










Decarbonising Buildings: the Role  
of Hydrogen

*Hydrogen Blending: Overview of  
Different Approaches*

31. March 2021 Eva Hennig

# THE THÜGA GROUP CONSTITUTES WITH NEARLY 100 COMPANIES THE LARGEST ALLIANCE OF MUNICIPAL UTILITIES SERVING REGIONS AND CITIES IN GERMANY

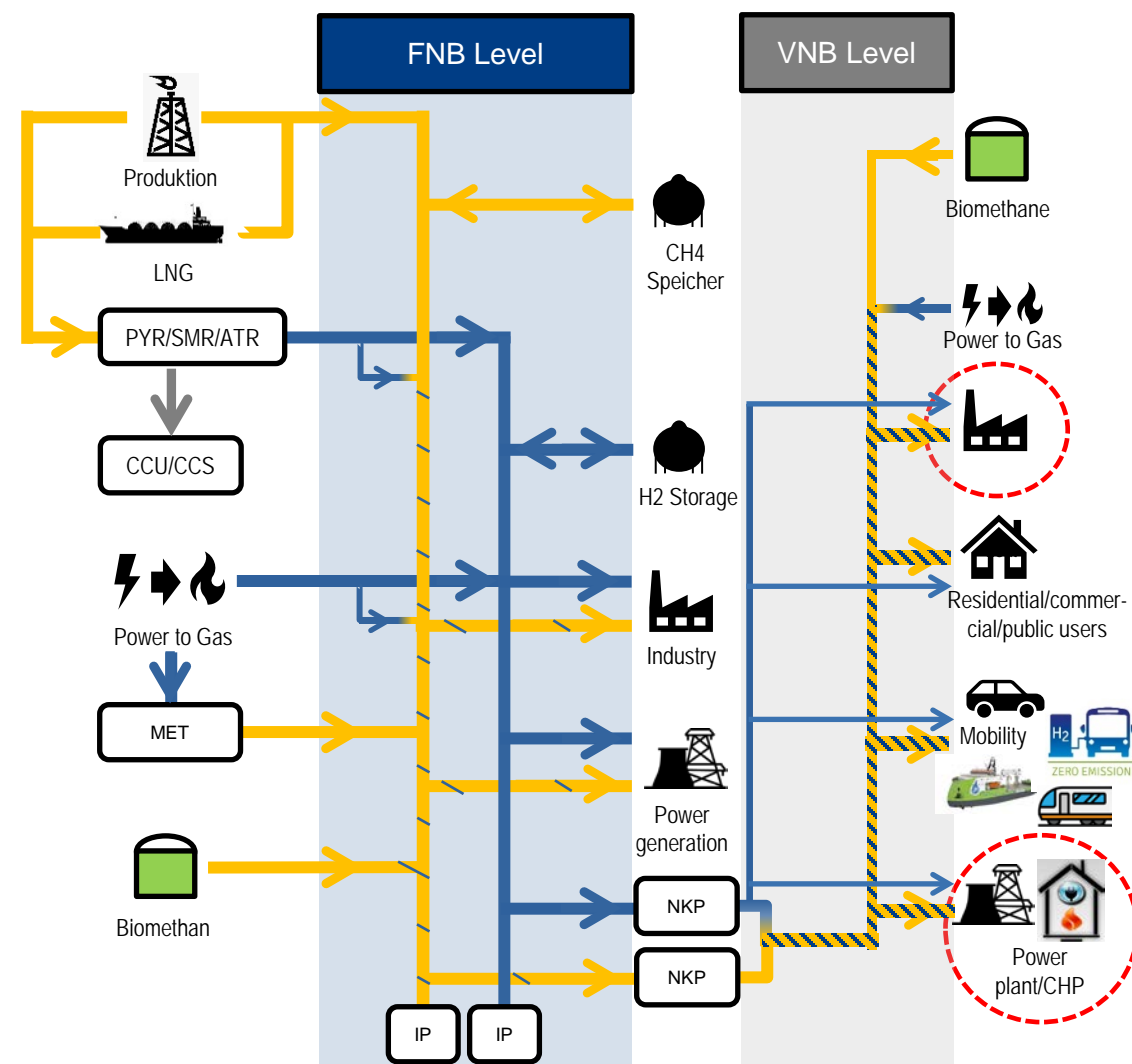
Turnover € 21.5 billion	Gas sales 118.8 billion kWh		Heating Sales 10.0 billion kWh
Investments € 1.3 billion		Electricity sale 57.5 billion kWh	Water sales 330.8 million m <sup>3</sup>
			Gas customers 2.0 million
			Electricity customers 4.4 million
Water customers 1.0 million			Heating customers 0.1 million
Gas grid 90.000 km	Electricity grid 170.000 km	Water grid 30.000 km	Employees 20.300



## Hydrogen projects:

- Sector integration is deeply rooted within Thüga companies due to the multi-utility concept. Very large interest of the cities and regions for local hydrogen projects.
- 2013 first PEM in Germany injecting H<sub>2</sub> into the grid of DSO of Frankfurt
- Since 2018 continuous injection into DSO grid in Freiburg
- „Reallabor“ Heide, injection of 20 % H<sub>2</sub> in the DSO grid as part of a complex project with refinery, TSO-grid, cement factory, underground storage, green kerosene for airport.
- „Reallabor“ North Germany with P2G from wind and usage of H<sub>2</sub> in all sectors
- 100 % grid and methane pyrolysis in concrete planning
- Buy Hydrogen-Ready: project with associations from DE, A, CH and many German DSO to classify new/existing components on their H<sub>2</sub>-Readiness
- Member of the EU Clean Hydrogen Alliance Roundtable Distribution&Transmission

# A MULTITUDE OF ACTORS ARE NEEDED TO KICK-START THE H2- MARKET, FROM PRODUCTION TO TRANSPORT TO DISTRIBUTION TO CONSUMPTION



PYR = Pyrolysis      ATR=Autothermal Reformer      MET = Methanisation  
 SMR = Steam Reformation      CCS = Carbon Capture & Storage      IP = Interconnection point  
 CCU = Carbon Capture & Usage      MET = Methanisation      NKP = TSO-DSO connection

## Potential developments on TSO level

- Utilization of existing grid infrastructure and appliances/ applications at the customer level
- Conversion of dedicated pipelines to 100 % H2, construction of additional H2-pipelines
- Low blending quota also possible into the CH4-grid, as long as not harm is done to customer appliances/applications
- Connection of customers an DSO to the **H2** and the **CH4 grid** according to the needs of the customers

## Potential developments on the DSO level

- Utilization of existing grid infrastructure and appliances/ applications at the customer level
- Individual solutions depending on the local situation possible, as the interconnection level between DSO is low
- Enable local injection of H2, biomethane, blends, SNG
- Build up pure H2 connections between local H2-production and/or H2-TSO.
- **Long-term decarbonization of all grids with renewable and decarbonized gases**

# „H2VorOrt“ - OUR PATH TO CLIMATE NEUTRALITY



The future of each distribution grid can be designed according to grid structure, the availability of renewable and decarbonized gasses and the development of the H<sub>2</sub> backbone of the German TSOs. 32 DSOs and the DVGW created this decarbonization strategy in the project „H2vorOrt“.

Hypothetical sectioned distribution grid



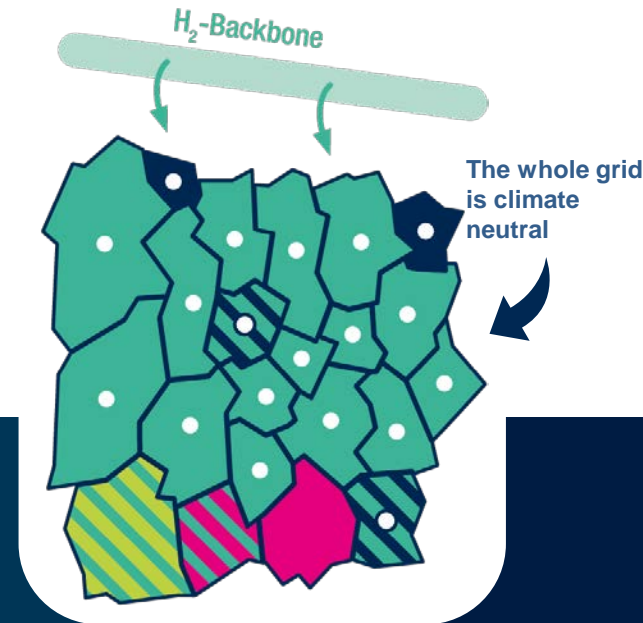
**I. Current State**  
today













**II. Initial Phase**  
starting now



**III. Expansion Phase**  
from 2030



**IV. Target State**  
at the latest by 2050

-  Distribution of Natural Gas
-  H<sub>2</sub>-ready
-  100% H<sub>2</sub> regionally produced
-  100% H<sub>2</sub> via backbone
-  Biomethane injection
-  20% H<sub>2</sub> regionally produced
-  20% H<sub>2</sub> via backbone
-  Biomethane with 20% H<sub>2</sub> via Backbone
-  100% RES-Methan (made with H<sub>2</sub> from Backbone and Bio-CO<sub>2</sub>)
-  80% RES-Methan (see above) and 20% H<sub>2</sub> via backbone

## THE DISCUSSION ON BLENDS SHOULD MAKE A CLEAR DISTINCTION BETWEEN TSO AND DSO AND EMBRACE THE FLEXIBILITY IT OFFERS. MYTHS IN BLENDS ARE PLENTIFUL.

Blends are too complicated, DSO can't deal with it.

Customers can't cope with blends, only 2 % of H2 can be injected because of CNG stations. And the grid can't take it anyway.

The heating sector is easy to decarbonise with other forms of energy and does not need blends.

Blends take away pure H2 for industrial processes and mobility.



The variety of DSO setup allows optimal solutions depending on grid topology, customers, availability of gases. Flexibility is key!



The Prime Mover group addresses all issues and works on mitigation measures. Many grids can take 100 % of H2 with few adaptations needed. And we learn every day from the projects in Europe and the rest of the world.



Heating sector is complicated with millions of building owners involved with their own private financing agenda. Blends offer a first step with the least interference.



Locally produced H2 does not travel to industrial clusters connected upstream. And blends stabilize the ramp up of large H2 production, the creation of the H2 Backbone. And enable the build-up of the H2 economy that needs many actors involved like producers, shippers, customers,.....

# THE 1400 EUROPEAN GAS DSO WORK CLOSELY TOGETHER ON THE MANY PARALLEL WORKSTREAMS. PRACTICAL PROJECTS AND LEGISLATION ARE IMPORTANT NOW.

## The new EU targets for 2030 are only achievable if we use all technologies – energy efficiency is not enough

- TSO backbone is key to build an **integrated H2 market**, but the conversion will require time. Gas DSO are able to bring renewable and decarbonised gases to local end consumers long before the back-bone is finished in the MS.
- In many member states large percentage of industrial and CHP gas-consumption is connected to the DSO grids.
- H2 Market update can be accelerated if H2 is included into existing gas laws. Without regulation H2 will end up in a very small market with few customers and producers connected only to the TSO. **Competition and liquidity needs a broad range of actors.**
- Guarantees of origins are important to facilitate the trading of renewable and decarbonised gases, in pure form or in blends. They offer customers the possibility to decarbonize their heating system independent of the local specialties.
- Extension of gas grids should be considered sustainable in the context of taxonomy to enable projects to connect H2 or biomethane production with customer locations.

## To create a market



### EU legislation

Integration of H2 in gas regulation/  
directive

fair Taxonomy rules

Acceptance of decarbonized gases

EU-wide Guarantee of Origin System

New gas quality rules & processes

Definition of the various gases

Extend TEN-E to DSO projects

### Organisation

Projects, mass production, research

Organize gas conversion strategy of grids

Interest of consumers in H2 applications

Adjust the technical rules

Design H2-ready appliances/ applications