

# 26<sup>th</sup> World Gas Conference

1 – 5 June 2015, Paris, France



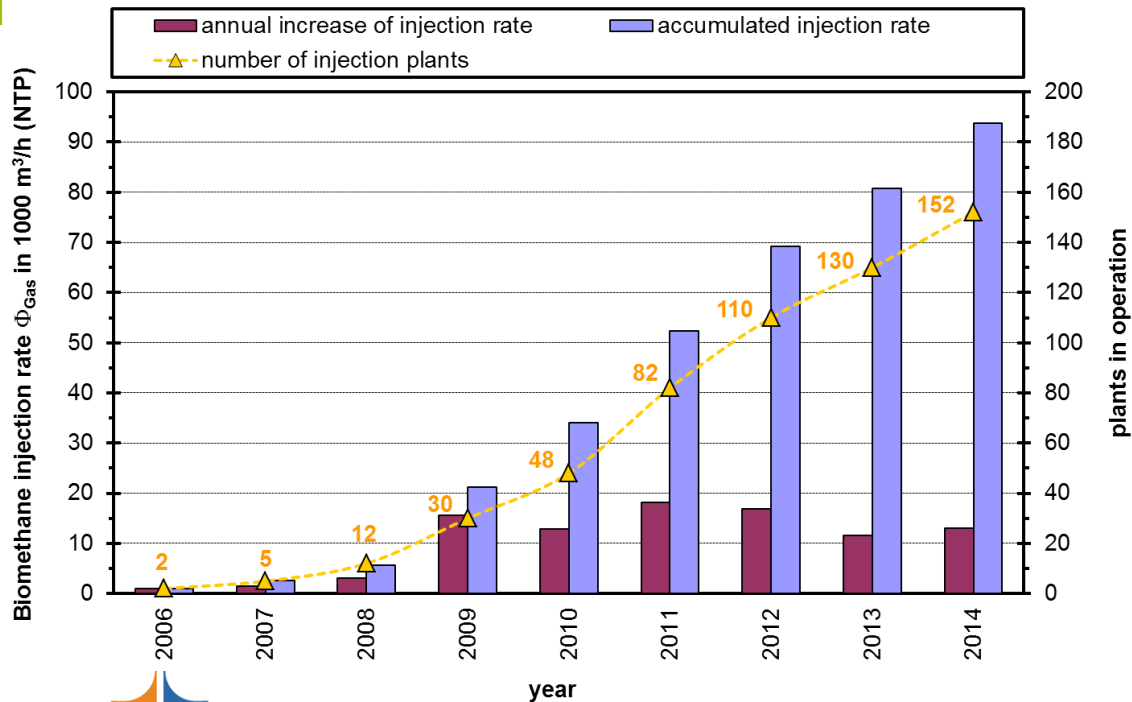
Biomethane in Germany – Lessons learned  
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# Content

1. Biomethane in Germany
2. Relevant issues and recommendations
3. Outlook

# Current situation in Germany



- Ca. 8,000 biogas plants exist in Germany
- About 0.8 mio. m³/a biomethane is injected
- Average injection rate per plant: 412 m³/h
- Biomethane is state-of-the-art technology

# Political and societal situation in Germany (I)

- ***Renewable Energy Sources Act (EEG)*** regulates grants for renewable energy technologies
  - To be eligible, biogas has to be used for power generation
  - Strongly increasing electricity costs has lead to political intervention
  - EEG amendment 08/2014 is discouraging for new biogas projects
  - Yield targets were dismissed (6/10 bn. m<sup>3</sup> biomethane in 2020/2030)
- Policy is in favour of biomethane **in the mobility sector**, but CNG utilization is still low (about 100,000 cars)
- Little incentives for biomethane in the **heating market**

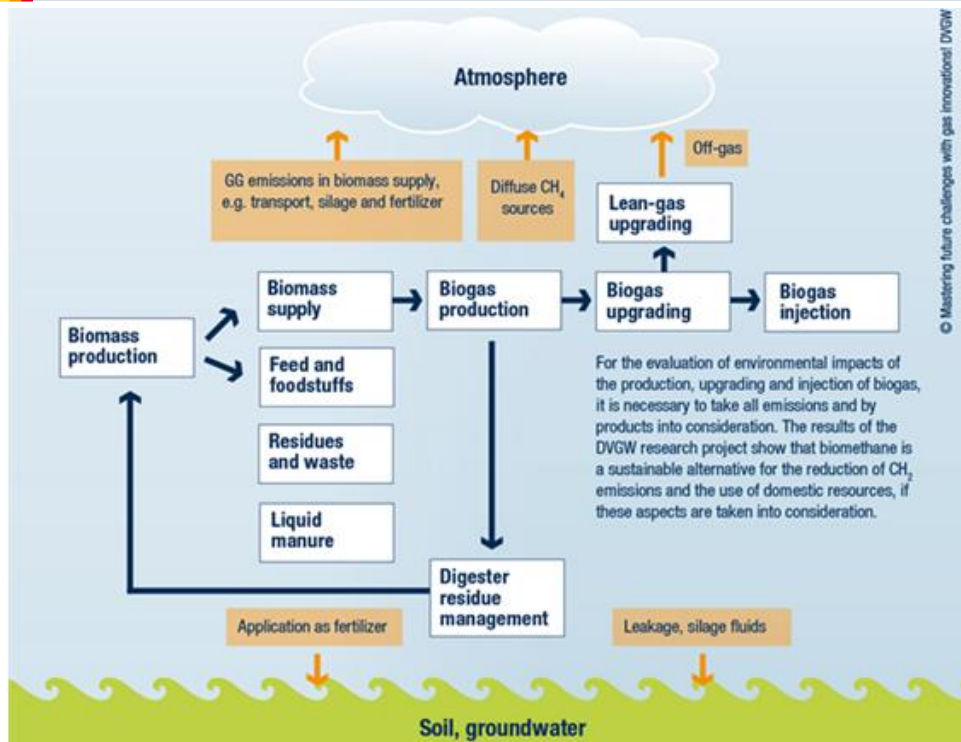
# Political and societal situation in Germany (II)

- Shrinking **public acceptance** for biogas
  - Mono-cropping of corn in combination with overfertilization caused by livestock farming in some regions
  - Food vs. fuel debate
  - Odour nuisance from biogas plants
  - Relative high accident and damage rates for biogas plants

# Relevant issues

- Sustainability and environmental aspects
- Biomethane production and injection costs
- Innovation in biomethane technologies
- Public acceptance and policy recommendation

# Environmental issues and solutions

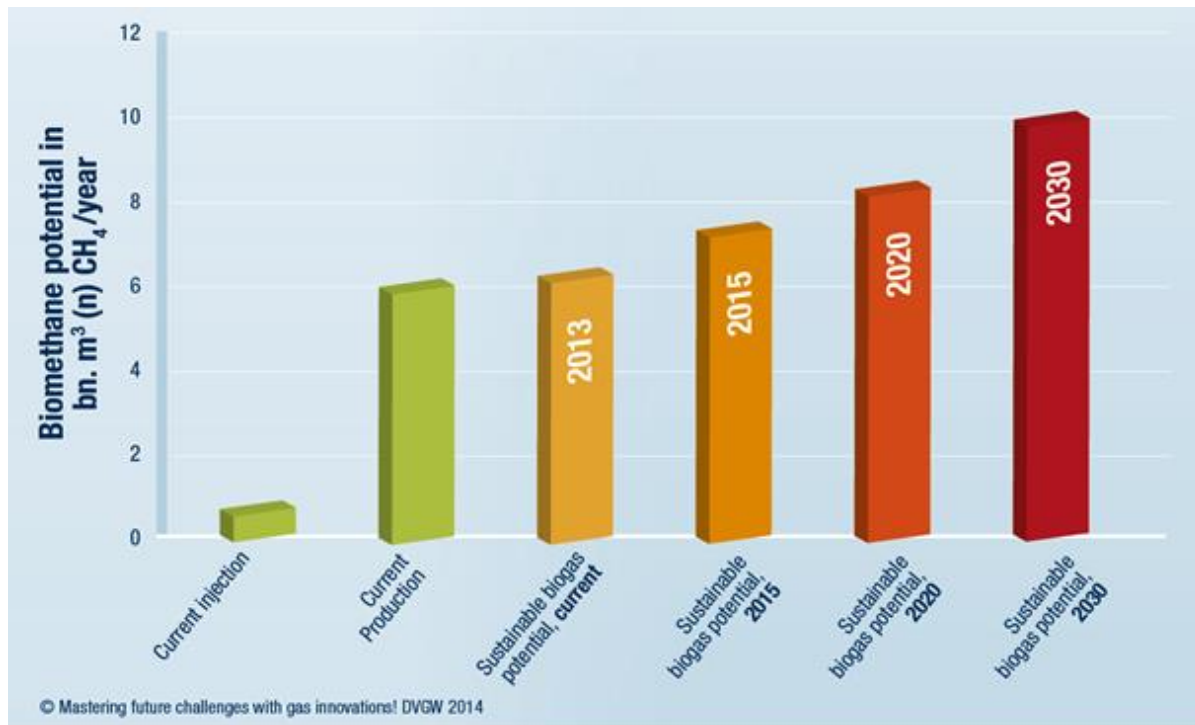


- Limits for methane emissions were developed
- Rules for digestate management were developed
- Interference with agricultural and livestock industry has to be considered
  - Competition in land between energy and cultivation crops
  - Overfertilization

# Sustainable biomethane potential in Germany

## DVGW study regarding biomethane potential in Germany with respect to:

- Substrate potential
- Water protection areas
- Gas grid availability





# Biomethane production and injection costs

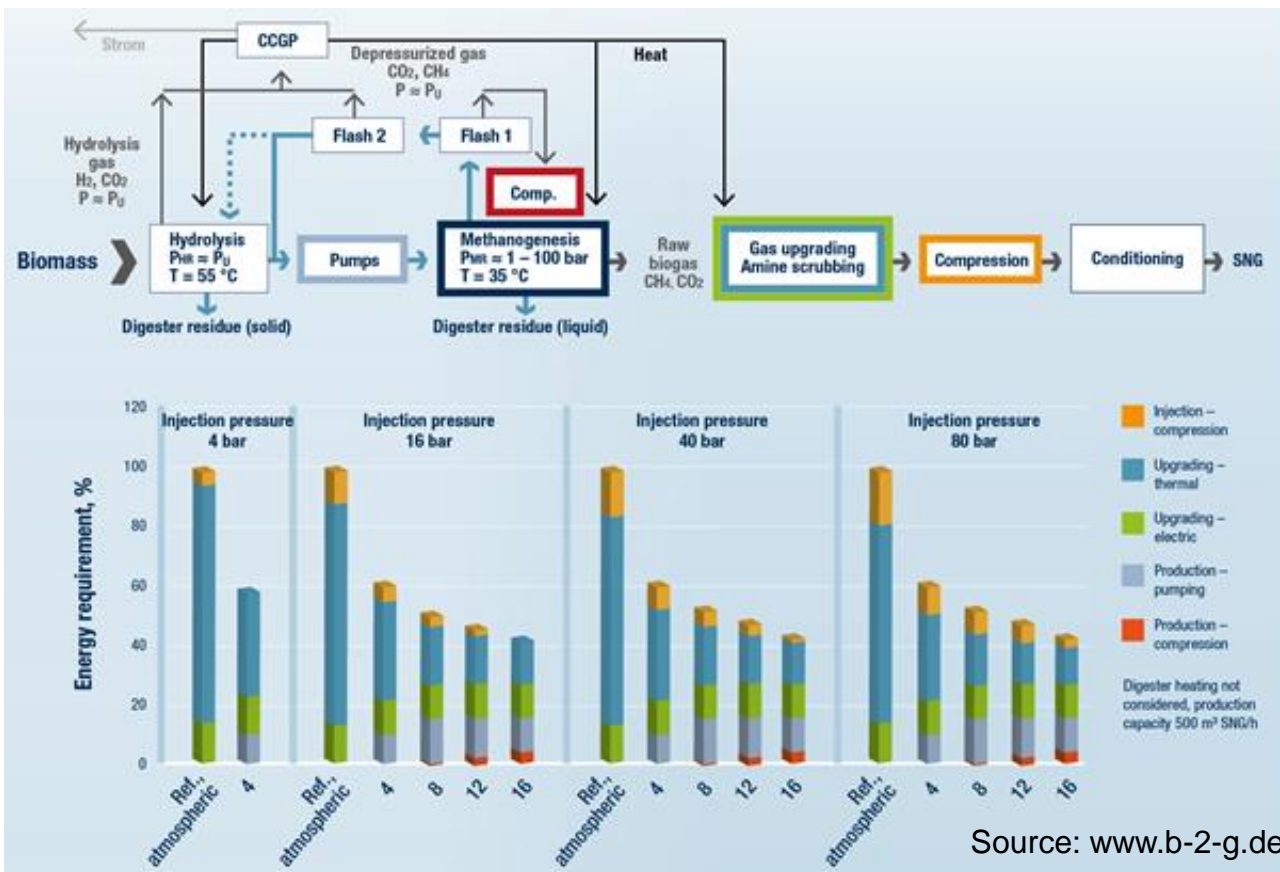
## Biogas Monitoring Report 2014 of BNetzA:

- average production costs: 7.5 € Ct/kWh (2.5 – 11.2 Ct/kWh)
- Average upgrading costs: 1.7 € Ct/kWh (1.0 – 3.4 Ct/kWh)
- average biomethane price: 6.4 € Ct/kWh
- transferable cost for grid operators: 131 Mio. € (0.6 €/kWh/h/a)

## Recommendations for cost savings:

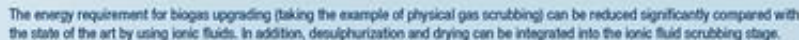
- design of process chain has to be optimised holistically
- Gas grid injection has to be decided considering economic aspects
- intelligent solutions for gas quality tracking/billing are preferable

# Innovation in biomethane technologies (I)



## Innovative biomethane production technology:

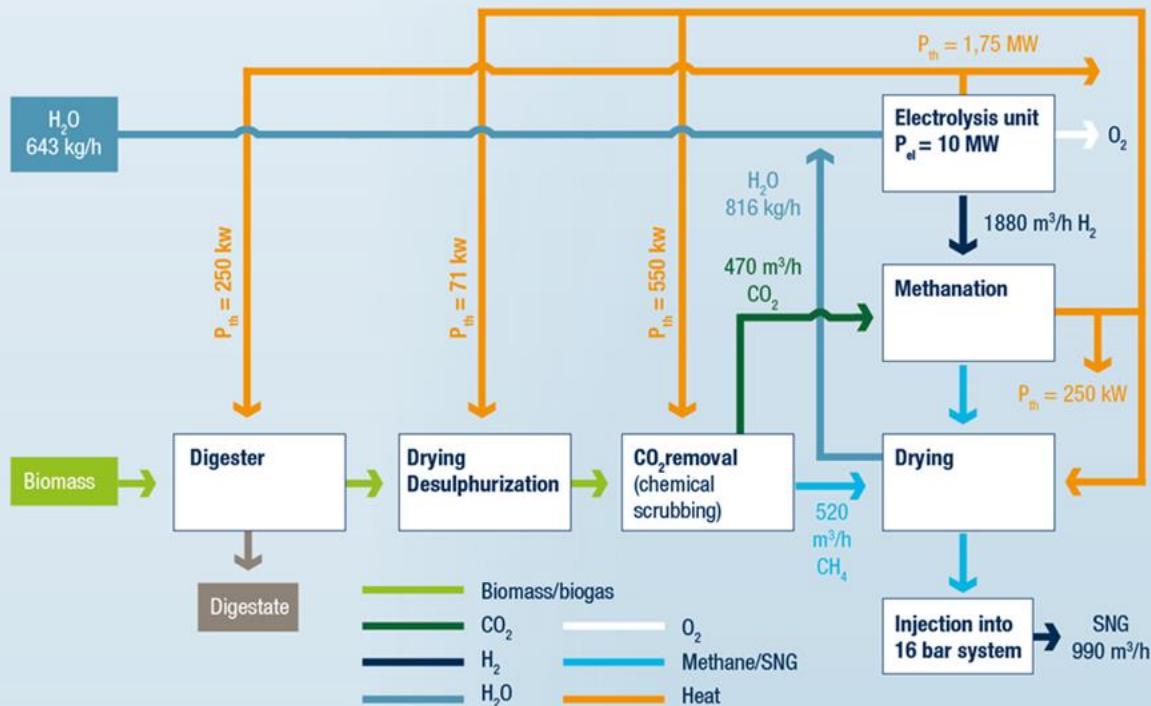
- Two-stage pressurized fermentation process
- Biogas is provided with elevated pressure
- In situ CO<sub>2</sub> removal enables CH<sub>4</sub> contents of above 80 vol.-%
- Relevant energy savings (40 - 60 %) are possible compare to state of the art



- Integrated scrubber system with ionic liquids
- Combined CO<sub>2</sub>, H<sub>2</sub>S and H<sub>2</sub>O removal in one stage
- Energy and cost savings in a range of 20 - 25 % are possible



# Innovation in biomethane technologies (III)



If the heat generated in the process is used, high efficiencies of up to 80% can be reached.  
The oxygen produced by electrolysis can also be utilized.

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## Coupling of biomethane with PtG:

- CO<sub>2</sub> could be used completely
- High overall energy efficiency possible (> 80 %)
- Considerable potential in Europe:
  - 14,000 biogas plants
  - In total 30 GW power input potential
  - Ca. 90 TWh electricity could be converted

# Public acceptance and policy recommendation

- Relevant players have to cooperate strongly
  - Farmers, substrate suppliers
  - Biogas producers
  - Grid operators
  - Regulator
  - Manufacturers, technology suppliers
  - Water suppliers, ecology groups etc.
- Policy roadmap has to be developed in cooperation with all stakeholders
- Public communication and information is mandatory

# Outlook

- Renewable gases are essential for future gas supply
- Biomethane and PtG have a symbiotic relationship
- The public and polity have to be convinced
- Stable legal and regulative framework is necessary
- Cost limiting is very important
- Technologies have to be developed further
- Relevant players have to cooperate strongly
- Mobility sector could be the main consumer of renewable gases