



## Energy Community

### 15th Gasforum

Grid readiness for H2 injection

30. September 2020 Eva Hennig

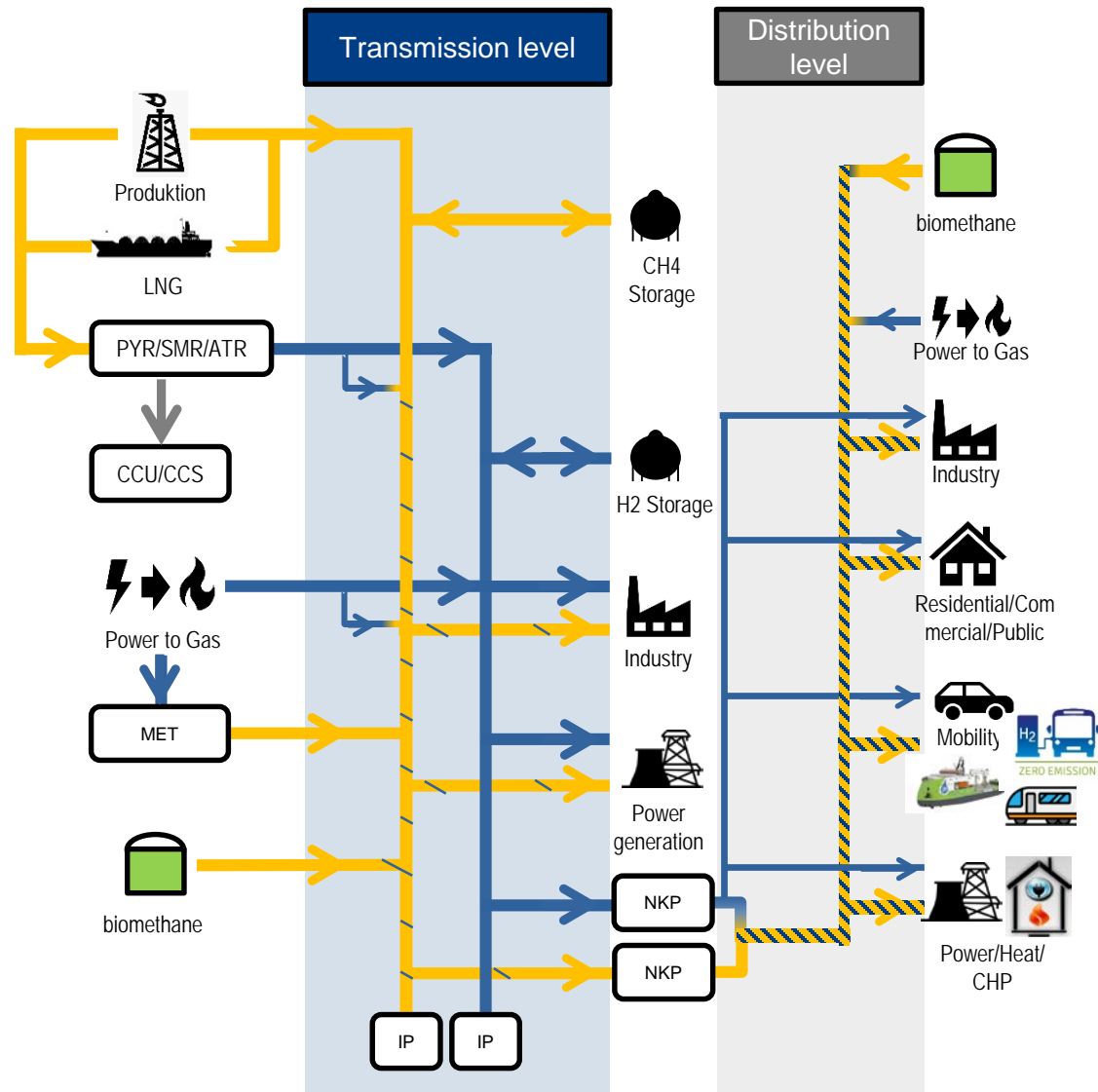
# THE THÜGA GROUP CONSTITUTES WITH NEARLY 100 COMPANIES THE LARGEST ALLIANCE OF MUNICIPAL UTILITIES SERVING REGIONS AND CITIES IN GERMANY



## Hydrogen projects:

- Very large interest of the cities and regions for local hydrogen projects. Sector integration is deeply rooted within Thüga companies due to the multi-utility concept
- 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 manufacturers and associations from DE, A, CH and many German DSO to classify new/existing grid components on their H<sub>2</sub>-Readiness

# COOPERATION IS KEY BETWEEN TSO AND DSO TO BRING H2 TO THE CUSTOMERS. A COMBINATION OF LOCALLY PRODUCED H2 + PIPELINE H2 SPEEDS UP DECARBONIZATION



## Possible developments on the transmission level

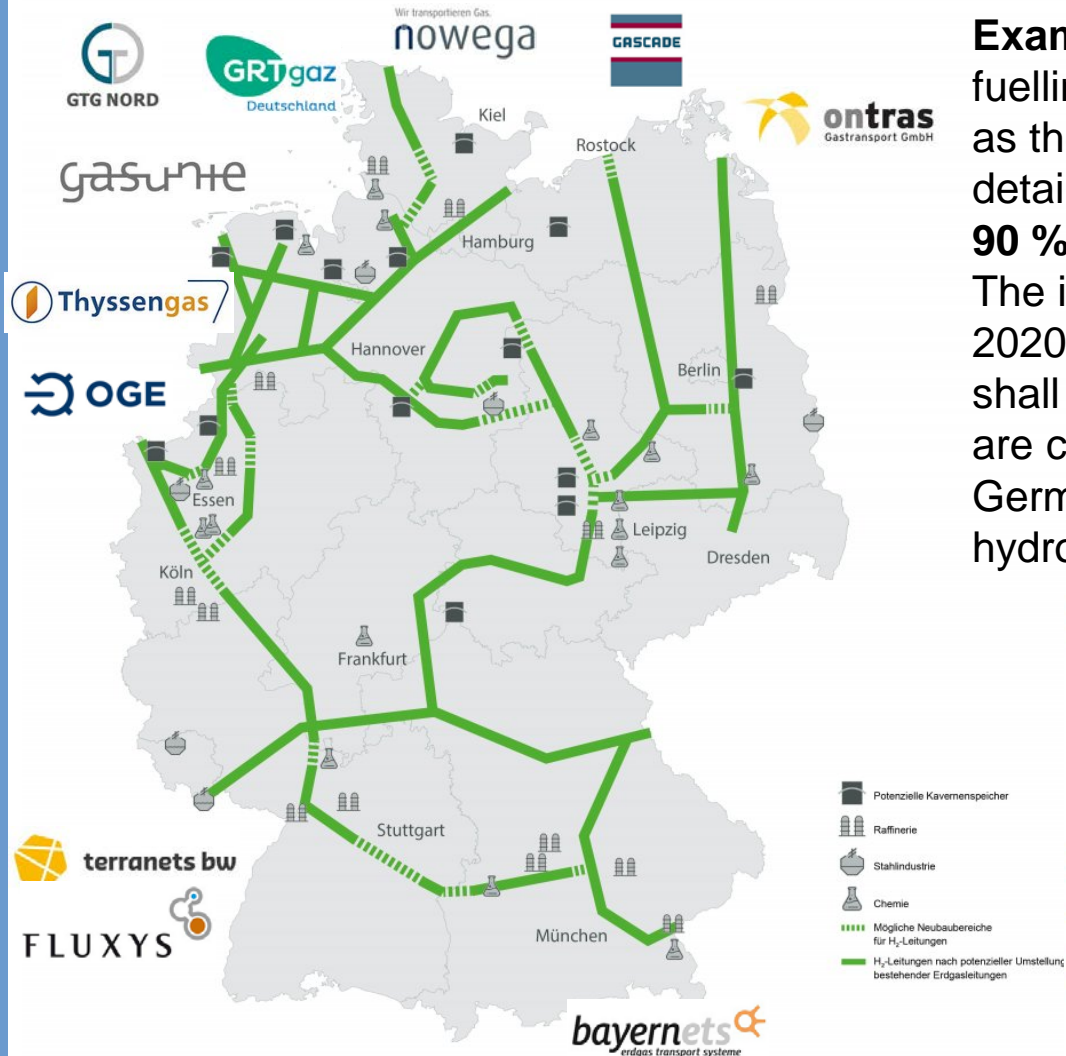
- Use of existing infrastructures
- Converting certain pipelines to 100 % H<sub>2</sub>
- Low H<sub>2</sub> blending into the CH<sub>4</sub> network. Level not harmful to large feedstock customers, storages, compressors, turbines
- Connect customers and DSO to H<sub>2</sub> and CH<sub>4</sub> grid according to their demand and individual situation

## Possible developments on the distribution level

- **Use of existing infrastructure of the grid and the consumers**
- Individual solutions depending in the local situation possible as DSO are usually not interconnected
- Enables local injection of **biomethane**, H<sub>2</sub> or **synthetic natural gas SNG**
- Potential for dedicated H<sub>2</sub> supply with separate pipes to industry, fuelling stations, CHP, new residential areas with fuel cells but also “deblending” with membranes for critical

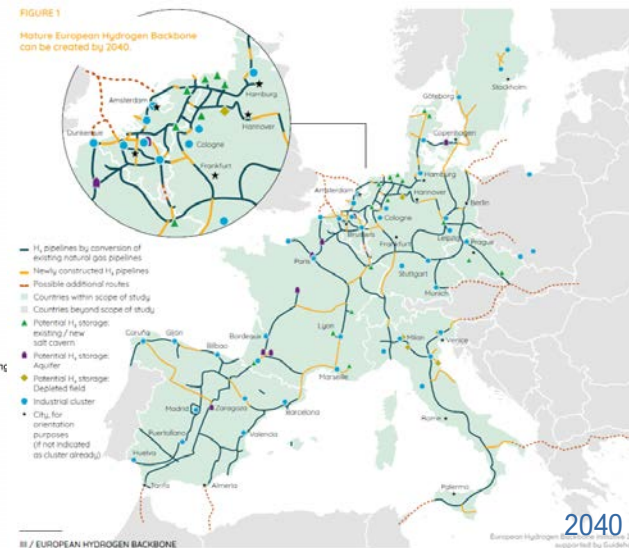
PYR = Pyrolysis                      ATR=Autothermal Reformer  
 SMR = Steam Reforming            MET = Methanisation  
 CCU = Carbon Capture & Usage    IP = Interconnection point  
 CCS = Carbon Capture & Storage   NKP = TSO-DSO connection

# THE TSO WORK ON THE CREATION OF H2 BACKBONES THROUGHOUT THE MEMBER STATES AND ACROSS THE BORDERS. THE DSO WILL BUILD ON THIS PLANNING.



**Example Germany:** This H2 grid has the ability to connect industrial clusters, fuelling station for the various kinds of mobility on land, water and air as well as the distribution grids. The TSO work at the technical solutions and the details of the grid planning. **It encompasses 5.900 km of pipeline of which 90 % are existing natural gas pipes**

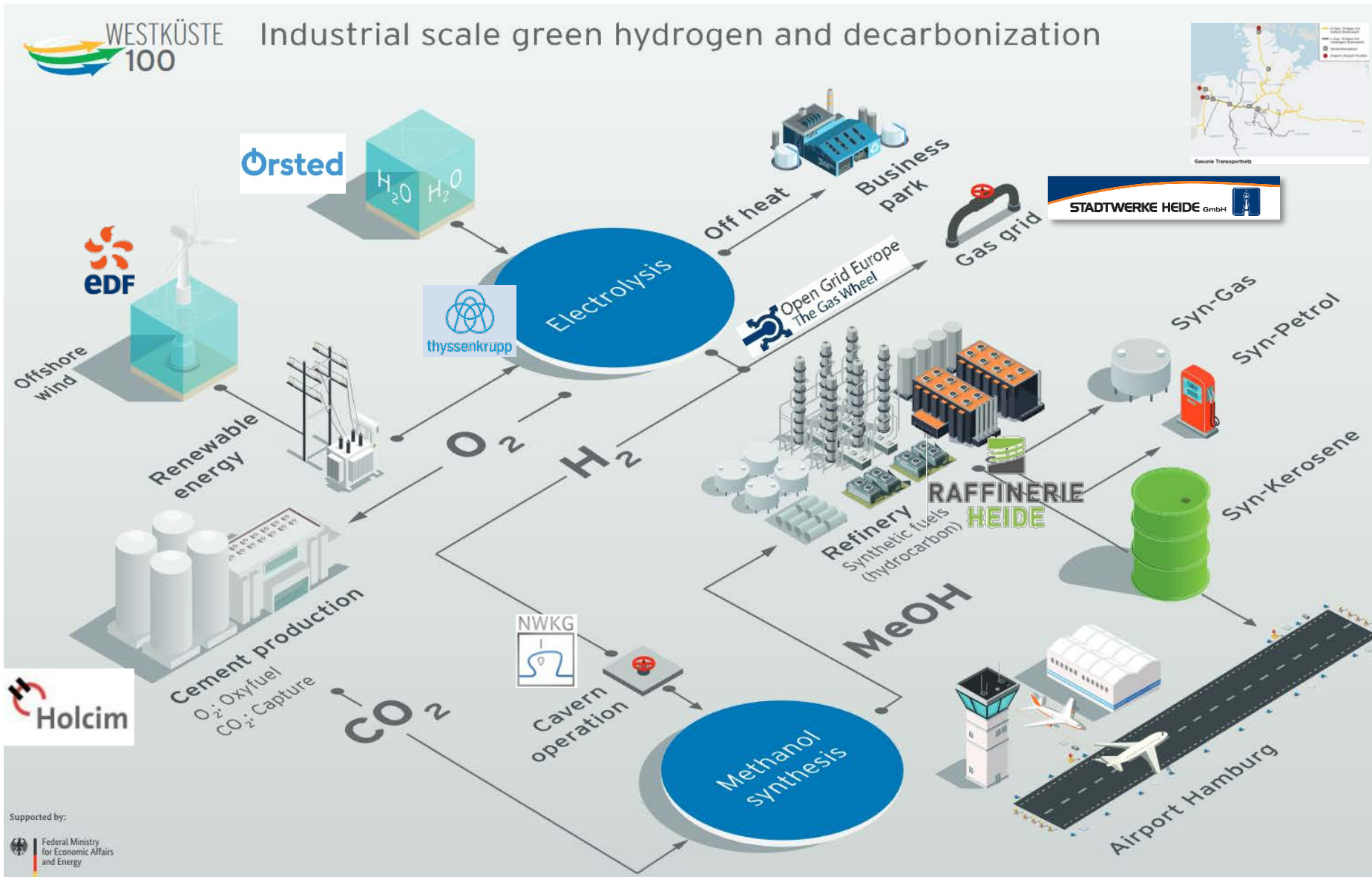
The infrastructure shall become part of the National development plan NEP 2020-30. To achieve this the rules and regulation has to be expanded. H2 shall be integrated into the legislation next to H-/L-Gas. The TSO and DSO are calling to the government and the NRA for a swift change of the existing German legislation. Without the gas pipeline infrastructure the German hydrogen strategy cannot be successful.



Also on the **European level** the TSO are working on a backbone. This planning has to be spread to all states and connected to the non-EU countries like Ukraine, Northern Africa, the UK and Norway.



# THE REAL-LIFE LABORATORY „WESTKÜSTE 100“ IN HEIDE IS A GROUND BREAKING PROJECT FOR VARIOUS USAGES OF H2 WITH MANY INNOVATIVE ACTORS



## Sustainable fuel, construction, heating and flying



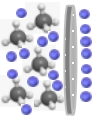



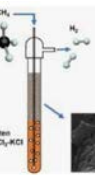

- H2 production in refinery with 1st stage 30 MW
- production of green cement with O<sub>2</sub> from electrolyser + CCS
- **blending** up to 20 % H<sub>2</sub> into the local grid of the DSO Heide with 215 heating customers
- Green **jet fuel** for the airport of Hamburg
- High pressure **transport** of pure hydrogen
- Integration into an underground salt cavern **storage**
- Timeline until **2025**
- **Co-financed** by BMWi

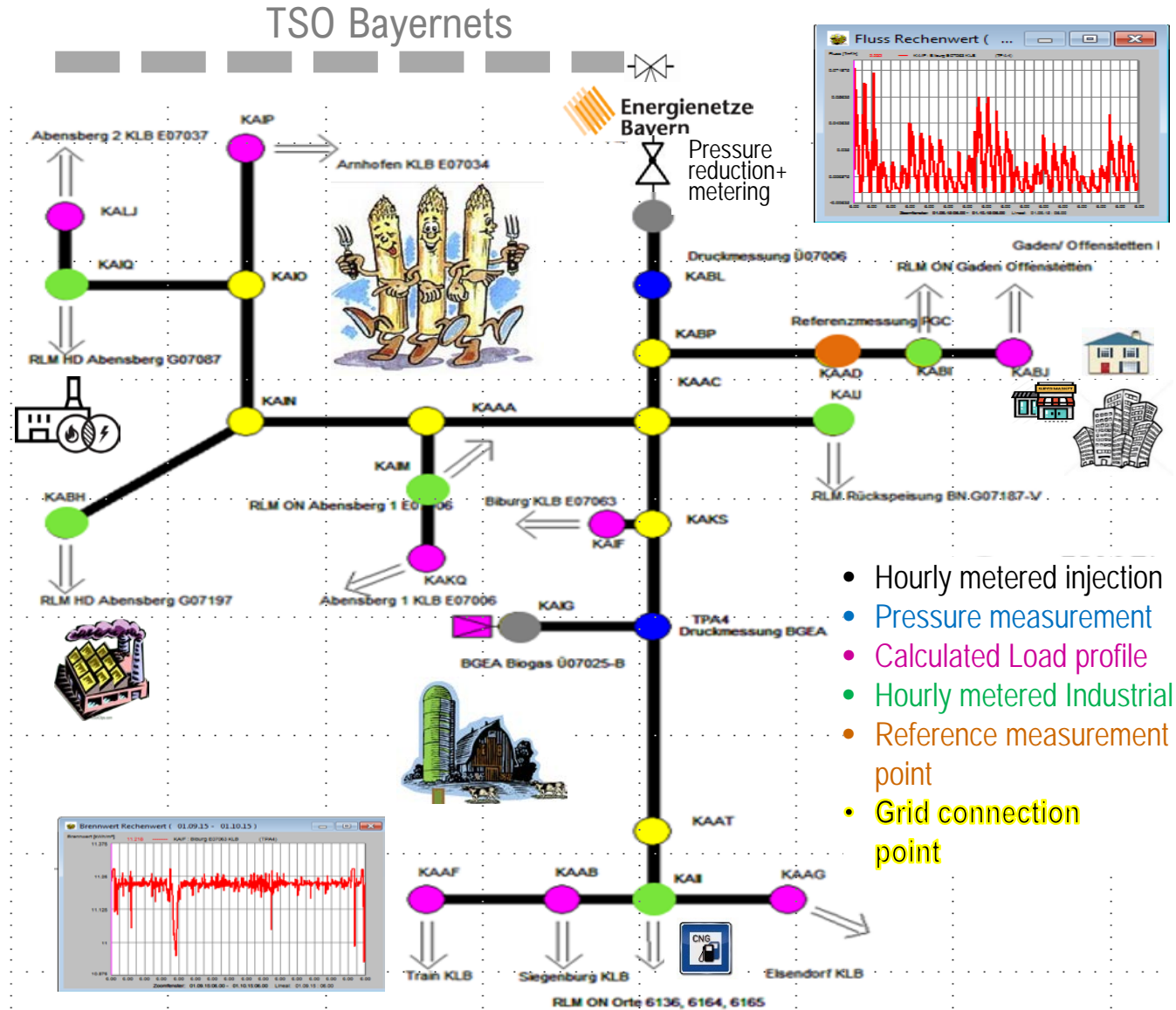
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# THE OPERATION OF GAS DSO CHANGES RAPIDLY. BLENDS OF NATURAL GAS, HYDROGEN AND BIOMETHANE WILL BECOME THE NEW NORMAL.

**Today** tracking systems enable the calculation of calorific value for accurate bills to the end consumer and monitor the injection of biomethane plants. Linepack is used in some grids to optimize the system capacity.

In the **future** new elements will be added to the system. For the safe operation more flow measurements and sensors have to be installed to monitor the grid e.g. H2 content, Wobbe Index and calorific value to ensure that appliances/applications work safely and efficiently and that bills are accurate. To increase the injection of R/D-Gas reverse flow from DSO to TSO, increase of line pack or local storages might be needed. Data communication between the various actors has to be developed.

-  Elektrolyse
-  Storage/Linepack
-  Membrane
-  H2 Fuelling Station
-  Sensors
-  H2 Customers
-  Methane Pyrolysis
-  Compressor + Deodorization



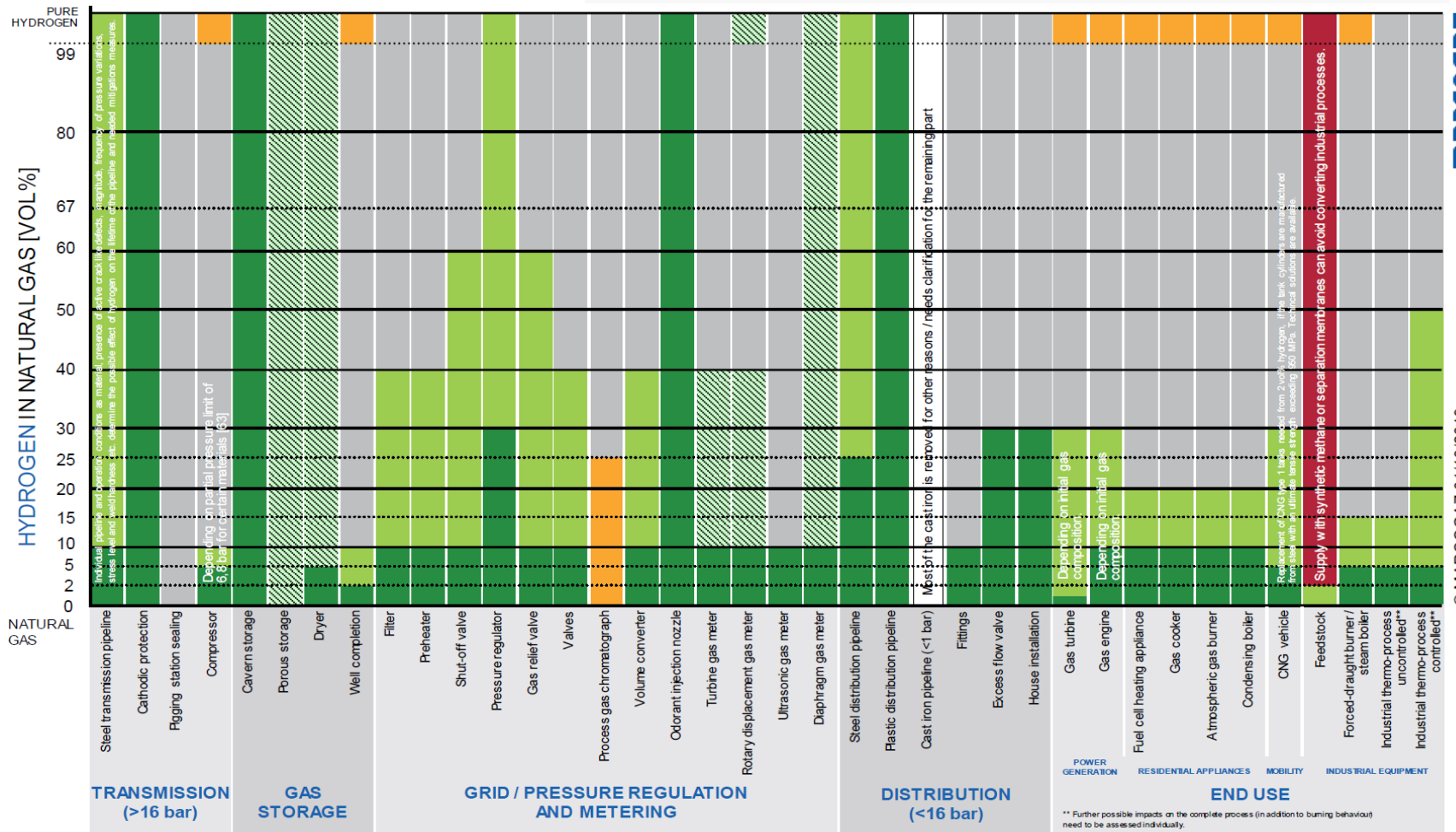
# SINCE MANY YEARS RESEARCHERS GLOBALLY HAVE LOOKED INTO THE POSSIBILITIES AND CHALLENGES OF H2. SINCE 1 YEAR MANY MORE PILOTS AND LABTEST COME ONLINE:

## OVERVIEW OF AVAILABLE TEST RESULTS\* AND REGULATORY LIMITS FOR HYDROGEN ADMISION INTO THE EXISTING NATURAL GAS INFRASTRUCTURE AND END USE

■ No significant issues in available studies\*.  
■ Mostly positive results from available studies\*. Modifications/ other measures may be needed.  
■ Technically feasible, significant modifications/ other measures or replacement expected.  
■ Currently not technically feasible.  
■ Insufficient information on impact of hydrogen, R&D required.  
▨ Conflicting references were found, R&D/ clarification required.

This assessment is based on information from R&D projects, codes & standards, manufacturers and MARCOGAZ members expertise.  
 The assessment applies to segments in isolation. Any decision to inject hydrogen into a gas infrastructure is subject to case by case investigation and local regulatory approval.

\*According to the list of references.



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The available data is huge and every week new intel is added worldwide. A very open and cooperative atmosphere between grid operators in Europe helps to disseminate the knowledge faster and learn from best practices.

The Task Force in Marco-gaz studied in detail 63 reports from all over the world. It is work in progress as many additional projects are starting which will add new intelligence.



