Fachverband BIOGAS

Biomethane
Actual status in Germany

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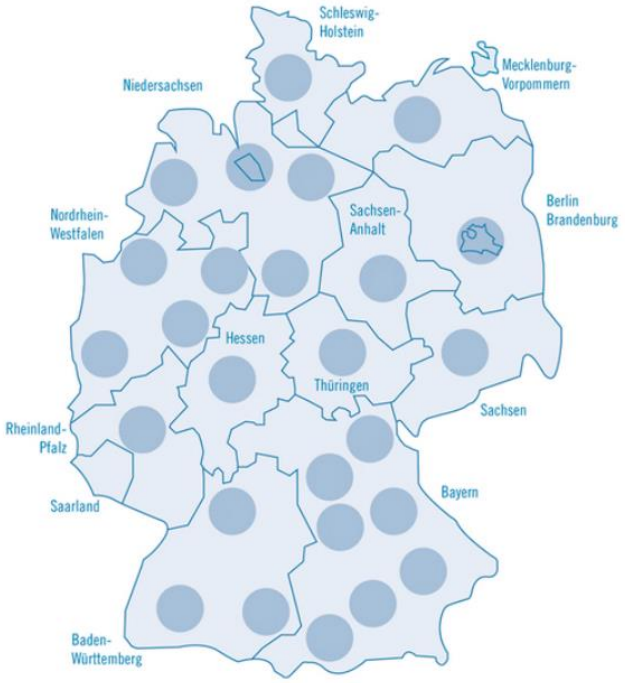
Main topics for today

- German Biogas Association
- Status quo: biogas in Germany
- Biogas / Biomethan for combined heat and power production (main field in Germany)
- Status quo: biomethane in Germany
- Biomethane in the transport sector
- Conclusion

The German Biogas Association: Our profile

Fachverband BIOGAS

4,700+ members



40+ employees

- Plant operators
- Manufacturers
- Research institutes
- Public Authorities
- Consultants
- dedicated individuals
- … and you?

Member of

EBA European Biogas Association

BEE BBE

World Bioenergy Association

Our Goals:

Establishing biogas as an important component for climate protection

- Definition of legal frameworks and guidelines
- Information exchange, knowledge transfer
- Advocating on EU-, national and regional levels

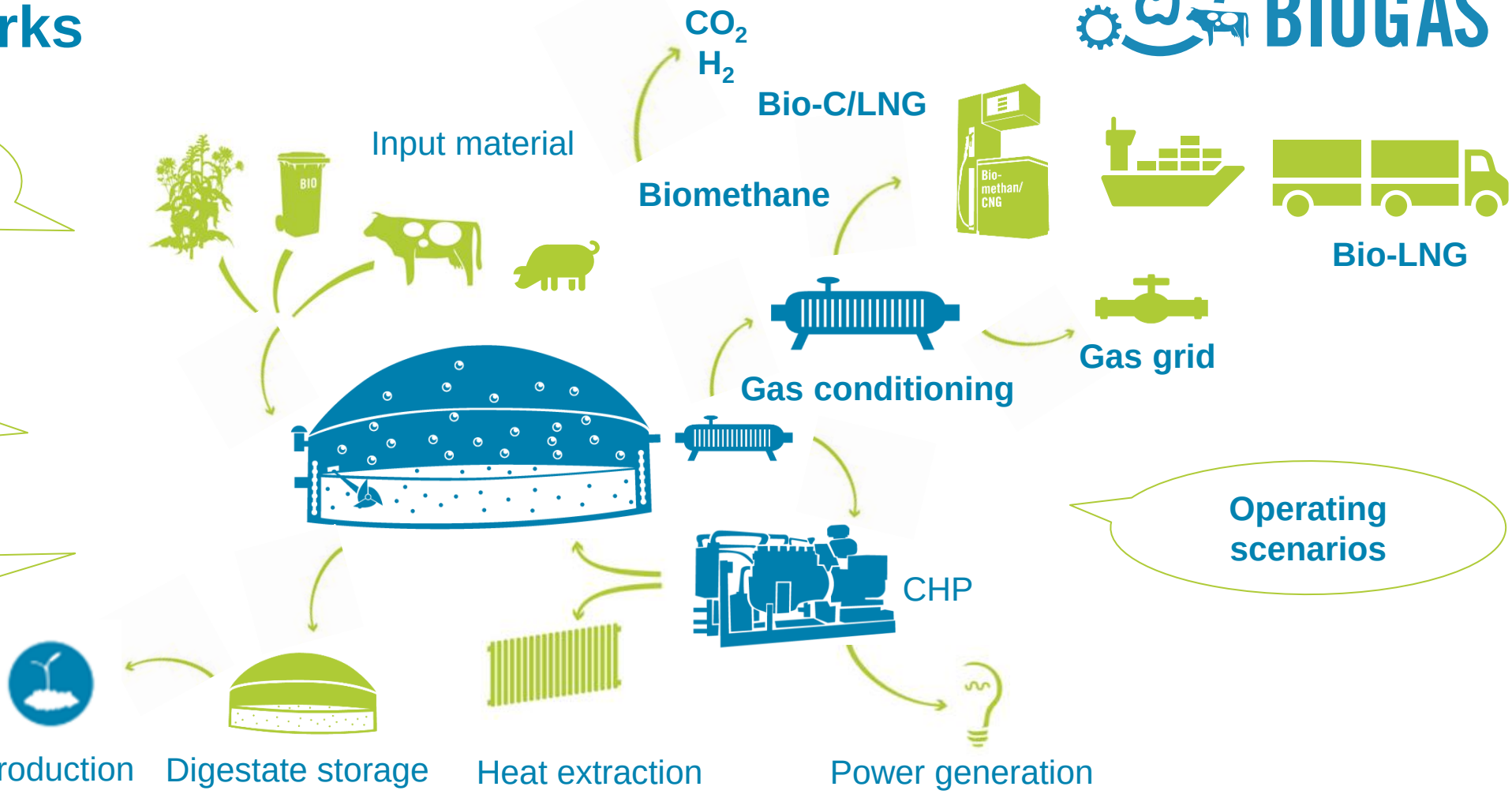
The German Biogas Association: Scope of works

Fachverband BIOGAS

Monitoring of directives and laws

Technological options

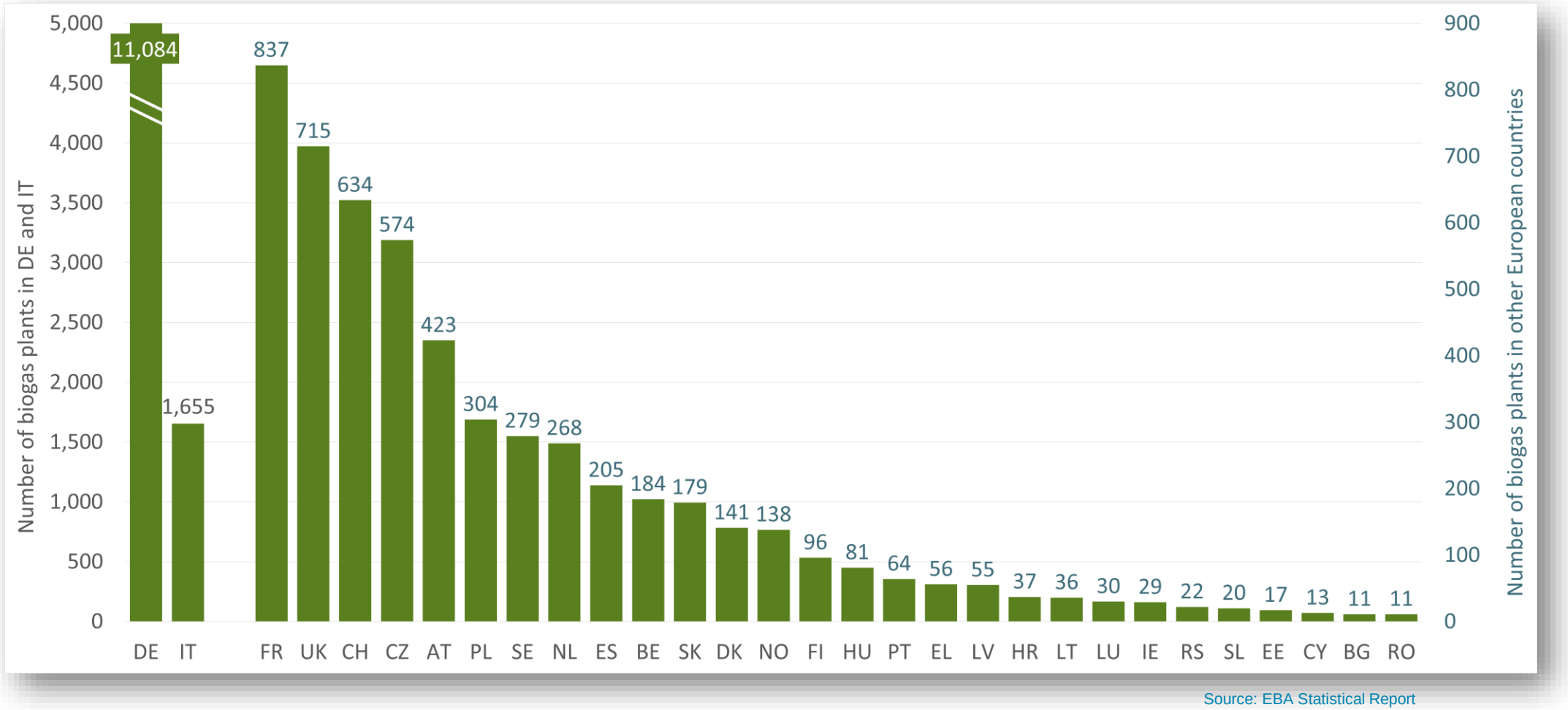
Knowledge transfer



Operating scenarios

Market screenings

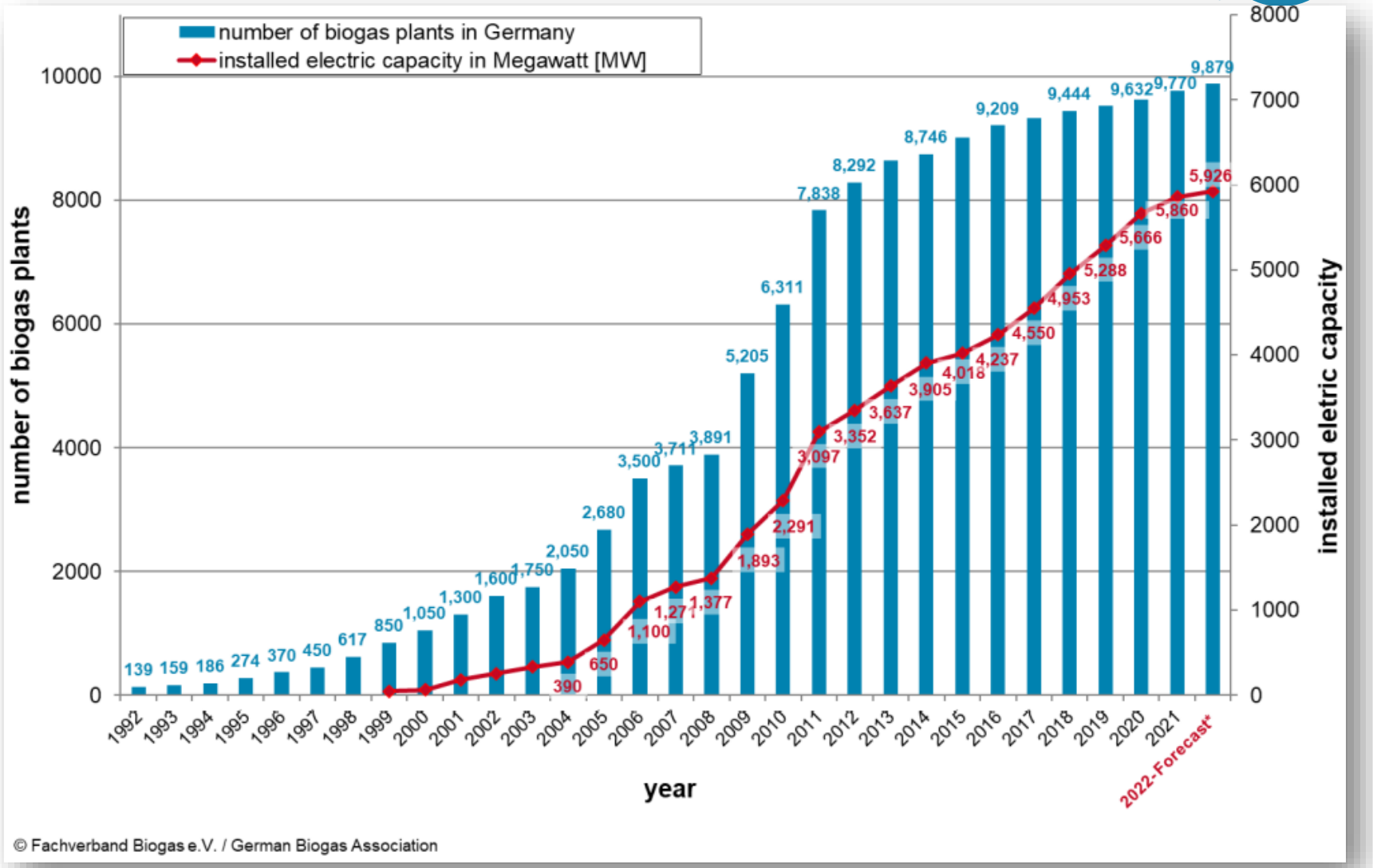
Installed biogas plants in Europe



Source: EBA Statistical Report

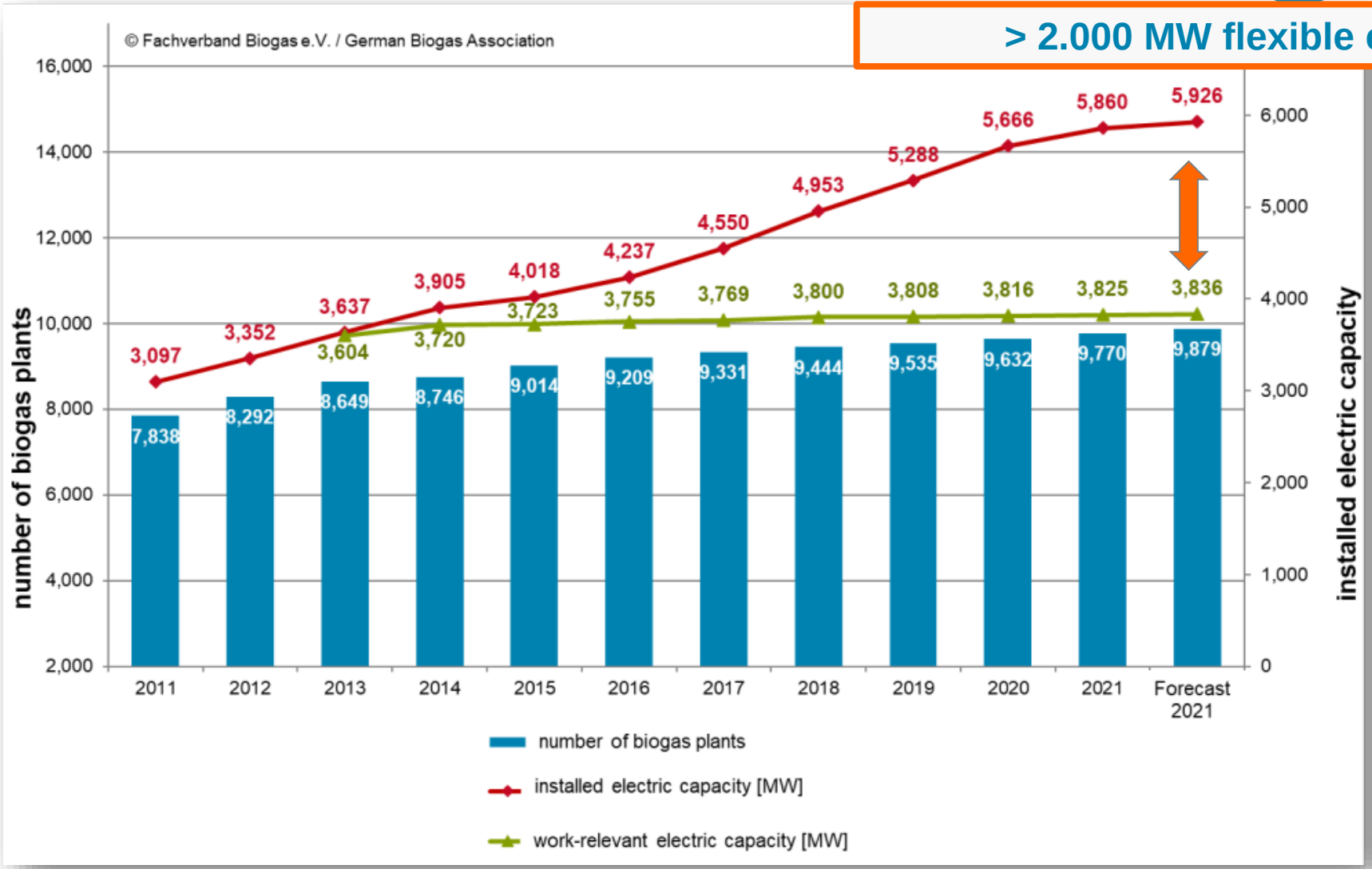
In **Europe** about **19,000** biogas plants !!!

Development of the German biogas sector (I)

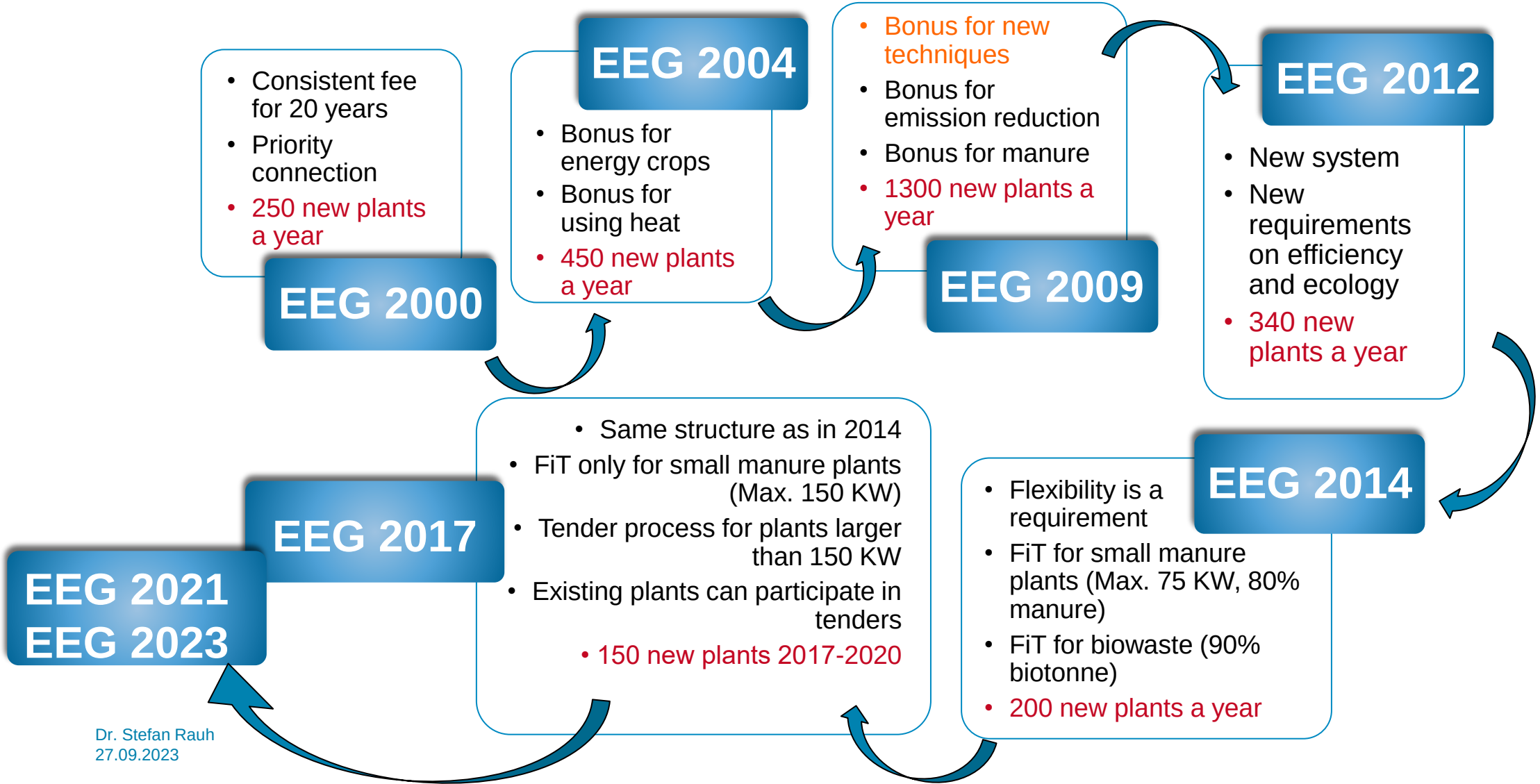


Development of the German biogas sector (II)

> 2.000 MW flexible capacity



Development of the Renewable Energy Act (EEG)



EEG 2023 (I)

- Biomass target for 2030: Inst. Capacity 9.1 GW + 42 TWh

➔ Stabilization of power generation at the current level

- Tender volume:
  - 2023 = **600 MW/a** installed capacity (100 MW decrease/a till 2026: 300 MW/a)
  - 2 tenders per year in 2023: 1st April & 1st October
- Participation in the tenders and max. prices (except biomethane):
  - All existing plants and new plants **> 150 kW** inst. Capacity (max. 40% energy crops)
  - Max. bid value for new plants: **16.07 ct/kWh**
  - Max. bid value for existing plants: **18.03 ct/kWh → higher because of Ukraine 19,83**
  - BGP ≤ 500 kW: + 0.5 ct/kWh
  - Degression: 1%/a (for existing plants: 0.5%/a)

EEG 2023 (II)

- Support for small scale new plants - no participation in the tender process!
- Special Feed-in-Tariffs (FiTs) for a period of 20 years as of 2023 for…
  - Small manure plants **75 kW - 150 kW**: 19 ct/kWh (min. 80% manure)
  - Small manure plants **> 75 kW**: 22 ct/kWh (min. 80% manure)
  - Biowaste treatment plants **< 150 kW**: 14.30 ct/kWh (min. 90% biowaste)
  - Biomass: **< 150 kW** inst. capacity: 12.80 ct/kWh
  - Degression: 0.5%/a for FiTs

EEG 2023 (III)

- Special tender for highly flexible biomethane plants (new plants only):
  - Tender volume 2023: **600 MW**
  - 2 tenders per year in 2023: 1st April & 1st October
  - Maximum bid value: **19.31 ct/kWh** (degression from 2024: 1% per year)
  - Flexibility requirement: remuneration only for **10%** of the installed capacity)
  - Flexibility premium: 65 €/kW installed capacity
- Example: Biomethan-chp with 1,000 kW inst. capacity (without revenues from heat)

Remuneration: 876,000 kWh x 19,0 ct/kWh	165,300 €	19.0 ct/kWh
Flexibility premium: 1,000 kW x 65 €/KW	65,000 €	7.4 ct/kWh
Revenues electricity market: 876,000 kWh x 2,0 ct/kWh	17,400 €	2.0 ct/kWh
Total revenues per year	**247,700 €**	**28.4 ct/kWh**

Source: BiogasForumBayern 2023; http://www.biogas-forum-bayern.de/bif38

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- Example: Biomethan-chp with 1,000 kW inst. capacity

Biomethan price ct/kWh	Resulting costs for produced electricity
9	33.2
8	30.1
7	27.0
6	23.9

Source: BiogasForumBayern 2023; http://www.biogas-forum-bayern.de/bif38
Remark: Sale of heat is included with a price of 2 ct/kWh;
per 1 ct/kWh higher heat price the costs decline with 1 ct/kWh

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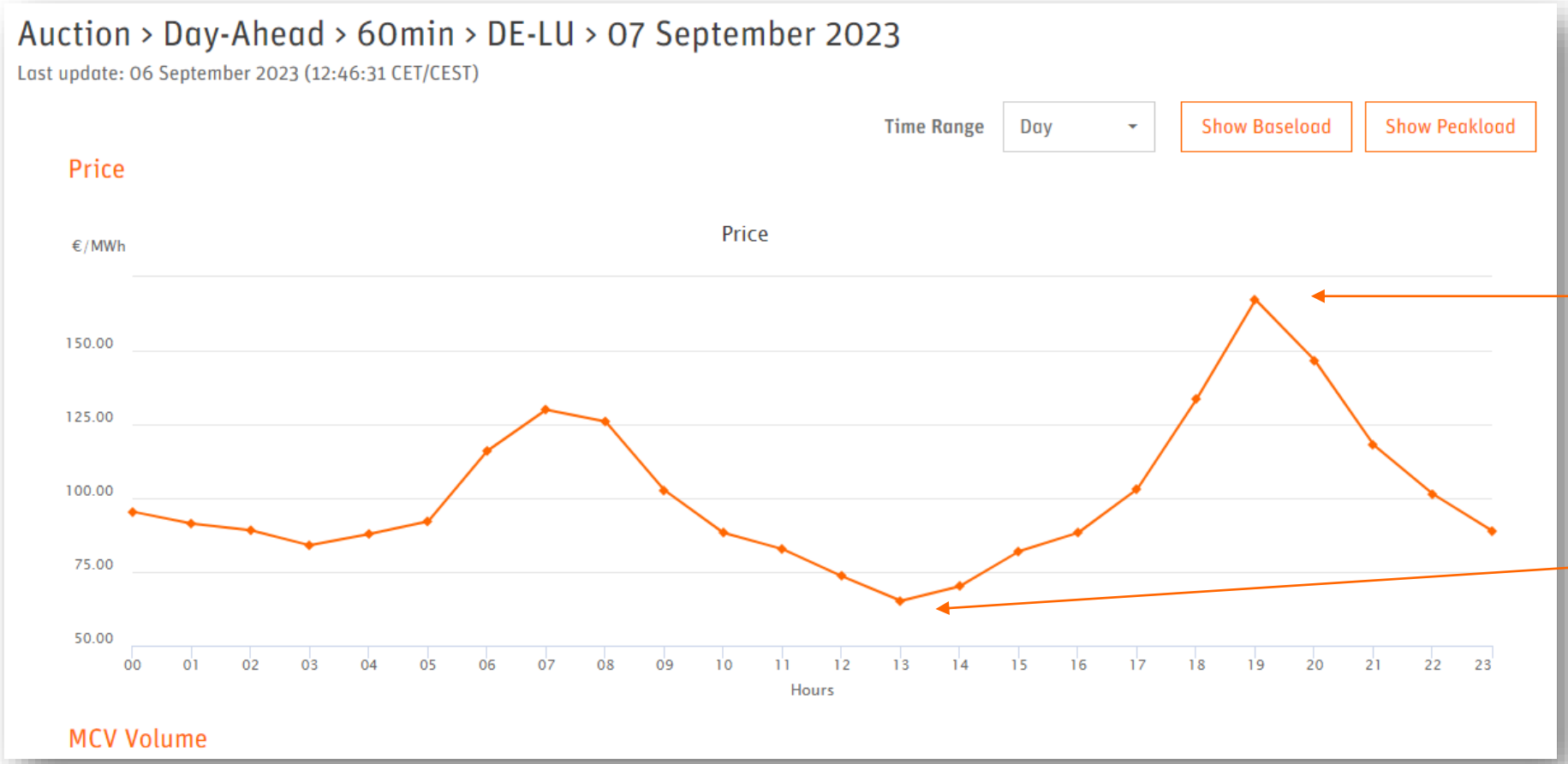
- Biomethane in tender processes

Tender	Successful plants	Successful capacity
09/2021	4	16
12/2021	21	148
03/2022	3	5.4
09/2022	5	11.7
10/2022	2	3.5
04/2023	0	0

Source: Landwärme 2023
Remark: 12/2021, 10/2022, 04/2023 highly flexible biomethanplants

Value of flexibility



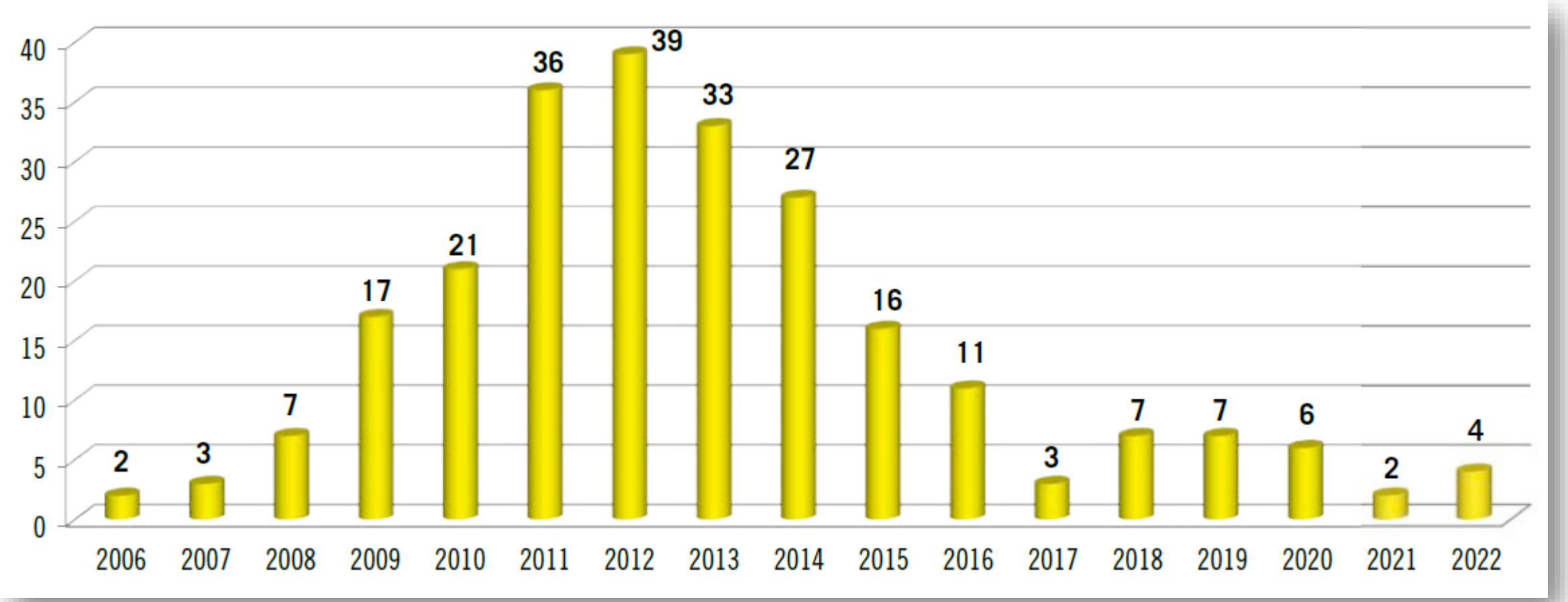
Peak: 170 €/MWh

Potential for flexible biogas plants: 100 €/MWh

Baseload: 70 €/MWh

Source: EPEXspot 2023

German Biomethane Plants



Source: Fachverband Biogas 2023

End of 2022:
242 biomethane plants
1,2 Mrd. m³ biomethane injection capacity

End of 2023
<10 new installations
but 50 projects in the pipeline,
mostly basend on manure and waste

How much biomethane ends up in Germany's different end-use sectors?

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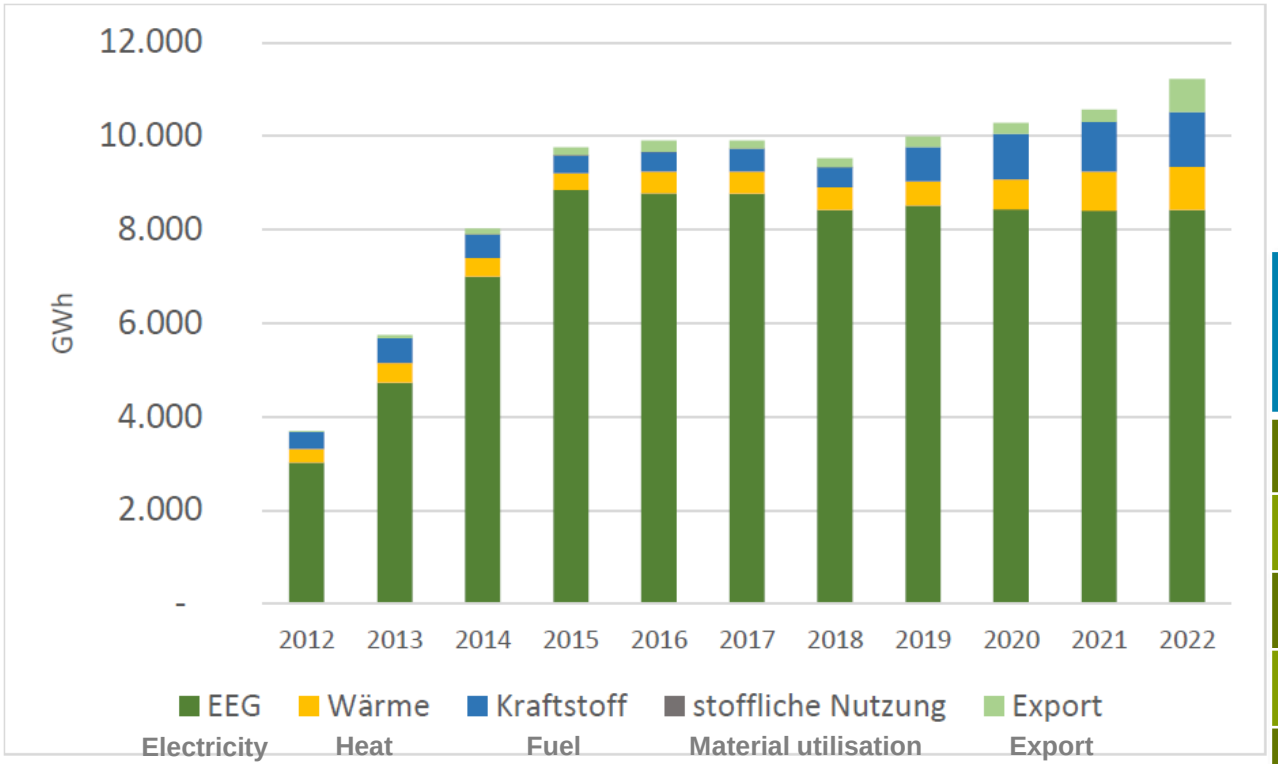
Biomethane Utilisation



Source: DENA 2023
and own assumptions

Year	Biomethane Feed-in [GWh]	Fuel utilisation [GWh]
2022	10,580	1,168
2021	10,395	1,062
2020	10,285	972
2019	10,167	700
2018	10,410	389
2017	10,220	380
2016	9,690	379

RED II: Emissions from biomethane

Default values in RED II for GHG Emissions (fossil comparator 94 g $CO_{2äq}$/MJ)

Substrate	g CO_{2eq}/MJ
Manure	-100
Biogenic waste	14
Maize	30

Disaggregated values along the process chain

Source: EU 2018

Disaggregated default values for biogas for the production of electricity

Biomass fuel production system		Technology	TYPICAL VALUE [g CO_2eq/MJ]					DEFAULT VALUE [g CO_2eq/MJ]				
			Cultiva-tion	Processing	Non-CO_2 emissions from the fuel in use	Transport	Manure credits	Cultiva-tion	Processing	Non-CO_2 emissions from the fuel in use	Transport	Manure credits
Wet manure (1)	case 1	Open digestate	0,0	69,6	8,9	0,8	– 107,3	0,0	97,4	12,5	0,8	– 107,3
		Close digestate	0,0	0,0	8,9	0,8	– 97,6	0,0	0,0	12,5	0,8	– 97,6
	case 2	Open digestate	0,0	74,1	8,9	0,8	– 107,3	0,0	103,7	12,5	0,8	– 107,3
		Close digestate	0,0	4,2	8,9	0,8	– 97,6	0,0	5,9	12,5	0,8	– 97,6
	case 3	Open digestate	0,0	83,2	8,9	0,9	– 120,7	0,0	116,4	12,5	0,9	– 120,7
		Close digestate	0,0	4,6	8,9	0,8	– 108,5	0,0	6,4	12,5	0,8	– 108,5

EUROPEAN UNION

THE EUROPEAN PARLIAMENT — THE COUNCIL

Brussels, 21 November 2018 (OR. en)

2016/0382 (COD) — PE-CONS 48/18

VTypical and default values for biomethane

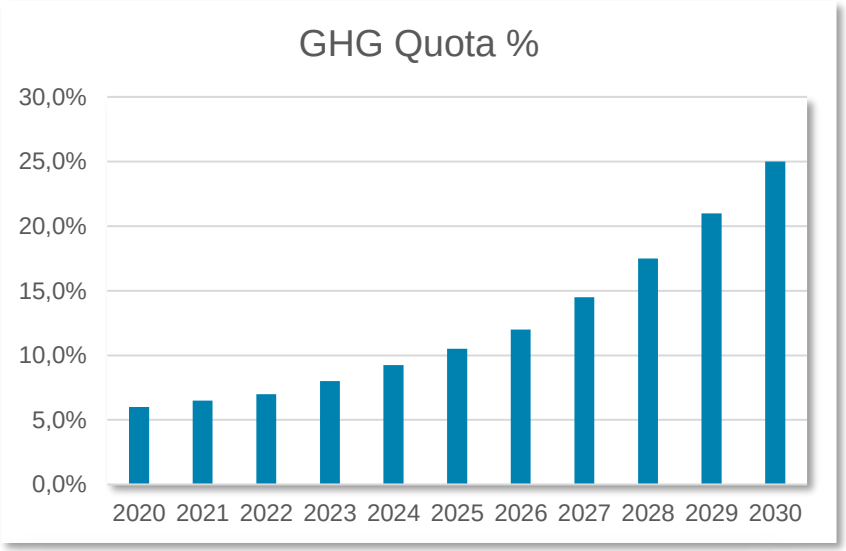
Biomethane production system	Technological option	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
Biomethane from wet manure	Open digestate, no off-gas combustion[1]	-20	22
	Open digestate, off-gas combustion[2]	-35	1
	Close digestate, no off-gas combustion	-88	-79
	Close digestate, off-gas combustion	-103	-100
Biomethane from maize whole plant	Open digestate, no off-gas combustion	58	73
	Open digestate, off-gas combustion	43	52
	Close digestate, no off-gas combustion	41	51
	Close digestate, off-gas combustion	26	30
Biomethane from biowaste	Open digestate, no off-gas combustion	51	71
	Open digestate, off-gas combustion	36	50
	Close digestate, no off-gas combustion	25	35
	Close digestate, off-gas combustion	10	14

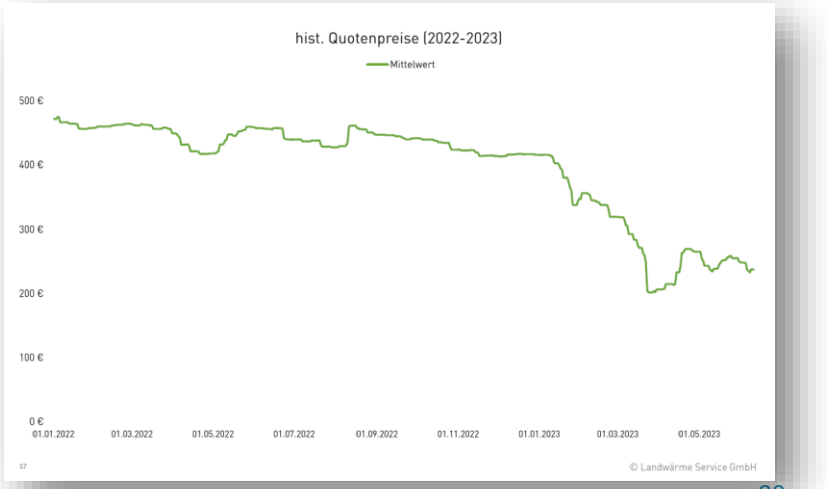
Relevance of the GHG balance in Germany's transport sector

- GHG quota replaces energy quota since 2015
  - since 2015 : 3.5 % GHG reduction
  - since 2017 : 4.0 % GHG reduction
  - since 2020 : 6.0 % GHG reduction
  - since 2022 : 8.0 % GHG reduction

- **Everyone who distributes fuel must prove quota fulfilment!**
- **Non-compliance is penalised: 600 €/t CO_2**

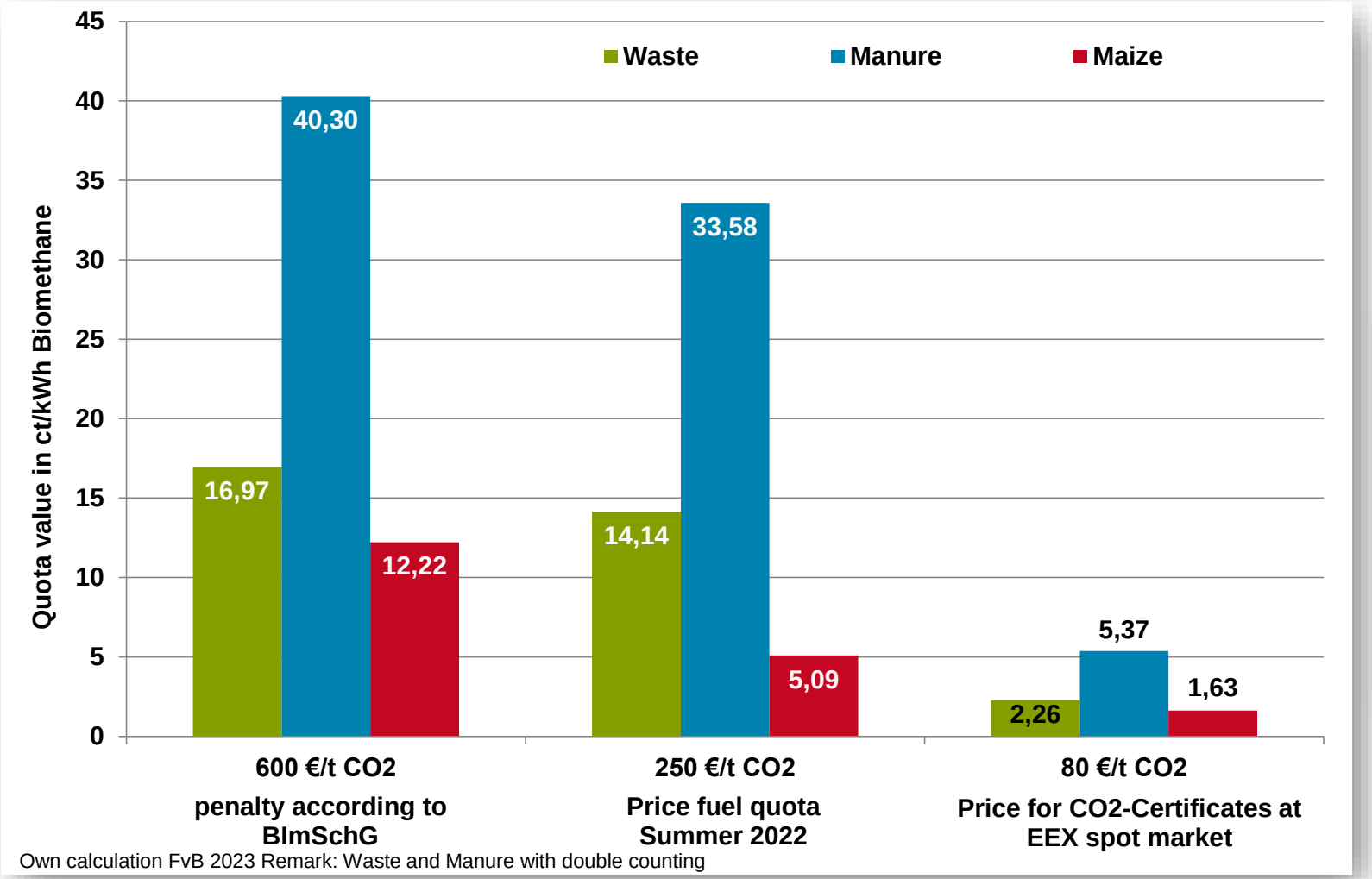
- Biomethane as fuel can be used to fulfill quotas
- Quota price between 200 and 450 €/t CO_2



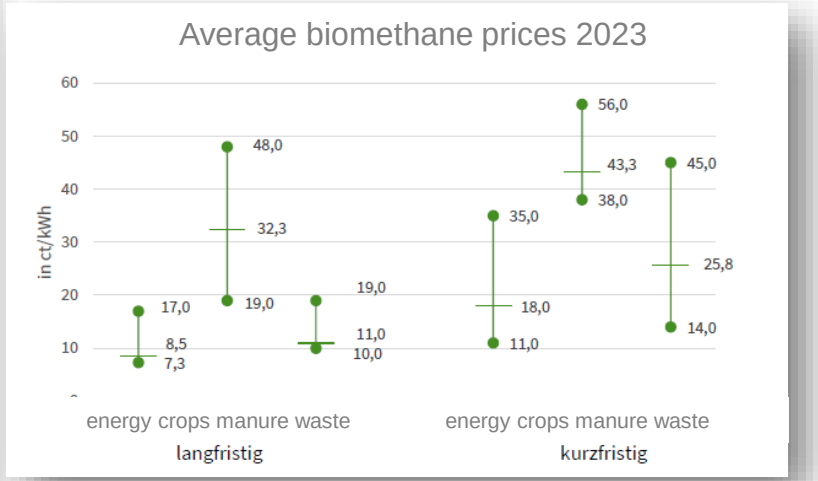


Source: Landwärme 2023

GHG quota leads to business case



Own calculation FvB 2023 Remark: Waste and Manure with double counting



Source: DENA 2023

Conclusion

- Biogas and biomethan are keys for energy security in Germany
- Until 2021 focus was on biogas / biomethane für chp
- Strong market for biomethane in the transport sector
- GHG-quota is very attractive
- Heat market looks also on biomethane
- Currently good position for biomethane in Germany