The Viessmann Group

The Viessmann Group

Family business with head office in Allendorf (Eder)

1917 Founded

11,600 Employees

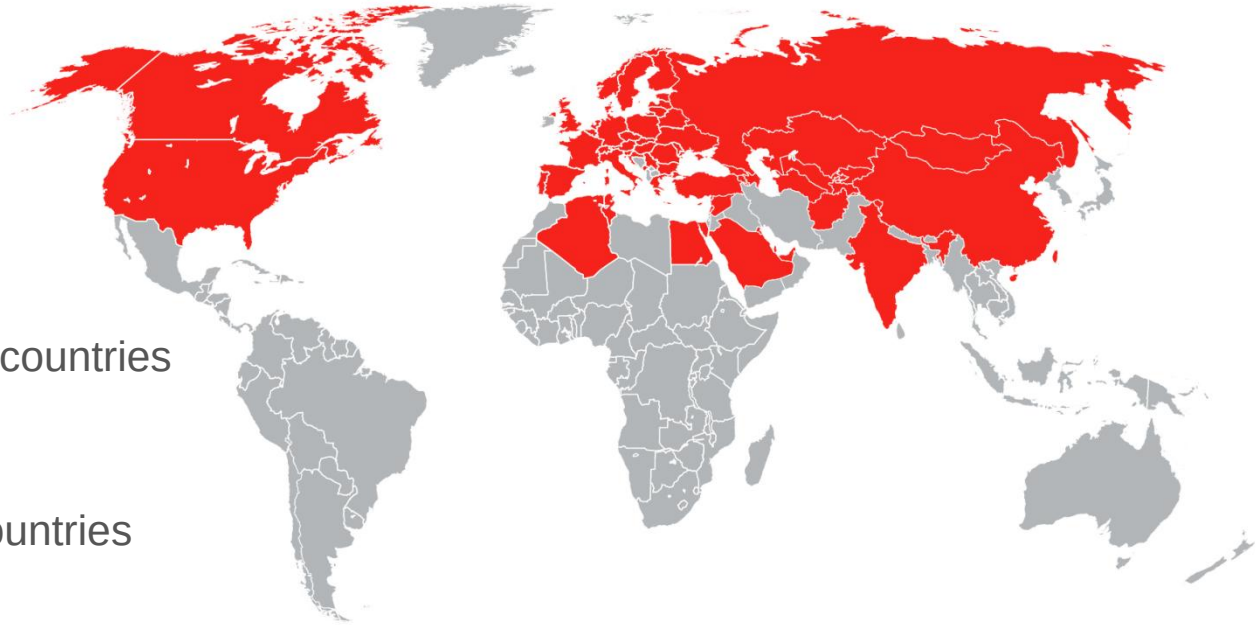
2.2 Turnover in €/billion

22 Manufacturing sites in 11 countries

49 Sales companies,
35 sales partners in 58 countries
and sales activities in
a total of 74 countries

120 Sales offices worldwide

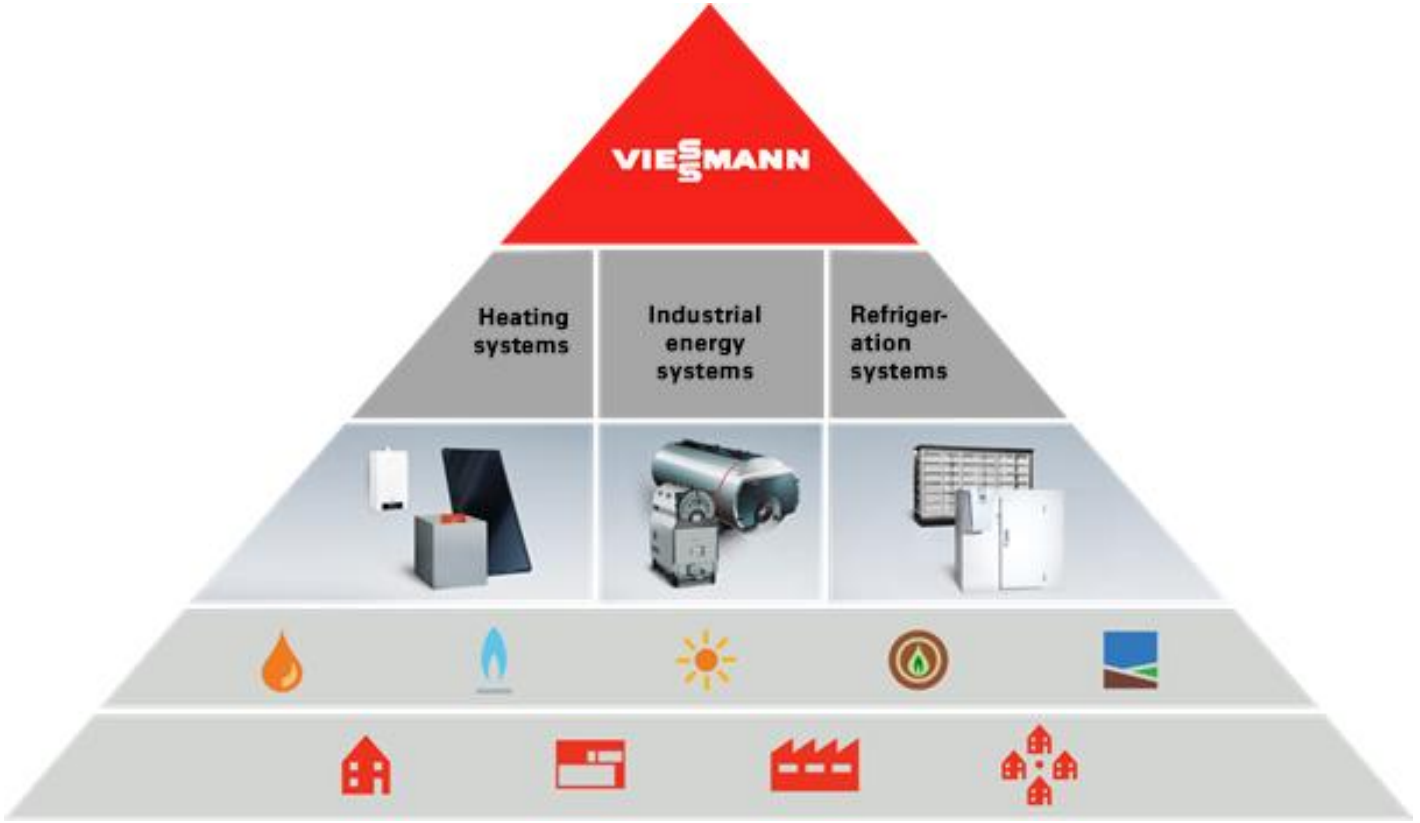
56 Export share in percent



Countries with their own sales companies or partners

Comprehensive range

Products and system solutions for all application areas



- Three divisions: Heating systems, Industrial energy systems, Refrigeration systems
- Comprehensive ranges for specific target groups, for the application areas of residential buildings, commerce, industry and local authorities

MicrobEnergy GmbH

A member of the Viessmann Group

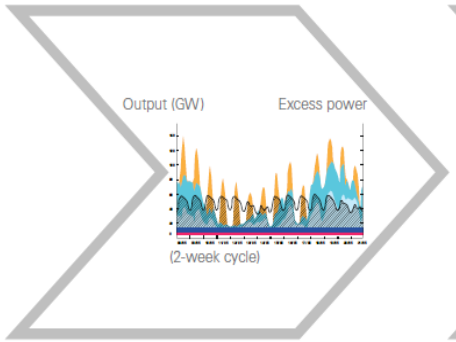
- Established: 2012
- Domicile: Schwandorf
- Services: R&D
- Employees: 26

- Experience, expertise and consolidated knowledge in Power-to-Gas-Technology, Biogas-Technology and Microbiology
- Development, production and distribution of microbiological and procedural goods
- Development of Business Segments and Projects in regards of Power-to-Gas

Power to Gas

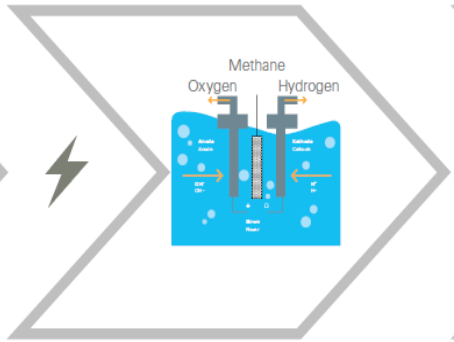
How Power to Gas works

Excess power



- Geothermal
- Hydroelectric
- Photovoltaics
- Offshore wind
- Onshore wind
- Load

Electrolysis

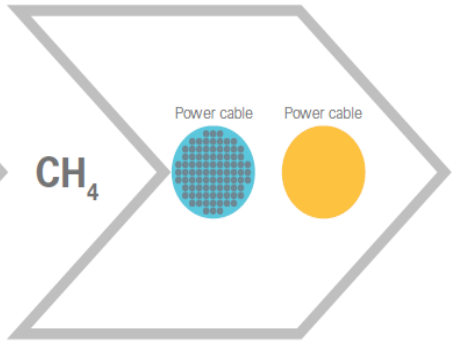


Hydrogen is produced from excess power.

Methanisation

Microorganisms and CO_2 act on the hydrogen, converting it into synthetic methane.

Power / gas grid



Methane is injected directly into the natural gas grid.

Biological Methanation

From laboratory to turnkey solutions

Laboratory	Technical Scale	Demonstrator	Product
			
	2,5 Nm³ H_2/h 12,5 kW Electrolysis	60 Nm³ H_2/h 300 kW Electrolysis	>400 Nm³ H_2/h >2000 kW Electrolysis
Fundamental Research	Testing Phase	Upscaling and Demonstration	Project development
2012	2013	2015	2016

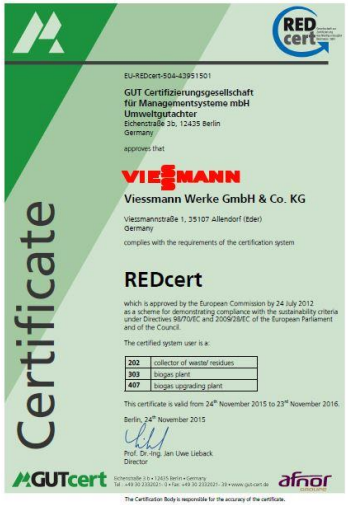
Power-to-Gas Demonstrator

Worldwide first demonstrator of its kind

BioPower2Gas

- Performance (MER): >80
- Operation time: >5500 h
- Sold energy so far: >350 MWh
- Life Cycle Assesment completed
- Control Energy Market since January 2016

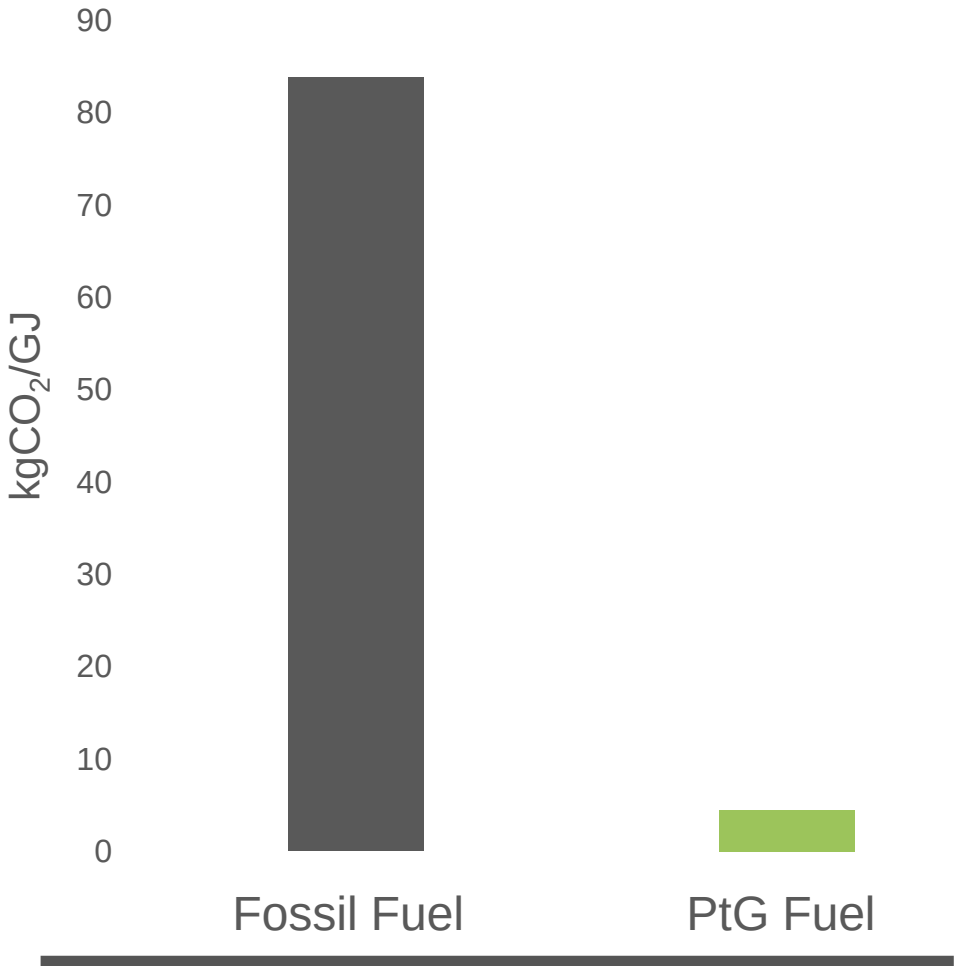
- Successful certification by TÜV Süd
- Successful certification by REDcert (as biogas upgrading plant)



Emissions

Low Emissions – Big Potential

- Standard value fossil fuel:
  83,8 kg CO_2/GJ
- Approved value PtG fuel:
  4,45 kg CO_2/GJ
- Greenhouse gas reduction potential:
  94,7%



- Calculation based on the Demonstrator. 3000 hours of operating a year. Electricity from hydropower. 70% usage of surplus heat.

Sector Coupling

Potential markets for PtG-Methane

Heat Market

Modell **proWindgas**

Source: Greenpeace Energy

Biofuel Market

Source: Erdgas Mobil

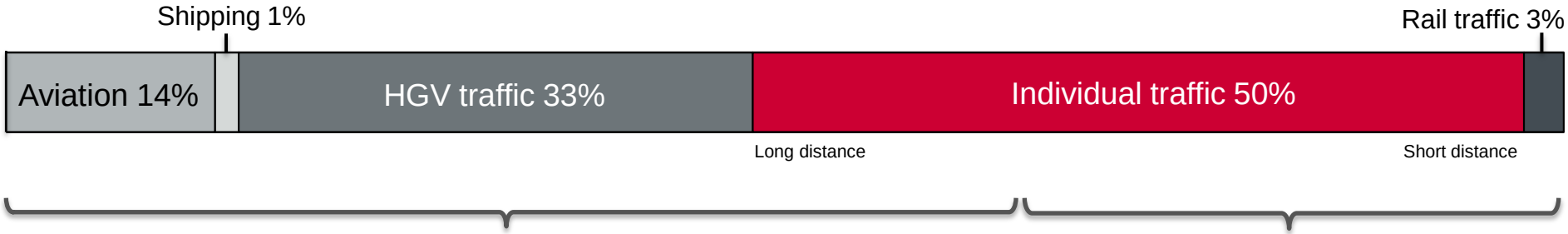
Fleet Emissions

Source: Audi

Mobility Sector

Potential for PtG-Fuel

- ~5.000 TWh Energy demand in the mobility sector in the EU in 2020[1]



Fluid and gaseous renewable fuels based on electricity

Electricity

Source: Audi AG

Source: 1 PRIMES, European Commission, DG Energy and Transport: European Energy and Transport Trends to 2030

Challenges

Several challenges to be solved to couple the sectors

- CO_2-Deduction

Challenge:

- Looking at the Tank-to-Wheel-Emissions, the production of the fuel is not considered
- Today there is no difference between fossil gas and PtG-Methane, even if it is produced with renewable electricity

Approach:

→ There should be an equal ranking with other alternative driving concepts like E-Mobility as Zero-Emission

→ Otherwise there should be an accuarate Cradle-to-Cradle Life Cycle Assesment

- PtG-Methane as biofuel

Challenge:

- Today PtG-Methane is not accepted to comply with the biofuel specifications
- Looking at Certification schemes there is a need to calculate a CO_2-footprint for the CO_2 used within the methanation process

Approach:

→ PtG-Methane should be accepted as biofuel with its real Greenhousegas-Reduction Potential

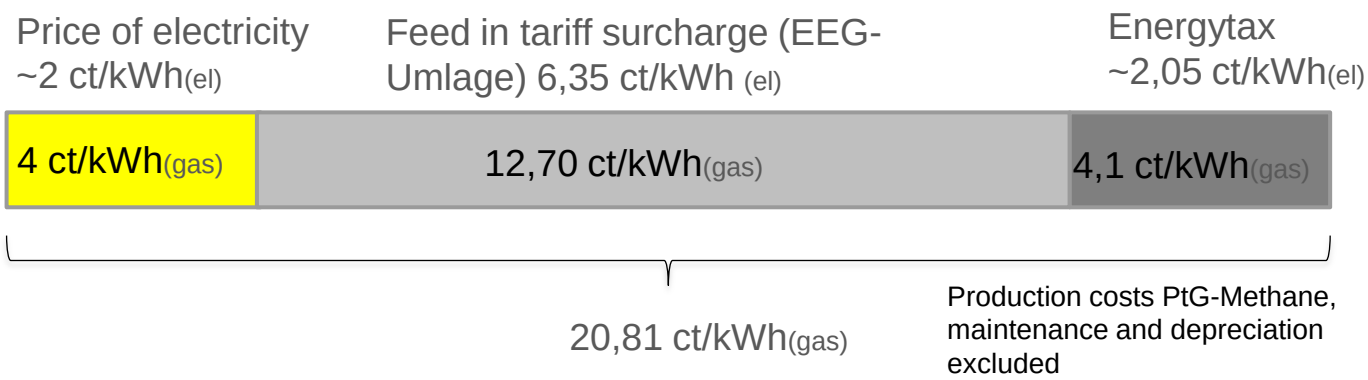
→ Any used CO_2 for renewable PtG-Methane should be defined as waste by certification shemes

Challenges

Several challenges to enable competitiveness of PtG

- Fees & Taxes

  The system efficiency is slightly higher than 50% (without using the surplus heat). It means that round about 2 kWh of electricity are needed to produce one kWh of gas (methane). With regard to production costs in Germany a rough calculation is as follows.



- Challenge:

  PtG-Methane is not competitive due to several fees and taxes

- Approach:
  - → There should be a tax exemption respectively an exemption of the feed in tariff surcharge.
  - → In Germany PtG is classified as an end user if the energy is transformed from electricity to gas, what means that the feed in tariff surcharge has to be paid. There should be an exemption of this fee.
  - → There should be an incentive to use the electricity based renewable PtG-Methane in the heat and mobility sector regarding the necessary CO_2 reduction.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climate of innovation