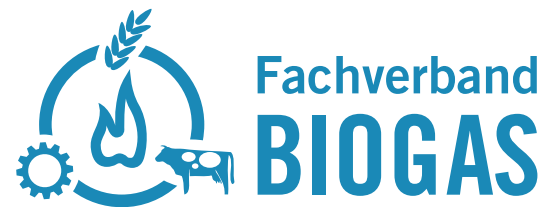


EBA Workshop on Biomethane
Amsterdam, 5th of December 2017



GHG quota system for promoting the use of biofuels in Germany

Frank Hofmann, International Affairs
Fachverband Biogas – German Biogas Association

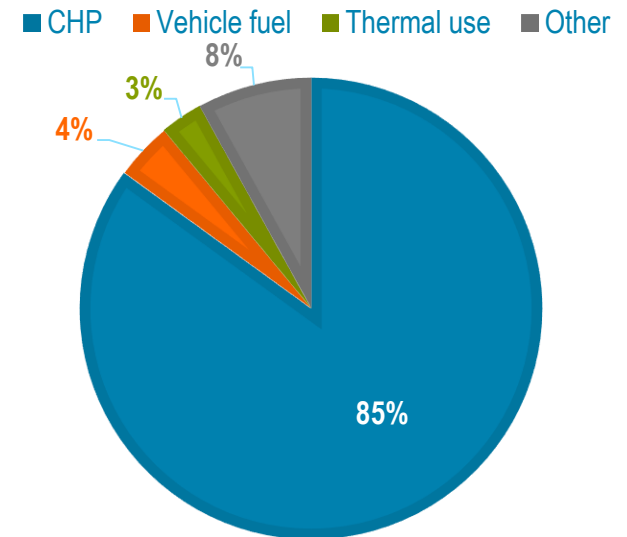
Biogas
kann's!

Agenda

- **Current status**
- European and German legal framework
- GHG quota in practice
- Problems in calculation of the GHG reduction according to BioKraftNachV
- Expected developments: RED II
- Conclusion

Current status biomethane

- Currently, 197 biogas upgrading plants in operation. In 2016, only 10 new biomethane plants were commissioned.
- The 9.4 TWh_{hs} of biomethane injected into the grid are used for:
 - Producing heat and electricity (CHP) - 8 TWh_{hs}
 - Mobility - 0.37 TWh_{hs}
 - As heat for about 2,6 million households - 0.3 TWh_{hs}
 - As raw material or for export - 0.7 TWh_{hs}



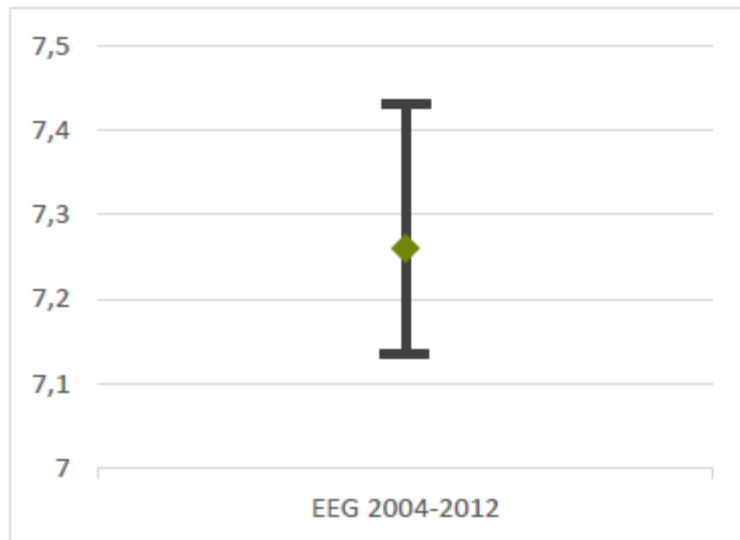
- In 2015, about 1.1% of transport fuel in Germany was biomethane.
- There are about 120 biogas filling stations in operation and additional 170 filling stations offer a blend of biomethane and natural gas.

Value of biomethane

Biomethanpreise Oktober 2016 bis Oktober 2017 Monatsdurchschnittswerte¹

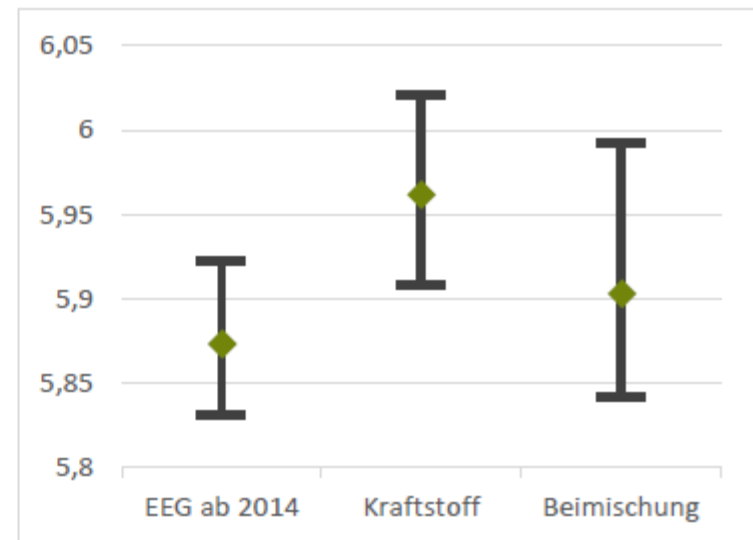


Monatsdurchschnittspreise EEG 2004 bis EEG 2012



Minimum, Durchschnitt, Maximum

Monatsdurchschnittspreise EEG aktuell, Kraftstoff, Beimischung

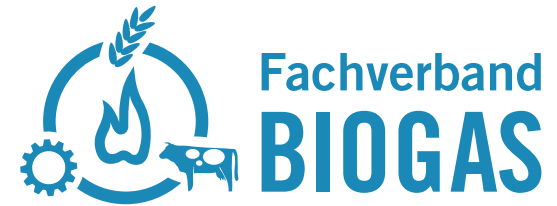


Minimum, Durchschnitt, Maximum

Agenda

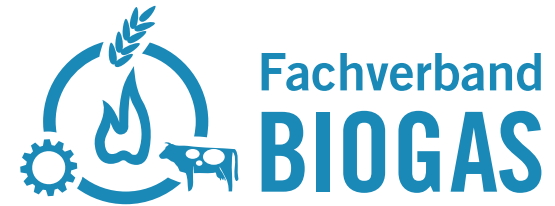
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European legal framework



- FQD (RL 98/70/EG) and RED (RL 2009/28/EG)
 - Common framework for the promotion of energy from renewable sources
 - Binding targets for the overall share of EE (18%) and biofuels (10%) until 2020
 - Sustainability criteria for biofuels, including biomethane
 - Transfer into national law until 5.12.2010
- Report EU Commission on the use of solid and gaseous biomass contains recommendations but no binding regulations (25.02.2010)
- In 2015, Amendment of the FQD (RL 2015/652/EU) and the RED (RL 2015/1513):
 - New, higher GHG value ($> 90 \text{ g CO}_2 / \text{MJ}$) for fossil fuels
 - Reporting about iLUC
 - Limit food and feed crops (7%)
 - Non-binding subquote

German legal framework



Biokraftstoff-Nachhaltigkeitsverordnung (BioKraft-NachV, Biofuel Sustainability Ordinance)

- In force since 02.11.2009
- Apply for biofuels for the recognition of the quota or tax exemption
- Authorization basis § 66 EnergieStG

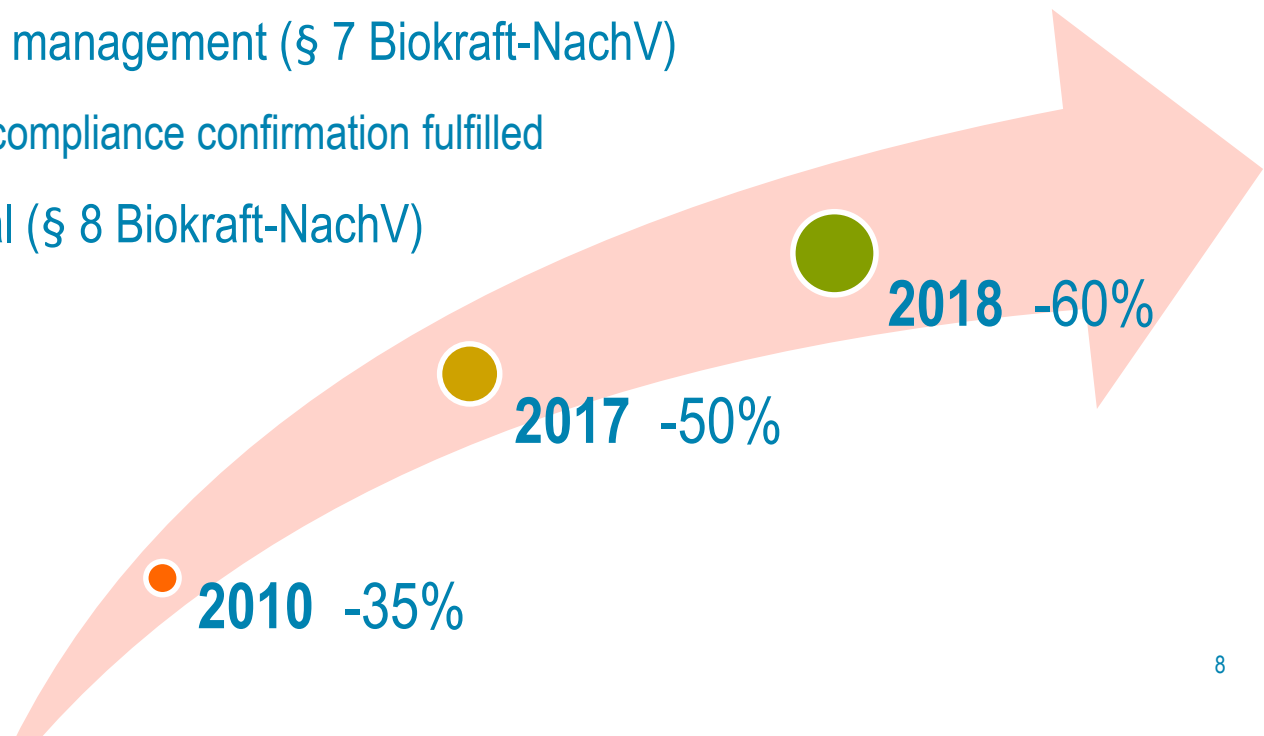
Biomassestrom-Nachhaltigkeitsverordnung (BioSt-NachV, Biomass Electricity Sustainability Regulation)

- In force since 24.08.2009
- Liquid biomass, which is used to generate electricity under the EEG
- Apply for liquid biomass for ignition or auxiliary firing since 01.01.2017
- Authorization basis § 64 EEG

- 1) Demand for sustainable management of agricultural and forestry land
- 2) Protection of natural habitats
- 3) Proof of a specific GHG reduction

Requirements on sustainability

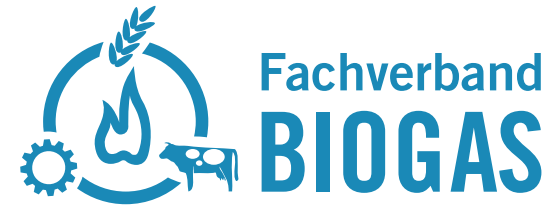
- Protection of natural habitats (§§ 4 to 6 Biokraft-NachV)
 - Areas with high biological diversity (forests, grassland)
 - Areas with high carbon stocks (wetlands, forests)
 - Peatlands
- Sustainable agricultural management (§ 7 Biokraft-NachV)
 - In Europe on cross compliance confirmation fulfilled
- GHG reduction potential (§ 8 Biokraft-NachV)



Agenda

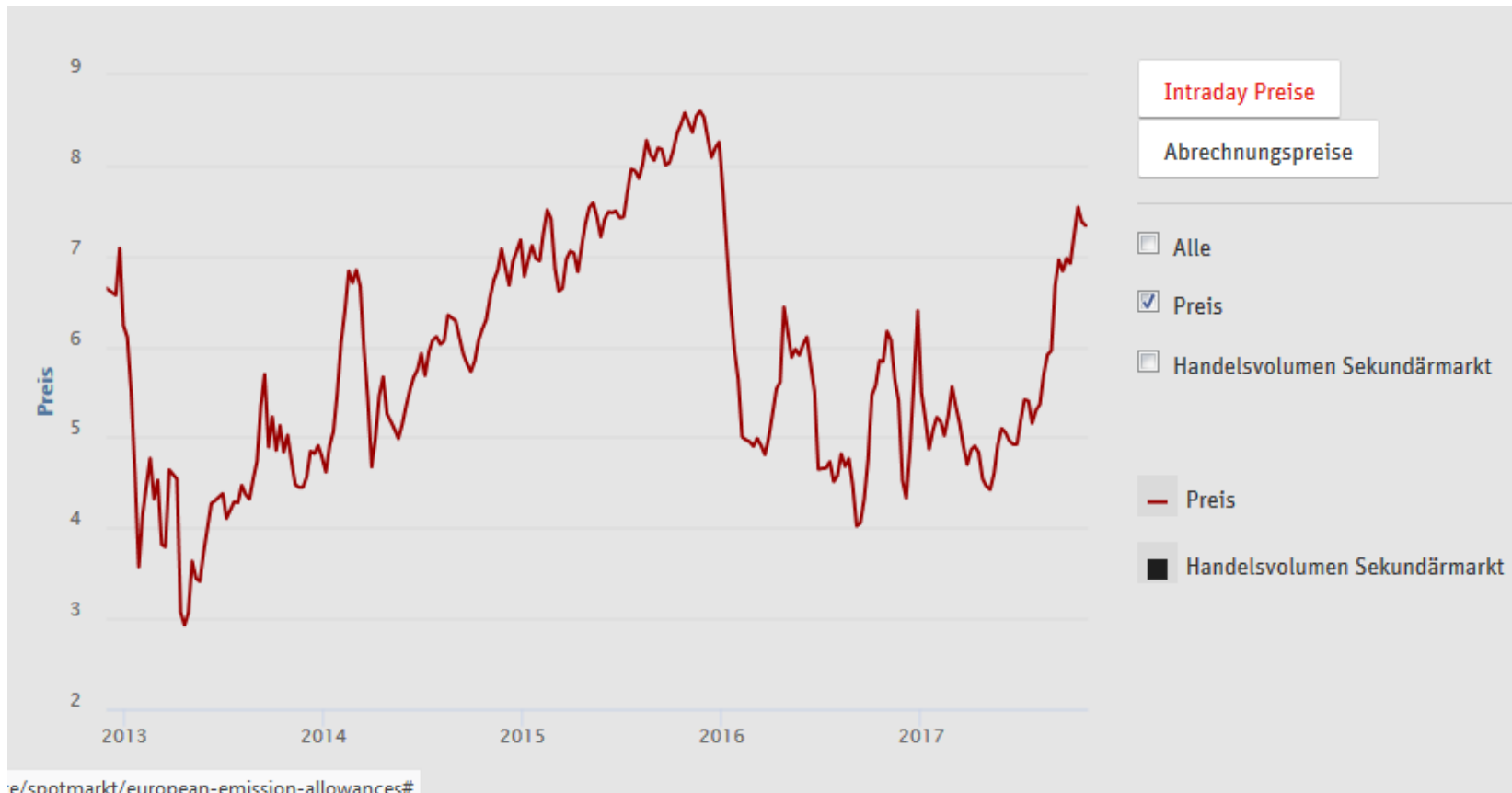
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Regulations on the GHG quota



- Petroleum industry must ensure GHG reduction
 - 2015/2016 → 3.5 %
 - 2017 to 2019 → 4 %
 - From 2020 → 6 %
- Bringing fossil fuels into the market triggers quotas.
- Calculation of quota fulfilment compared to base value: 83.8 g CO₂/MJ
 - According to 37. BImSchV 94 g CO₂/MJ
- Penalty for not meeting the quota: 0.47 €/kg CO₂ = **470 €/t CO₂**
- **In comparison to CO₂ certificates: 7 €/t CO₂**

Price at the EEX



Source: EEX 2017

Example (1)

The following fuel quantities are sold for consumption:

- 50,000 l fossil diesel plus 2,000 l blended biodiesel
- 75,500 l fossil gasoline plus 3,000 l blended ethanol
- 25 MWh biomethane

Calculation of the reference value:

50,000 l of fossil diesel x 36 MJ/l x 83.8 g CO ₂ /MJ / 1.000	150,840 kg CO ₂
2,000 l biodiesel x 33 MJ/l x 83.8 g CO ₂ /MJ / 1.000	5,531 kg CO ₂
75,000 l fossil gasoline x 32 MJ/l x 83.8 g CO ₂ /MJ / 1.000	201,120 kg CO ₂
3,000 l bioethanol x 21 MJ/l x 83.8 g CO ₂ /MJ / 1.000	5,279 kg CO ₂
25 MWh biomethane x 3.6 GJ/MWh x 83.8 kg CO ₂ /GJ	7,542 kg CO ₂
Total	370,312 kg CO₂

Example (2)

Calculation of actual emissions according to sustainability proof:

Note: Emissions of biofuels using evaluation report BLE for 2015

50.000 l fossil diesel	150,840 kg CO ₂
2.000 l biodiesel x 33 MJ/l x 24.6 g CO ₂ /MJ / 1,000	1,624 kg CO ₂
75.000 l fossil gasoline	201,120 kg CO ₂
3.000 l bioethanol x 21 MJ/l x 25.5 g CO ₂ /MJ / 1,000	1,607 kg CO ₂
25 MWh biomethane x 3.6 GJ/MWh x 13.2 kg CO ₂ /GJ	1,188 kg CO ₂
Total	356,378 kg CO₂
Comparison with reference value	370,312 kg CO ₂
Avioded emissions	13,934 kg CO₂

Example (3)

Checking compliance with the GHG quota:

Avoided emissions	13,934 kg CO ₂
Required savings 370,312 kg CO ₂ x 4%	14,812 kg CO ₂

- Obligor does not fulfill requirements!
- Difference of 878 kg CO₂



Penalties in case of non-conformance

- If the target value is not reached, a penalty is set.
- Penalty according to § 37 BImSchG: $0.47 \text{ €/kg CO}_2 = 470 \text{ €/t CO}_2$

Assuming the obligor has a shortage of 878 kg CO₂

- Penalty = 413 €
- Options to avoid penalty:
 - Quota trading (e.g., purchase of GHG savings from biomethane sales)
 - Addition of larger amounts of biodiesel/bioethanol/biomethane
- Obligor chooses most economic option.

Comparison of options

1. Purchase of “biomethane quota“ (limit = penalty = 413 €)

- Required amount of biomethane to avoid 878 kg CO₂:
 - Savings in kg CO₂ per GJ = 83.8 – 13.2 = 70.6 g CO₂/MJ
 - 12.4 GJ = 3.6 MWh = 261 kg biomethane = 363 m³
- Price on base of the penalty: 114 €/MWh = **11.4 ct/kWh**

2. Blending with biodiesel

- Required amount of biodiesel to avoid 878 kg CO₂:
 - Savings in kg CO₂ per GJ: 83.8 – 24.6 = 59.2 gCO₂/MJ
 - 477 l biodiesel
- Price biodiesel: 85 €/100l vs. Price fossil diesel: 52 €/100l = 33 €/100l
- Costs of penalty avoidance = 157 € → Limit “biomethane quota“: **4.3 ct/kWh**

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Default values of EU-KOM

STANDARD-THG EMISSIONEN FÜR BIOKRAFTSTOFFE



¹ mit Methanbindung; ² Erdgas-KWK; ³ künftige Biokraftstoffoptionen — Basis: geschätzte Standardwerte nach 2009/28/EG

Current problems of biomethane

Methodological restrictions

- Missing default values
- Wrong calculation of the fertilization (100% mineral fertilizer)
- No credits for fertilizing-value of digestate
- No credits for avoided emissions of farm fertilizer storage
- No average GHG performance for multiple substrates

- Since 2017 conversion to GHG quota
 - → stimulation to calculate
 - → biofuels have improved

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RED II: calculating GHG reduction

- RED II probably sets new standard values for:
 - biomethane/biogas from manure,
 - biowaste and
 - silage maize
- Own calculations (but very complex !!)
- Allows mixture of substrates
- Credit for avoiding methane emissions from storage
- Credit for the use of fertilizer
- Allocation factor for emissions to electricity and heat CHP utilization

Impact on revenues?

Typical and default values – biomethane - mixtures of manure and maize: GHG emissions with shares given on a fresh mass basis

Biomethane production system	Technological options	Typical	Default
		(g CO ₂ eq/MJ)	(g CO ₂ eq/MJ)
Manure – Maize 80% - 20 %	Open digestate, no-off gas combustion	32	57
	Open digestate, off gas combustion	17	36
	Close digestate, no-off gas combustion	-1	9
	Close digestate, off gas combustion	-16	-12

Source: EU KOM 2016

- **New default values:**
 - 100% manure: -100 g CO₂/MJ
 - 80% manure + 20% maize: -12 g CO₂/MJ
- **Value of GHG quota:**
 - 100% manure: 11.6 ct/kWh!!
 - 80% manure + 20% maize: 6.0 ct/kWh!

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Conclusion

- GHG quota allows revenues through
 - GHG certificates
 - Heating value
 - Current value of biomethane in transport 5.8 – 5.9 ct/kWh
 - Current value for biomethane quota at approx. 4 ct / kWh
 - Calculation methodology not adapted to biomethane in practice
 - Very complex process
-
- RED II can lead to simplicity and better conditions, furthermore it could assign a high value to manure
- ➔ Marketing of manure in the fuel sector may be interesting and a perspective in the electricity / heat sector**

Thank you for your attention!



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