



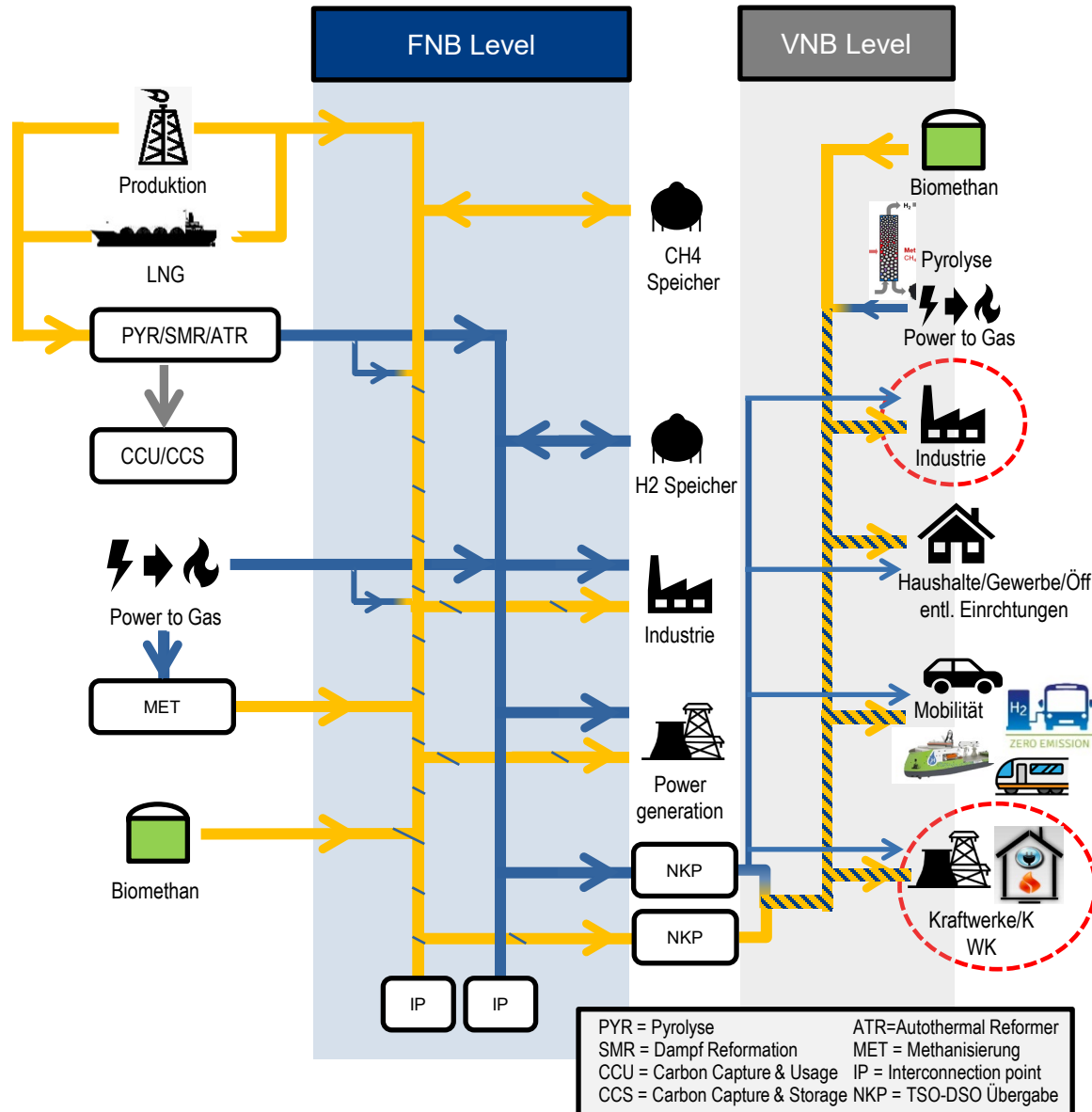
**Development and operation of hydrogen
distribution network**

Regulatory School Training Course
Decarbonisation of the Gas Market-
Regulatory Framework

15.2.2022

Eva Hennig, Head of Brussels Office


THE CONVERSION OF EXISTING GAS NETWORKS IS THE FASTEST WAY TO OFFER THE CONNECTED CUSTOMERS PATHWAYS INTO A FAST DECARBONISATION





- Length of distribution grids in Germany 512,000 km, another 34,000 km on the TSO side.
- In Germany and many other countries, **industrial customers and especially CHP plants** are connected to the distribution grids. In Germany these are 1.75 million customers.
- Much more biomethane, hydrogen and SNG will be produced locally and injected into the distribution grid
- The diversity of solutions is the secret to finding optimal transformation solutions together with the customers in the grid areas.
- Blending is a first cost-effective step towards decarbonization; in the long term, all grids are converting to H₂ and biomethane and their blends.
- At the DSO level, there will be pure H₂ lines very early on for the decarbonization of industry, CHP and for delivery to mobility.
- Injection at the DSO level gives access to the market


THE INTEGRATION OF H2 INTO THE EXISTING GAS LEGISLATION IS A VERY IMPORTANT STEP TO CREATE A MARKET AND DELIVER H2 TO ALL CUSTOMERS


Hydrogen is just a gas. And as other gases it needs clear rules to be transported, distributed, allocated, nominated, metered,.....


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Comprises the revision of the Regulation on natural gas transmission networks and the revision of the Directive on common rules for the internal market on natural gas from 2009. It includes as well **amendments to the related legislative acts** such as Gas Security of Supply Regulation
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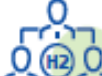
Creates the conditions for increasing the share of renewable and low-carbon gases in our energy system and decreasing the share of fossil natural gas
- 

Establishes the appropriate framework for market actors. It enables the creation of a European-wide market for renewable and low-carbon gases, introduces a comprehensive certification scheme, and ensures at the same time energy security and market liquidity, and competitiveness
- 

Empower and protect consumers through facilitating switching energy providers, strengthen provisions for basic contractual rights, accurate, fair and transparent fees, and ability to choose renewable and low carbon gases over fossil fuels
- 

Facilitate the integration and access of renewable and low-carbon gases into the existing gas grid
- 

Foster integrated network planning between electricity, gas and hydrogen networks
- 

Improve the resilience of the EU energy system and **energy security**
- 

Establishes the European Network of Network Operators for Hydrogen (ENNOH), promoting the creation of a dedicated hydrogen infrastructure, cross-border coordination and interconnection, and elaborate on specific technical rules

The proposal contains many very good thoughts for all market players. Only gas DSO with their > 2 Mio. km grids are not seen as an important infrastructure in the H2 market. No distinction between TSO and DSO in **H2** → Only ownership unbundling or ISO allowed, latest after 2030. Today out of 1.400 DSO only a few are ownership unbundled, legal unbundling or de-minimes is the standard. Reason: “green field” is not relevant and competition doesn’t depend on unbundling form, but H2 is just not wanted in local endusers, not even the many industrials/ CHP.






Consequences:

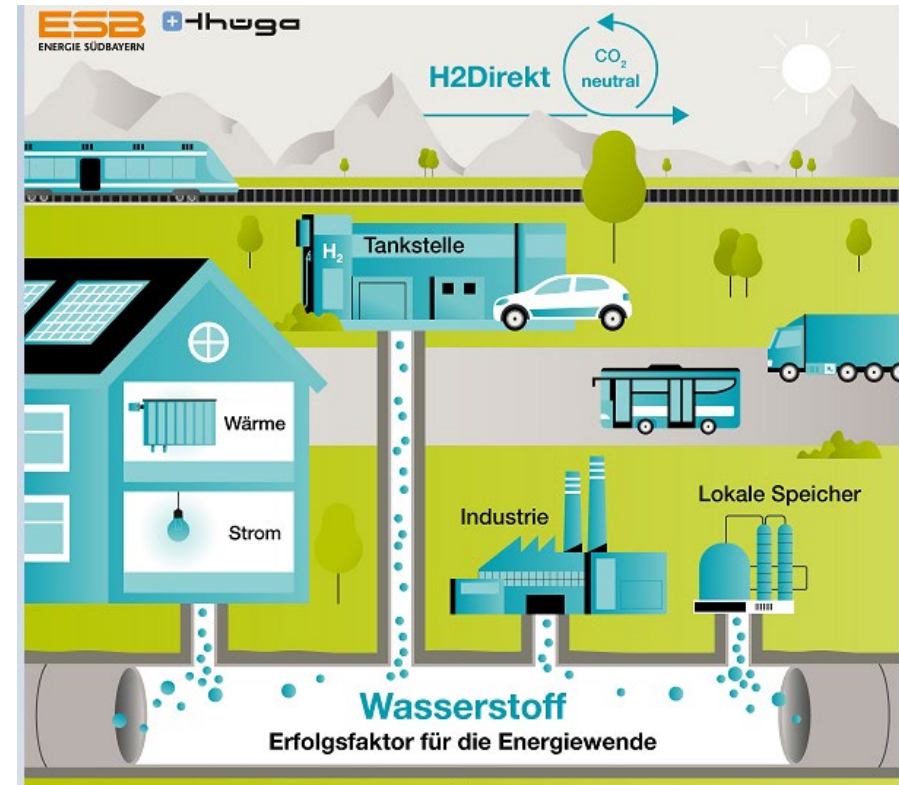
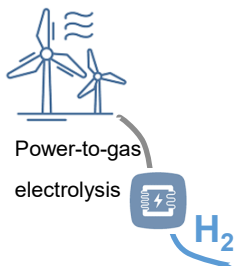
- No incentive to organize the transition for investors as the H2 grid has to be sold at unknown price, or control given up in ISO model.
- Huge barrier for decarbonisation of 99 % of all industrial customers and CHP plants as they are connected to the DSO. They can’t convert to electricity, nor be reconnected to the TSO.
- It limits the connection of H2 production plants

IT IS VERY IMPORTANT TO START WITH **SMALL PROJECTS**, AS COUNTRIES DIFFER. INFORMATION SHARING HELPS TO AVOID COSTS AND WORRIES:

Technology innovation project H2Direct

- **Goal:** Part of the gas grid is adapted to 100% H2 by 2023
- Existing gas infrastructure is used for H2 distribution
- Participation of private customers allows testing of hydrogen-ready household appliances for heat supply
- **Create a detailed guidance document on how to organize the process, in which order with which tests. The results will be used for the German Gas Transformation Plan GTP in the DSO project H2vorOrt**
- H2Direct will demonstrate:

-  Future use of gas distribution networks
-  Feasibility of 100% hydrogen for domestic use
-  Hydrogen in heating sector
-  Supply for local industry
-  Use of carbon-neutral / green hydrogen



H2Direct: 100% hydrogen supply for

- 10-15 existing private homes
- 1 local industrial customer

ESB ENERGIE SÜDBAYERN
thuga
Bundesministerium für Bildung und Forschung



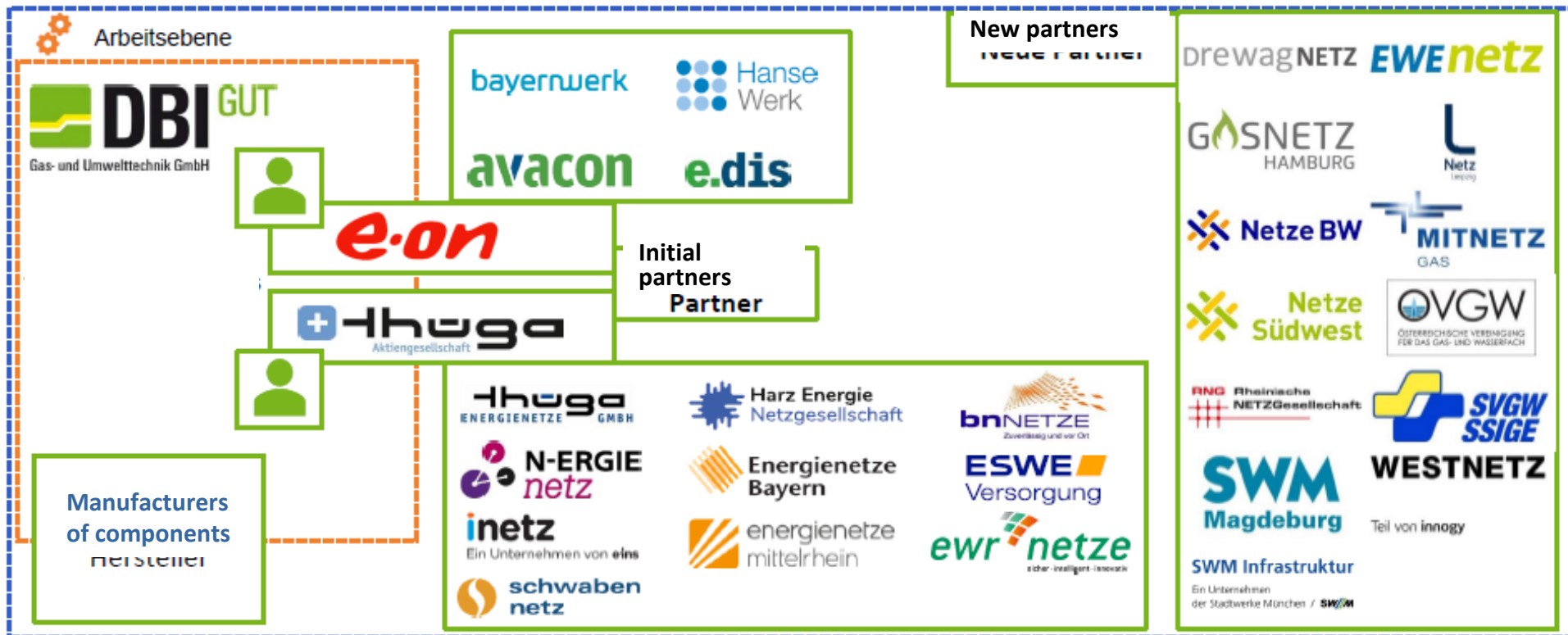


DETAILED KNOWLEDGE ON THE HYDROGEN READINESS OF EXISTING AND FUTURE COMPONENTS IS KEY FOR THE PLANNING OF THE FIRST INJECTION

- Project **Kompendium Wasserstoff in Gasverteilnetzen** set up to analyse components of the grid for sensitivity to H2. Many tenders are adjusted to include this as a requisite.
- Study included 29 project partners from 3 countries representing 220.000 km.
- Goal: develop conformity declarations for each component from all manufacturers
- The projects was moved in 2021 to the DVGW in cooperation with the Swiss and Austrian partner associations and **shall become a European platform**

components on DSO level:

- Butterfly valve
- insulating flanges/pieces
- ball valves steel, PE
- polyethylen pipes
- Mechanical connectors
- Pipe renovation – p-i-p (PE)
- Slider
- Steel ball valve
- Steel pipes
- Tapping valves
- Pressure regulator
- Natural gas filling stations
- Filters
- Injection nozzle for odorant
- Safety relief valve
- Safety shut-off valve
- Preheater



THE 512.000 KM DISTRIBUTION GRIDS ARE A CENTRAL PART OF THE GERMAN ENERGY LANDSCAPE:



1.750.000 industrial
and commercial
endusers, CHP



48,2% (> 19 Mio.) of house-
holds are heated with gas



Delivery of > 80% of the
German gas consumption

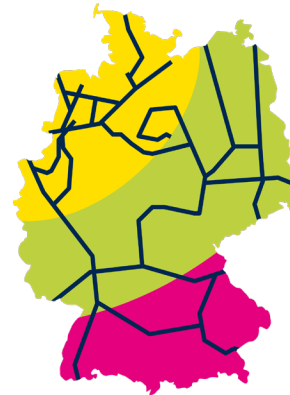
H₂-Readiness/grid material:



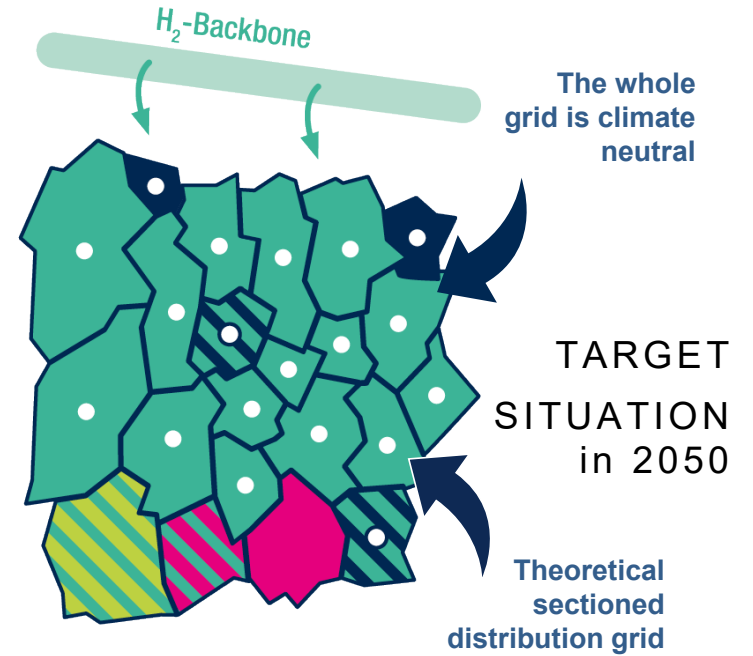
● plastics

● steel

How can the gas system become
climate neutral until 2050?



Delivery over the
H₂-Backbone



- + Biomethane
- + decentral H₂-production
- + SNG (methanized H₂)

The gas grid can distribute climate
neutral hydrogen.

First a 20% blend and 100 % after the
upgrading of the grid.

The climate neutral distribution in
2050 will develop in line with the
local conditions.

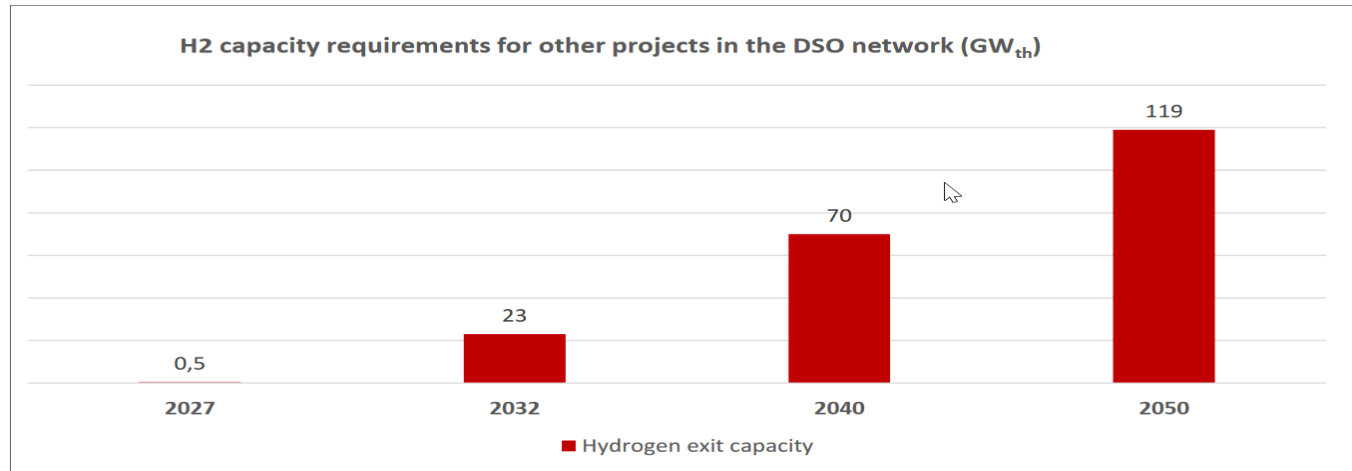
A CLOSE COOPERATION WITH THE TSO IS VERY IMPORTANT TO SUPPORT THE DEVELOPEMENT OF THE BACK BONE. TSO AND DSO DEPEND ON EACH OTHER:

To plan the conversion of the grids the German TSO had a market call in spring 2021 for future H2 demand



Leitfaden zur Abschätzung des H₂-Bedarfs für Gasverteilnetzbetreiber im Kontext der Marktabfrage für den NEP 2022 des FNB Gas e.V.

WEB and green gas market surveys Reports about other projects in the DSO network (Category 3)



- ▶ Increase in demand in **DSO network** to as much as **119 GW** in 2050.
- ▶ In terms of volume, this corresponds to a demand in the DSO network of **290 TWh** in 2050.

- This was a first round and not all DSO took part in it. The demand had to be declared for physical interconnection points to allow the TSO to build the planning on it.
- The DSO have to underline the demand with projects and MOU
- Parts of the demand is planned for an average blend of 20 Vol. %, others are already for 100 % conversion

European DSO Project READY4H2

Ready4H2 is a project that aims to combine the hydrogen expertise and experiences across the European gas distribution companies creating a common understanding of how the distribution networks can help realize the huge growth potential and deliver the carbon reduction potential of hydrogen utilization.

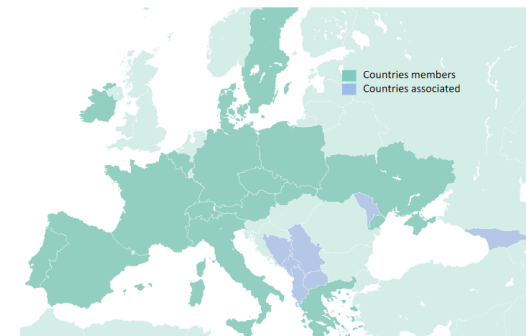
The Ready4H₂ alliance is growing. As of February 2022, it consists of 90 European gas distribution companies working together to support net zero

Ready4H₂ participating countries:

- Austria
- Belgium
- Czech Republic
- Denmark
- France
- Germany
- Greece
- Ireland
- Italy
- Israel
- Portugal
- Poland
- Switzerland
- Slovakia
- Spain
- Sweden
- Ukraine



90 DSOs 17 countries

Gas & Electricity (62%) Gas only (38%)

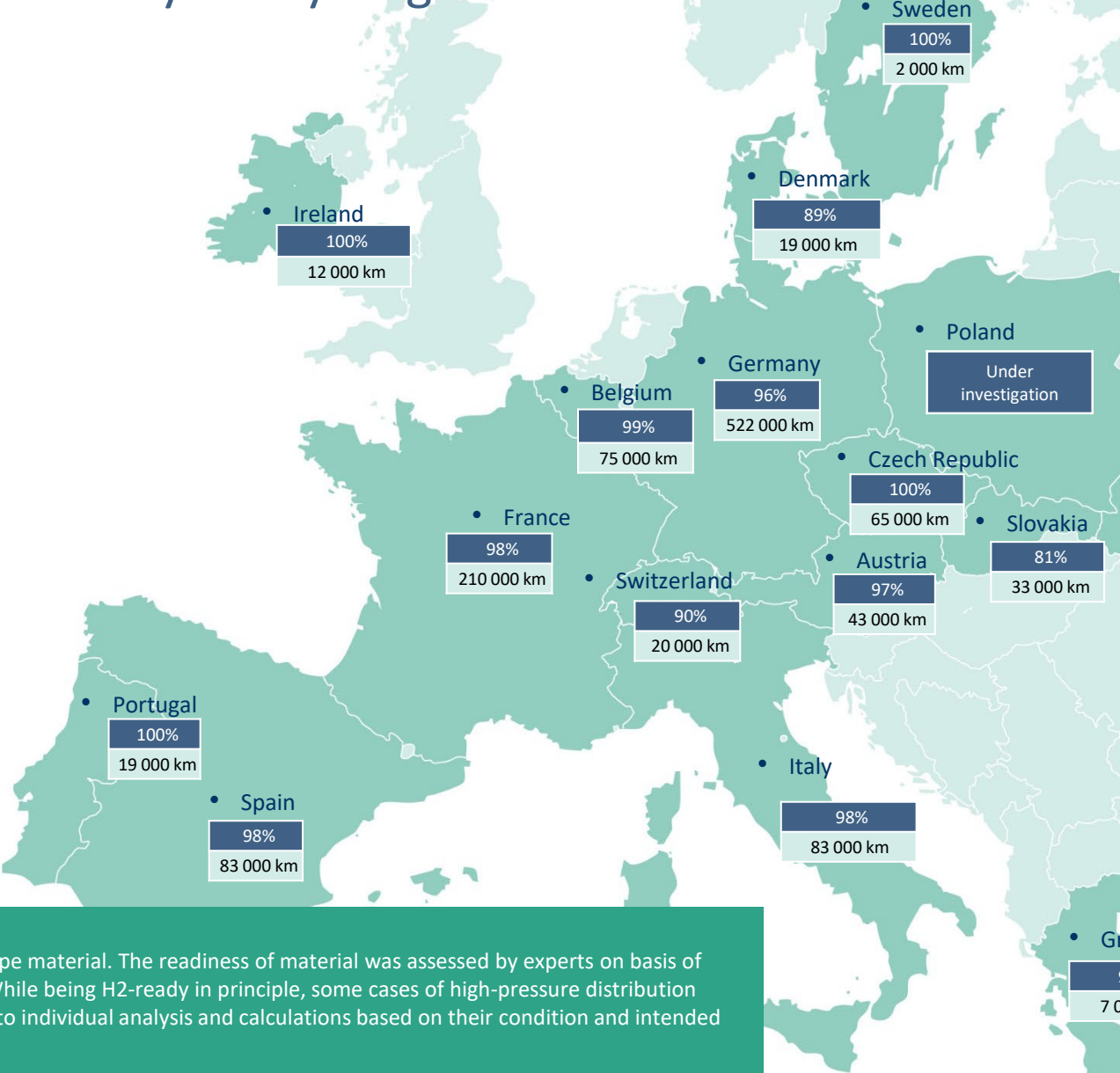


 ready4H₂

The first phase of the Ready4H2 project will run until February 2022 and consist of three new studies:

- (1) The gas distribution companies' hydrogen knowledge: The first analysis will be a collection of the experiences that the European gas distribution companies have with hydrogen projects and hydrogen infrastructure. It will furthermore investigate how the DSOs are involved in their country's hydrogen developments and how far the country's hydrogen strategy is evolved 
- (2) How can the gas distributors contribute to the hydrogen value chain: The second analysis will build upon the first analysis by analyzing how the European gas distributors can contribute to the hydrogen development. The gas distributors' experiences and knowledge will be analyzed and converted into value propositions for the hydrogen value chain. Not just hydrogen experience but also the gas distribution companies' unique positions and contribution to strategic land planning. 
- (3) A roadmap on how the gas distribution companies can transform into Europe's primary hydrogen distribution infrastructure: The third analysis will provide a roadmap with concrete initiatives for how the gas distribution companies at the European and national level can be a link between hydrogen producers and consumers. It should describe possible barriers and opportunities along the gas distributors' road to being the responsible hydrogen pipeline distributor.

Over 1 million km of distribution pipelines is **material** ready for hydrogen



Local gas networks across Europe are working hard to get ready for hydrogen. Currently, 1 151 000 km of pipelines are material ready for conversion to pure hydrogen, representing 96 % of the combined network of Ready4H2 members.

The readiness of components (connections, valves, metering equipment, compressors, etc.) is under evaluation.

Ready4H2 is building a roadmap to complete the gas system for hydrogen distribution, addressing not only pipelines, but components and end-user equipment as well.

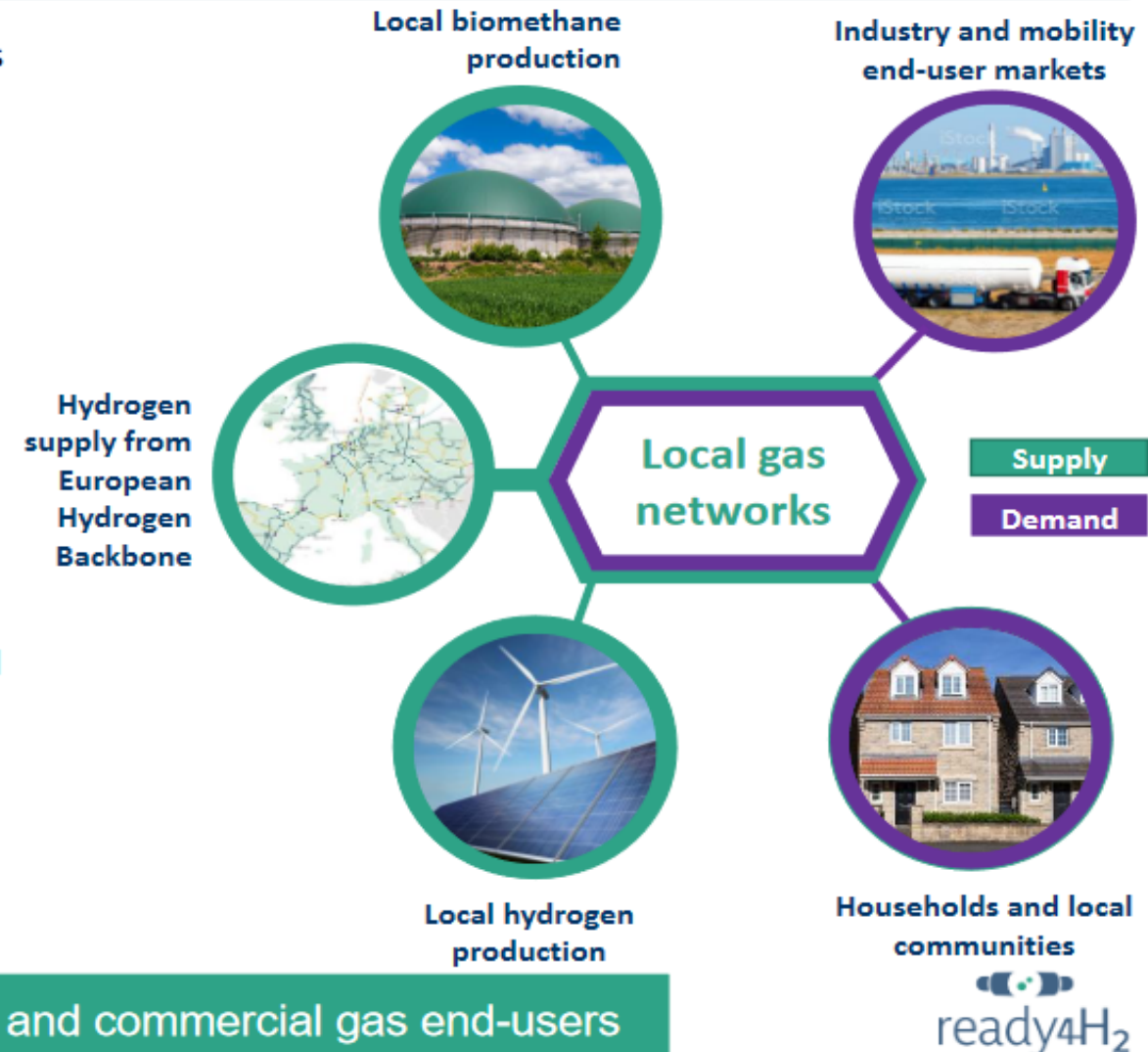
96% (1 151 000 km) of network H2Ready
1 193 000 km of pipelines in total

What is H2 ready?

The figures are based on pipe material. The readiness of material was assessed by experts on basis of today's best knowledge. While being H2-ready in principle, some cases of high-pressure distribution steel grids shall be subject to individual analysis and calculations based on their condition and intended operating parameters.

Local gas networks are flexible hubs connecting supply and demand, and are ready to convert to hydrogen

- **Local gas networks are flexible** and can distribute and manage varying blends of molecules, depending on the local mix of supply and demand. They connect large portions of end-users and provide decarbonisation options for millions of European consumers, businesses and industries and at the same time give local producers of hydrogen and biomethane a cost effective route to market. They can offer rapid decarbonisation with no changes for many consumers through blending of hydrogen and green methane.
- Local gas network are to a large extent ready for hydrogen. Currently, more than **1 million km of the pipeline material is ready for conversion to pure hydrogen, representing > 95% of the combined network of Ready4H₂ members**. The readiness of components (connections, valves, metering equipment, compressors, etc.) is under evaluation.
- Given the importance of hydrogen and other green molecules, the EU's framework to decarbonise gas markets states that national network development plans should be based on a joint scenario for electricity, gas and hydrogen to cover the energy needs of buildings, industry and transport.
- Local gas network are key to managing the complexity of joint planning, as they are the crucial hubs connecting numerous sources of (local) hydrogen supply with most end-users.



99% of industrial, CHP and commercial gas end-users are connected to local gas networks

ready4H₂

THE LEGISLATION IN SUSTAINABLE FINANCE HAS A GREAT IMPACT ON FUTURE INVESTMENTS IN ALL ENERGY INFRASTRUCTURES, THE NEEDED REPORTING IS EXTENSIVE.

The first part of the taxonomy contains rules for gas DSO

The taxonomy was published on 14 Dec 2021. Many products and processes are described in detail “ *establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining whether that economic activity causes no significant harm to any of the other environmental objectives*”.

Example gas distribution in climate change mitigation:

4.14. Transmission and distribution networks for renewable and low-carbon gases

Description of the activity

Conversion, repurposing or retrofit of gas networks for the transmission and distribution of renewable and low-carbon gases.

Construction or operation of transmission and distribution pipelines dedicated to the transport of hydrogen or other low-carbon gases.

6 Umweltziele

Climate Change Mitigation

Circular economy

Climate Change Adaption

Pollution prevention

Sustainable use of water and marine sources

Healthy ecosystem, biodiversity

Technical screening criteria

Substantial contribution to climate change mitigation	
1. The activity consists in one of the following:	
<ul style="list-style-type: none"> (a) construction or operation of new transmission and distribution networks dedicated to hydrogen or other low-carbon gases; (b) conversion/repurposing of existing natural gas networks to 100 % hydrogen; (c) retrofit of gas transmission and distribution networks that enables the integration of hydrogen and other low-carbon gases in the network, including any gas transmission or distribution network activity that enables the increase of the blend of hydrogen or other low carbon gasses in the gas system; 	
2. The activity includes leak detection and repair of existing gas pipelines and other network elements to reduce methane leakage.	
Do no significant harm ('DNSH')	
(2) Climate change adaptation	The activity complies with the criteria set out in Appendix A to this Annex.
(3) Sustainable use and protection of water and marine resources	The activity complies with the criteria set out in Appendix B to this Annex.
(4) Transition to a circular economy	N/A
(5) Pollution prevention and control	Fans, compressors, pumps and other equipment used which is covered by Directive 2009/125/EC of the European Parliament and of the Council ⁽¹⁸⁷⁾ comply, where relevant, with the top class requirements of the energy label, and with implementing regulations under that Directive and represent the best available technology.
(6) Protection and restoration of biodiversity and ecosystems	The activity complies with the criteria set out in Appendix D to this Annex.

DON'T PICK THE WINNER TODAY. HYDROGEN IS DEVELOPING AT AN IMPRESSIVE SPEED WORLDWIDE. EACH WEEK NEW TECHNOLOGIES AND PROJECTS ARE PUBLISHED.



The energy transition happens locally. Gas DSO are an important link to residential, commercial, industrial and CHP end-users.

The heating sector is as complicated to decarbonize as the industrial sectors as every house owner is a stakeholder with different financial means, restrictions of the building or personal preferences.

The decarbonization of gas DSO grids offers choices to the citizens and companies.

The connection of local hydrogen producers to the grids is far cheaper than building long stretches of pipes and compressors to connect them to the grid.

The legislation should support the efforts of the grid operators and not build up barriers.

The repurposing of existing infrastructure is the most efficient and fastest way to deliver renewable and low-carbon gases to the end-users of all sizes.

Making grids hydrogen ready and converting also helps to reduce methane emissions.