Deutsches Biomasseforschungszentrum
gemeinnützige GmbH

DBFZ

Market developments regarding biomethane in Germany

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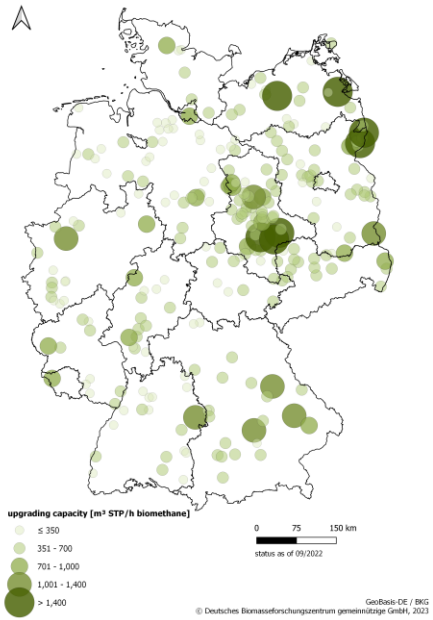
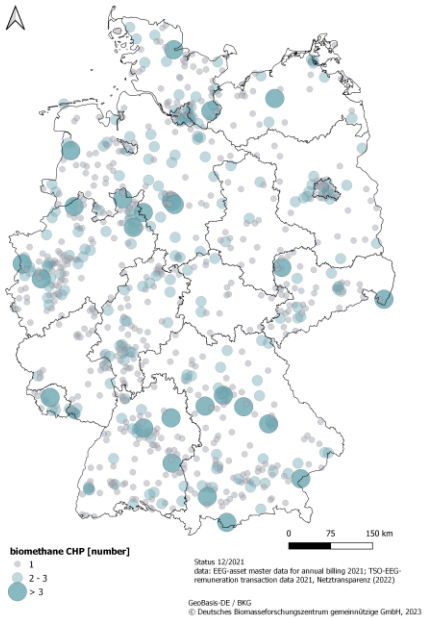
GreenMeUp Workshop„From Policy to Action: Driving Biomethane MarketGrowth”
25th March 2025, Leipzig

Biogas upgrading vs. biomethane CHPs in Germany

Biogas upgrading plants



Biomethane CHP units



~ 10 billion m^3 biogas production incl. biomethane (> 100 TWh_{Hs})

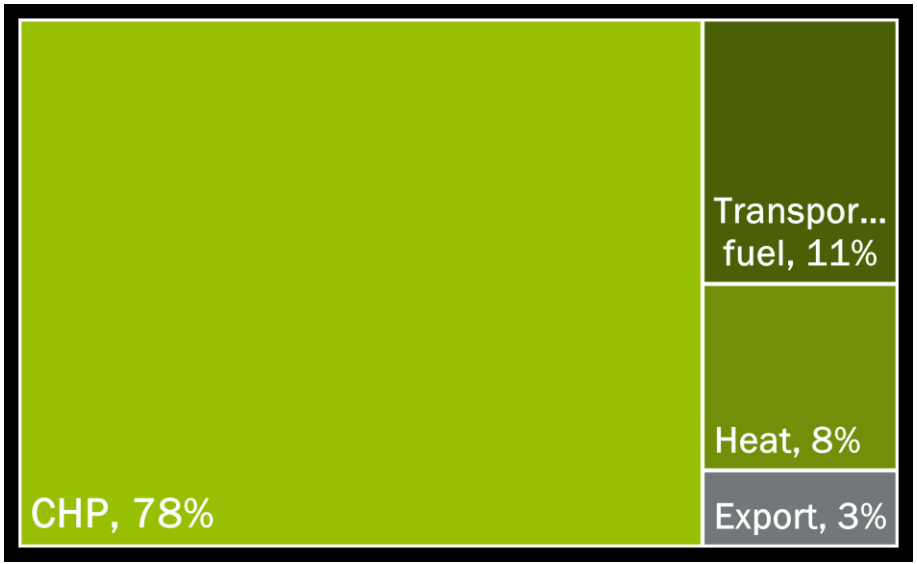
as of 12/2024:

- **~ 250 biogas upgrading plants** with feed-in capacity of ~155.000 m^3/h
- **~ 1,150 biomethane CHPs with gross electricity production**: ~3TWh_e (1% RE electricty share) and **heat supply**: 4.9 TWh_e (2% RE heating and cooling share)

Sources: (1) DBFZ database 08/2024; (2) DBFZ disaggregation of TSO EEG-remuneration transaction data for 2022, as of 08/2024; (3) Federal Ministry for Economic Affairs and Climate Action: Time series for the development of renewable energy sources in Germany, as of 02/2024

Biomethane utilization in Germany

Biomethane utilisation in 2023

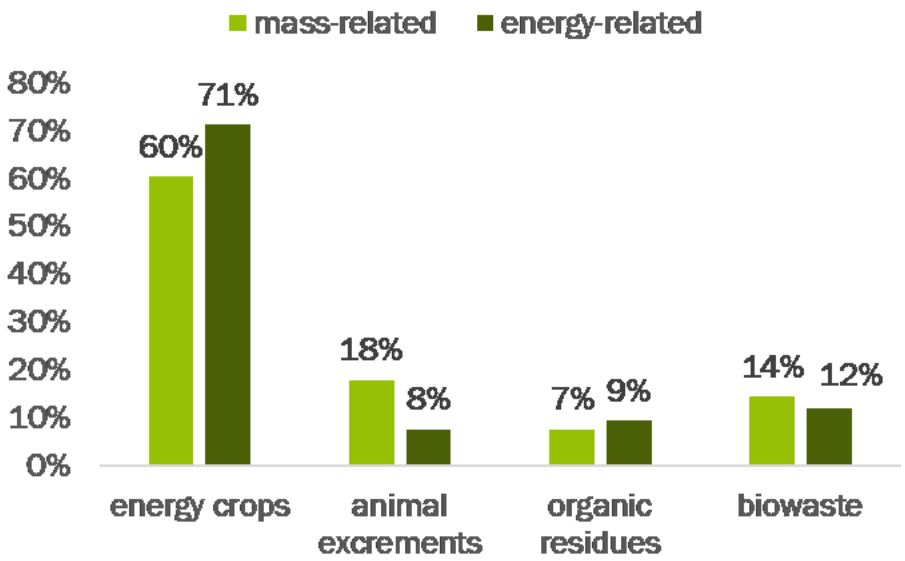


- ~10% of biogas for providing biomethane
- Feed-in of biomethane around 10 TWh_{Hs}
- Biomethane produced in plants receiving EEG tariffs is mainly utilized in CHP processes with the share of 78 % in 2023;
- Export decline from 6% in 2022 to 3% in 2023 due to the market distortion and high national demand;
- Steady growth in transportation sector

Sources: (1) German Energy Agency dena: Projection biomethane utilisation, Biogaspartner meeting, 04/2024;) (2) Federal Ministry for Economic Affairs and Climate Action: Time series for the development of renewable energy sources in Germany, 02/2024

Biomethane feedstocks

Biomethane feedstocks in 2022



Maize cap (incl. whole crop silage, corn-cob-mix, grain maize and ground ear maize): 60% introduced by EEG 2012;

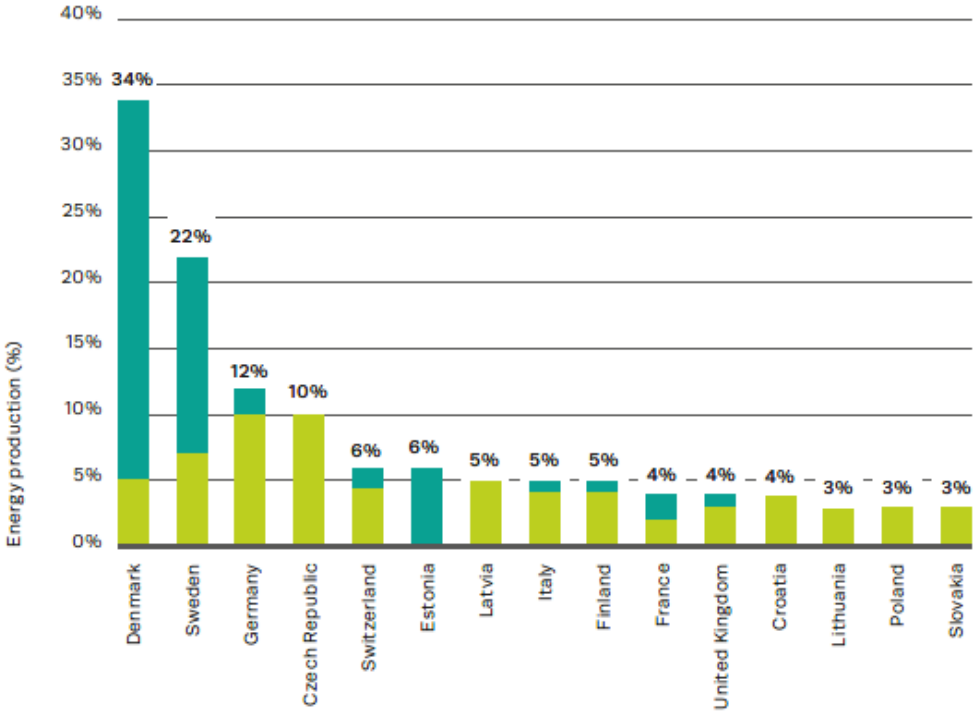
EEG 2023 thresholdes (Maize cap):

- 2023 – 40%
- 2024 – 2025 – 35%
- 2026 – 2028 – 30%

Sources: Biomethane feedstock - Rensberg et al. (2023): Biogaserzeugung und -nutzung in Deutschland: Report zum Anlagenbestand Biogas und Biomethan. (DBFZ-Report No. 50), Leipzig: DBFZ. VII, 9-122 S. DOI: 10.48480/zptb-yy32.
Maize cap – Renewable Energy Law (EEG 2023), in force on 16/5/2024

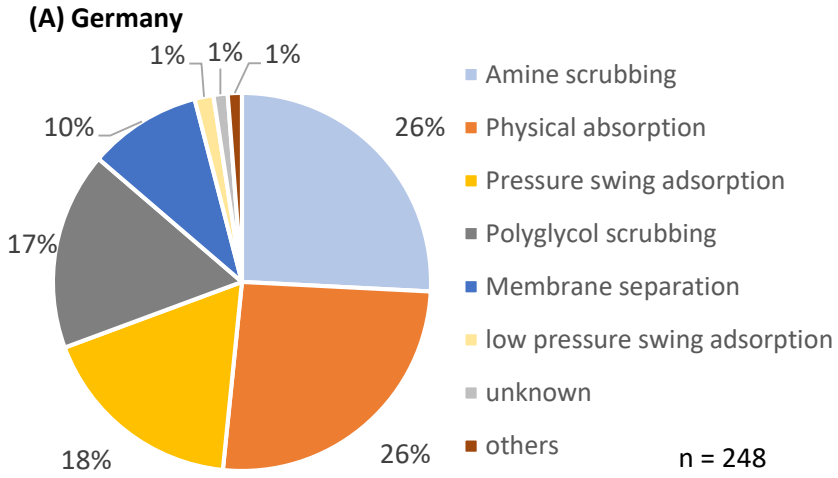
Biomethane and biogas production relative to total gas consumption in 2023, top 15 countries

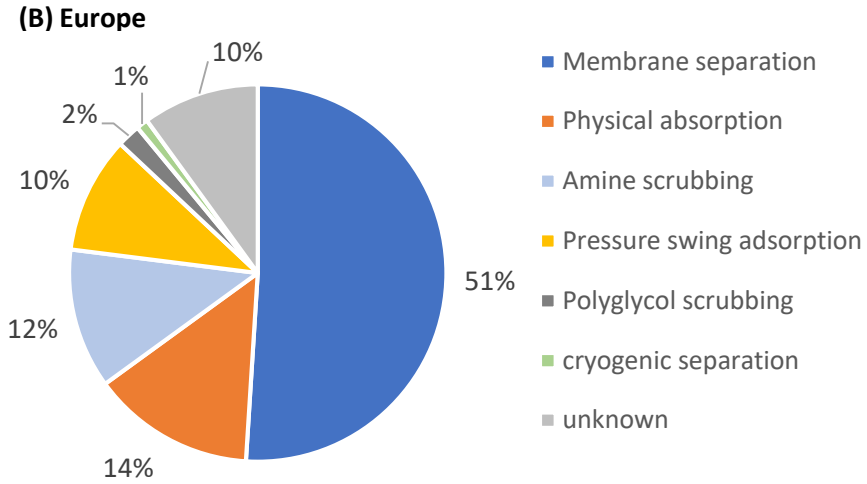
- 22 bcm of biogas are produced today in Europe
- = 7% EU gas consumption in 2023



Source: EBA Statistical report 2024.

Upgrading technologies providing biomethane from biogas





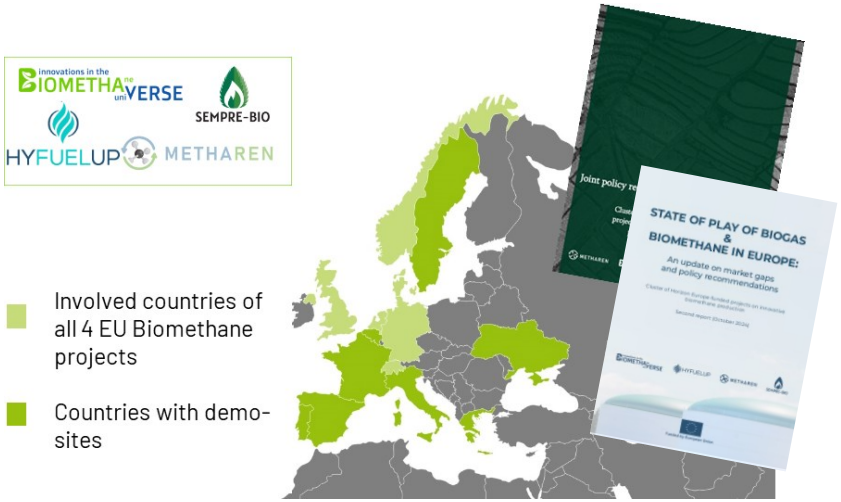
Distribution of the processes used in Germany and Europe for upgrading biogas to biomethane, percentage share; (A) Total number of plants in Germany 12/2022, (B) Total number of plants in Europe 12/2022 (EU-27 incl. Great Britain, Norway and Switzerland); Sources: DBFZ database of biogas upgrading plants, as at 11/2024; EBA Statistical Report 2023

SEMPRE-BIO: Policy recommendations

- Overview policy regulations in countries
- Survey on biomethane (country specific)
  → Joint policy reports
- Biomass potentials in each countries

→ **Estimation plants - market uptake of investigated pathways**

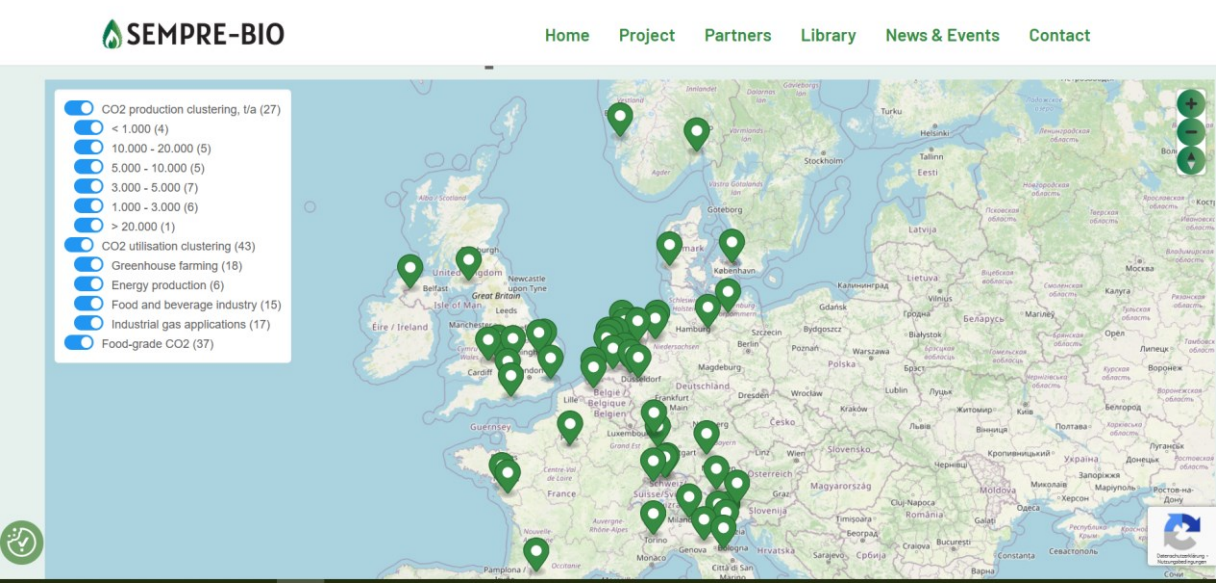
- e.g. **Biomethane plants with CO2 utilization** in EU → interactive map to be continued by the help of all biomethane project partners



Funded by the European Union

SEMPRE-BIO project (GA 101084297): https://sempre-bio.com

Biogas and biomethane plants with CO_2 valorisation in Europe: the case of Germany



Source: https://sempre-bio.com/co2-plants/

Germany (as of 11/2023):
7 plants in operation + 24 in the planning stage,
food-grade CO_2 - 42% of all plants;

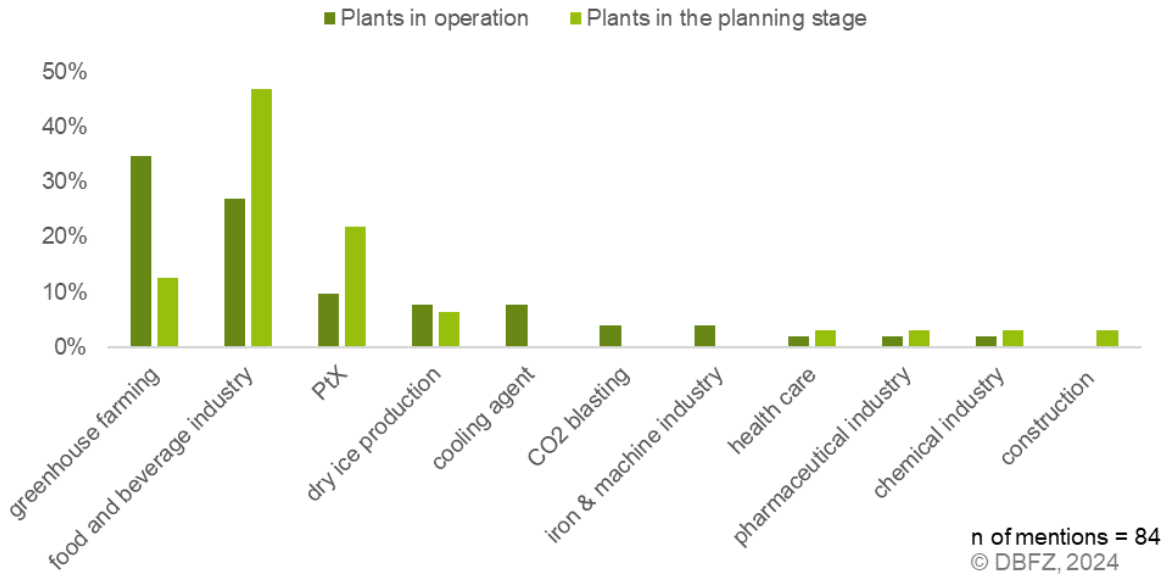
CO_2 utilisation: (increasing share of) food & beverage, greenhouse farming, PtX

Trend: emerging bio-LNG production + CO_2 valorisation (by 2025, GER, IT + NL leading in the EU);

Funded by the European Union

Sources: interactive map – Inveniam for Sempre-Bio website based on: Denysenko, V.; Daniel-Gromke, J.; Binder, P. M.; Foix, L. (2023): Opportunities for the valorisation of CO_2 extracted from biogas. Deliverable 4.1. EU-Projekt SEcuring doMestic PRoduction of cost-Effective BIOmethane (SEMPRE-BIO), GA 101084297, 30.11.2023; bio-LNG forecast - European Biogas Association (2022): EBA Statistical Report 2022. Brussels, Belgium, 11/2022. report on CO2 utilization

Distribution rate of different types of CO2 valorisation



Distribution rate of different types of CO2 valorisation at operational (as of the end of 2023) and announced CO2 capture sites at biogas and biomethane plants in Europe (operational and announced commercial-scale CCU), as of 10/2023; number of mentions (source: based on DBFZ literature review, 2023; DBFZ survey of 4 Horizon Europe projects on biomethane, 2023; DBFZ survey of the German biomethane plant operators, 2023)

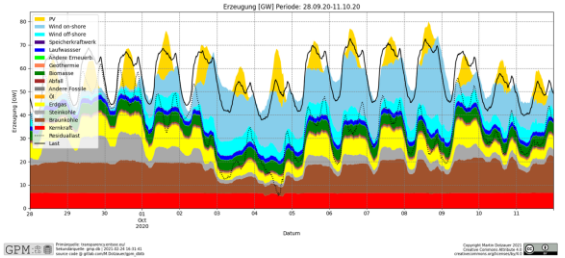
Denysenko et al. 2023
report on CO2 utilization

Funded by the European Union

SEMPRE-BIO project (GA 101084297): https://sempre-bio.com

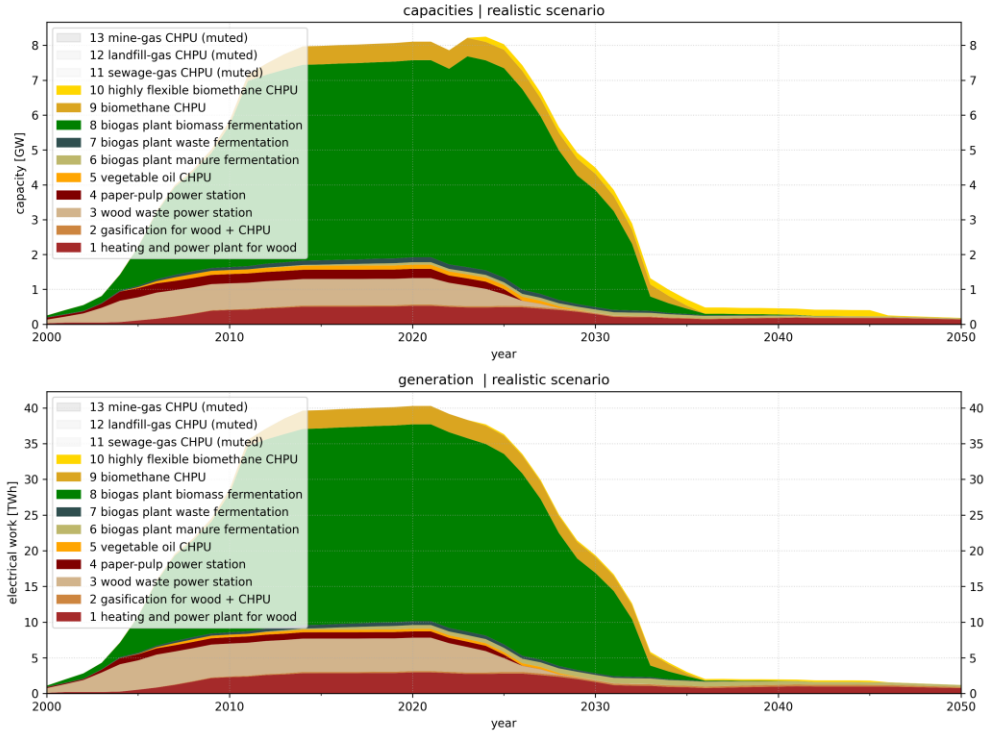
Bioenergy in the energy transition - general trends in Germany

- Electricity: **focus on flexibilisation** & system services (wind & solar as the backbone of electricity production); increasing quality criteria of **demand-driven electricity provision** (daily / seasonal).
- Heat: use & market more heat with higher value (increase overall efficiency)
- Transport: bio-based fuels provide GHG reductions (niches)
- Focus on agricultural residues and waste, reduce share of energy crops (maize cap); sustainable cultivation of biomass (limited)
- GHG reduction: better utilisation in the agricultural sector (e.g. liquid manure) & efficiency increase
- General measures (selection): CO_2 pricing for transport & heat, Renewable Energy Directive (RED II), European Green Deal, nuclear and coal phase-out, etc.



www.dbfz.de/transbio

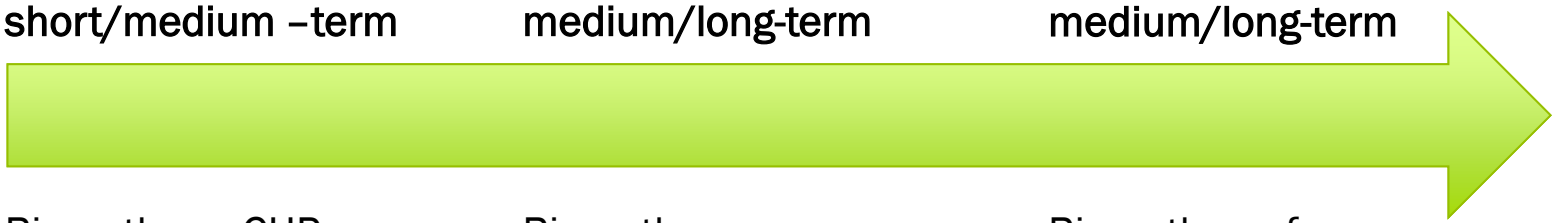
Biomass development in Germany - Scenario



- Bioenergy in Germany mainly driven by the Renewable Energy Sources Act
- Until 2016: fixed feed-in-tariff for 20 years
- Since 2017: switch to the tender (pay-as-bid)
- By 2030, end of FiT for a large number of existing biomass plants
- Possibility for existing plants to get **follow-up funding for another 10-12 years** in case of successful participation in tender
- Expansion volume and bidding values of the tenders increased, at the same time **higher requirements for the flexible operation** defined
- RED II / III: incentives for biogas/biomethane as transportation fuel (esp. large plants based on residues) due to GHG-quota

References: DBFZ, 2023, Real case Szenario – development of installed capacity and electricity production of bioenergy plants Germany

Future applications of biomethane



Biomethane-CHP especially in urban regions with gas infrastructure

Biomethane as transportation fuel for niches (CNG, LNG, perspective fuel cell)

Biomethane for industrial processes (process steam)

→ **Use of biogas/biomethane in areas where other renewable energies offer few alternatives**

Main topics/ questions - biomethane

- Roll of biomethane in the future energy system? System contribution of biomethane?
- Future application/sector for biomethane?
- Location of plants /future concepts /Development of infrastructure?
- Optimization of technologies → more cost-effective and efficient
- Substrates of the future?
- Synergies with (ecological) agriculture in connection with the use of biomass for energy and materials?
- Design of transformation path? Biomethane strategy in Germany? Biomethane targets?

→ Research and development needs in all areas …

Outlook - Options for action

- Transition of energy system needs higher amount of RES in total (esp. wind and solar energy)
- Biomass resources are limited, but of great important as flexible element

→ Focus on hybrid concepts (biomass + RE): stronger connection between fluctuating renewable energies (e.g. biogas/biomethane + wind/solar electricity + heat pump)

→ Incentives for the construction of new plants and the provision of biomethane by repowering existing plants (raw gas-side coupling of plants, cluster of plants)

→ Incentives for full cost-optimised production and feed-in of biomethane into the natural gas grid by amending the legal framework

→ **long term perspectives and stable planning security for all stakeholders needed**

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Smart Bioenergy – Innovations for a sustainable future

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