



German experiences in the development of Biogas – Technology – Sustainability, Trends and Examples

- Kirchberg, 12. August 2020
- Michael Köttner
- International Biogas and Bioenergy Centre of competence, IBBK
- International Green Technologies Investment Center, IGTIG

International Biogas and Bioenergy Centre of Competence IBBK

- Know-How transfer (international workshops, conferences, study tours, training)
- Technical support especially with dry digestion, lagoon technology, small scale installations
- Contacts to experts in planning, design and construction
- Contacts to specialized companies
- Networking with members in different regions nationally and internationally
- Origin in Organic Biogas

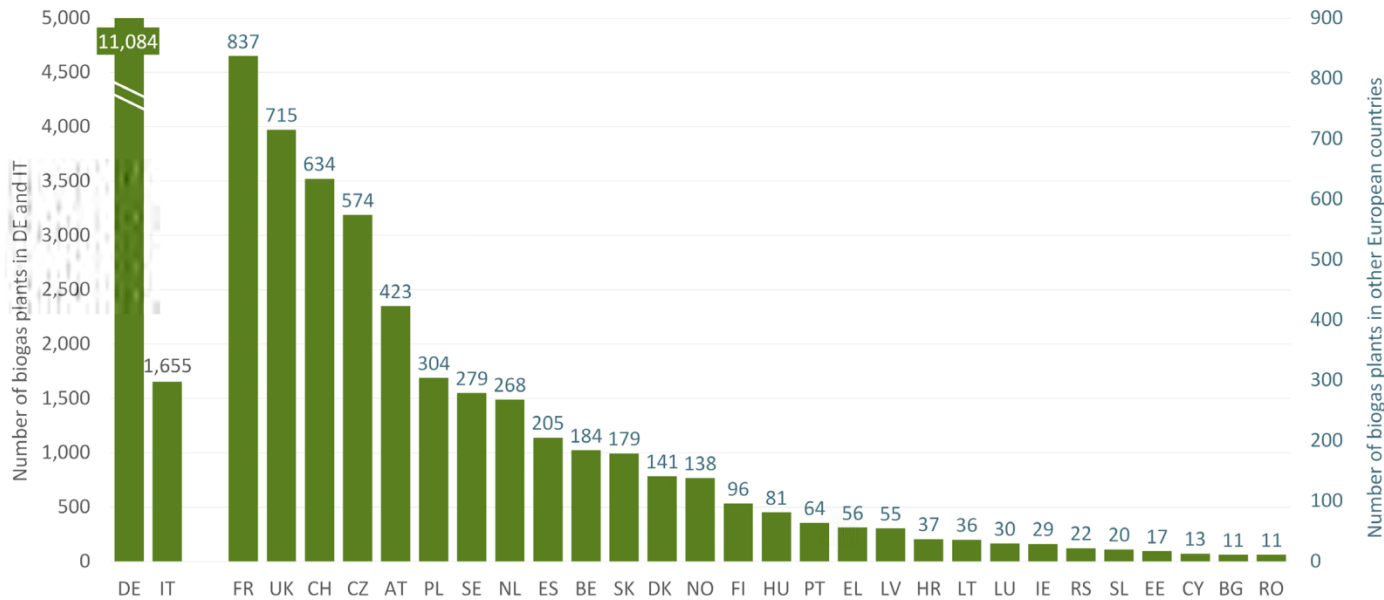
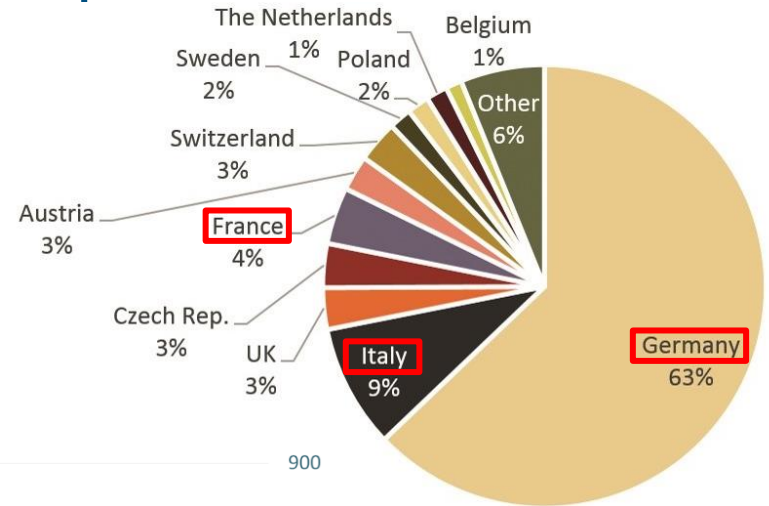


Content

1. Overview of Biogas and Biomethane Production in Europe
2. Feasible technology options for dry and wet residues
3. Economic success factors
4. Case studies of wet and dry digestion in India and Germany

Number of biogas plants in Europe

- 18,202 biogas plants in Europe
- 11,082 MWeI total installed electric capacity



EBA Statistical Report
European Overview 2019

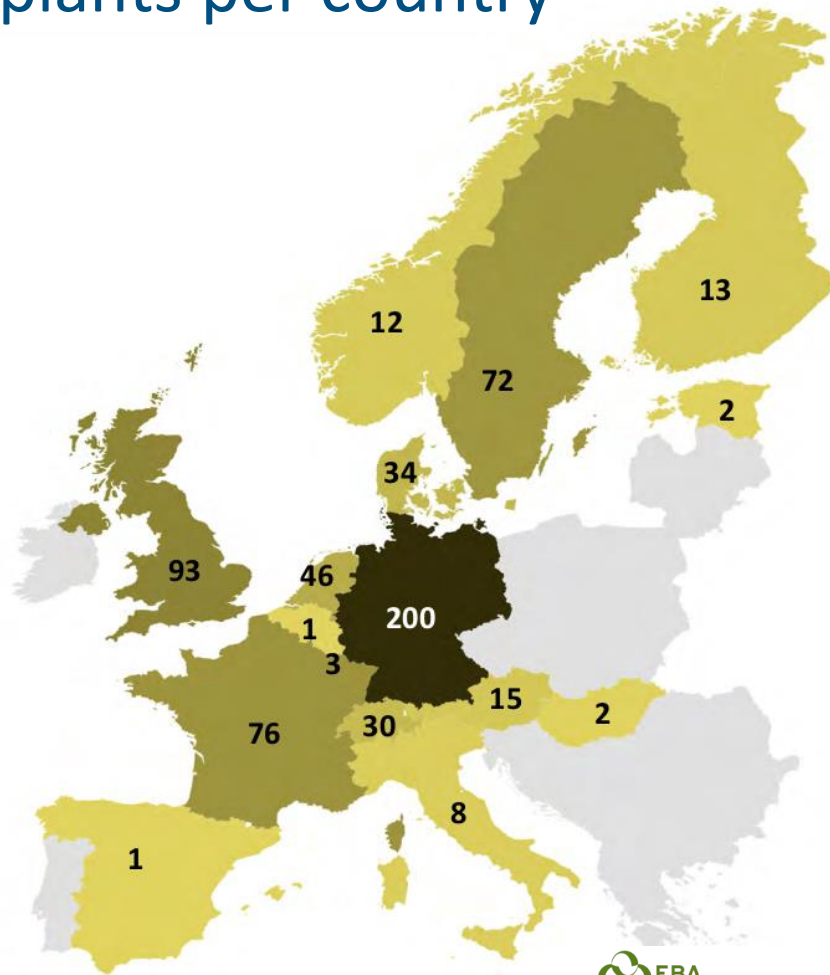


Number of biomethane plants per country

31 countries in Europe have biogas plants, but only 17 have upgrading units to produce biomethane.

18,202 biogas plants in Europe
610 biomethane plants

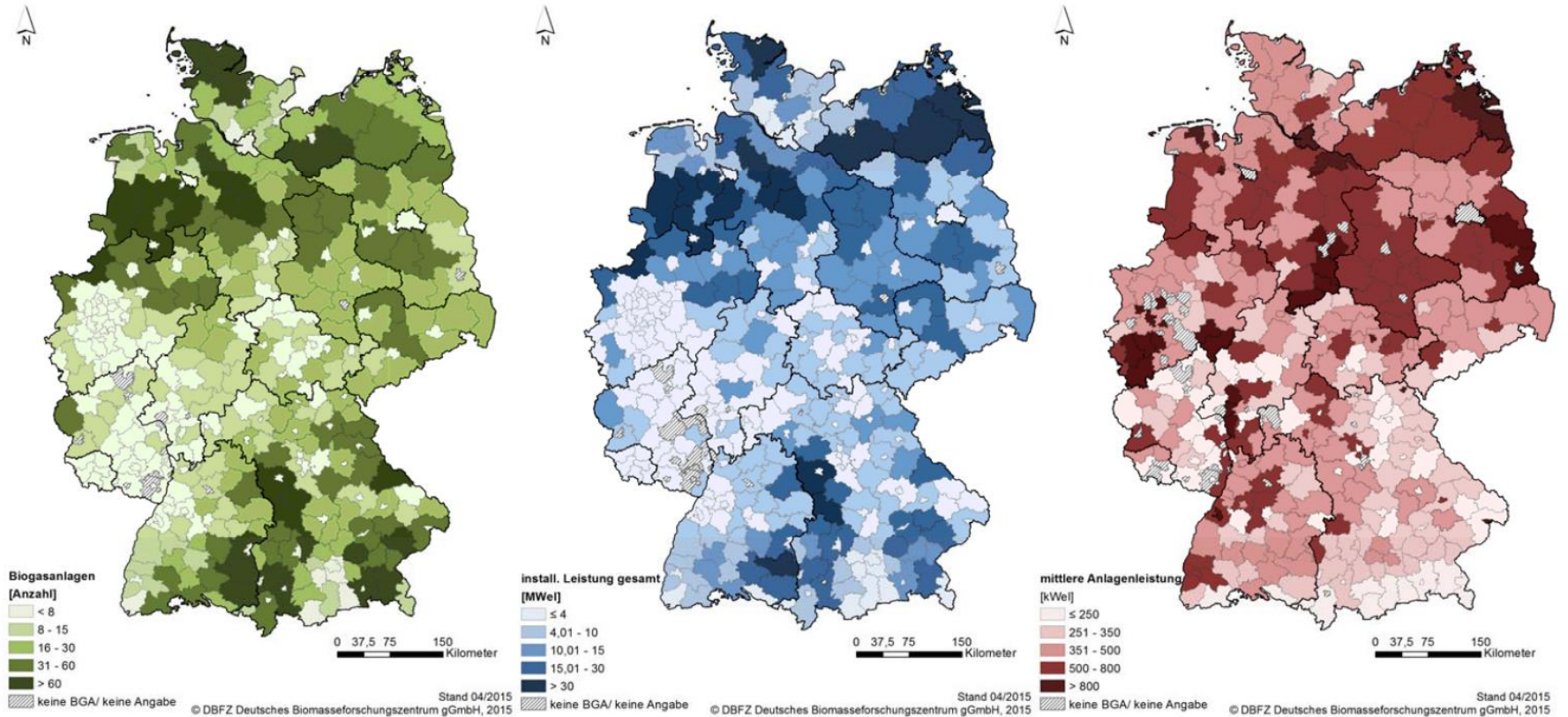
Germany is the market leader for both biogas and biomethane plants



EBA Statistical Report
European Overview 2019

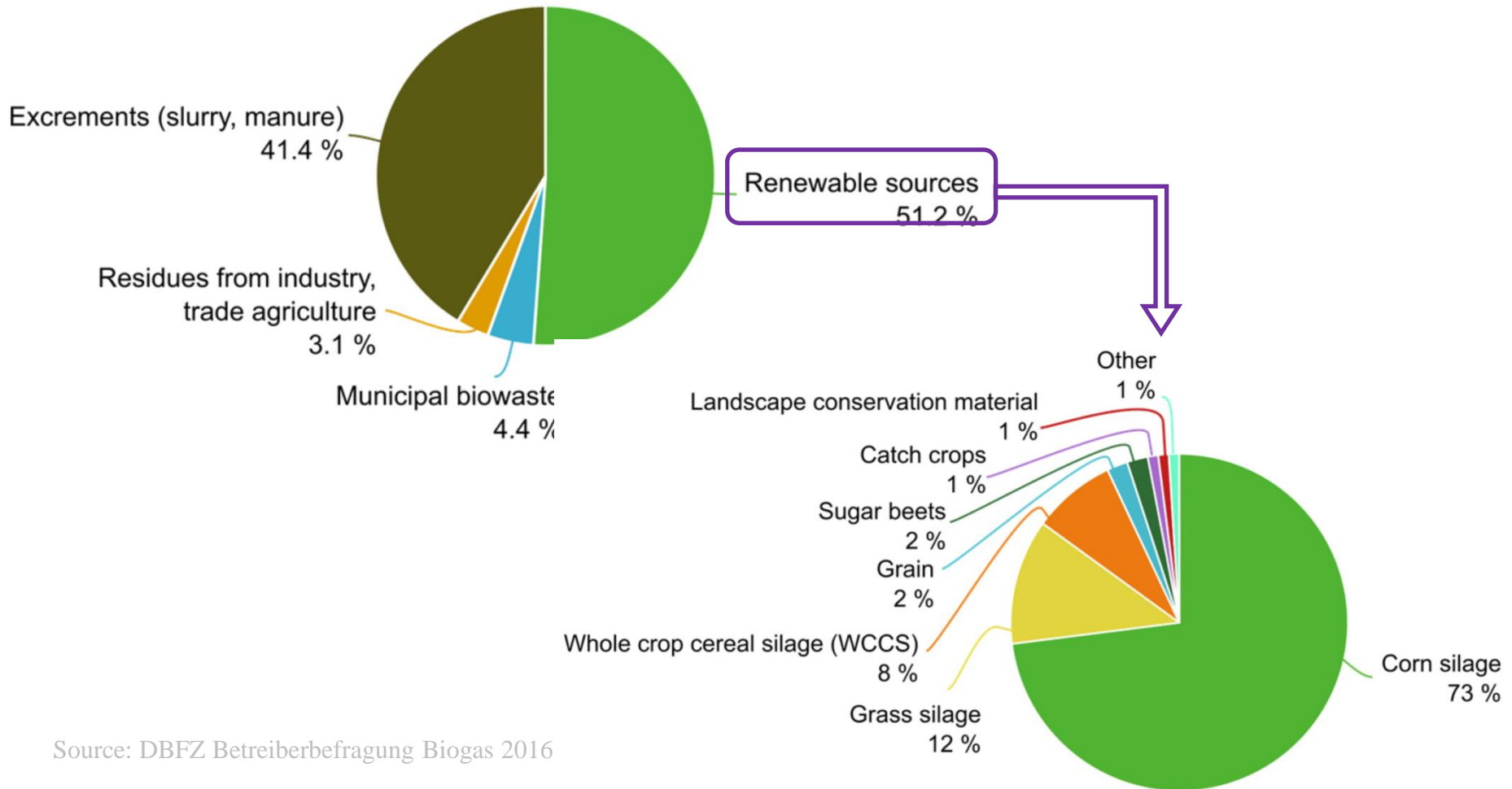


Biogas plants in Germany



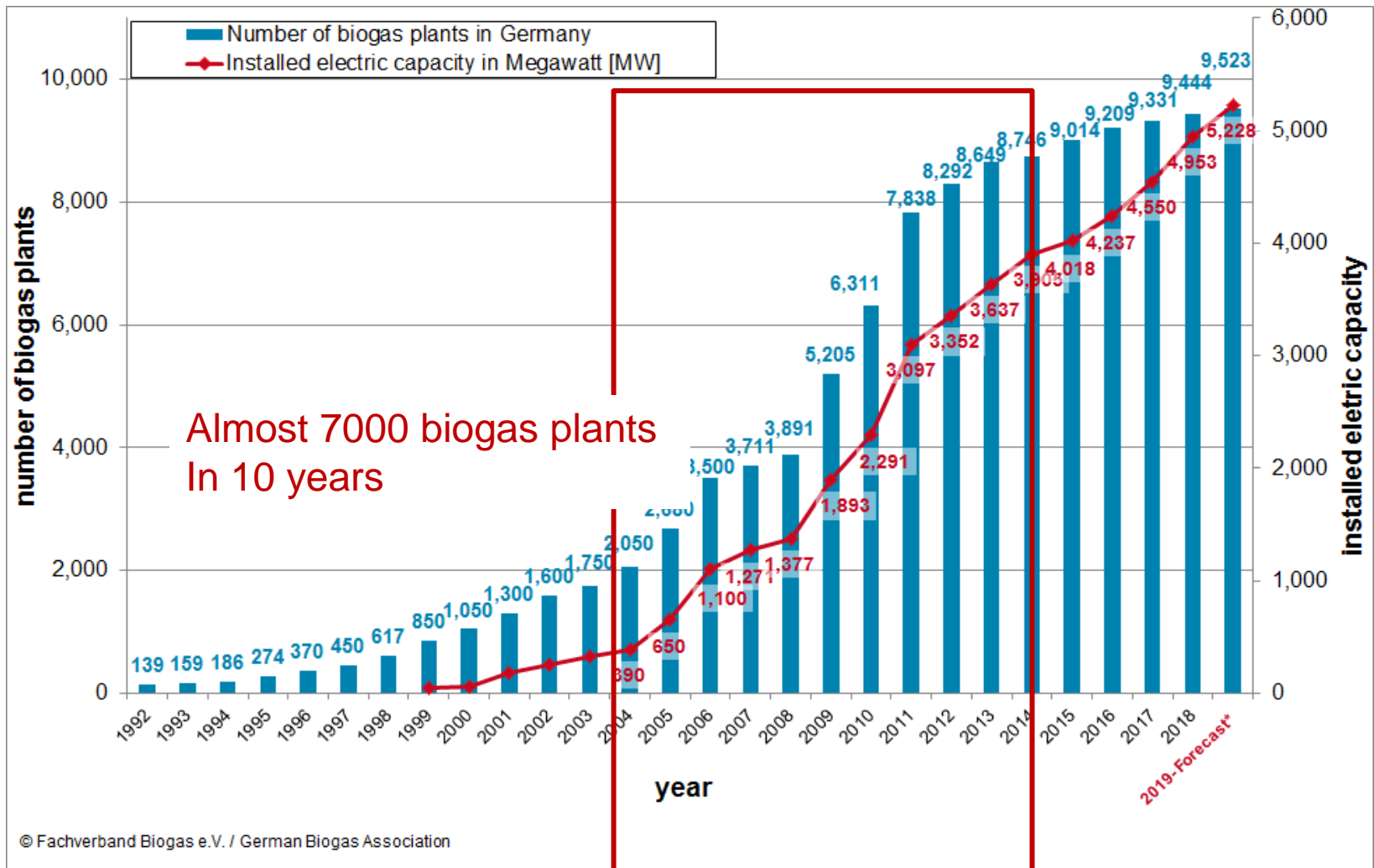
Feedstock for biogas production in Germany

9 009 biogas plants with a total installed electric capacity of 4 166 MWeI



Source: DBFZ Betreiberbefragung Biogas 2016

German development: Number of biogas plants and electrical output in MWe



Biogas sector statistics in Germany

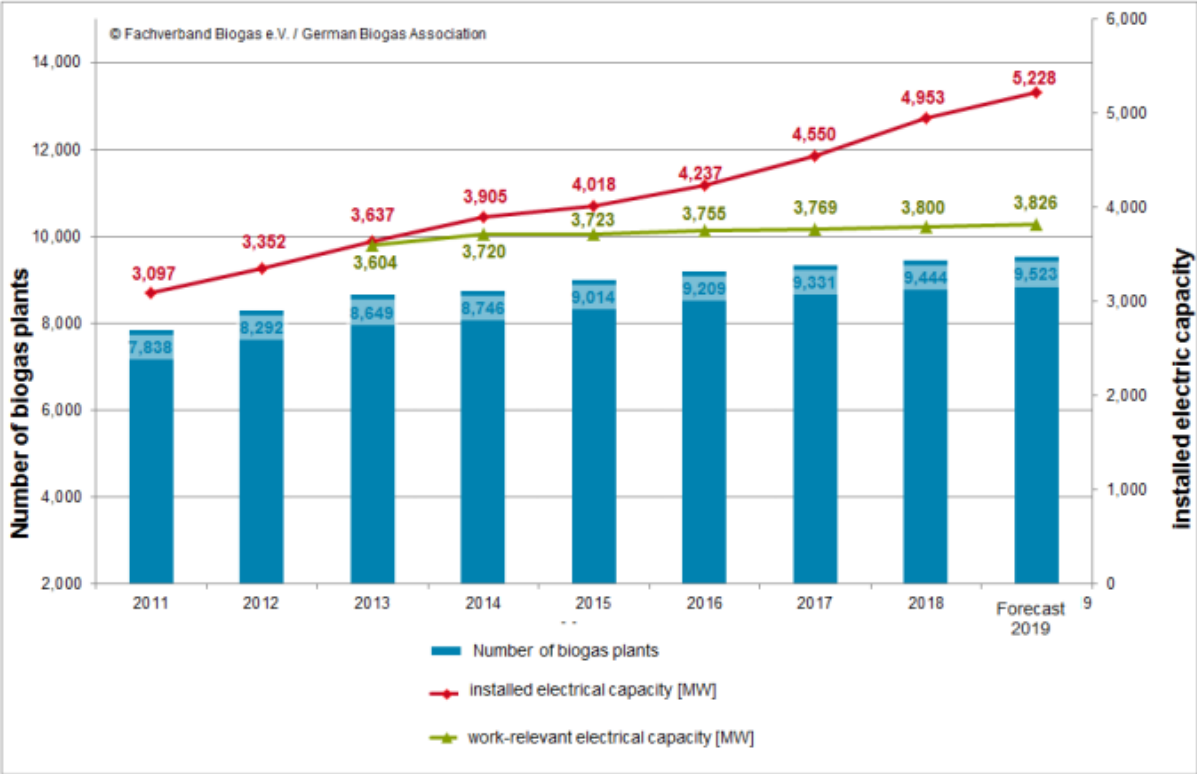
	2018*	Forecast 2019**
Number of biogas plants (biogas plants with biomethane injection)	9,444 (200)	9,523 (204)
Installed electric capacity in MW	4,995	5,228
Gross electricity production in TWh per year	33.15	33.4
Households supplied with biogas-based electricity in millions	9.47	9.54
CO₂ reduction by biogas in million tonnes	20.0	20.1
Turnover in Germany in Euro	9.7 billion	9.3 billion
Jobs in the biogas sector	49,000	48,000

◆ Fachverband Biogas e.V. / German Biogas Association

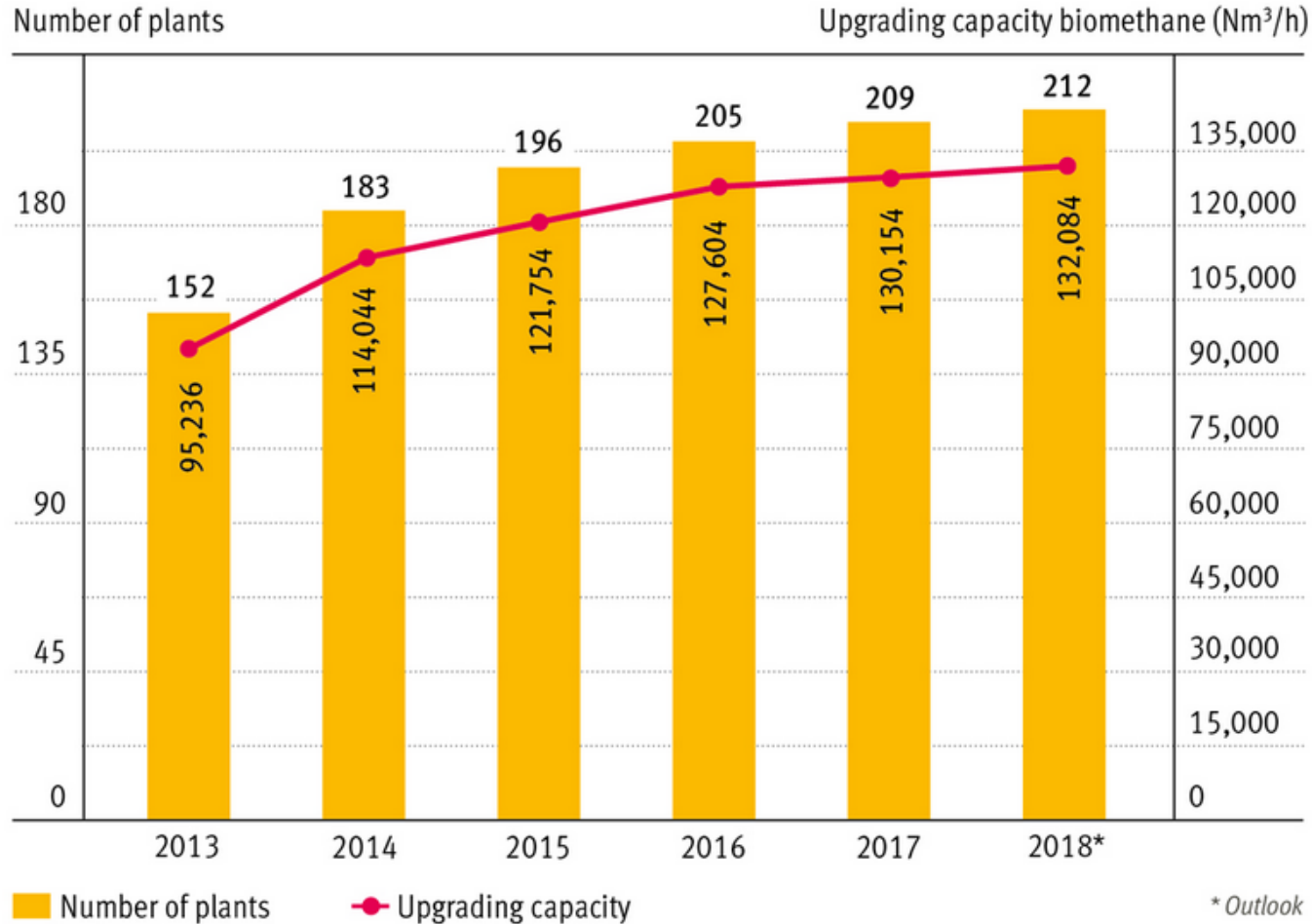
* Own extrapolation based on country data / plant register BNetzA

** Based on a expert survey / plant register BNetzA

Development of the number of biogas plants, installed electric capacity and the work-relevant electric capacity per year in Germany (as of 07/2019)



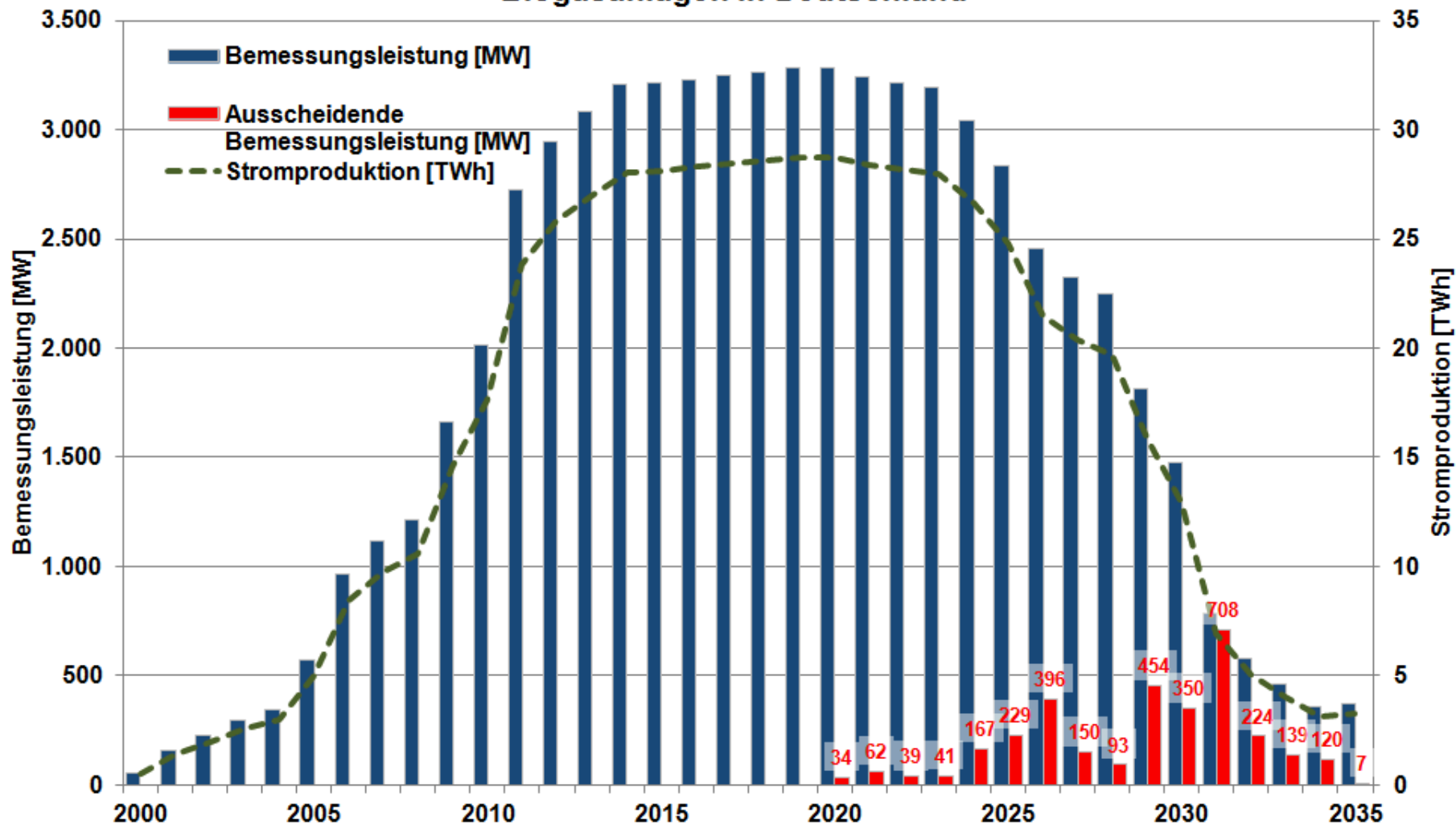
Cumulative number of biomethane plants in Germany



Source: FNR based on dena (2018)

© FNR 2018

Entwicklung der Bemessungsleistung sowie der Stromproduktion der Biogasanlagen in Deutschland

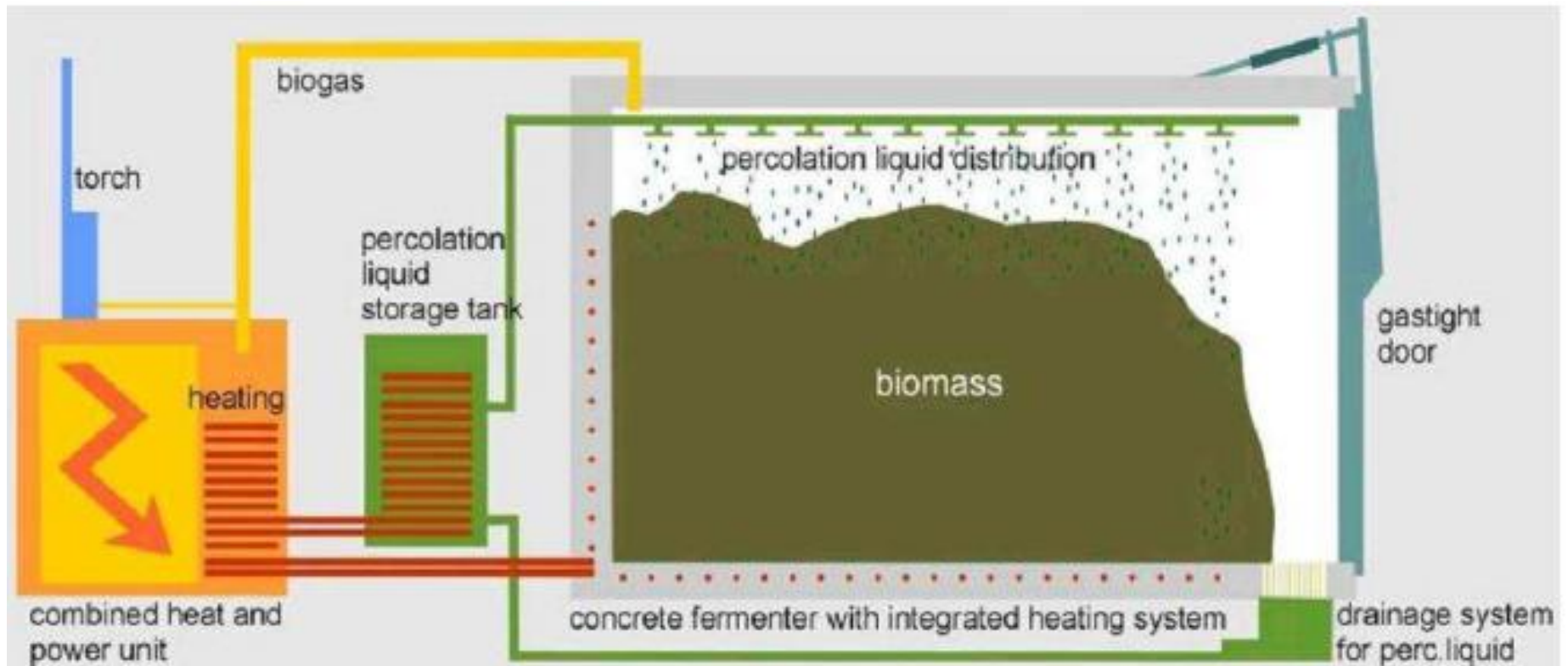


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2. Feasible Technology Options for Biomethane Production from feedstock over 20% DM



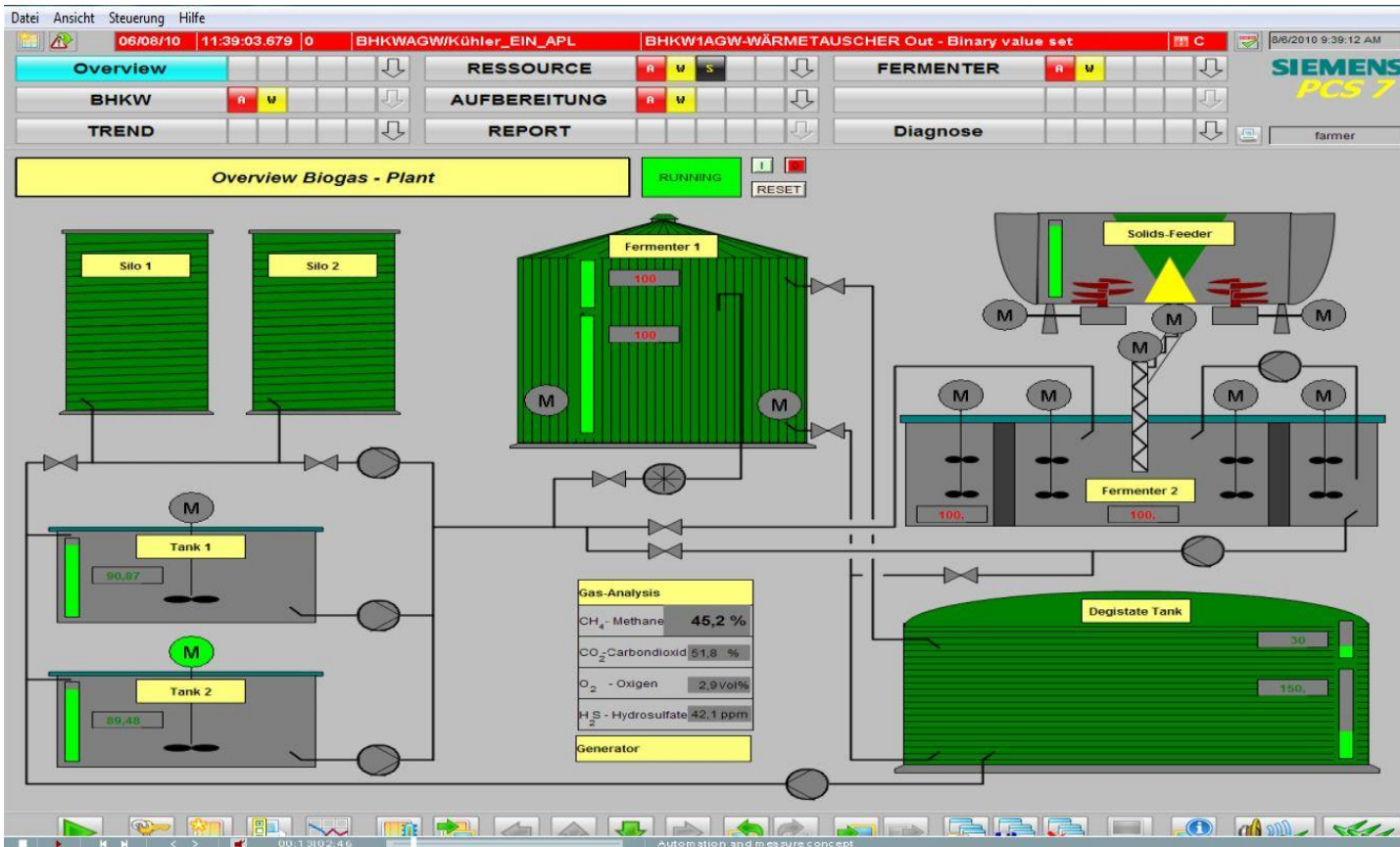
Dry fermentation in a batch garage type digester



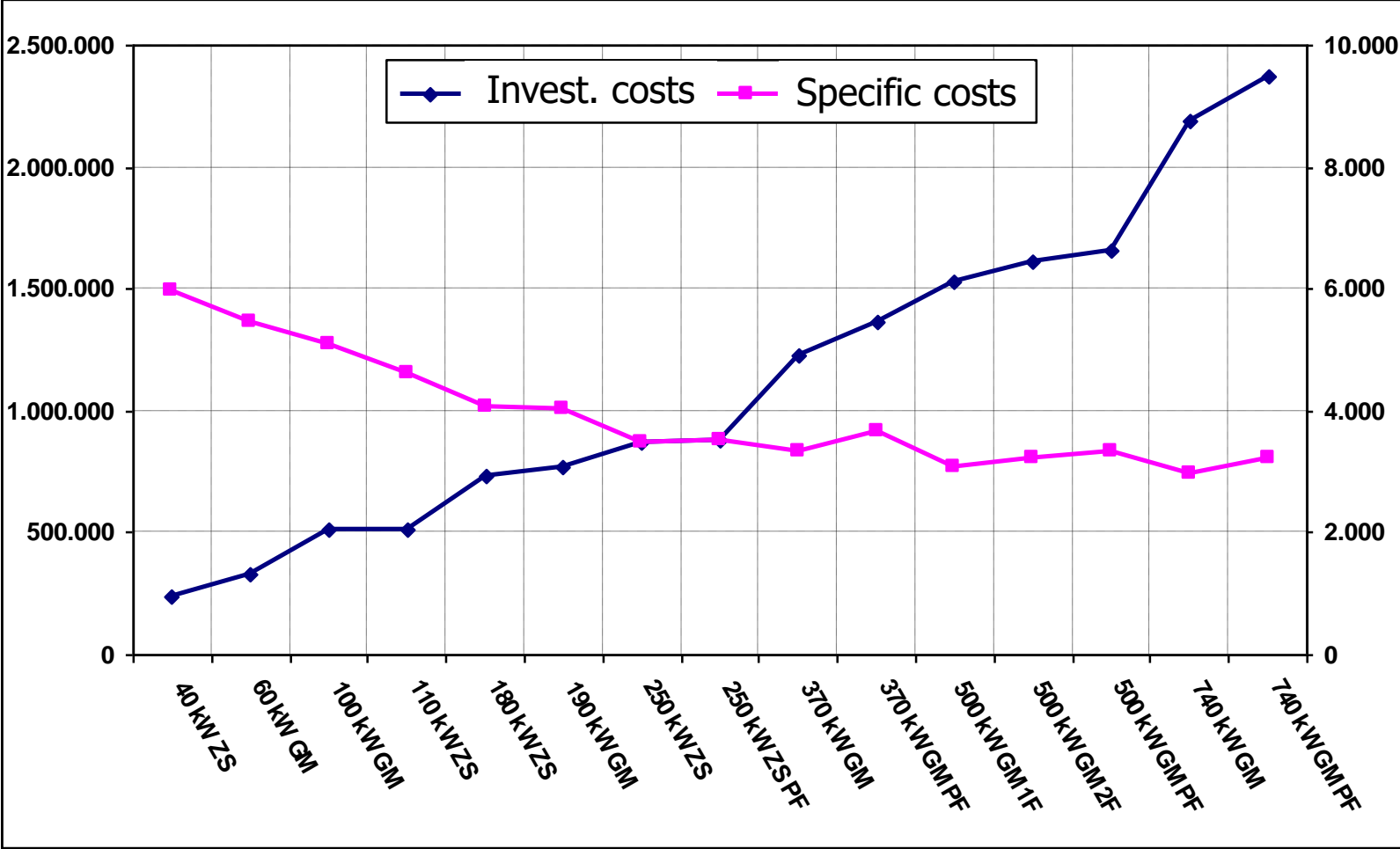
CSTR System Steel Tank with Hydrolysis



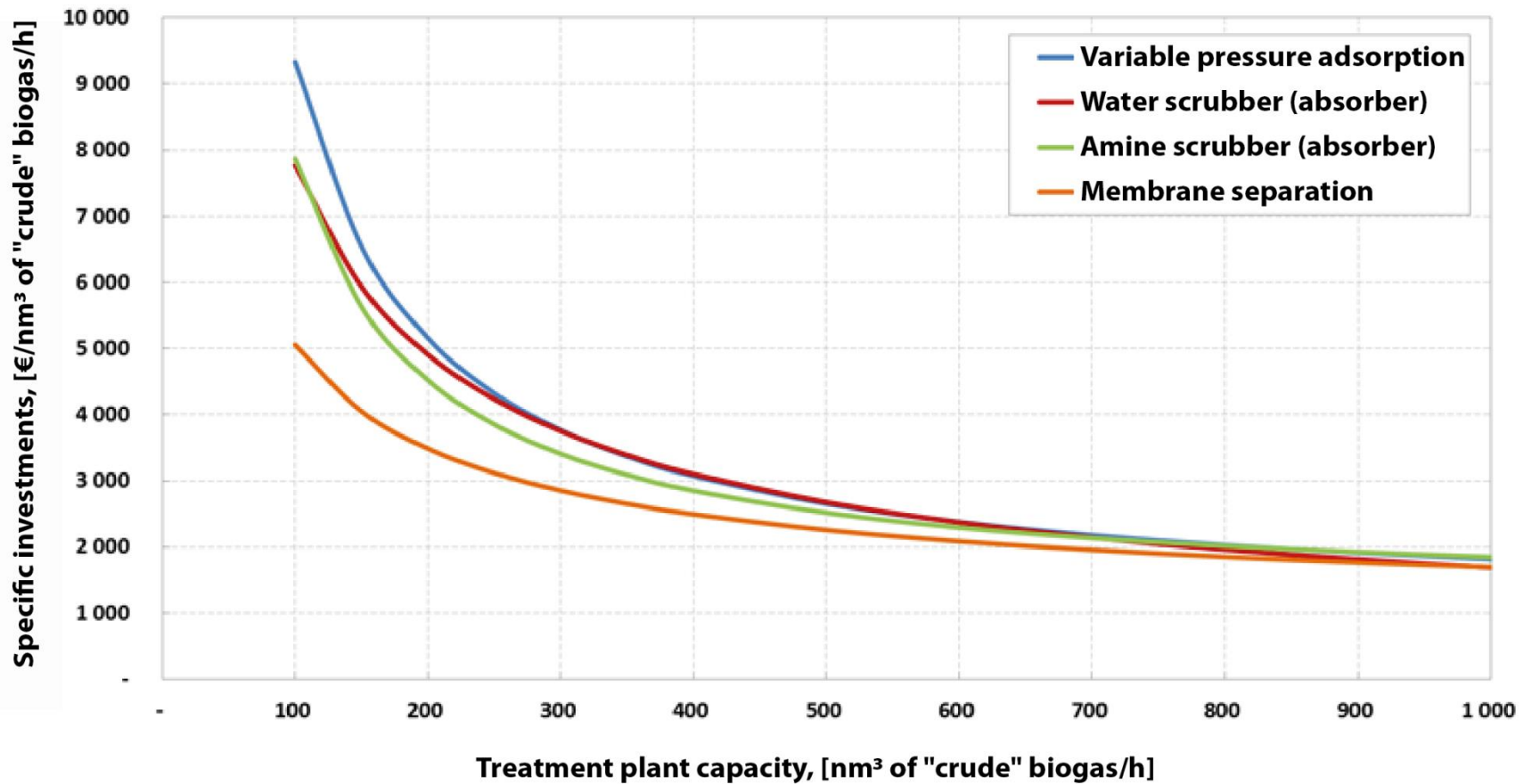
CSTR Control system with Hydrolysis



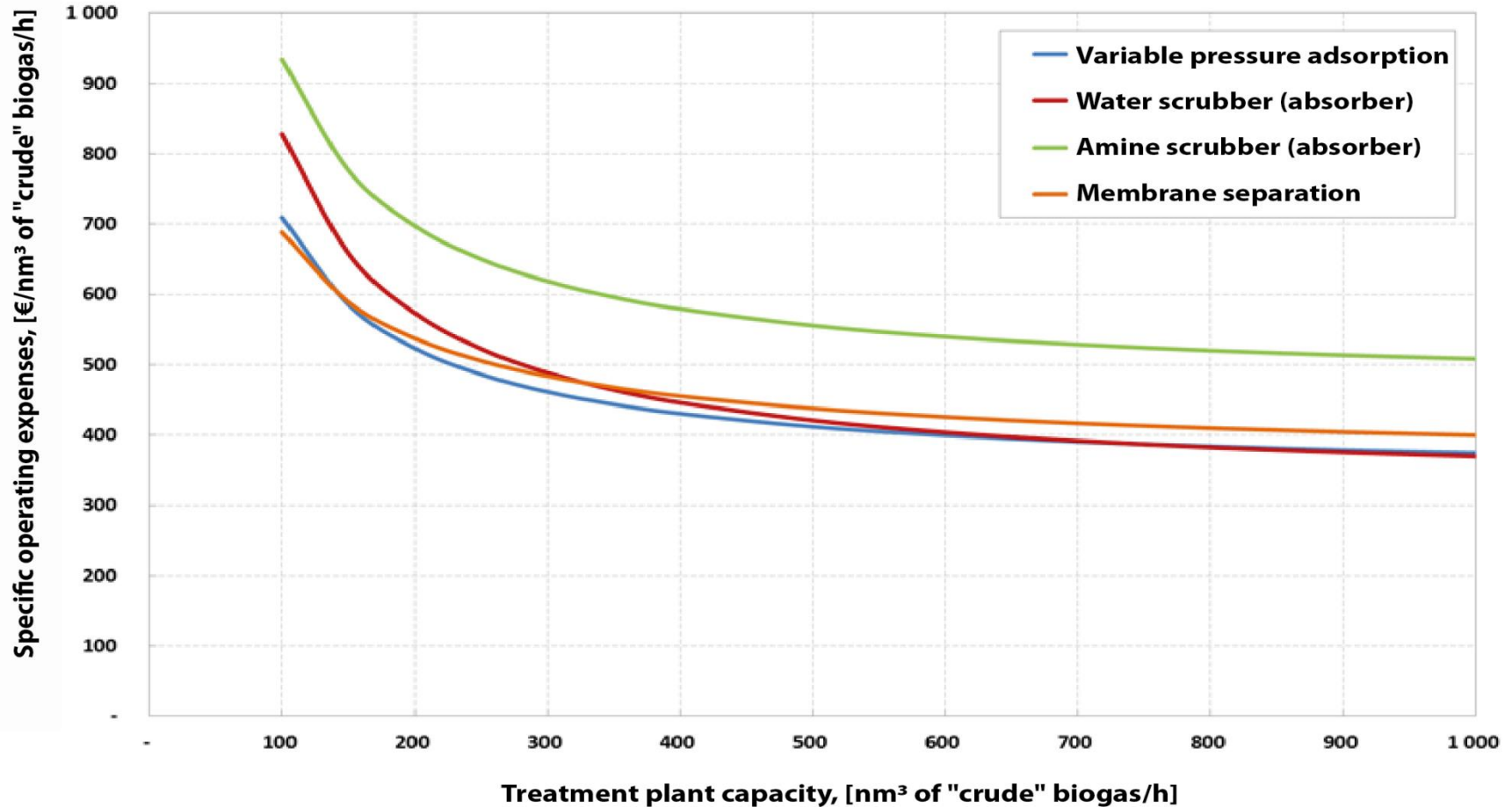
Investment costs for Biogas Plants without gas upgrading



Investment costs for Biomethane Upgrading Plants



Operating Costs for Biomethane Plants

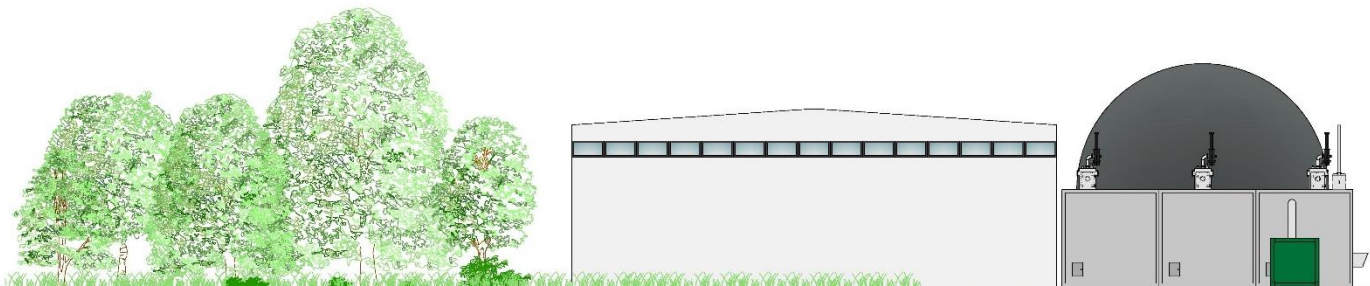


Operating Costs

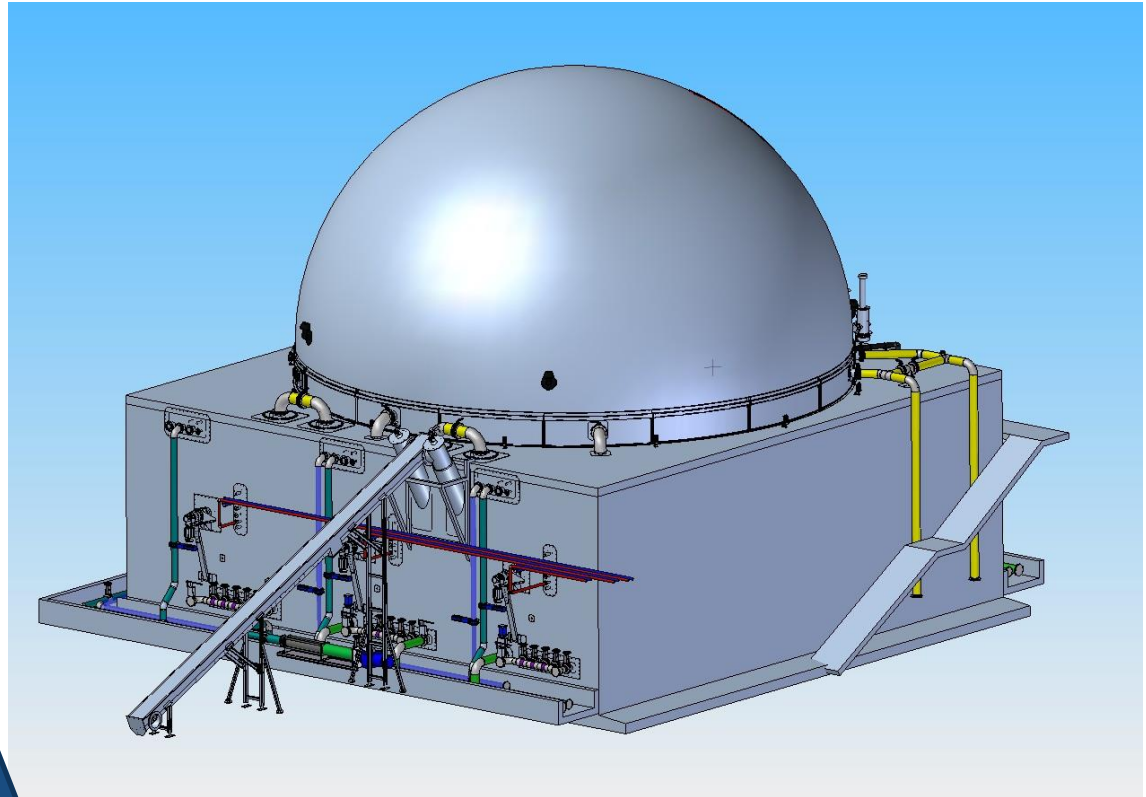
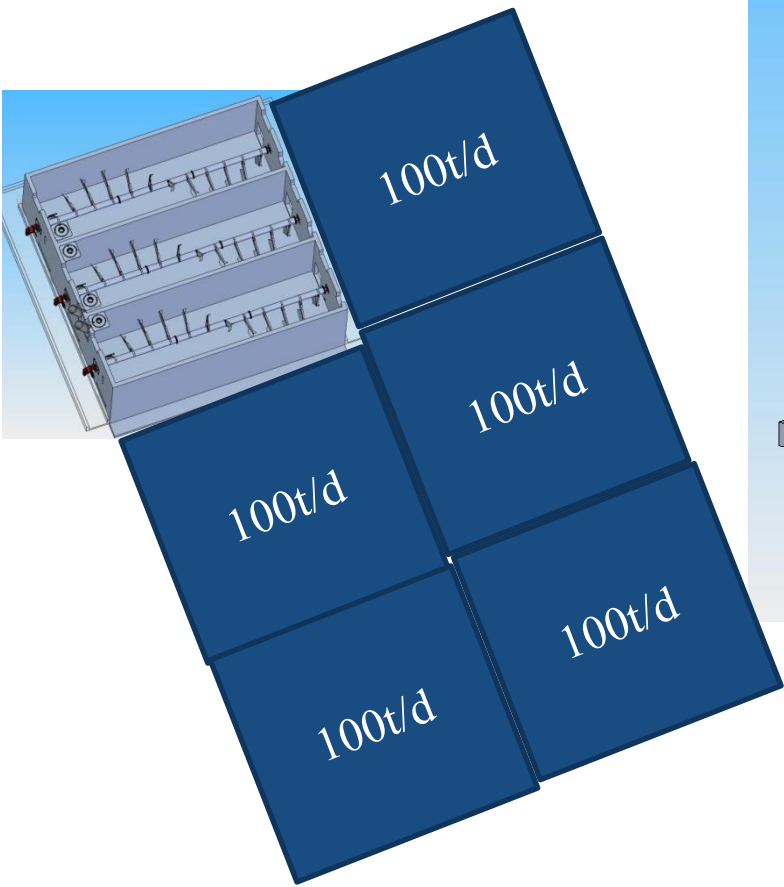
- Depreciation costs
- Interest charge (related to 1/2 of investment costs)
- Maintenance & repair of biogas plant
- Maintenance Biomethane Upgrading plant
- Insurance
- Labour costs
- Costs for input substrates
- Costs for land spreading digestate

1. Biogas Project, Goa, India

- 1500 m³ Dry Digester volume for 350 m³/h biogas production
- Thermophillic operation at 55° C
- Slow turning paddle mixer at 2 rpm
- Digester is easily accessible to be able for maintenance
- Continious sand drain for safe operation



Dry digester in modular construction



Dry Digester Inside





- Digester within waste treatment facility
- Composting and waste water treatment plant
- Prettreatment and reception hall

2. Manure and straw to CNG, Germany

- **Future option BioCNG instead of (only) green electricity**
- **Readiness for new technology**



Winfried Veess Energiehof Weitenau

Manure and straw to CNG

Biomethane tractor

Full day of farm-work autonomy



Manure and straw to CNG

Biogas Plant Hof Weitenau; VEES

Problems encountered:

- Little offered technology for On farm plants
- Lack of political support (generally only political “electrical vehicle euphoria”)
- Offers are mostly for larger plants
- Service problem (Chicken - egg)



Outlook

- IBBK can help with Technology adaptation and knowledge Transfer.
- The technology adaption is combining low investment cost with high rate degradation performance
- Long experience with solids („dry“) digestion in batch and continuous mode



Thank you for your attention!

- Michael Köttner
- International Biogas and Bioenergy Centre of competence, IBBK
- www.ibbk-biogas.de
- m.koettner@ibbk-biogas.de