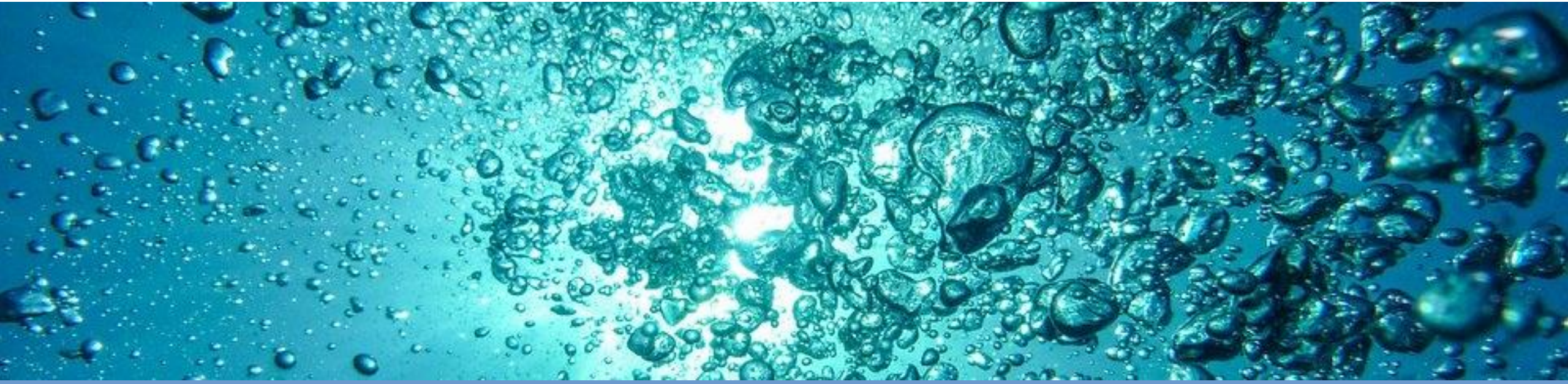
thüga
Aktiengesellschaft



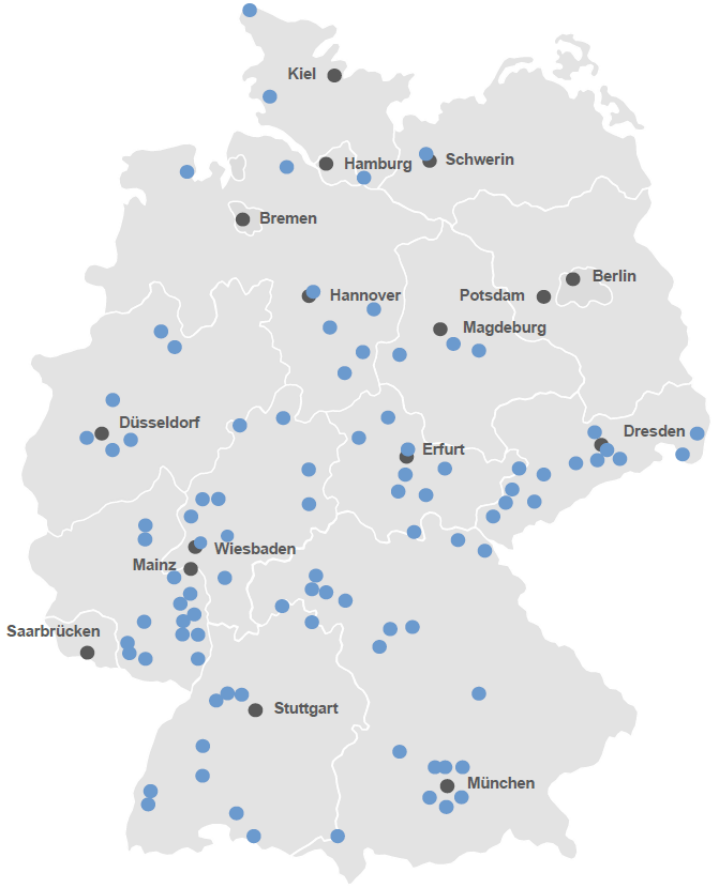
ROUNDTABLE REGULATION OF A H2 MARKET

COMMISSIONER SIMSON NOV 11 2021

Eva Hennig, Head of Brussels Office

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

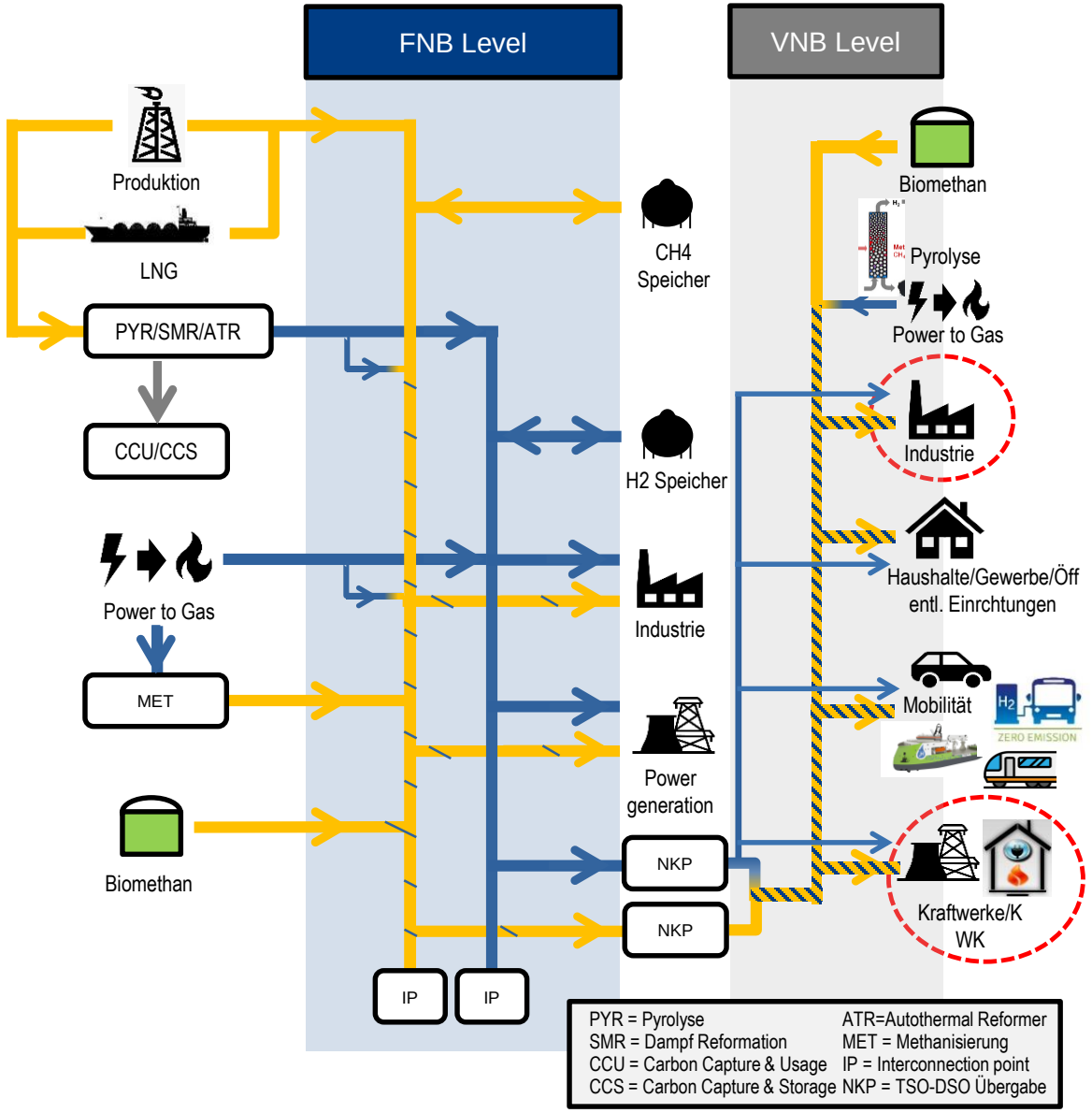
Turn-over **€ 24,0 Mrd.**	Gas sales **123,6 Mrd. kWh**		Heat sales **10,0 Mrd. kWh**
Investments **€ 1,3 Mrd.**		Electricity sales **61,4 Mrd. kWh**	Water sales **329,1 Mio. m³**
			Gas customers **2,0 Mio.**	Electricity customers **4,5 Mio.**
Water customers **1,0 Mio.**			District Heating customers **100.000**
Gas grids **90.000 km**	Electricity grid **170.000 km**	Water grid **30.000 km**	Employees **21.200**



H2 projects:

- 2014 first PEM in Germany injecting H2 into the grid of DSO of Frankfurt
- Since 2018 continuous injection into DSO grid in Freiburg
- „Reallabor“ Heide, injection of 20% H_2 in the DSO grid in a complex project with refinery, grids, cement factory, underground storage, green kerosene www.westkueste100.de/
- Conversion of a 100 % H2 grid in Bavaria and construction of methane pyrolysis are in concrete planning www.esb.de/ueber-uns/presse/2021/
- Project “H_2-Kompendium” (by DSOs & associations from DE/A/CH and manufacturers) classify new/existing components on their H_2-Readiness
- Member of the joint projects H2vorOrt and Ready4H2 and the EU Clean H2 Alliance Roundtable Distribution & Transmission
- High interest of cities and regions in local projects. Public transport and public vehicles and CHP come into focus

THE LARGE DSO GRIDS IN GERMANY BRING TOGETHER THE LOCAL PRODUCTION OF H2 AND BIOMETHANE AND THE HUGE VARIETY OF CUSTOMERS INCLUDING INDUSTRY



- Length of distribution grids in Germany 520,000 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 DE 1.8 million customers are connected to the DSO and 600 to the TSO.
- The local high pressure grids are interconnected with the medium and low-pressure grids. The grid design has grown over many decades. In some regions the next TSO is far away from the local grids, a separation of just the industrial or CHP points is not feasible.
- Much more biomethane, H2 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 H2 into the grid is a first cost-effective step towards decarbonisation; in the long term, all grids are converting to H_2 and biomethane and their blends.
- At the DSO level, there will be pure H_2 lines early on for the decarbonisation of industry, CHP and for delivery to mobility.

EXISTING INFRASTRUCTURE IS AN ENABLER AND NOT A LOCK-IN. NEITHER GRID NOR APPLIANCES ARE FOSSIL PER SE AND THE CONTENT CAN BE SWITCHED.

- The companies of the Thüga Group operate electricity, gas and/or district heating grids. The right choice of infrastructure for the different tasks is a continuous process within the triangle of sustainability, security of supply and affordability as guiding principles. Sector coupling is in our DNA and renewables have a very long history with biomethane, wind and PV.
- Thüga and its companies are owned by the cities and regions. We understand their needs as we not only deliver energy, water and services to their citizens and local companies but support them on their challenging path to full decarbonization.
- Gas is used in 50 % of German homes and most CHP-plants. Out of 1,8 Mio. industrial gas consumers only 500 are connected to the TSO. To decarbonize industry and CHP we need H_2 and biomethane in the distribution grids. These customers can´t be connected to the TSO, often there are long distances to the next TSO.
- Electric grids are not build to support the loads especially if the mobility sector is strongly electrified. Both Dena Studies[1] have shown that a technology mix is more cost-efficient, faster and more resilient. According to a recent Frontier study[2] the efficiency between electric heat pumps and H2 boilers equals out on cold days. With the new H_2 Gas absorption heat pumps and fuel cells the efficiency is even higher.
- Blending H_2 into the grid is a first step, but our target is the full decarbonization with H_2 and Biomethane. For this reason we joined the European project **Ready4H2**[3] where 90 companies from 15 countries + the energy community want build a roadmap to show that the full conversion is feasible and that the costs are much lower than assumed. The ability of DSO grids to distribute pure H_2 if far more advanced than commonly known. In Germany 70 % of all grids are built in Polyethylene, which has been declared as 100 % H_2-ready[4]. Also low grad steel pipes utilized at the DSO level are considered as H_2-ready. This allows us to develop flexible concepts built on the availability of the gases, customers needs, technical developments and the speed at TSO level. The more we can inject into the grid the better it is for all.

SPECIAL TOPIC: BLENDING

- Blending is the key to integrate local H_2 production and the cheapest first step for customers into decarbonization. As long as the H_2 backbone is not ready, the local production needs to be ramped up. Often the first projects are not able to deliver enough H_2 to convert all connected customers - with a sufficient security of supply – and storages are increasing the costs. Blending is the first phase and allows many smaller plants to participate. Through a combination of electrolysers and other production technologies e.g. the pyrolysis a more stable injection throughout the year can be achieved.
- Locally produced and injected H_2 does not take away any H_2 from industrial clusters at the TSO level.
- Connecting Wind/PV-installations not only to the electricity grid bus also to local electrolysers and inject the H_2 can increase their running hours and profitability. It reduces the investment in the electricity grid as the peak loads don´t have to be transported.
- Smart grid systems enable the integration of different gases by tracking the gases through the grid to allow correct billing and forecasting of gas quality at the various exit points. In the future this is also important in regions where a strong biomethane production shall be maintained in the future, and hydrogen is blended in addition.
- To bring H_2 only to few industrial clusters leaves the industrial customers connected to the DSO behind. In addition, the Backbone process would depend solely on the investment cycles of few very large industries. From the moment the 1st large import pipe is fully converted to H_2, a stable and plannable offtake is key. Blending H_2 offers this and immediately reduces the amount of natural gas in the system. That way the TSO and storage operators can identify infrastructure parts that can already be converted to H_2.
- The appliance/application industry invested in research on blends, new results are published continuously about the blending abilities. In addition the membrane technology is considered as a game changer as it enables higher blends in the grids. Clear technical rules for all market players are needed, much of the work is already done in CEN and the Prime Movers group where many associations joined the discussions about challenges and mitigation ideas.

1. How should internal energy market principles apply to the H2 market (unbundling, third party access, tariff regulation, transparency…etc.)? Should these principles apply differently to the different types of H2 networks (future H2 backbone, closed H2 pipelines, H2 valleys)?

- DSO should be allowed to extend their operation to H_2 . We advocate for the full integration of H_2 alongside natural gas, bio-methane and synthetic methane in the gas directive/-regulation and the network codes. The transport and distribute of H_2 through grids follows the same rules that we have in gas today like nomination, allocation, reconciliation, metering, billing, trading, supply, booking of capacities, granting of access to the grids for consumers and injections. These processes are existing and implemented all around Europe. They don´t depend on the colour of the gas but on the kind of infrastructure that is used and the market roles involved. Many of the market actors of today most probably will join the H_2 -market. Existing processes and IT systems can advantageously be used with minor adaptions, this eases the path for all market participants.
- Thüga believes in strong markets, with many active players. Rules for a future liquid H_2-market can be designed from the beginning with time limited exemptions for specific tasks and processes. We also encourage a virtual market as it brings more consumers in contact with renewable and decarbonized gases and increases demand and production.
- The conversion at DSO level will follow different cycles than at TSO level. Blends from local H_2-production have already started and will grow in size and number. As soon as more H_2 is available, parts of the grids will be sectioned off to supply pure H_2 to first customers interested e.g. industry, CHP, public mobility like busses, garbage trucks but also fuelling stations. Sometimes the sections will already include residential and commercial consumers. For this reason we advocate for regulated grid access. From our experience with negotiated grid access in the 2000s we learnt that it is not feasible with many consumers. A direct privately owned connection between one singular H_2 production site and few industrial consumers is a special small market. As soon as more consumers want to connect, it becomes a legal struggle that would slow the pace.
- We advocate for joint grid tariffs between gas, blends and H_2 as they allow a flexible and gradual conversion step by step. At the start potential additional grid costs are carried by all consumers with very minor increases and in the future the H_2 consumers will carry the natural gas consumers. The grid conversion follows a logic that the singular consumers cannot influence. A joint tariff is fairer to all consumers. During the last 3 gas switches in the past 65 years this logic was used and has been valued by the market.

2. How do we bridge the gap in regulatory terms between the emerging H2 networks and the future fully-fledged H2 backbone? What are the timelines or milestones for the introduction of regulation?

- Regulation has many facets. Some of them are important right from the beginning, others can be designed from the beginning but implemented later. Even if the market is emerging we can already develop a vision how the future market will look like. The existing gas market is a good starting point as there will be a strong interlinkage between the different gases. The existing hubs can easily be expanded to all gases to offer a marketplace for all the actors. H_2 producers want to connect and inject and market their product. The processes for the integration of locally produced H_2 are very similar to biomethane, which has a long experience in several countries.
- The existing gas DSO and the cities should be allowed to extend the concessions also to the H2 pipes in the area, and DSO should be allowed to operate blends and pure H_2 grids. To enforce a split of the DSO into a company distributing methane, blends, SNG and H_2 would increase the complexity and cost of operations as more personal is needed and new interoperability issues arise. The process of repurposing existing natural gas pipes and shifting them to H_2 should not be burdened with excessive legal processes. Often the upgrading of the pipes or plants is done during maintenance or repair processes, even if the physical conversion to H2 comes later as soon as the H_2 is available and the consumers are ready. We want to connect as many H_2 injection plants to as many consumers as possible, be practical and cost efficient, and offer the best service to the consumers.
- The development of the EU H_2 Backbone is a huge project. The DSO want to work closely together with the TSO to make it happen. The more H_2 already exists at the local level and the further the transition is prepared and under way, the easier it is for the TSO to identify free space in the system start the transition. As in the ongoing conversion from L-Gas to H-Gas each country needs a detailed conversion plan. In Germany we started the work in the **project "H2vorOrt[5]"** which is carried by 40 DSO in cooperation with the technical association DVGW. Many processes are well known, well trained personal is available.
- In the German grid development plan the TSO called on the DSO to identify their H_2 demand for 2050, resulting in 290 TWh/a. This process will be repeated continuously and become more detailed and binding along the way. Letters of intent have to be signed with end users and concrete projects shall be named. This will feed back into the plan and the backbone process. A **legally binding quote for climate neutral gases** as proposed by 67 companies of the Thüga group[6] could stabilize the development.

3. What kind of organizational structures would be the most appropriate to deal with the H2 network regulation and the preparation of network codes (ENTSO-G, H2-specific bodies, Commission)?

- We see the need for a separate DSO entity for Gas, integrating natural gas, biomethane, SNG and H2 distribution grids. Until the gas package is implemented and the entity operational, the 4 DSO associations and their member companies could organise the work in a structured way to be involved - from the beginning - in the adaption of the network codes and the future TYNDP. To ensure that cross sectorial issues between gases and electricity are addressed, a standing committee between the two DSO entities can be installed. It could be helpful to have a cooperation already before the gas entity is formed as e.g. the network code cyber security and potentially also the network code flexibility is relevant for all energies at the distribution level.
- A close cooperation between the DSO and TSO will enable a faster roll out of the H_2-economy. For many years the German Cooperation Agreement (KOV) joins together all market players in a set of contracts and rules, which also includes green H_2. We successfully organized the ongoing process of the German gas switch from L-Gas to H-Gas as equal partners, where one third of all consumers will go through the gas quality transition. With this experience we promote a more structured cooperation between the DSO entity and ENTSOG as it will help the transition process.
- We consider transport and distribution of H_2 as regulated business. Splitting the ENTSO in gas and H_2 or building two separate DSO entities for gas and H_2. It would double the work, double the institution, and put even more pressure on the limited number of specialists doing the work in Brussel and in the member states. The expansion of the existing rules of the network codes to H_2 can be efficiently organized with the expertise of the gas specialists joint with expertise of H_2 specialists.
- Maybe we can use the next Madrid Forum to have a detailed session on what kind of market and rules the different actors envisage and work out similarities and differences between the different gases in dedicated working groups. This could be a starting point for the concrete work on the network code adaption processes that we will need very soon, even before the gas legislation is passed. For gas quality issues for example a lot of preparatory work in CEN and the Prime Movers Group is already far advanced.

1. www.dena.de/fileadmin/dena/Dokumente/Pdf/9283_dena_Study_Integrated_Energy_Transition.PDF
   www.dena.de/fileadmin/dena/Publikationen/PDFs/2021/Abschlussbericht_dena-Leitstudie_Aufbruch_Klimaneutralitaet.pdf
2. www.frontier-economics.com/media/4835/the-value-of-hydrogen-in-the-heating-market.pdf
3. www.ready4h2.com/
4. https://www.dvgw.de/medien/dvgw/regional/nrw/meinelg/2021-08-17-Wasserstoff_in_der_Energiewende-was_geht-Prof-Linke.pdf
5. https://www.dvgw.de/medien/dvgw/leistungen/publikationen/h2vorort-wasserstoff-gasverteilnetz-dvgw-broschuere-engl.pdf
6. https://thuega-cdn-copy.s3.eu-central-1.amazonaws.com/Thuega/documents/210929_Papier_Thuega_Quote_THG_final.pdf

The 512.000 km of german distribution grids are a central part of the german energy landscape:

www.**H2vorOrt**.de

An Initiative of 40 DSOs in cooperation with the DVGW (technical gas association) & VKU (public utilities association

1.700.000 industrial and commercial endusers, CHP

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

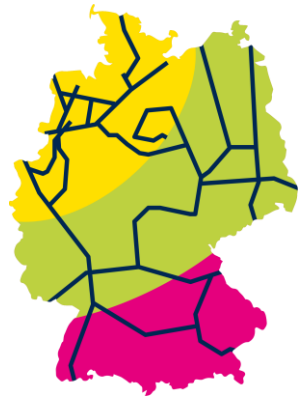
Delivery of > 80% of the German gas consumption

H2-Readiness/grid material:

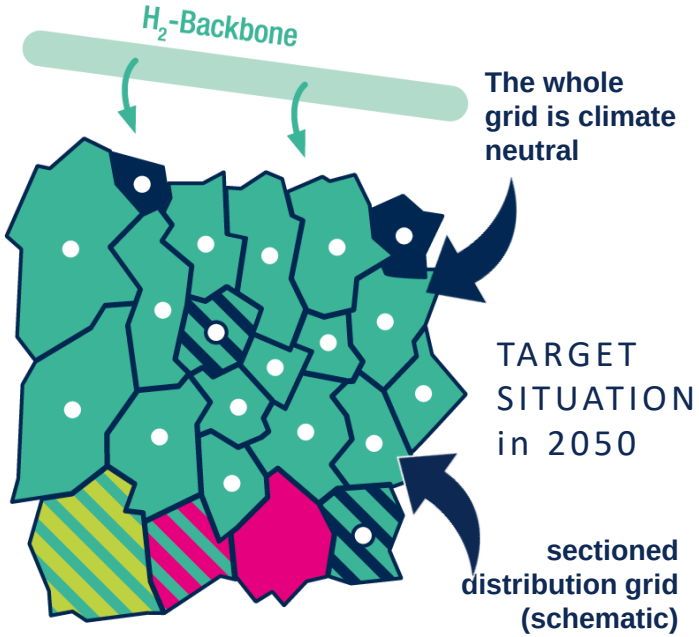
● Plastics ● Steel

Source: Monitoringbericht der BNetzA (2019), BDEW „Wie heizt Deutschland 2019“, DVGW GaWa-Statistik

How can the gas system become climate neutral until 2050?



Delivery via H_2-Backbone

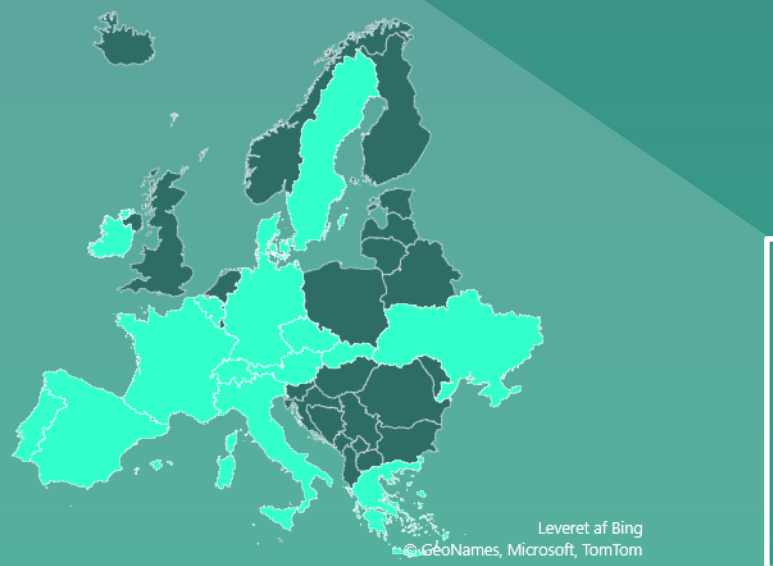


+ Biomethane
+ decentralized H_2-production
+ SNG (methanized H_2)

The gas grid can distribute climate neutral H2.

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

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



European DSO Study

ready4H2

90 DSOs from 15 member countries
Austria, Belgium, Czech Republic, Denmark, France, Germany, Greece, Ireland, Italy, Portugal, Slovakia, Spain, Sweden, Switzerland, Ukraine

8 member associations
CEDEC, Eurogas, Energy Community, GEODE, GERG, Marcogaz, ERIG, GD4S

Ready4H2 is a project that aims to combine the H2 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 carbon reduction potential H2 utilization.

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

1. The first analysis will be a collection of the experiences that the European gas distribution companies have with H2 projects and infrastructure. It will also investigate how the DSOs are involved in their country's H2 developments and how far the country's H2 strategy is evolved.
2. The second analysis will evaluate how the gas distributors can contribute to the H2 value chain. The gas distributors' experiences and knowledge will be analyzed and converted into value propositions for the H2 value chain. It will also involve the gas distribution companies' unique positions and contribution to strategic land planning.
3. The third analysis will be a roadmap on how the gas distribution companies can transform into Europe's primary H2 distribution infrastructure. It will provide concrete initiatives for how the gas distribution companies at the European and national level can be a link between H2 producers and consumers. It also elaborates on possible barriers and opportunities in this development.

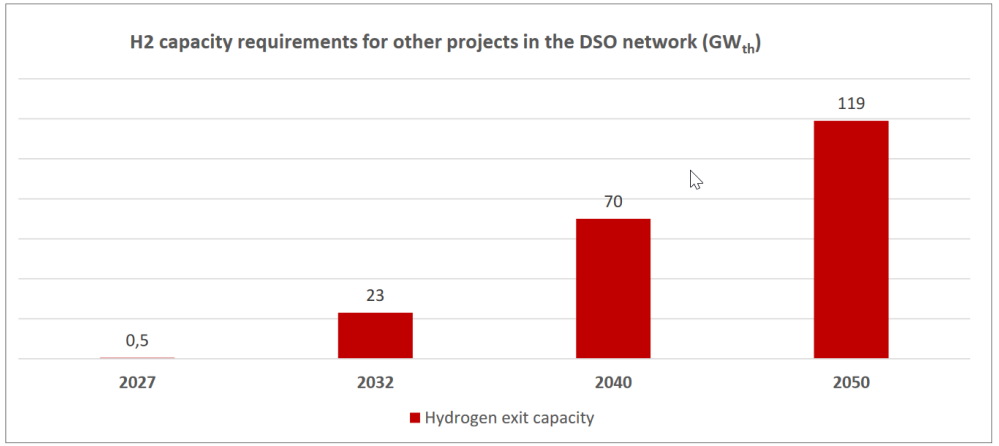
THE GERMAN TSO CALLED FOR THE NATIONAL GRID DEVELOPMENT PLAN ON THE DSO TO DEFINE THEIR H2 DEMAND UNTIL 2050 AND THE RESULT WAS EXCEPTIONAL

A manual was created to help the DSO to define the demand as concrete as possible with different levels of certainty for large endusers

WEB and green gas market surveys

FNB Gas
DIE FERNLEITUNGSNETZBETREIBER

Reports about other projects in the DSO network (Category 3)



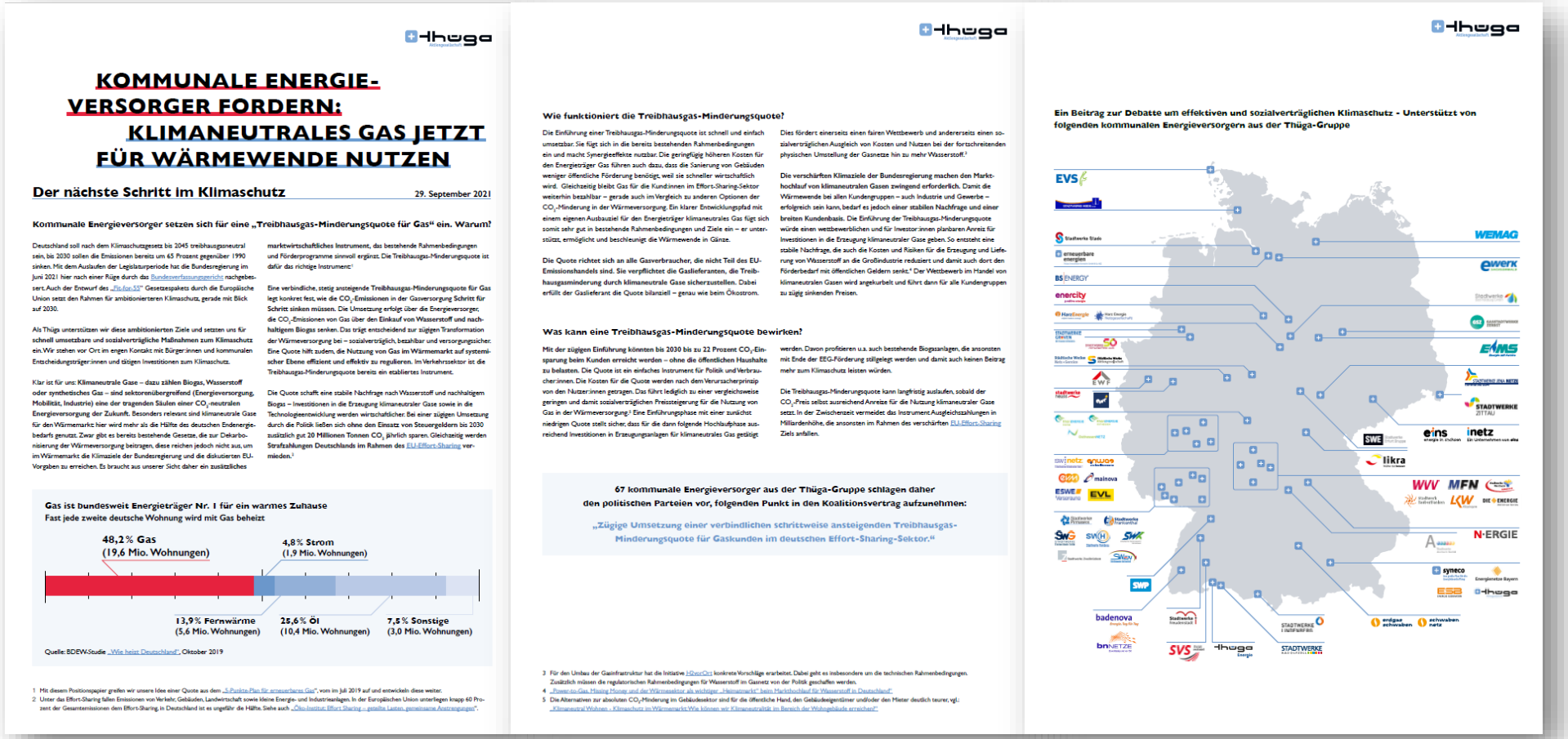
- Increase in demand in **DSO network** to as much as **119 GW in 2050**.
- In terms of volume, this corresponds to a demand in the DSO network of **290 TWh in 2050**.

- 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

FROM OUR EXPERIENCES IN THE ELECTRICITY SECTOR WE BELIEVE THAT A QUOTA FOR CLIMATE NEUTRAL GASES OFFERS PRODUCERS AND CUSTOMER

67 Companies of the Thüga group signed up to a legally binding quota

- Many years of very mixed experiences in the biomethane business showed us, that investors in production sites need the certainty of offtake volumes.
- The quota would be used to ramp up the usage of climate neutral gases for gas customers in the EU Effort Sharing sector.
- For Germany, a 22% CO2 reduction (= 20 million tCO2) would be possible by 2030.



KOMMUNALE ENERGIE-VERSORGER FORDERN: KLIMANEUTRALES GAS JETZT FÜR WÄRMEWENDE NUTZEN

Der nächste Schritt im Klimaschutz

29. September 2021

Kommunale Energieversorger setzen sich für eine „Treibhausgas-Minderungsquote für Gas“ ein. Warum?

Gas ist bundesweit Energieträger Nr. 1 für ein warmes Zuhause

Fast jede zweite deutsche Wohnung wird mit Gas beheizt

48,2 % Gas (19,6 Mio. Wohnungen)

4,8 % Strom (1,9 Mio. Wohnungen)

13,9 % Fernwärme (5,6 Mio. Wohnungen)

25,6 % Öl (10,4 Mio. Wohnungen)

7,5 % Sonstige (3,0 Mio. Wohnungen)

Quelle: BDEW-Studie „Wie heizt Deutschland“, Oktober 2019

Wie funktioniert die Treibhausgas-Minderungsquote?

Was kann eine Treibhausgas-Minderungsquote bewirken?

67 kommunale Energieversorger aus der Thüga-Gruppe schlagen daher den politischen Parteien vor, folgenden Punkt in den Koalitionsvertrag aufzunehmen:

„Zügige Umsetzung einer verbindlichen schrittweise ansteigenden Treibhausgas-Minderungsquote für Gaskunden im deutschen Effort-Sharing-Sektor.“

Ein Beitrag zur Debatte um effektiven und sozialverträglichen Klimaschutz - Unterstützt von folgenden kommunalen Energieversorgern aus der Thüga-Gruppe

Download