



HYDROGEN IN THE PUBLIC GAS GRID: A CHALLENGE FOR CNG TRANSPORT

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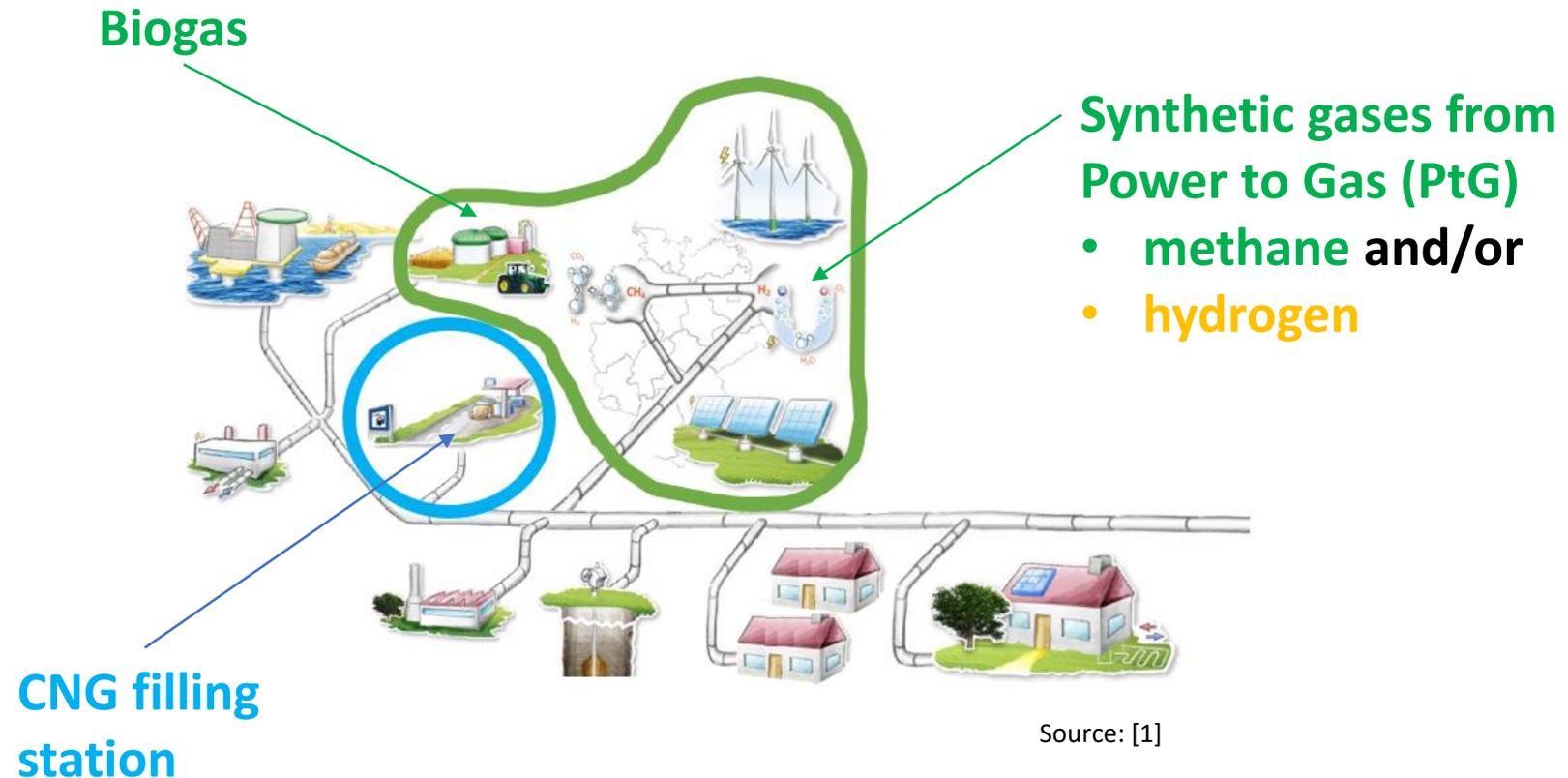


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Gas in the energy transition

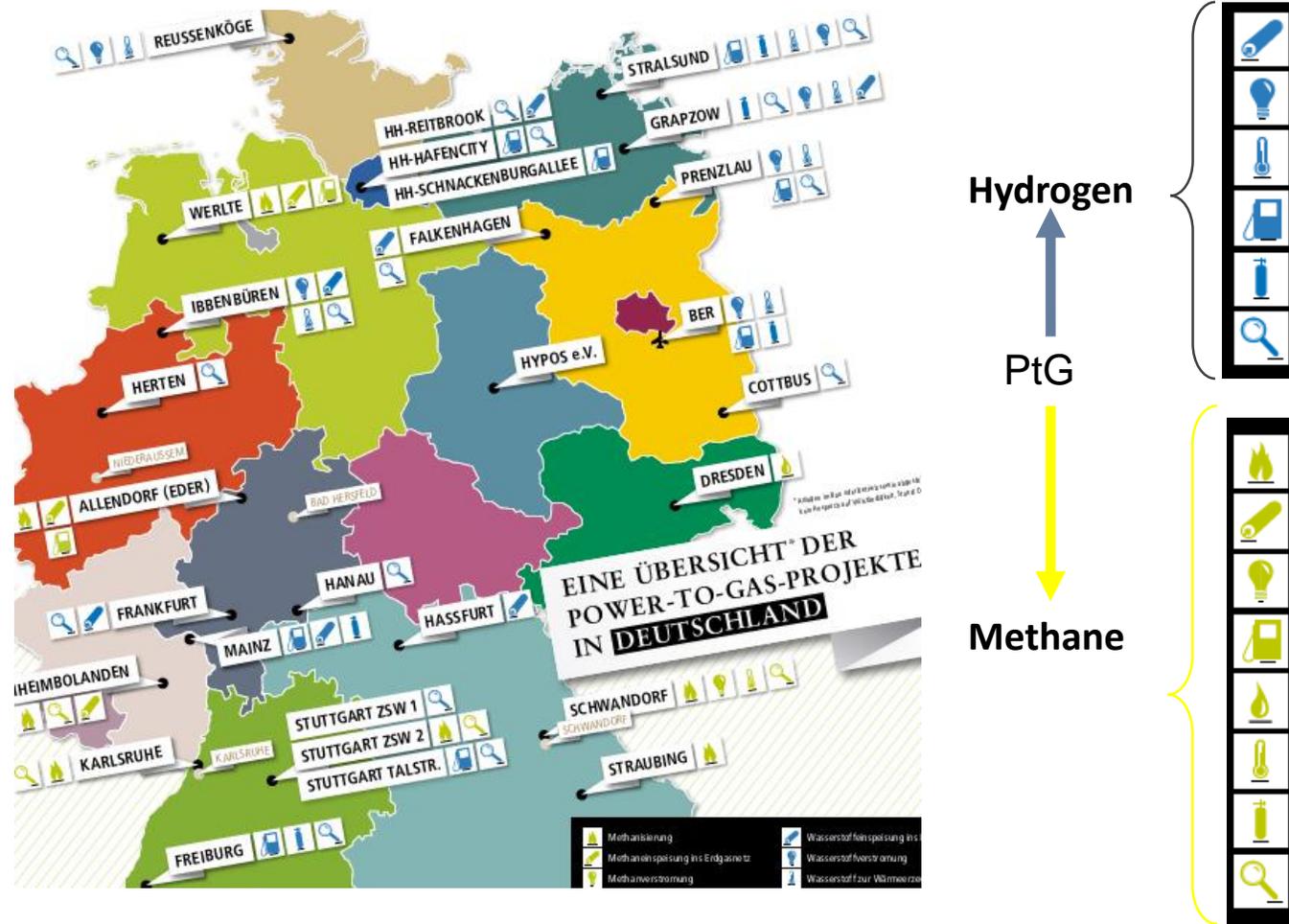
Feeding CO₂-neutral gases into the natural gas grid is essential to achieve the COP 21 aim to reduce fossil CO₂ emissions



Source: [1]

Power to Gas in Germany

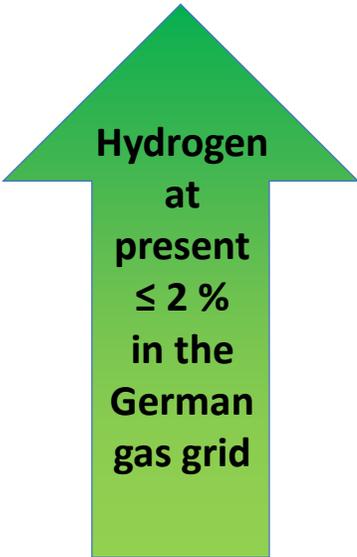
- Hydrogen from PtG is a smart possibility for greening natural gas.



Source: [2]

Forecast: Hydrogen in the future German public gas grid

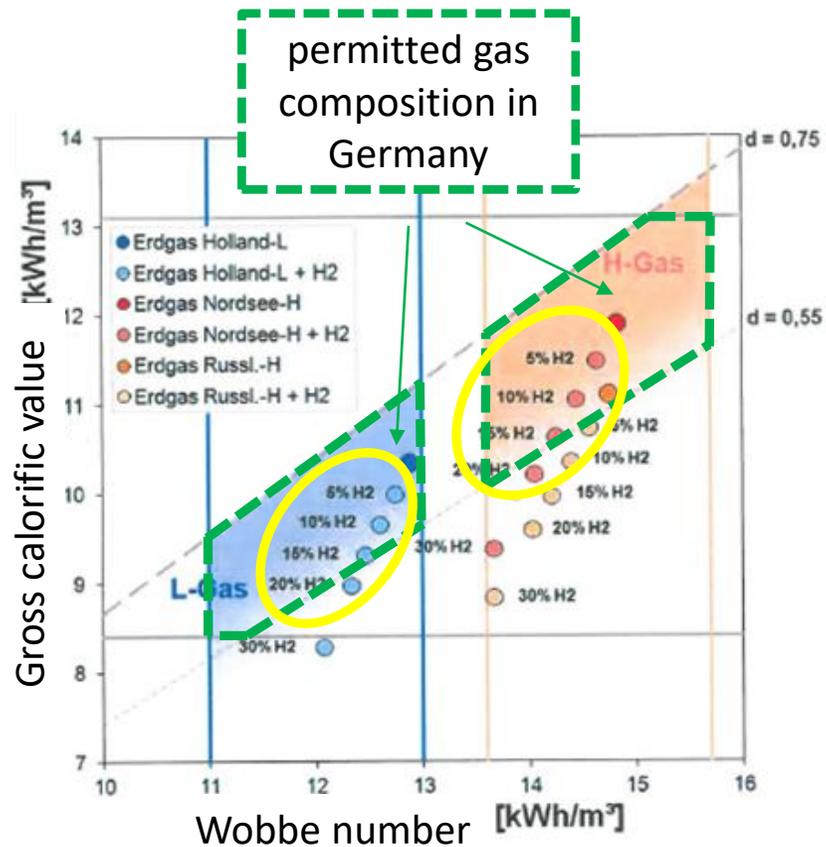
> 10% ?



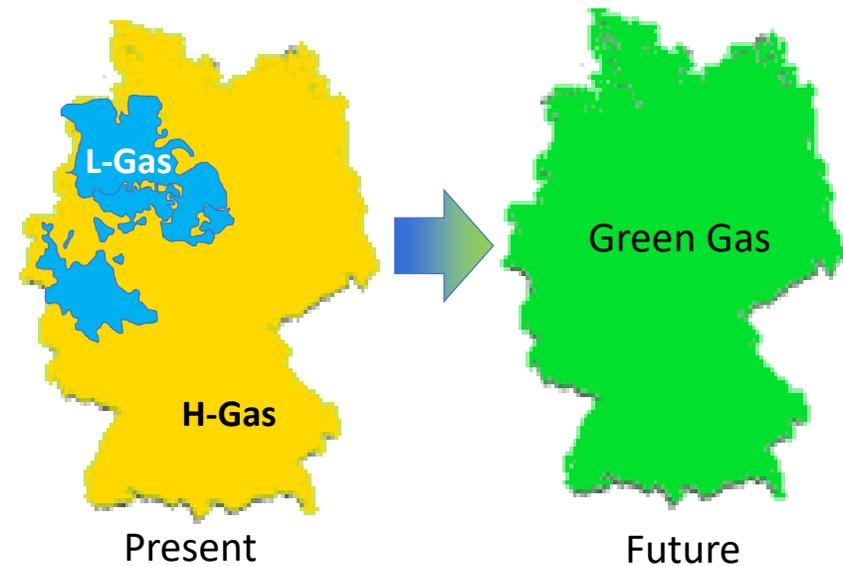
Hydrogen
at
present
 $\leq 2\%$
in the
German
gas grid

Attempts to green German gas

- At present the Code of Practice DVGW G 262 (A): Use of Regenerative Gases in the Public Gas Infrastructure, allows a maximum hydrogen concentration of only **10 %** in Germany.



Source: [2]



German Gas Grid

Current status of CNG passenger cars in Germany

- In Germany there are \approx 80,300 CNG passenger cars, most of them equipped with steel tanks (type 1).
- Average age of all German vehicles: 9.2 years.

Source: [3]

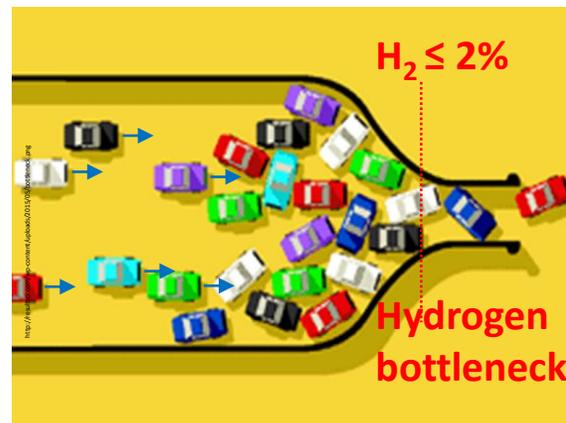
UN ECE R 110 CNG vehicles

Regulation No 110 of the Economic Commission for Europe of the United Nations (UN/ECE) —
Uniform provisions concerning the approval of

II. vehicles with regard to the installation of specific components of an approved type for the use
of compressed natural gas (CNG) in their propulsion system

4.5. Gas composition

Hydrogen shall be limited to 2 per cent by volume when cylinders are manufactured from a steel with an ultimate tensile strength exceeding 950 MPa;



Source: [5]

CNG tanks on the market

Type 1 CNG Tank



- Heavy, All Steel Construction

Type 2 CNG Tank



- Steel Construction
- Hoop-Wrapped with Composite
- 25% Lighter Than Type 1

Type 3 CNG Tank



- Aluminum Liner, Composite Shell
- Significant Weight Savings

Type 4 CNG Tank



- Polyethylene Liner, Composite Shell
- Significant Weight Savings



Source: [4]

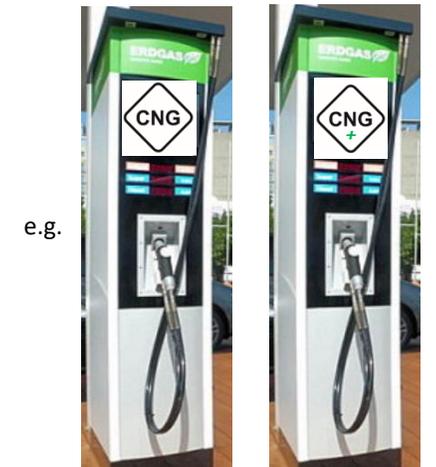
The way forward – measures for vehicles

- The CNG fleet today needs improvement for the hydrogen future
 - Switch to type 4 tanks
 - Develop a durable hydrogen sensor for motors to ensure correct engine timing

The way forward – measures for filling stations

- Equip filling stations for a hydrogen concentration above 2 per cent
 - Introduce new label (CNG +)
 - Provide two dispensers: $H_2 \leq 2\%$ and $H_2 > 2\%$
 - Adapt connectors to avoid misfilling
 - Replace steel tanks and other components of filling stations
- Local gas treatment at CNG filling stations as second option

2 dispensers

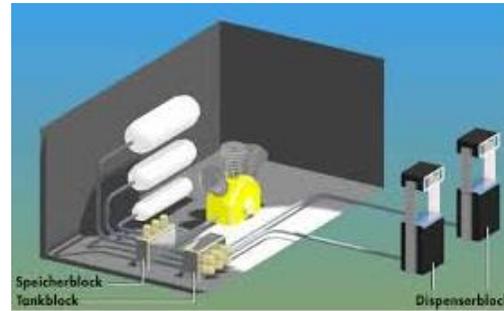


$H_2 \leq 2\%$ $H_2 > 2\%$

e.g.



Conclusion



mobile
future



Hydrogen > 2 % in Gas Grid

Thank you for your attention!

Literature

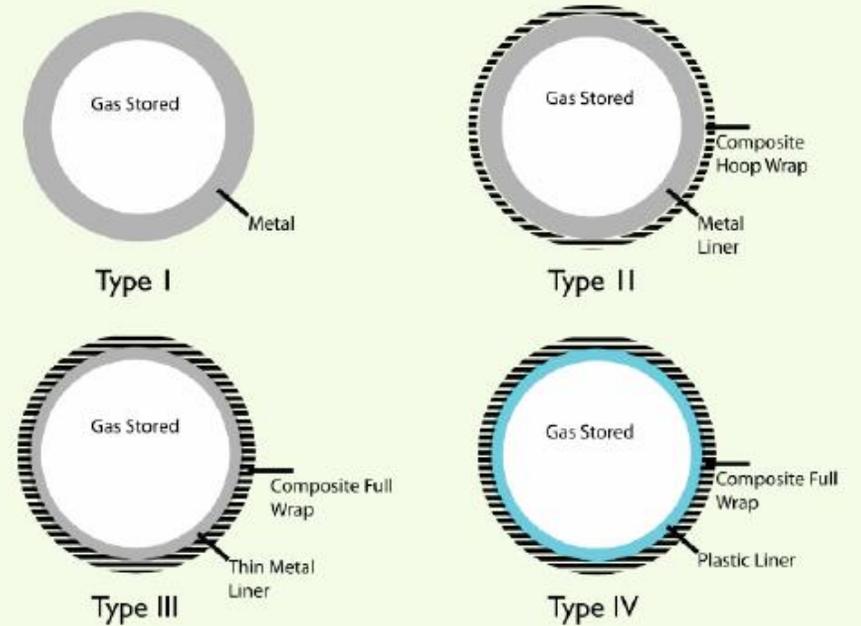
- [1] E.ON
- [2] German Association for Gas and Water (DVGW)
- [3] Kraftfahrtbundesamt: http://www.kba.de/DE/Statistik/Fahrzeuge/Bestand/bestand_node.html, January 1, 2016
- [4] <http://www.cngpitstop.com>
- [5] UN ECE R 110

Additional slide

CNG tanks on the market

<p>Type 1 CNG Tank</p>  <ul style="list-style-type: none"> • Heavy, All Steel Construction 	<p>Type 2 CNG Tank</p>  <ul style="list-style-type: none"> • Steel Construction • Hoop-Wrapped with Composite • 25% Lighter than Type 1
<p>Type 3 CNG Tank</p>  <ul style="list-style-type: none"> • Aluminum Liner, Composite Shell • Significant Weight Savings 	<p>Type 4 CNG Tank</p>  <ul style="list-style-type: none"> • Polyethylene Liner, Composite Shell • Significant Weight Savings

<http://www.cngpitstop.com>



<http://www.gastocngutah.com>