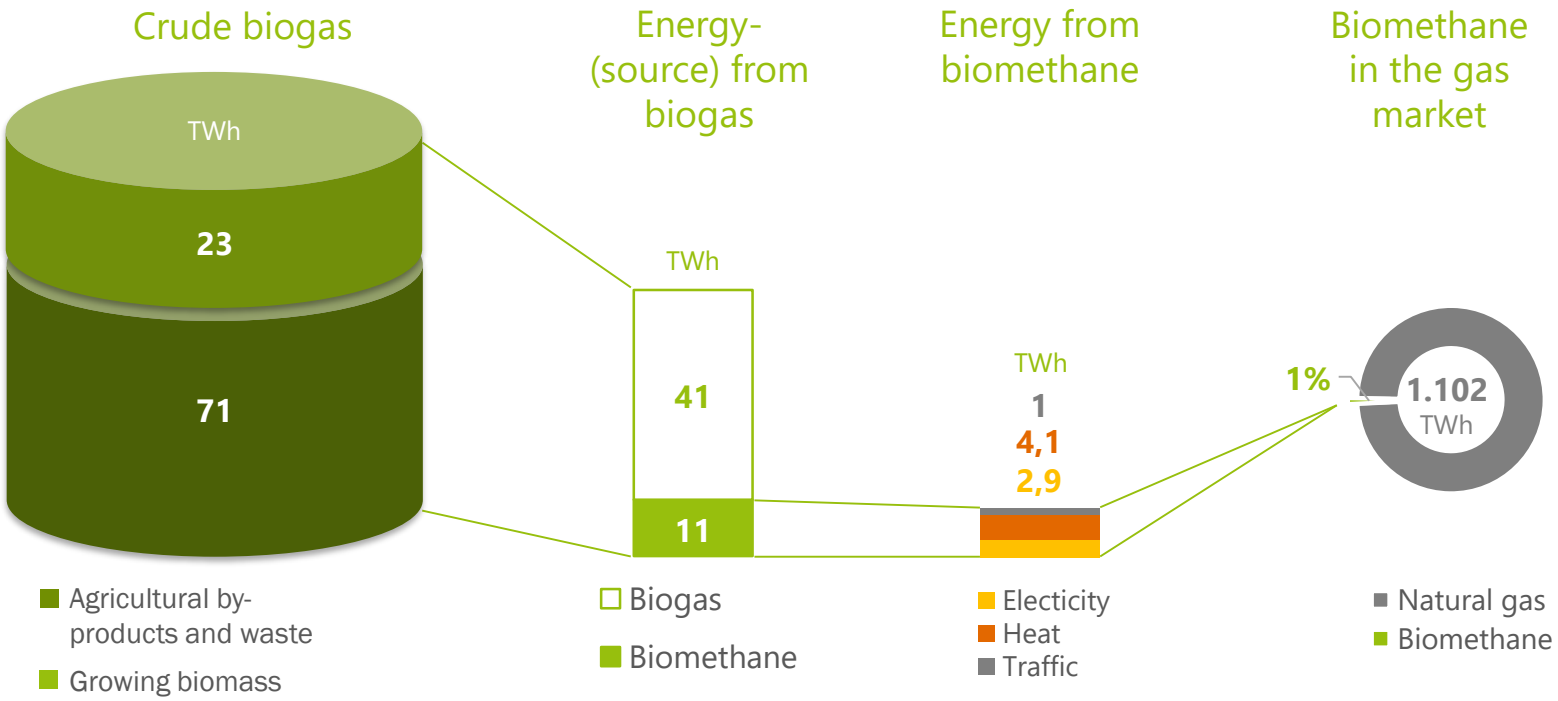
DFBEW Conference 06.10.2022 (online)

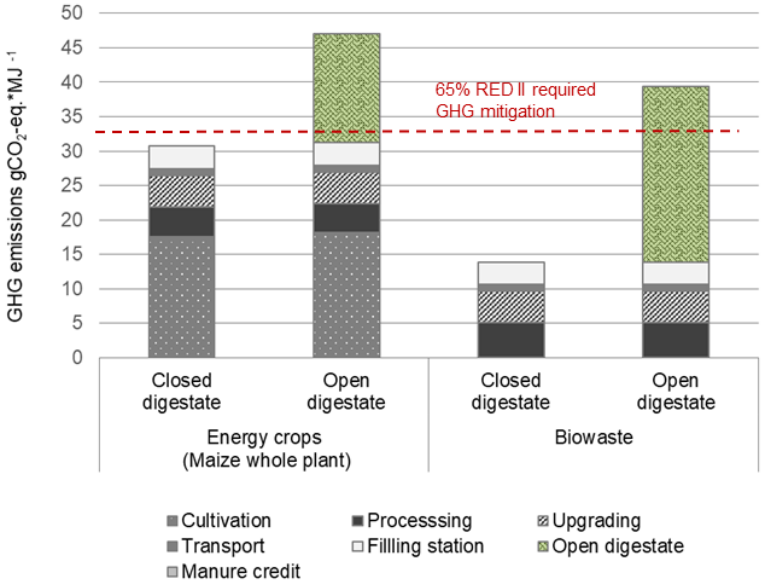
"Biomethane In Germany and France: General conditions, potentials, challenges"

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

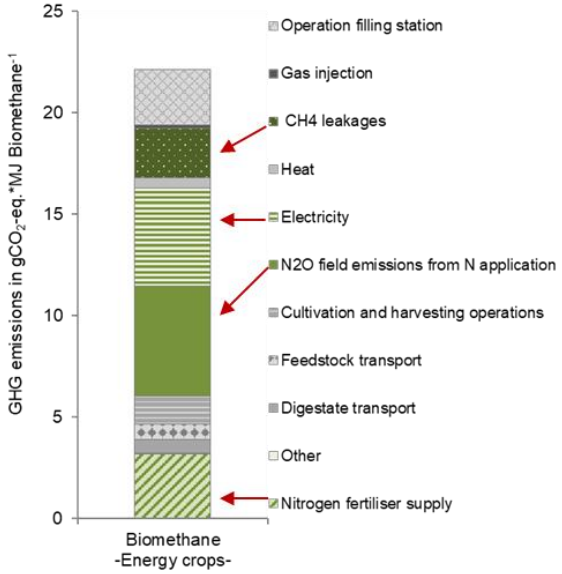
GHG savings



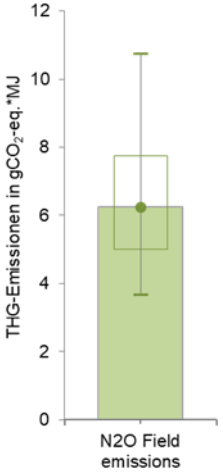
- Wide range of GHG emissions for biomethane
- Dependent on a variety of factors: used feedstock, operation management, etc.
- GHG savings of biomethane compared to fossil comparator of 17 - 202% possible in transport sector (RED II default values).
- High GHG savings possible through the use of residues,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

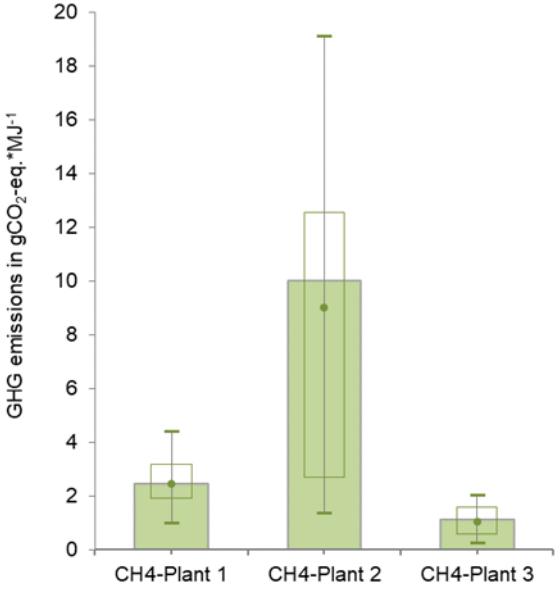
Sustainability certification



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

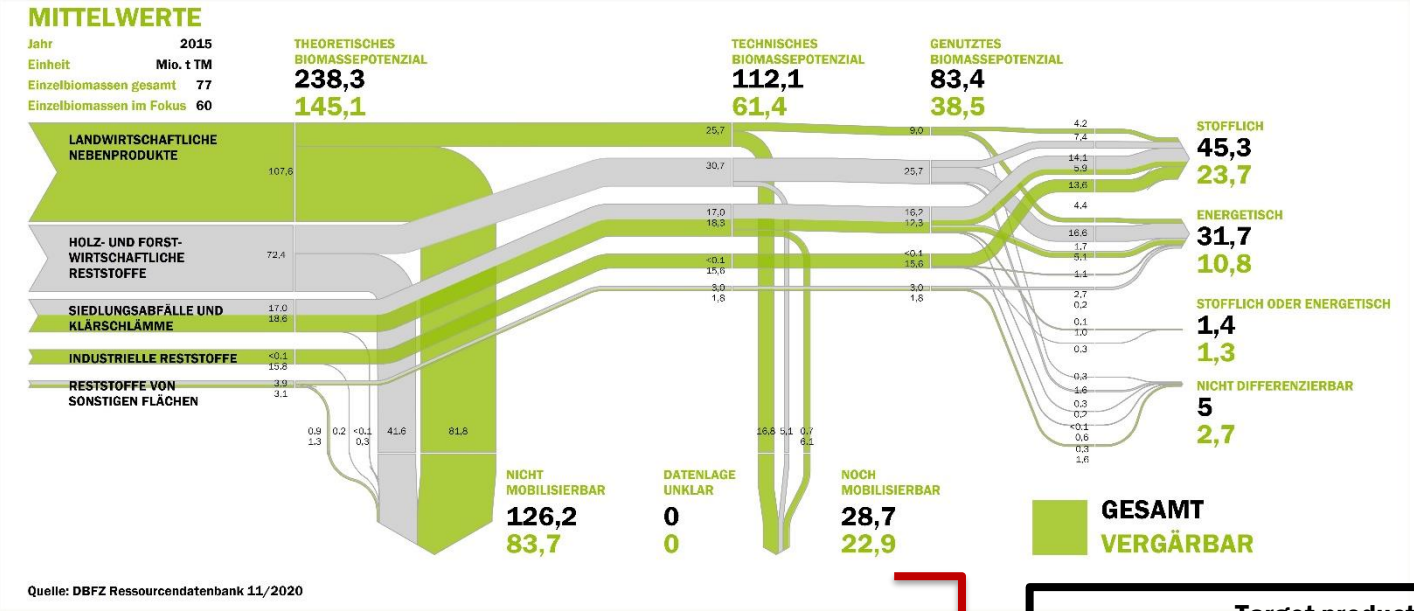
Heat

- 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

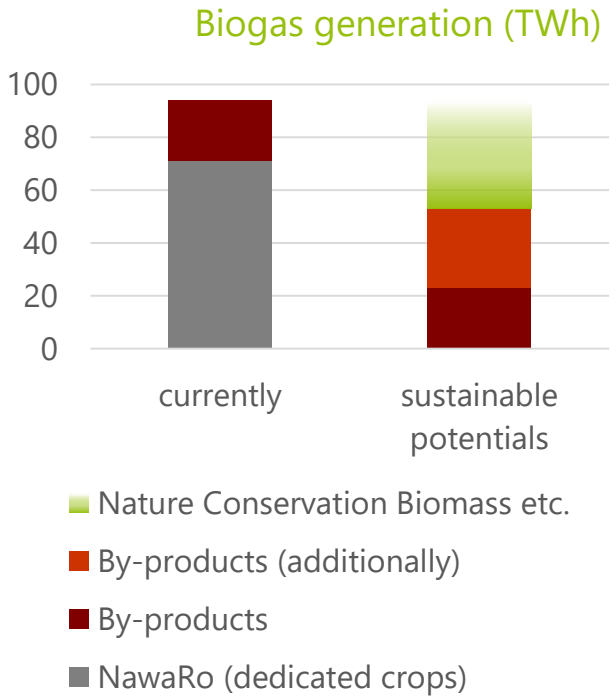


Target product „Biomethane“

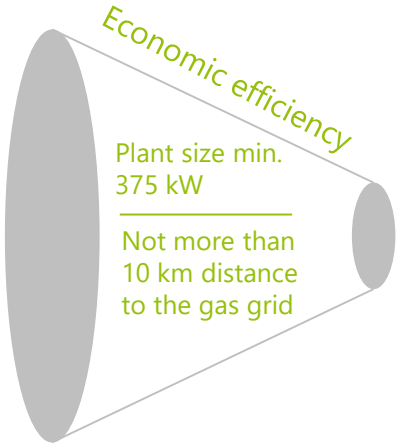
97 - 279 PJ (27 -77.5 TWh)

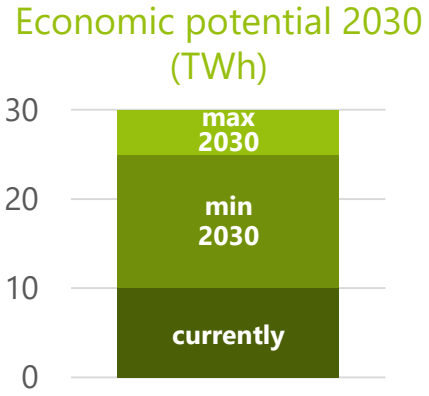
Source: Brosowski et al. (2016), DOI 10.1016/j.biombioe.2016.10.017; Brosowski et al. (2019), DOI 10.1016/j.biombioe.2019.105275;
Brosowski et al. (2019), https://www.fnr-server.de/ftp/pdf/berichte/22019215.pdf

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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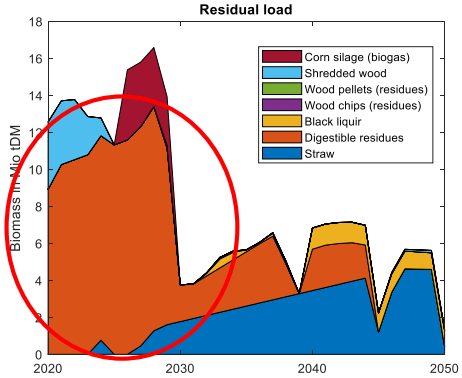
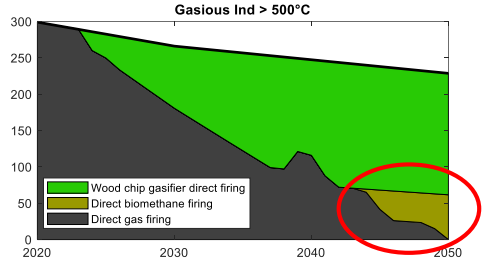
2020 — Fermentable residues — 2050

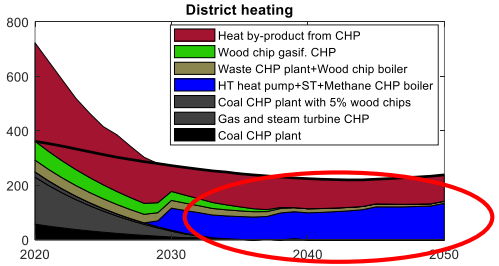
Biogas plants

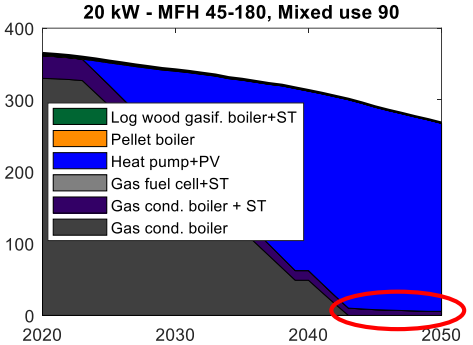
Biomethane applications

- 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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