

Greening of Energy

Gas and Renewable Energy Sources

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Venue: Strategic Panel 8



Patron



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Greening of Energy: CONTENT



- **Future Research**
 - Biogas, Biomethane, SNG: Enlargement of Feedstock
 - Power to Gas: From Idea to Commercial Solution
 - Ambient Heat and Gas Heat Pumps, Solar and Gas Systems: Higher Efficiency

- **How Natural Gas & Renewables Link us to the Future**

Natural Gas & Renewables Research: BIOMETHANE

BIOMETHANE: Enlarging Feedstock Sources

- **Residual biomass:**

- No seeding, cropping needed / very high GHG emission reduction possible



- **Woody biomass:**

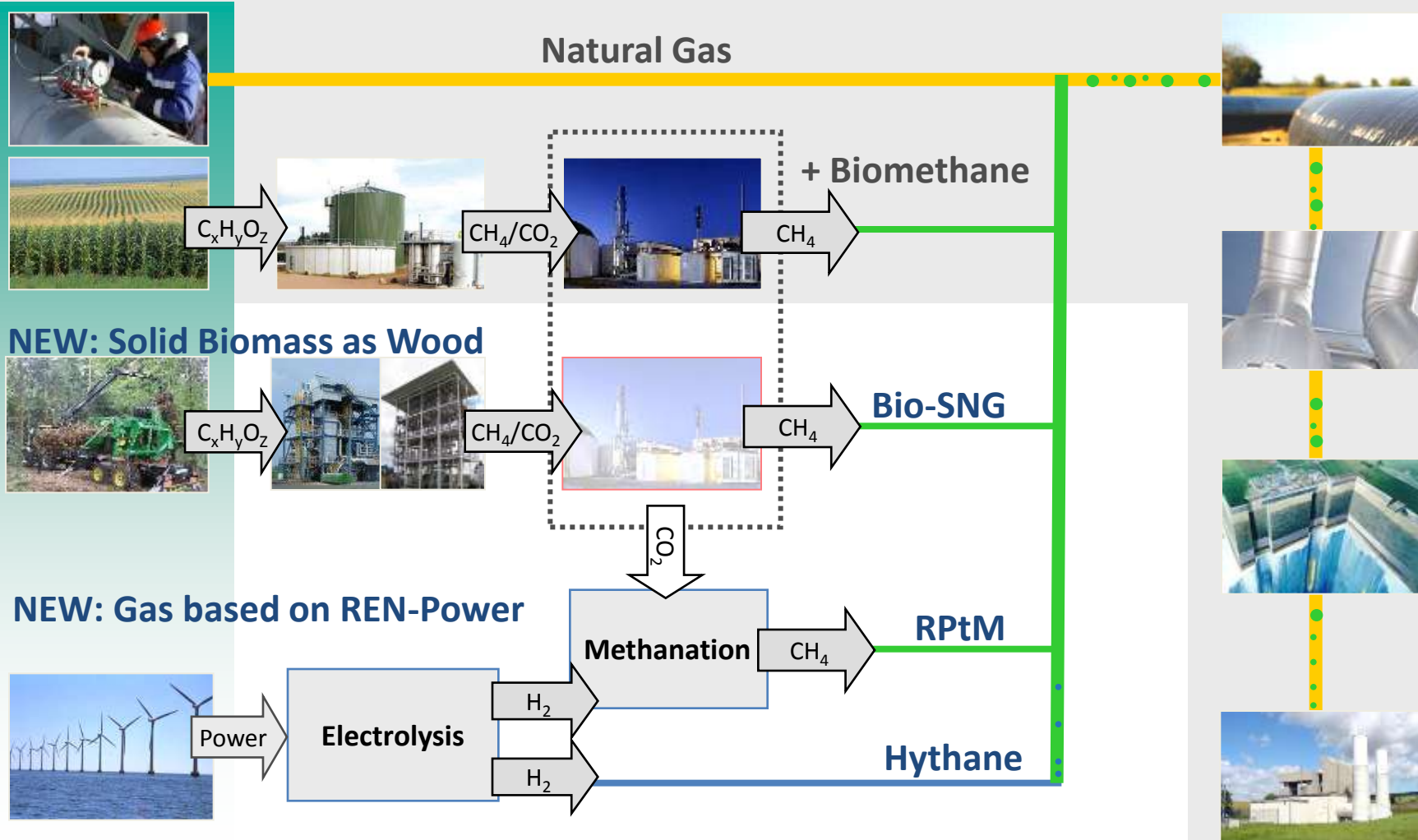
- Unused residual wood or straw for SNG production / Conversion via thermo-chemical gasification



Natural Gas & Renewables Research: BIOMETHANE

BIOMETHANE: Enlarging Feedstock Sources


New Energy Carriers Reduce CO₂ Emissions



Natural Gas & Renewables Research: POWER TO GAS



POWER TO GAS: From Idea to Commercial Solution



What do we need?

H₂ Generation and Grid Integration:
(see German Demo Plant Falkenhagen)

- + Improvement of Electrolysis Performance
- + Evaluation of Hydrogen Tolerance
- + Test and Verification of Methanation
- + Test of H₂ Underground Storage

+ Business Conditions

+ New Business Models

Natural Gas & Renewables Research: GAS HEAT PUMPS & SOLAR/GAS SYSTEMS

Improvement of Gas Heat Pumps

- + Reduction of size of application
- + Optimization of operation
(lower noise emission, wider range of modulation)
- + Increased share of renewable energy
- + Costs reduction



Source: Buderus



Source: Vaillant

Improvement of Storages and Entire System

- + Compact storages
- + Higher efficiencies
- + Better integration
into smart home technology



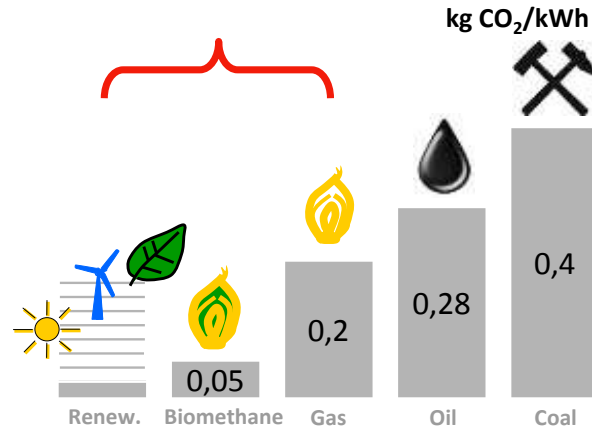
Source: Viessmann

Facts & Figures*	
Condensing boilers in place:	~ 3 mill
... many in combination with solar panels	
Gas heat pumps in market since 2009	
... many in combination with solar panels	
Rise in efficiency obtained:	~ 30%

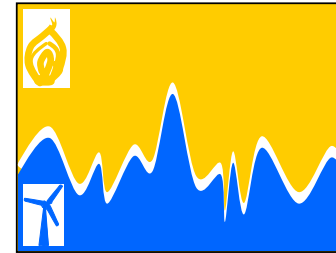
* (German perspective)

Natural Gas & Renewables: Ideal Partners

Team with lowest emissions

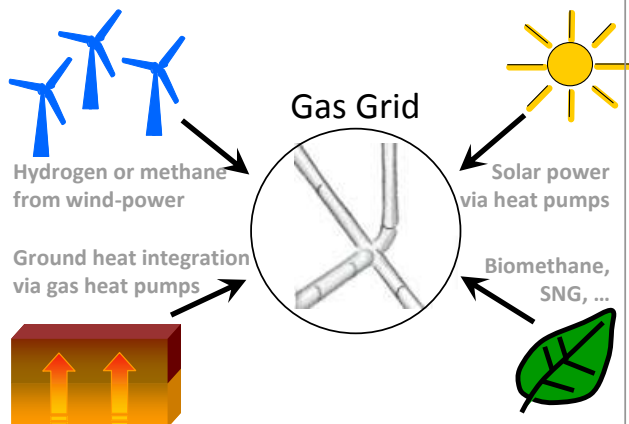


Fluctuation meets flexibility



Intermitting Renewables
+ Flexible Gas
= Stable Supply

Gas integrates renewables



Gas renews itself



- Biomethane (from maize, silage)
- SNG (wood, straw)
- Methane (from waste via algae)
- Hythane (H₂ and CH₄)
- Syn. Methane (4H₂ + CO₂ → CH₄ + O₂)

Greening of Energy: Gas and Renewables Energy Sources link us to the Future



Thanks for your attention, Gerald Linke, E.ON Ruhrgas AG