Deutsches Biomasseforschungszentrum
gemeinnützige GmbH

DBFZ

State of art and perspectives of biogas production from organic materials in Germany

Jan Liebetrau

DBFZ – Overview

Development:

- The Deutsches Biomasseforschungszentrum (DBFZ) was founded on 28 February 2008 in Berlin as a non-profit LLC (gGmbH).
- The Federal German Government represented by the Federal Ministry of Food and Agriculture (BMEL) is the sole shareholder of the DBFZ.

Mission:

- The scientific task of the DBFZ is to comprehensively support the efficient establishment of biomass as a valuable resource for sustainable energy supply within the scope of applied research and to drive it forward, both theoretically and practically.

Structure:

- Around 220 employees in12/2013 (administration &
- research).

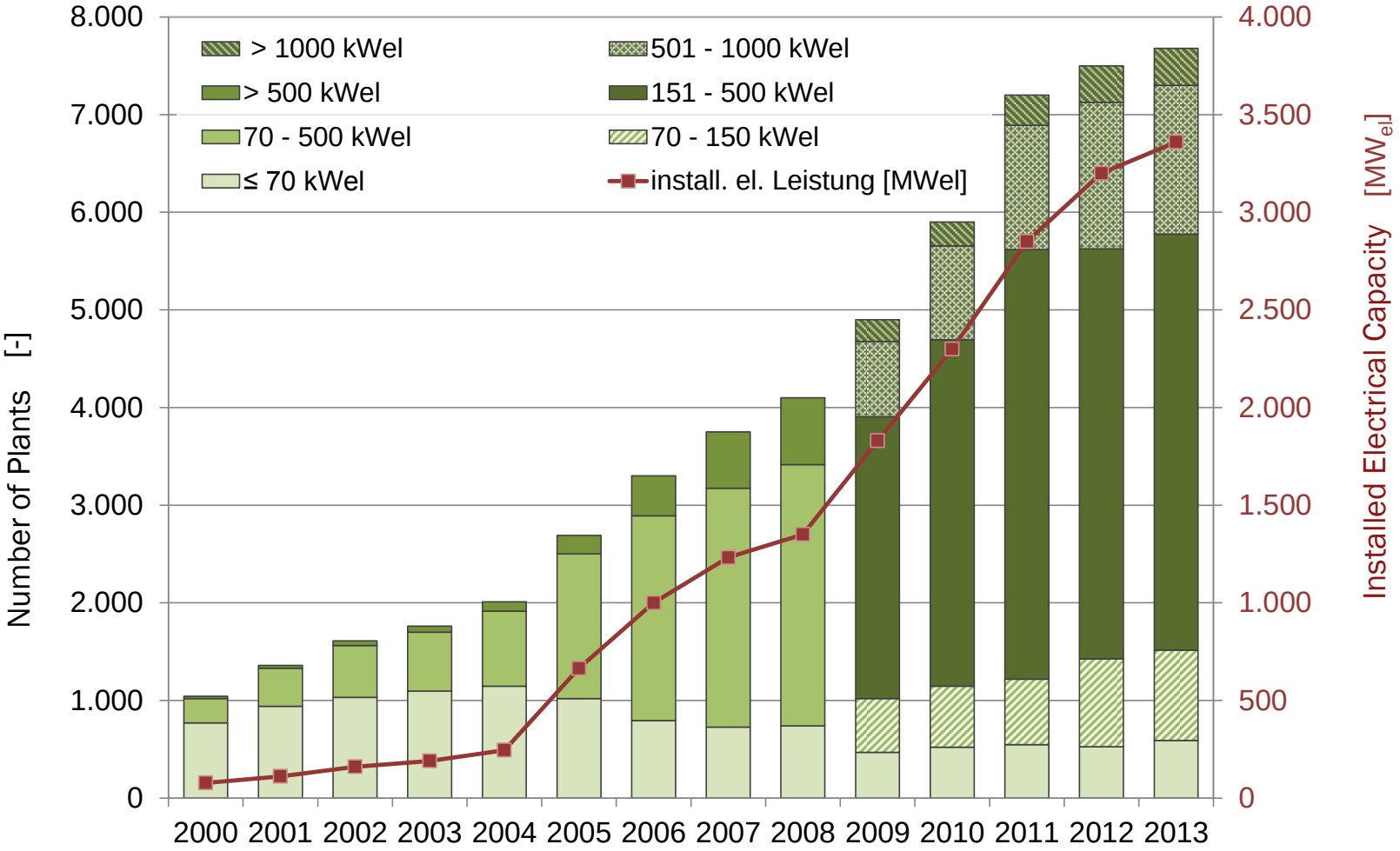
Management:

- Prof. Dr. mont. Michael Nelles (Scientific Managing Director)
- Daniel Mayer (Administrative Managing Director)

Abb.: DBFZ

Agricultural Biogas Plants

Electricity Generation from Biogas (2000-2013)



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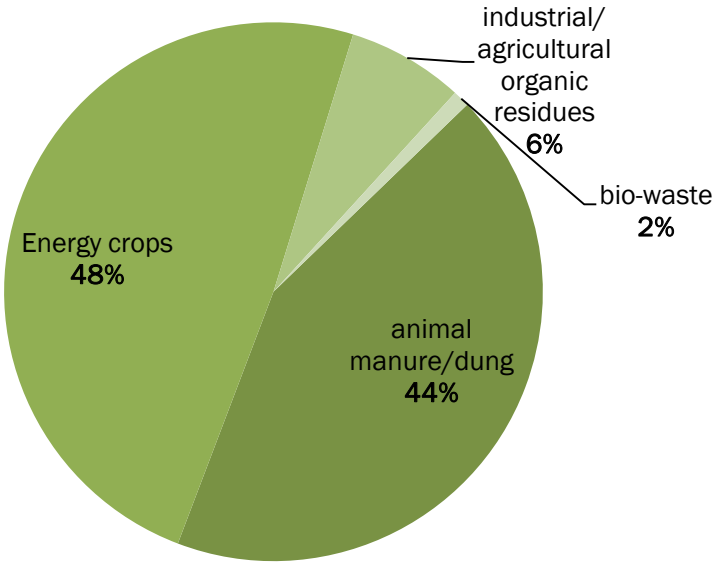
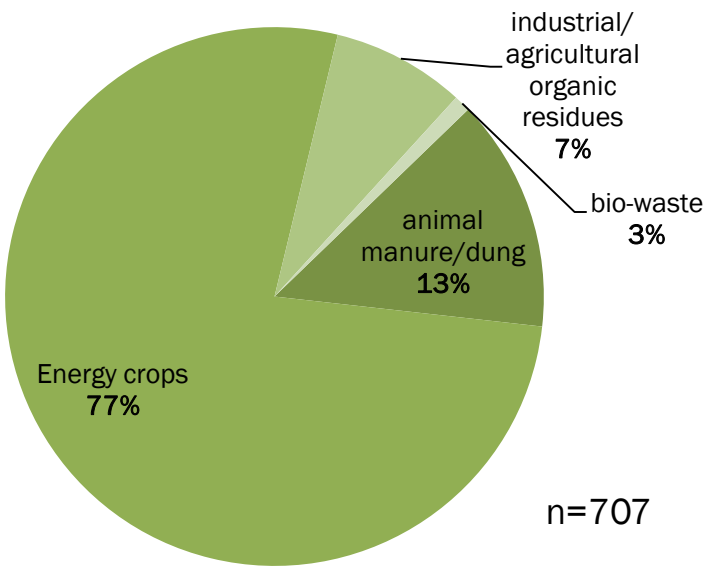
Composition of Substrates Biogas I

Mass-specific substrate composition



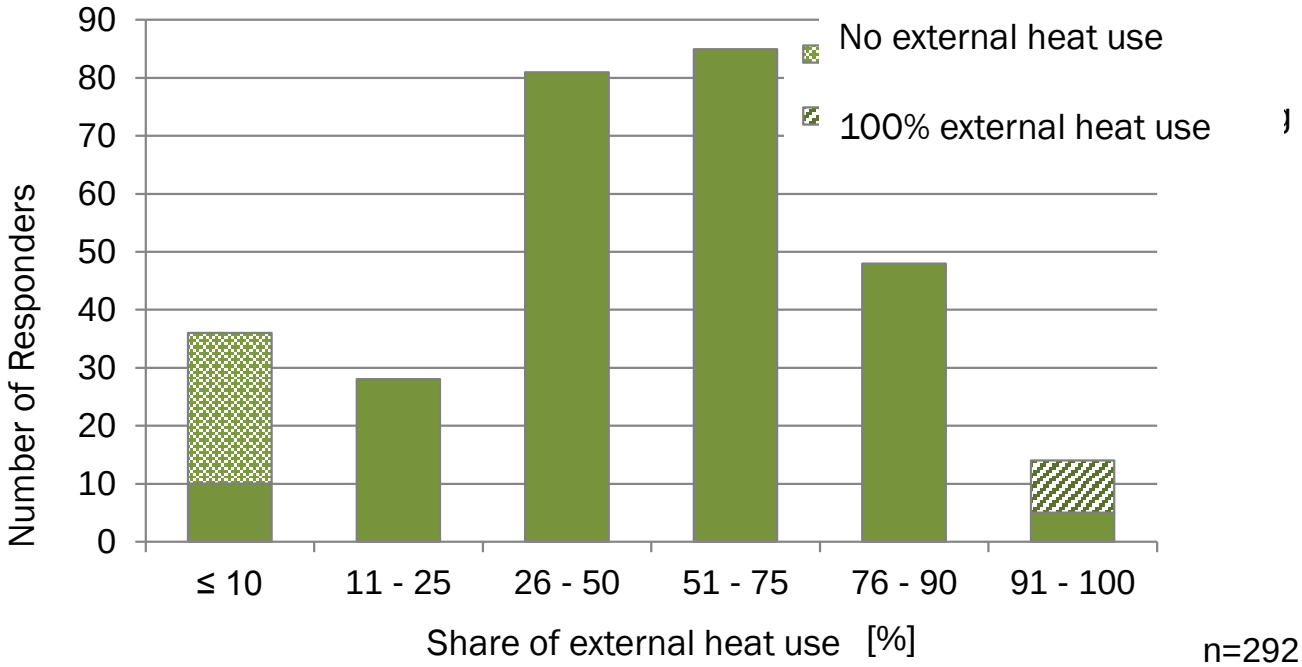
Energy-specific substrate composition



- The substrate composition in biogas plants is dominated by animal manure and renewable materials (over 90%)
- Energy-specific manure plays a minor role (13%) due to the low biogas potential

Source: DBFZ, Stromerzeugung aus Biomasse 5/2014

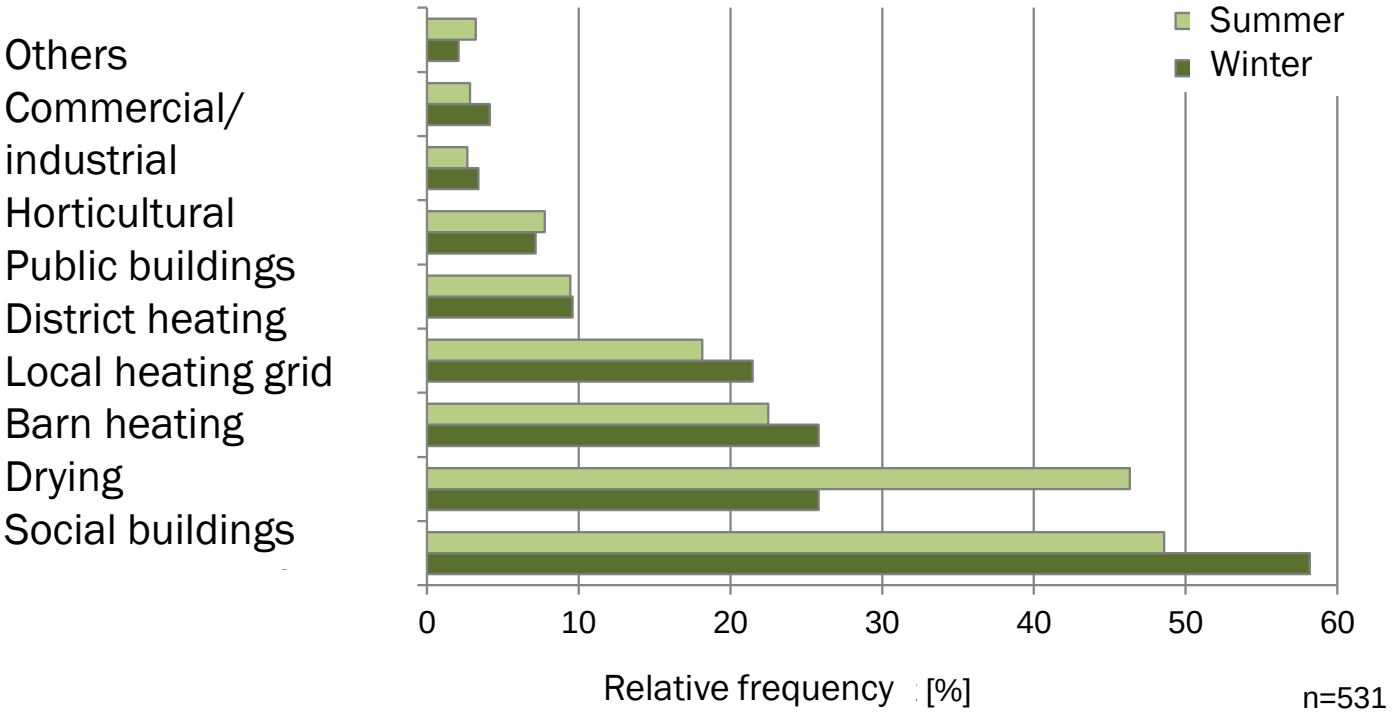
Heat Use I



n=292

- Around 85 % of responders use heat for external purposes (excluding own heat requirements
- On average 51 % of excess heat is used for external purposes

Heat Use II

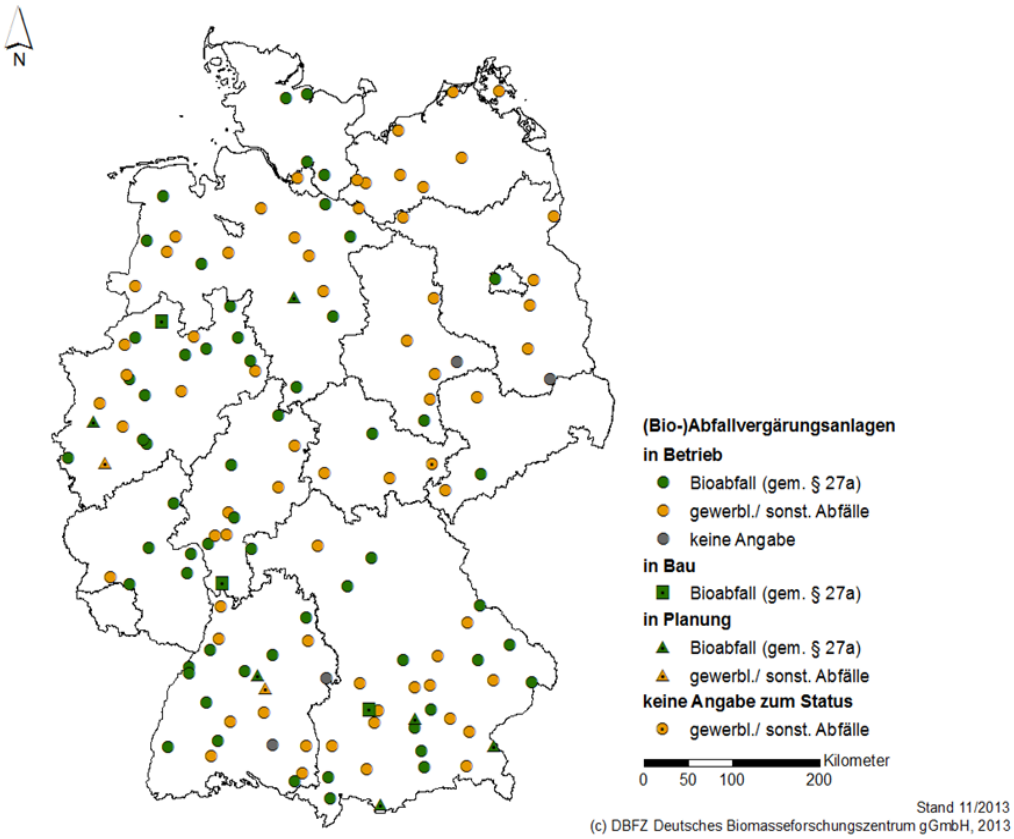


- Mostly no difference in seasonal utilization given
- Drying plays a greater role in summer compared to winter season

Externe Wärmenutzung differenziert nach Sommer und Winter, relative Häufigkeit bezogen auf Stichprobe (n=531) (DBFZ-Betreiberbefragung 2014)

Bio-waste Plants

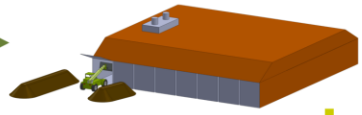
Fermentation of Bio-waste



- Around 130 plants (mainly or exclusively) for the fermentation of organic wastes (2013)
- 962 plants with permission to use bio-waste and organic residues; 443 plants utilize bio-waste (2012: Federal Statistics Office)
- Statistics for bio-waste biogas plants are not clear due to the problem of different definitions of" bio-waste/waste"
- 76 plants use bio-waste and organic residues from separate collection
- 62 plants use bio-waste according to § 27a EEG 2012

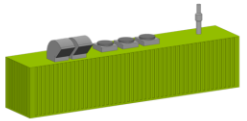
(Bio-)Abfallvergärungsanlagen in Deutschland differenziert nach Betriebsstatus und Substratinput (Datenbank DBFZ, Stand 11/2013)

DBFZ Abfall-Biogasanlage

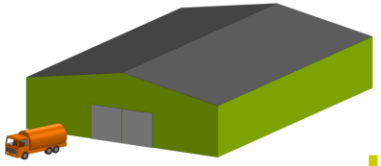


Box fermentation

Torch

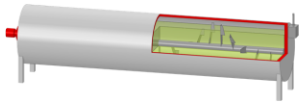


CHP

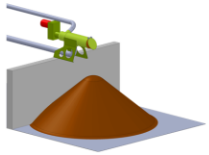


Conditioning

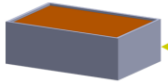
Sanitation



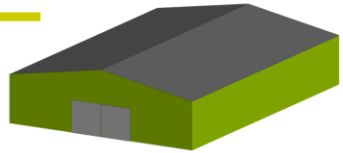
Plug-flow fermenter



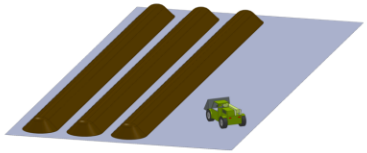
Separation



Biofilter



Composting (closed)



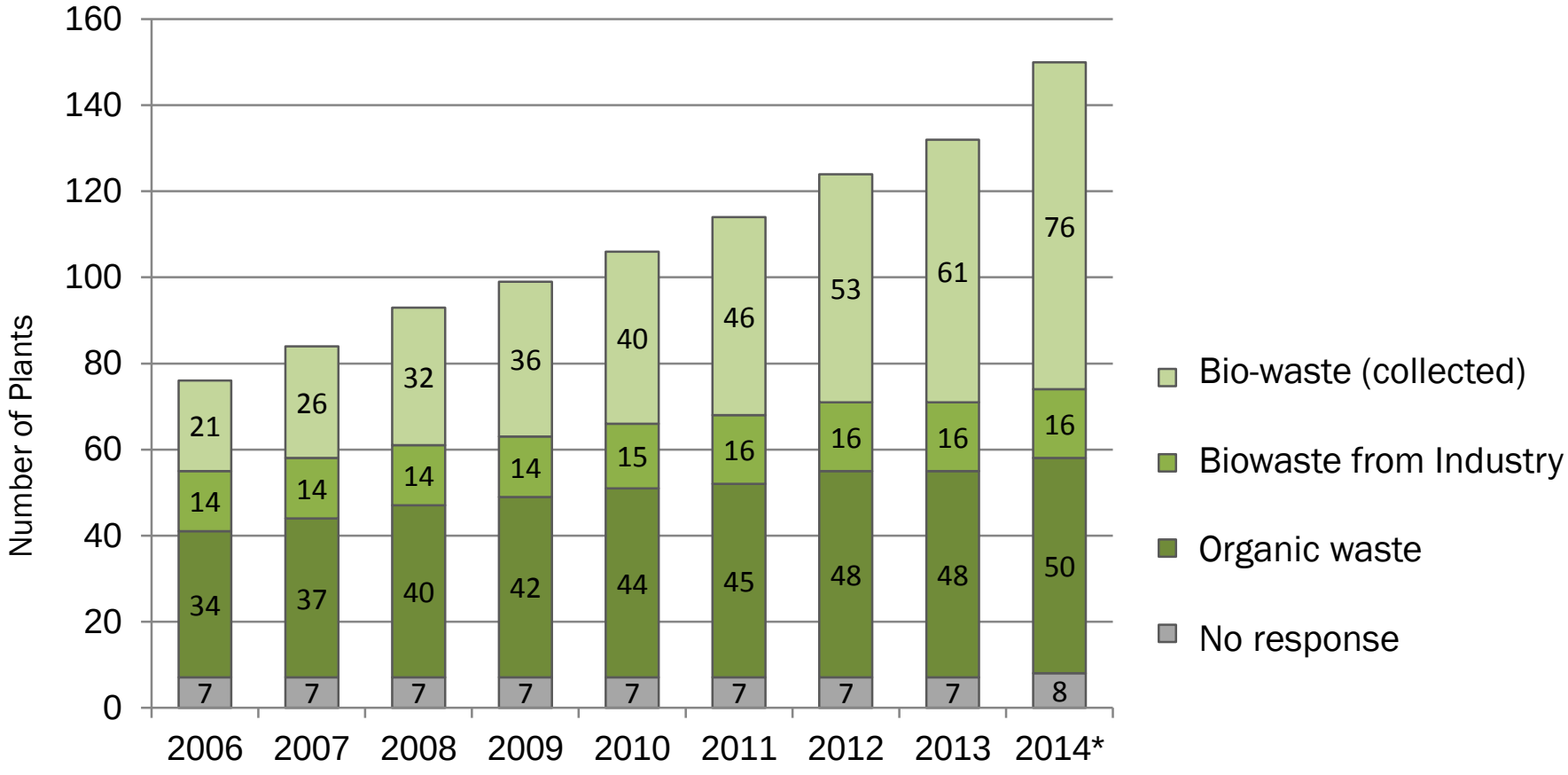
Composting (open)

Process water

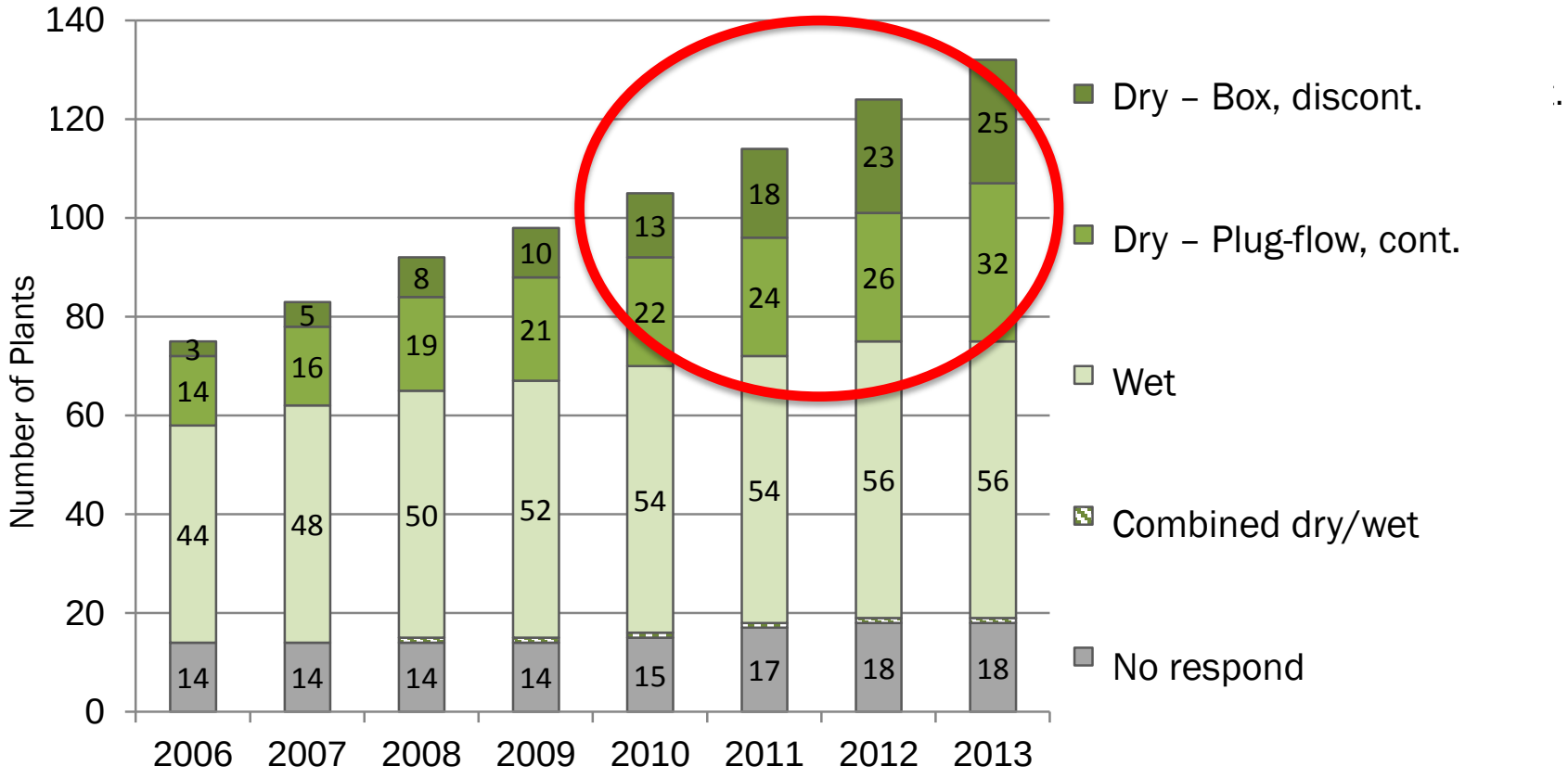
Technology Differentiation Agricultural and Bio-waste Plants

- **Aim of treatment (reduction of waste vs. energy generation, type of end product(s)**
- **Legal frame**
  - Especially 150 day rule of the EEG
  - Enclosure of construction parts incl. exhaust gas capture and treatment
- **Large share in dry fermentation**
- **Large share of plants with post-composting facilities – open air handling of digestates necessary**
- **Sanitation, biofilter, acid scrubber**
- **Used substrates**
- **Modes of operation**

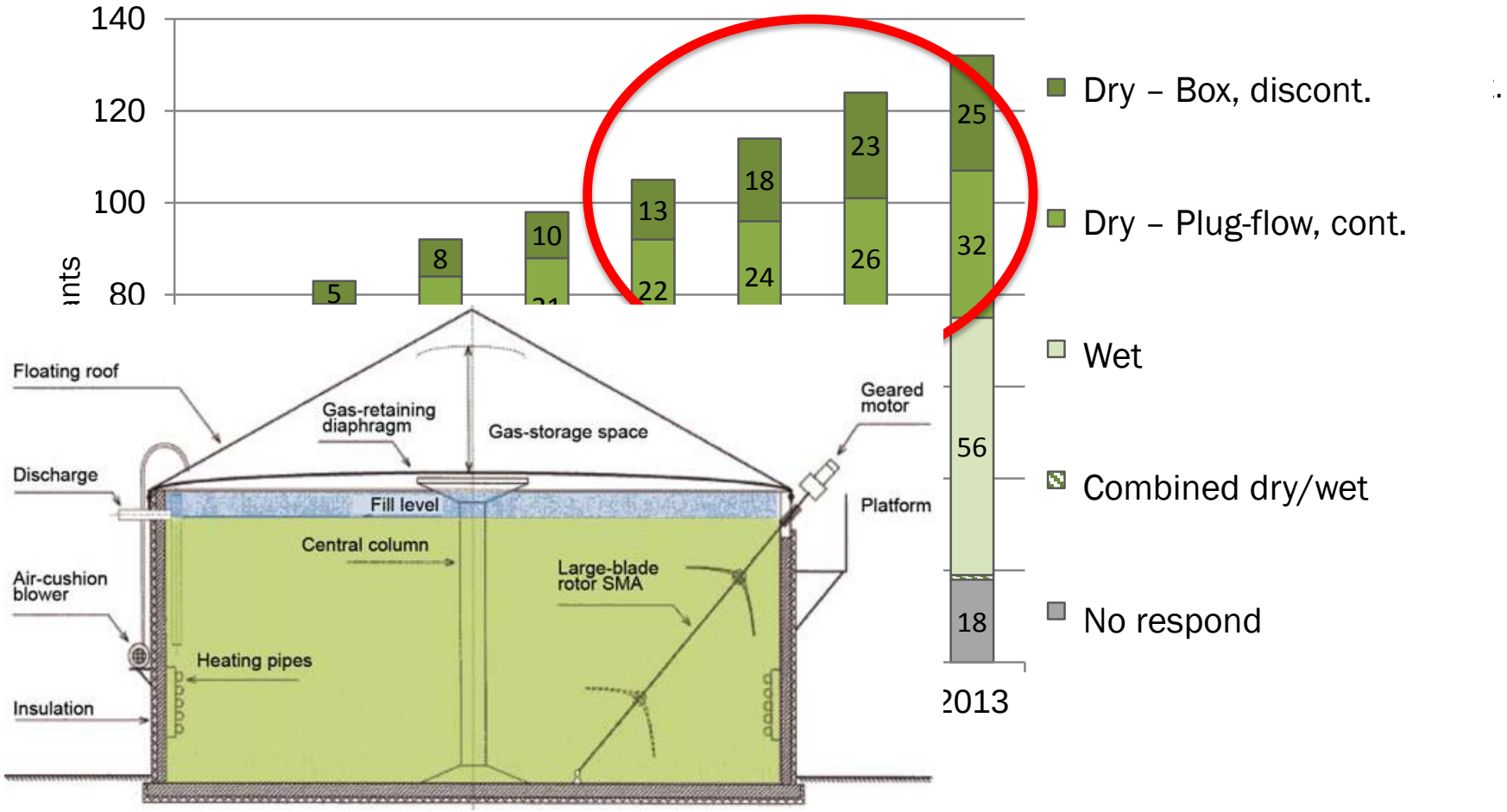
Composition of Substrates Bio-waste Plants



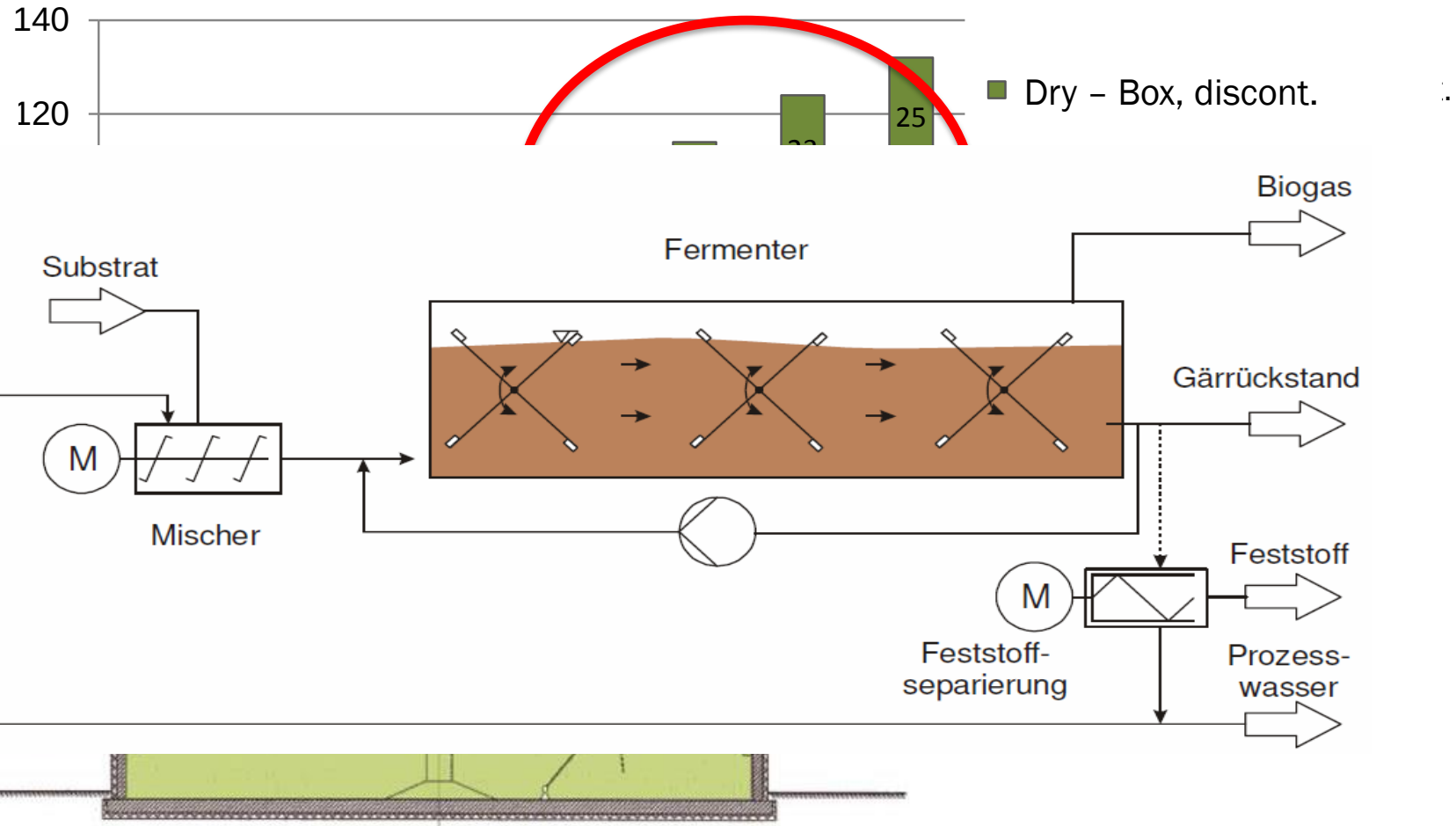
Treatment Technology Bio-waste plants



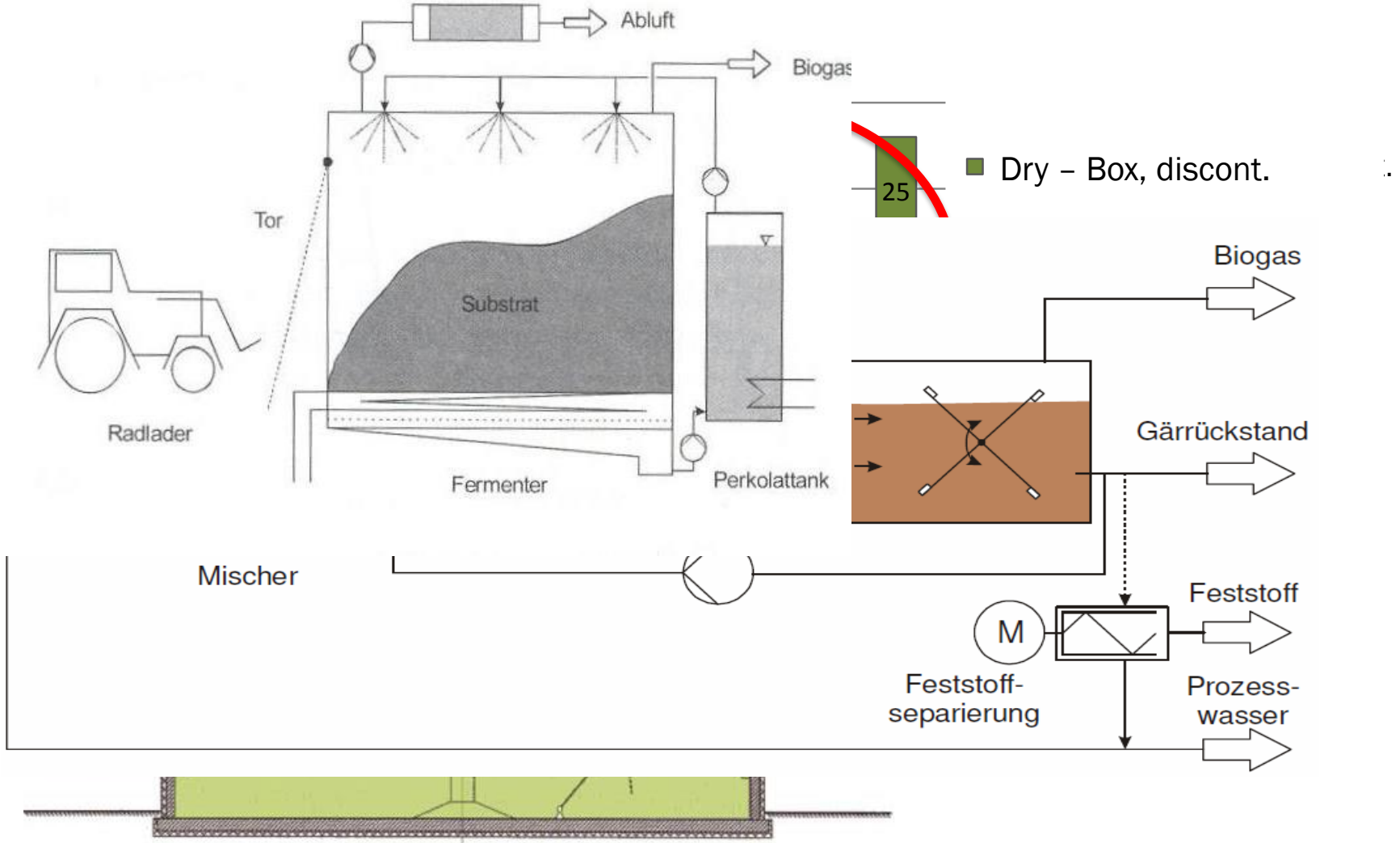
Treatment Technology Bio-waste plants



Treatment Technology Bio-waste plants

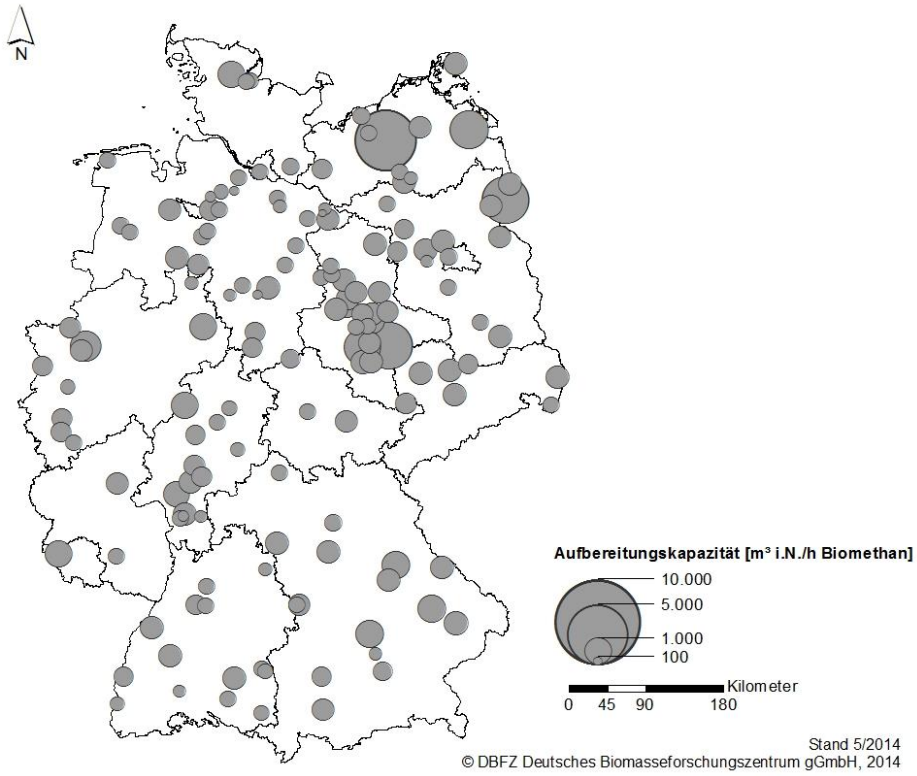


Treatment Technology Bio-waste plants



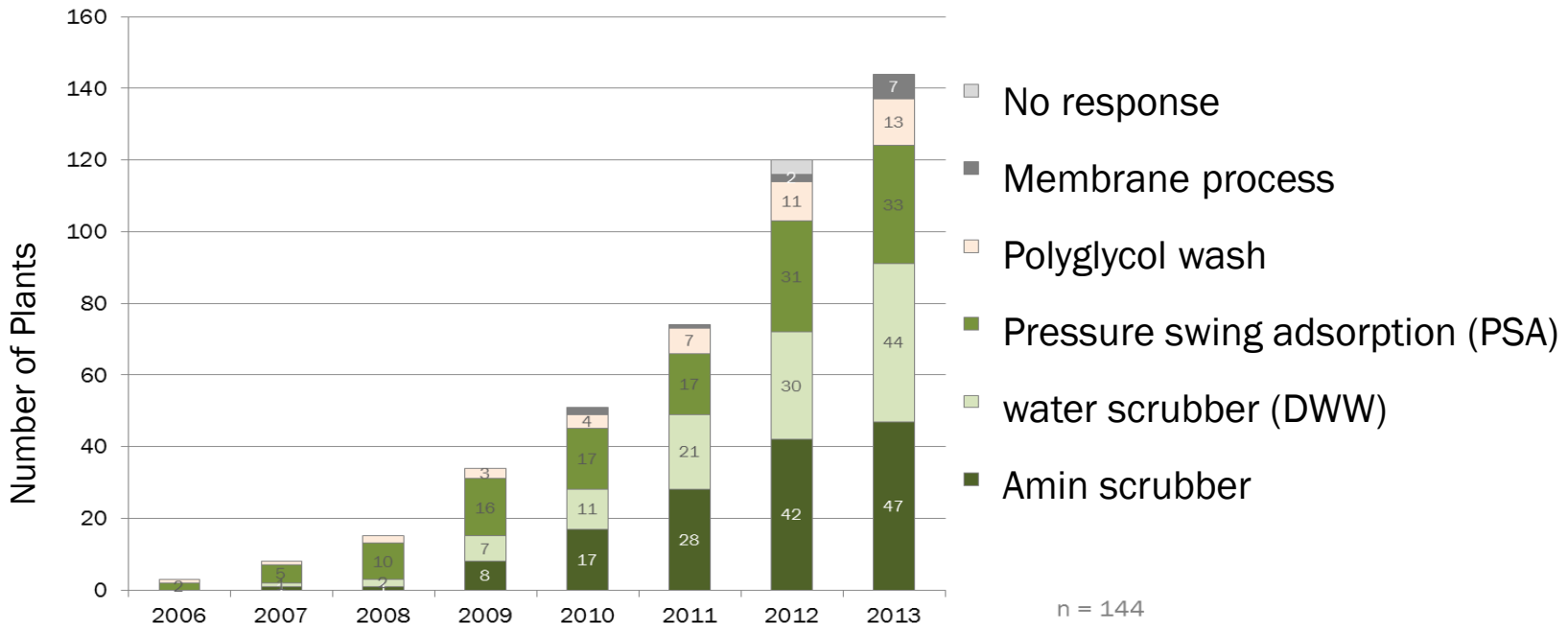
Biomethane

Biomethane Plants – Upgrading Facilities



- 31.12.2013:
- 144 Biogas upgrading facilities in operation
- 24 new plants in 2013
- Most significant increase in Sachsen-Anhalt (6 plants)
- m^3 i.N./h Biomethane (2013) ca. 8,9 TWh_{Hs}(IWES)

Treatment Technologies I



Upgrading (raw) biogas towards natural gas quality (CO2-Separation):

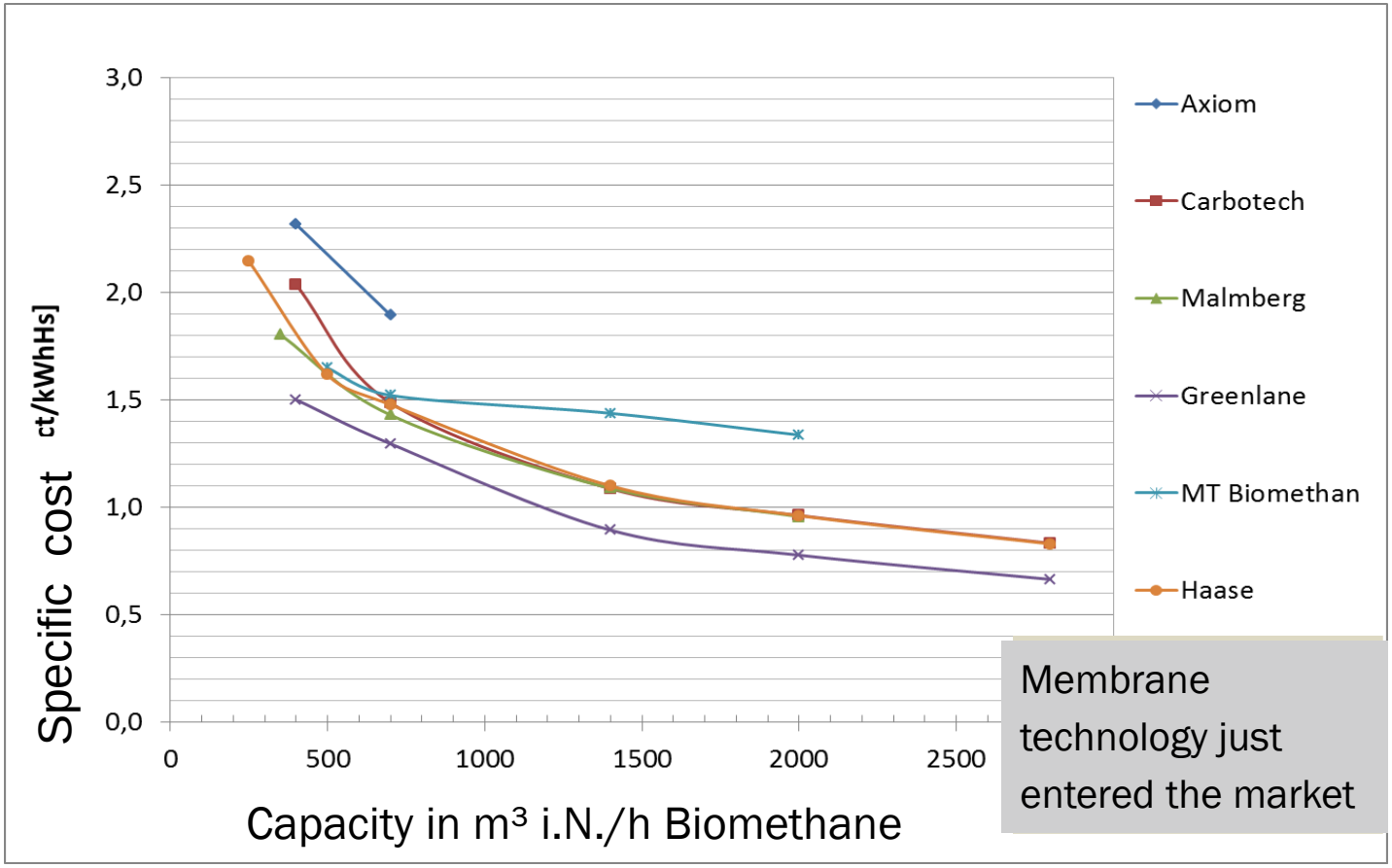
- Mostly used technologies: Amin scrubber, DWW and PSA
- In comparison to the previous year membrane technologies increased its share (was 3 plants, is 7 plants)

Technical Description of Treatment Technologies (2012)

	Carbotech	Malmberg	Greenlane	Haase	MT Biomethan	Axiom
Technology	PSA	WS	WS	Absorption with organic solutions	Amin scrubber	Membrane
Plant site in m^3 i.N./h biogas	400-2.800	350-2.000	400-2.800	250-2.800	400-2.000	400-700
Required space in m^2	200-300	80-250	36-60	100-555	107-230	105-166
Required elec. energy in kW/m^3 i.N./h biogas	<0,19	0,2-0,23	0,17-0,22	0,23-0,27	0,09	0,24
Required therm. energy in kW/m^3 i.N./h biogas	0	0	0	Internal heat use	0,6	0
Transfer pressure in bar	2	4,5-5,5	7-8	5-7	1,2	6
Max external heat usable kWhth/m^3 i.N./h biogas	<0,1	0,06-0,18	0,1-0,12	0,12-0,13	0,3	0,36
Methane losses	<1,55	<1%	<1%	<1%	<0,1%	<5%

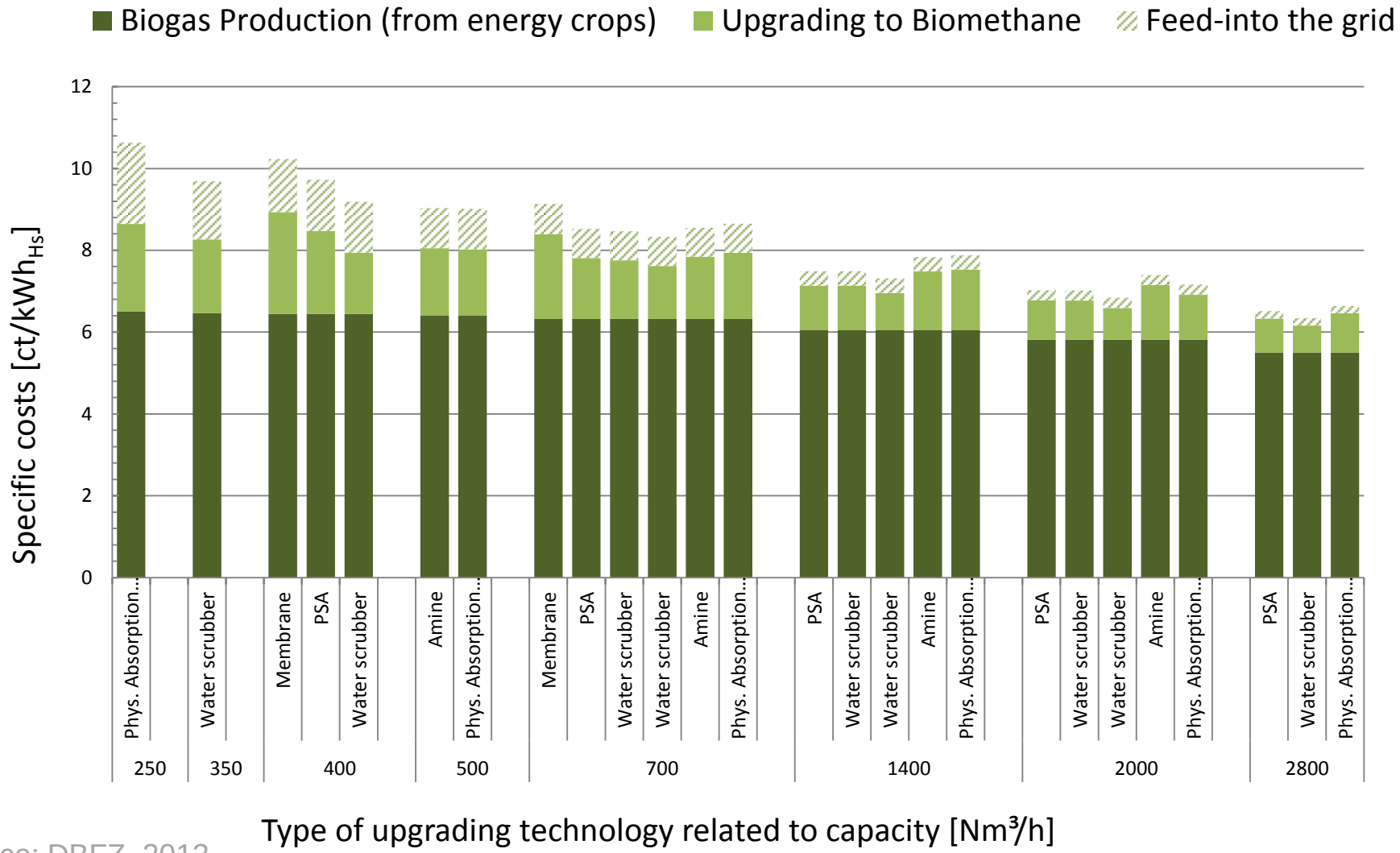
Source: FNR (Hrsg.): Leitfaden Biogasaufbereitung und -nutzung, 2014

Specific Technology Cost



Membrane technology just entered the market

Specific Electricity Generation Cost – Biomethane from Biomass



Source: DBFZ, 2013

Summary

- **Wide range of technologies for various substrates and conversion paths for biogas are available**
- **Customized technology for each plant required**
- **State of the art technology is available**
- **Future flexible operation of electricity generation**

Further developments :

- **Small-scale plants for animal manure**
- **Optimized plants for bio-waste and composting**

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DBFZ

Researching the energy of the future – come and join us!

Contact

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