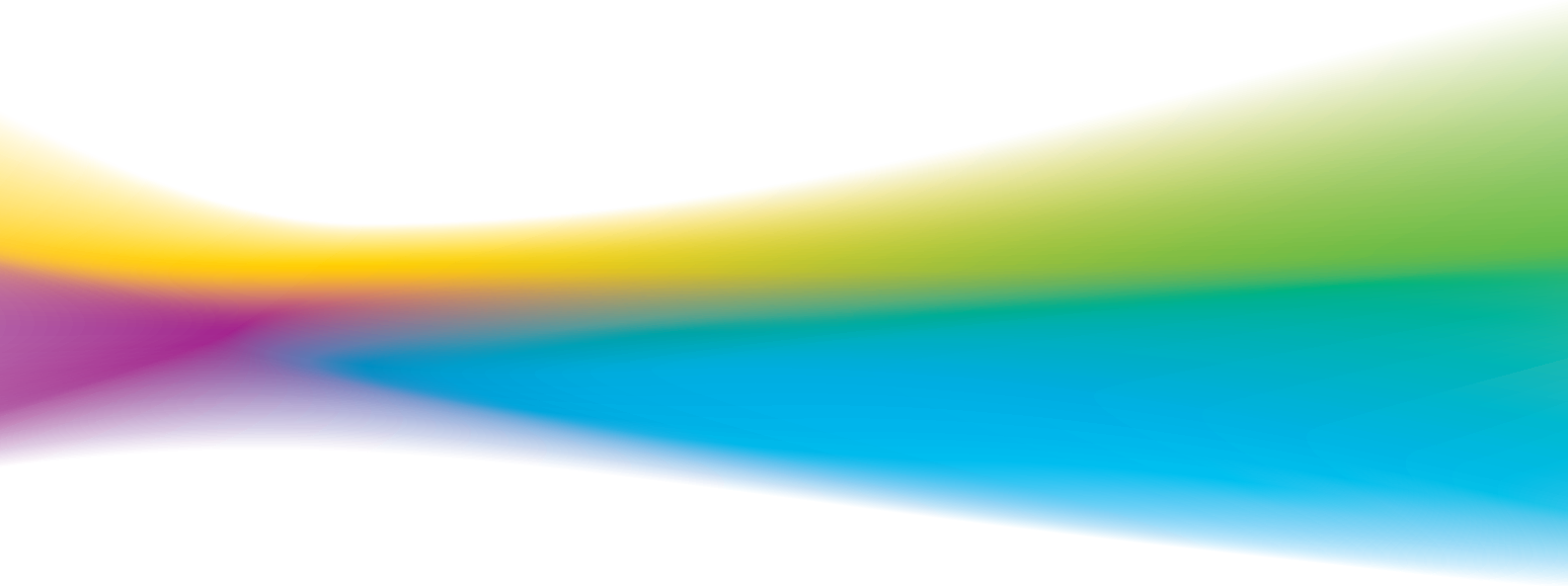
GAS UND WASSERSTOFF WIRTSCHAFT

THE GERMAN
GAS AND HYDROGEN
INDUSTRY



The Transformation of Gas Supply

The Successful Transition to New Gases.

The Importance of Gas will Increase, Enabling Our Country to Become Climate-Neutral.

Even if some claim otherwise: the importance of gas will increase, enabling our country to become climate-neutral. Because even in a world with a lot of electricity from wind and sun and less energy consumption, it is gas that mainly keeps our lives functioning in Germany.

Heating homes and hospitals or producing fertilizer, paper, glass, beer, bread rolls and oat yogurt – almost nothing runs in our country without gas.

This is why we're converting the gas supply now, to new gases such as biogas and hydrogen, generated in a climate-neutral way from the sun, wind and organic material.

These new gases will enable us to replace coke in the steel industry, diesel in trucks and ships and coal and natural gas in city heating plants. And when the wind and sun decide to take a break, gas-fired power plants take over the production of electricity: with hydrogen, which we can produce from the wind and the sun.

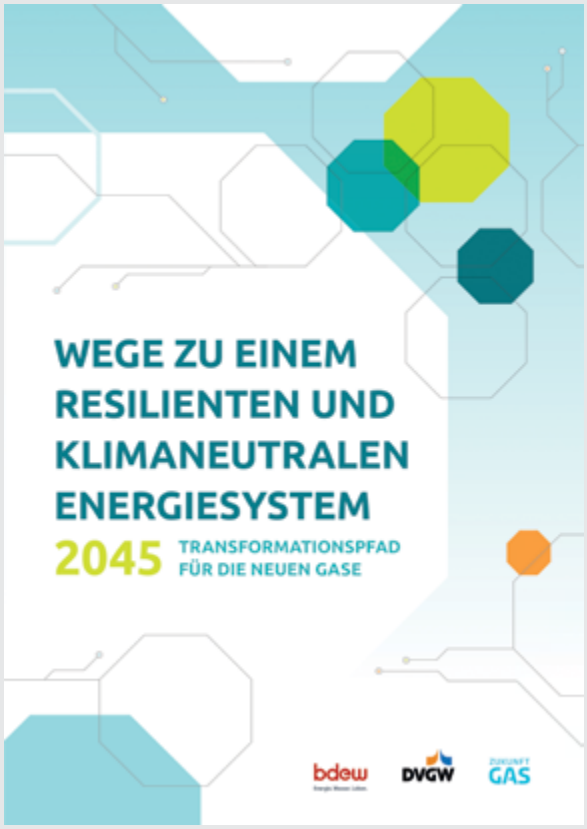
Hydrogen is becoming the energy source of the future. In hydrogen we can store solar and wind energy from summer for the winter, and from day for the night. Hydrogen lets us import an infinite amount of sustainable energy from all over the world and make ourselves independent of individual countries and technologies.

Germany aims to be completely climate-neutral by 2045 – as the first industrialized nation in the world. To achieve this we are expanding new terminals at sea as well as the existing gas network. And we create solutions for carbon dioxide, a gas which cannot be avoided.

To make this happen, we are investing more than 80 billion euros in new, climate-neutral gas supply for Germany.

Transforming energies safely – this is our mission.

DIE GAS- UND WASSERSTOFFWIRTSCHAFT (THE GERMAN GAS AND HYDROGEN INDUSTRY)



The implementation concept 'Wege zu einem resilienten und klimaneutralen Energiesystem 2045 – Transformationspfad für die neuen Gase' [Paths to a Resilient and Climate-Neutral Energy System 2045 – Transformation Path for the New Gases] is the basis of this publication.

The transformation path for the new gases was developed by the BDEW Bundesverband der Energie- und Wasserwirtschaft e. V., DVGW Deutscher Verein des Gas- und Wasserfaches e. V. and DIE GAS- UND WASSERSTOFFWIRTSCHAFT e.V. in an intensive process together with member companies and external stakeholders, and was presented to the public on 10 May 2023.

english.gas-h2.de/transformation

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Transformation Path for the New Gases

The economic sector and society worldwide are undergoing a profound transformation to limit global warming to 1.5 degrees. Germany has set itself the goal of achieving climate neutrality by 2045. We, the gas industry in Germany, unconditionally support this – and are further developing our business models, which until now have been centered around natural gas, for a climate-neutral future.

The use of fossil natural gas that has not been decarbonized will become meaningless to 2045. New gases such as hydrogen (H_2) and its derivatives as well as biomethane will play the primary role in the future. Today's consensus is that these are indispensable for a climate-neutral energy system. The future energy system is therefore based on the coexistence of electricity- and gas-based technologies, and the gas industry is gearing its strategic decisions to this climate-neutral system.

The transformation must be accelerated for it to succeed by 2045. To this end, it is essential to secure the transformation path so that the energy transformation can occur in a way that is as crisis-proof and socially acceptable as possible. Both the consequences of Russia's attack on Ukraine and the supply chain bottlenecks during the COVID-19 pandemic have underlined the high importance of resilience: In the transformation process we must work together to ensure that we can cope with energy price crises, challenges to security of supply and setbacks in reducing greenhouse gas emissions.

Abstract debates about electrification, energy efficiency and establishing a hydrogen economy are not very helpful. The crises experienced in recent years have taught us that reality quickly makes model-based considerations obsolete and detailed planning invalid. Achieving climate neutrality in a good two decades is such an ambitious target that, rather, timely directional decisions are needed for a pragmatic and resilient operational framework that stimulates the necessary investments in ways that are open to technology.

The gas industry is changing, and this affects supply and demand as well as the gas infrastructure and associated business models. The industry is facing up to this transformation: During several workshops held with representatives from member companies and external stakeholders, the six theses and a proposal presented below were drawn up which outline the contribution of the energy industry towards climate neutrality in 2045. Our special thanks go to Dr. Felix Matthes (Öko-Institut), Simon Müller (Agora Energiewende) and Dr. Sascha Samadi (Wuppertal Institute) for their valuable suggestions.

We view these theses as our proposal for a new entry into one of the most important energy and climate policy debates of our time, and in this way we aim to contribute to the current political topics of discussion: This involves for example the National Hydrogen Strategy and the heat transition, but also the development and implementation of a carbon management strategy and the monitoring of corresponding European developments.

Toward Climate Neutrality – a Resilient System Emerges with Green Power Generation and New Gases

New gases, meaning renewable and decarbonized gases, are indispensable for a climate-neutral energy system. It is still unclear for what and in which quantities the new gases will be used for in the future. This is the result of uncertainties in terms of technological, economic, (geo)political and social developments in some areas.

A resilient design of the energy transition is necessary due to such uncertainties. This relates to both the robustness of the transformation path and the crisis resistance of the targeted system. Resilience is ensured by the provision of alternative solutions and sufficiently dimensioned infrastructures – when intermeshed, both ensure rapid response and regeneration capability in the event of stress. The storage capability of renewable and decarbonized gases in close interaction with renewable power generation contributes significantly to establishing a resilient energy system. The domestic production of new gases also importantly strengthens the resilience of the overall system.

Electricity and Gas Systems Expand Together in Haßfurt

In October 2016, Windgas Haßfurt GmbH, a joint venture between the Stadtwerk Haßfurt (public utilities) and the Hamburg-based Greenpeace Energy eco-energy cooperative, commissioned a Power-to-Gas (PtG) plant. The core of the plant is a PEM electrolyzer with 1.25 megawatts (MW) of peak power. The state of the art system converts surplus wind- and solar power into green hydrogen, with up to one million kilowatt hours annually.[1]

Since 2019, a hydrogen combined heat and power plant, which can run on pure hydrogen without fossil fuel components, has expanded the plant. This meant that, for the first time, a hydrogen-based and carbon dioxide (CO_2)-free storage chain for renewable electricity was set up in municipal practice. The storage chain leads from renewable power generation from wind energy, via conversion into hydrogen by means of electrolysis as well as storage in pressure tanks, to reconversion via combined heat and power generation.[2]

Innovative Hydrogen Energy Solution: Utilising Energy from the Sun for the Winter

With its hydrogen-powered combined heat and power plant, the INNIO Group and RAG Austria AG are demonstrating how renewable energy can be efficiently stored and utilised: Surplus solar energy from the summer months is utilised to produce green hydrogen. This is then stored in the world's first underground hydrogen storage facility in a porous storage site in Upper Austria.

In winter, it is then converted into electricity and heat in a highly efficient hydrogen CHP unit from INNIO. The innovative plant demonstrates how sector integration and renewable energies can contribute to a sustainable energy supply.[3]

1 Stadtwerk Haßfurt.
2 2G Energy.
3 INNIO Group, RAG Austria AG

In a Climate-Neutral Energy System, New Gases are Essential in Parts of Industry, Transport, Electricity and Heat Supply

Climate neutrality requires the use of renewable and decarbonized gases. Undisputed applications are their material use in industry (e.g. ammonia, steel), in non-electrifiable energy consumption (e.g. aviation and shipping), and the safeguarding of electricity and heat supply (with reference to 'dark lulls').

In view of considerable uncertainties, estimates of the corresponding requirements vary. A meta-study[4] commissioned by us, summarizing the results of several recognized climate neutrality studies, indicates the following ranges: For the year 2030 there is demand for 49 to 133 terawatt hours (TWh) of indispensable ('no regret') renewable and decarbonized gas, and for 2045 between 127 and 396 TWh.

CO_2-Low Carbon Steel Production in Salzgitter

The objective of the SALCOS® (Salzgitter Low CO_2 Steelmaking) transformation program is to achieve virtually CO_2-free steel production, to be implemented in three stages. The first stage will become operational as early as the end of 2025 and will consist of a direct reduction plant, an electric arc furnace and a 100 MW electrolysis system for hydrogen production. The conversion of steel production at the Salzgitter site is planned for completion by the end of 2033, well ahead of statutory requirements.

The direct reduction plant is based on the innovative Energiron ZR® Direct Reduction technology jointly developed by Tenova and Danieli, which can be operated flexibly with hydrogen and gas in any mixing ratios.[5]

4 Team Consult (2023).

5 Salzgitter AG.

Hydrogen for the Frankfurt Rhine-Main Metropolitan Region

The Rh2ein-Main Connect project is planning to build a regional hydrogen grid around 300 kilometres long in the Frankfurt Rhine-Main metropolitan region. The aim is to supply climate-friendly hydrogen to power plants, industry and private heat generators from 2028. Leading energy providers and network operators are working together to repurpose existing natural gas pipelines.

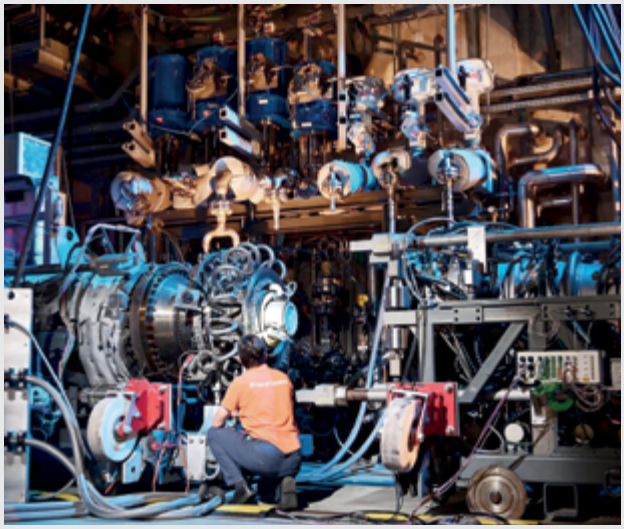
The project serves as a blueprint for the development of regional hydrogen grids and makes an important contribution to decarbonisation and secure energy supply in Germany.

The joint project of ENTEGA AG, Mainova AG, ESWE Versorgungs AG, Kraftwerke Mainz-Wiesbaden AG, e-netz Südhessen AG, NRM Netzdienste Rhein-Main GmbH, Open Grid Europe GmbH and GASCADE Gastransport GmbH illustrates the added value of shared resources and synergies for a climate-neutral energy supply.[6]

HEART Hydrogen Jet: Sustainable Aviation Through Hydrogen

The HEART project by Rolls-Royce Germany and the DLR German Aerospace Centre marks a milestone in aviation technology. For the first time, a fuel jet has been developed that enables modern aircraft engines to run on 100 percent hydrogen.

The innovative technology reduces CO_2 emissions to zero and fulfils certifiable nitrogen oxide emission values. The project shows how hydrogen can make aviation more sustainable and makes a significant contribution to the decarbonisation of the transport sector.[7]



6 ENTEGA AG.

7 Rolls-Royce Deutschland.

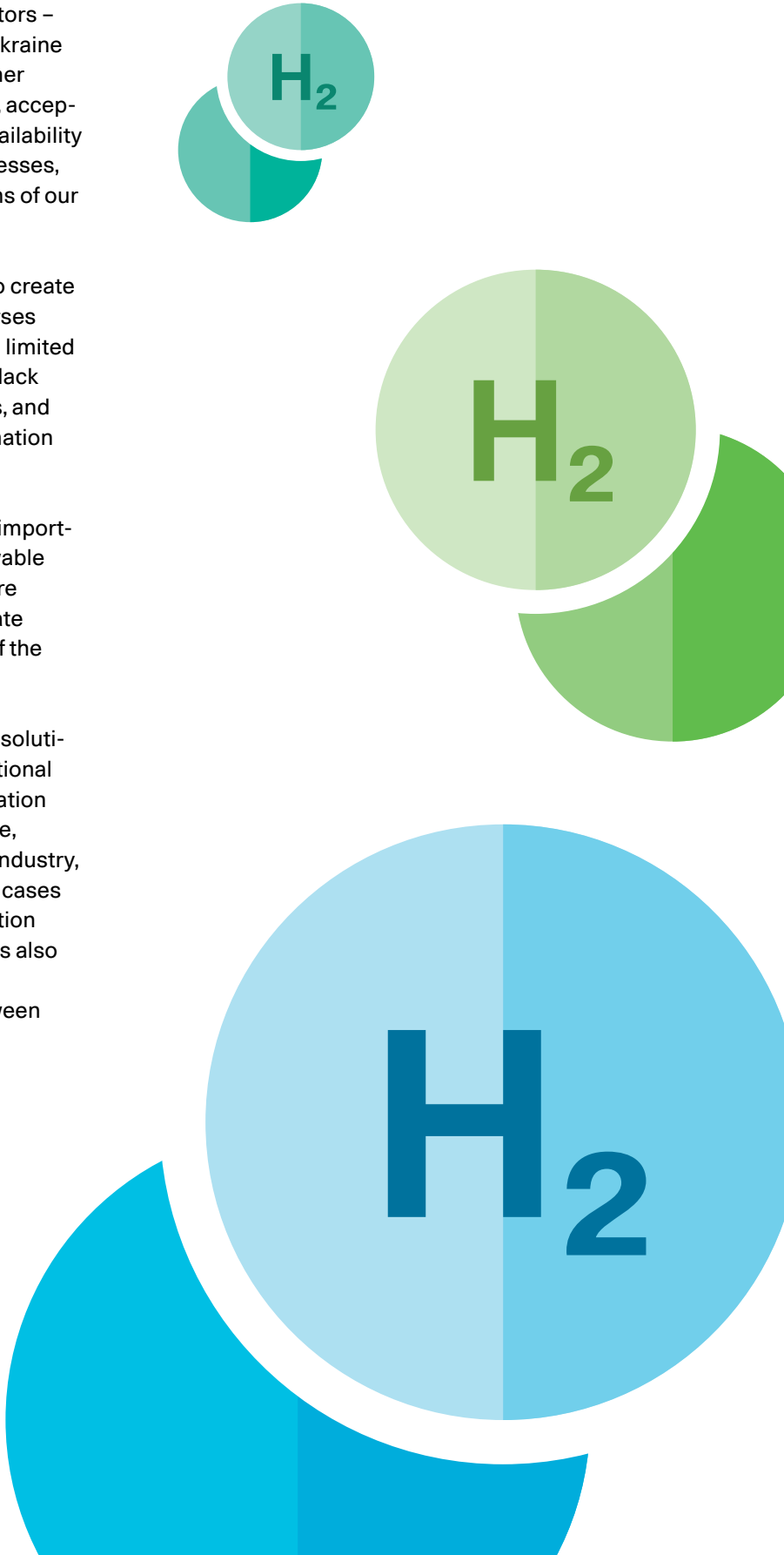
New Gases Make the Transformation and the Energy System Resilient

The path to climate neutrality cannot be fully planned and will always be challenged by external factors – the effects of Russia's war of aggression on Ukraine have made this clear. There are also many other imponderables: technological developments, acceptance, financing conditions, supply chains, availability of experts and skilled workers, planning processes, and also, importantly, the transformation paths of our European neighbors.

The best response to these uncertainties is to create as many options as possible. Alternative courses of action reduce the risk of high energy costs, limited supply security, climate protection setbacks, lack of acceptance among citizens and customers, and ultimately declining support for the transformation project toward climate neutrality.

Given the aforementioned uncertainties, it is important to utilize the storage capabilities of renewable and decarbonized gases and the infrastructure already in place for this. This allows us to create more options and strengthen the resilience of the overall energy system.

In addition to purely electric decarbonization solutions, applications with new gases create additional solution spaces for mitigating the implementation risks. Resilience applications of new gases are, for example, high-temperature processes in industry, heavy-duty road transport and heat supply in cases where energy-efficient design and electrification are not sufficient solutions. Forecast demands also vary for resilience applications of new gases, ranging from 20 to 60 TWh for 2030 and between 80 and 434 TWh for 2045.[8]



8 Team Consult (2023).

Energy Park Ehrang: Sustainable Heat Supply for Trier

Stadtwerke Trier's Ehrang energy park utilises the infrastructure of a former sewage plant to produce biomethane from wastewater and biogenic waste. This is fed into the existing gas grid and enables the climate-friendly operation of heating systems in Trier-Ehrang and Quint.

The project significantly reduces CO_2 emissions, ensures a sustainable heat supply and is a role model for other regions. By utilising existing infrastructure, it makes an important contribution to the energy transition.[9]

Hydrogen Heat in Hohenwart

Energie Südbayern, Energienetze Bayern and Thüga are converting an existing gas network to 100% hydrogen as part of the innovative H2Direkt research project. H2Direkt thus demonstrates the future-capable use of gas infrastructure and creates a blueprint for a climate-friendly heat supply.

The conversion of the network section to pure hydrogen needs only a few construction measures on the network components. The household heating systems are being replaced with state-of-the-art H_2 condensing boilers. Vaillant, as a heating industry expert, is reinforcing the innovation project by supplying 100% hydrogen condensing boilers.

Ten private households already connected to the local gas grid were selected for the field test, and a commercial customer is also being supplied with hydrogen.

The supply of hydrogen to the buildings started in September 2023. The conclusion: the changeover went smoothly and even at minus 15 degrees Celsius, the entire hydrogen infrastructure and the new heating systems can be relied upon.[10]

9 Stadtwerke Trier.

10 Energie Südbayern.

Bavaria's Largest Electrolysis Plant in Wunsiedel

WUN H2 GmbH was founded in 2021 by Rießner-Gase GmbH, Siemens Project Ventures GmbH and Stadtwerke Wunsiedel (public utilities) as a joint venture. The aim is to plan, build and operate Bavaria's largest energy storage facility. At the time of commissioning in September 2022, the plant was one of the largest in Germany and Europe. The facility, with a nominal capacity of 9 MW, generates around 175 kilograms of hydrogen per hour. This will enable an annual production of up to 1,350 tons of green hydrogen. The hydrogen supplied has a purity of up to 99%. Compressed to up to 500 bar, it is then stored in on-site tanks. In the plant, water is split into hydrogen and compressed in a PEM electrolysis process using electricity from solar and wind power systems.

The PEM hydrogen generation plant converts the available renewable energy into a storable medium and makes it available for various applications in transport and industry.[11] Thus, the efficient coupling of individual sectors is achieved.

11 WUN H2.

The Future Infrastructure for New Gases will be Built According to Needs on the Basis of the Existing

The existing infrastructure (import terminals, storage facilities, transmission and distribution networks) forms the starting point for the future gas infrastructure. The transformation to be achieved includes building new hydrogen infrastructure, converting existing infrastructure to new supply tasks, and the decommissioning of infrastructure where gases are fully replaced by electrification.

Feasibility studies and pilot projects by the gas industry clearly indicate that on the technical side nothing prevents the successful and rapid transformation of the infrastructure. However, what is needed are political decisions on the direction to be taken and the further development of a reliable regulatory framework. Planning certainty is important so that nfrastructure companies concerned are able to quickly make investment decisions.

Green Hydrogen from Central Germany

As part of the Bad Lauchstädt Energy Park innovation project in central Germany, the intelligent generation of green hydrogen from wind power as well as its storage, transport, marketing and utilization are being tested on a large scale.

It is the first project in Germany to map the entire H_2 value chain in a closed loop. The energy park is thereby helping to research future green hydrogen technology and bring it to market maturity.

Construction of the eight wind turbines, and thus the first stage of green hydrogen production, is scheduled to start in 2023. The project will be realized by experienced partners including Uniper and VNG.[12]

12 Energiepark Bad Lauchstädt.

The European Hydrogen Backbone – the Future Hydrogen Transmission System

A consensus exists throughout Europe on the high importance of hydrogen as a climate-friendly energy supplier. Accordingly, a functioning hydrogen infrastructure is essential. 33 gas transmission system operators from 28 European countries, including OGE and Ontras, have specified the hydrogen transport infrastructure required for future needs in the form of the European Hydrogen Backbone (EHB).

By 2030, five pan-European hydrogen supply and import corridors can be established to serve ports, industrial clusters and hydrogen valleys. This network is expected to have a length of 28,000 kilometers by 2030 and up to 58,000 kilometers by 2040.

Approximately 60% of the hydrogen pipelines are based on retrofitted gas infrastructure, whilst a good 40% will be newly built. Subsea pipelines and interconnectors link countries to offshore energy centers and other potential export regions. The proposed backbone will require investments of 80 to 143 billion euros.[13]

The first sections of the EHB are being realised via joint projects, so-called 'IPCEI' (Important Projects of Common European Interest). The approval of the hydrogen core grid in October 2024 marks the starting point for the development of a hydrogen infrastructure in Germany. A total of 9,040 kilometres of pipelines will gradually go into operation until 2032. This could accelerate greenhouse gas reductions in industry and the energy sector.

Zero Emission Terminal for new Gases in Stade

In June 2024, construction of the first land-based energy terminal in Germany began. The Hanseatic Energy Hub (HEH) is a future-flexible terminal for liquefied gases at the industrial location of Stade. The construction costs amount to around 1 billion euros, which emphasises the importance and scope of the project. The planning and realisation of the terminal, port, industrial park and connecting infrastructure are designed in such a way that the conversion from gas to hydrogen can be modular. The hub will thus secure and diversify Germany's import requirements for affordable energy.

The Hanseatic Energy Hub is designed onshore for LNG (liquefied natural gas) and new gases such as bio-LNG and synthetic methane and, with a total capacity of 13.3 billion cubic metres of gas, is expected to cover around 15 percent of Germany's gas requirements from 2027. With the growing global supply, the hub will also be available for the import of green ammonia.[14]

The chemical company Dow operates one of the largest industrial plants in northern Germany in Stade and is cooperating with the Hanseatic Energy Hub. Thanks to the strategically favourable location and the existing infrastructure, the regasification of the cryogenic LNG can be carried out almost emission-free with the help of industrial waste heat. Enagás is an industrial partner and co-partner of the Hanseatic Energy Hub in Stade. Gasunie Deutschland is realising the connection pipeline for the energy import terminal as the transmission system operator for the Dutch corporation.

13 Amber Grid.

14 Hanseatic Energy Hub.

H_2ercules – the Fast Track for Hydrogen in Germany

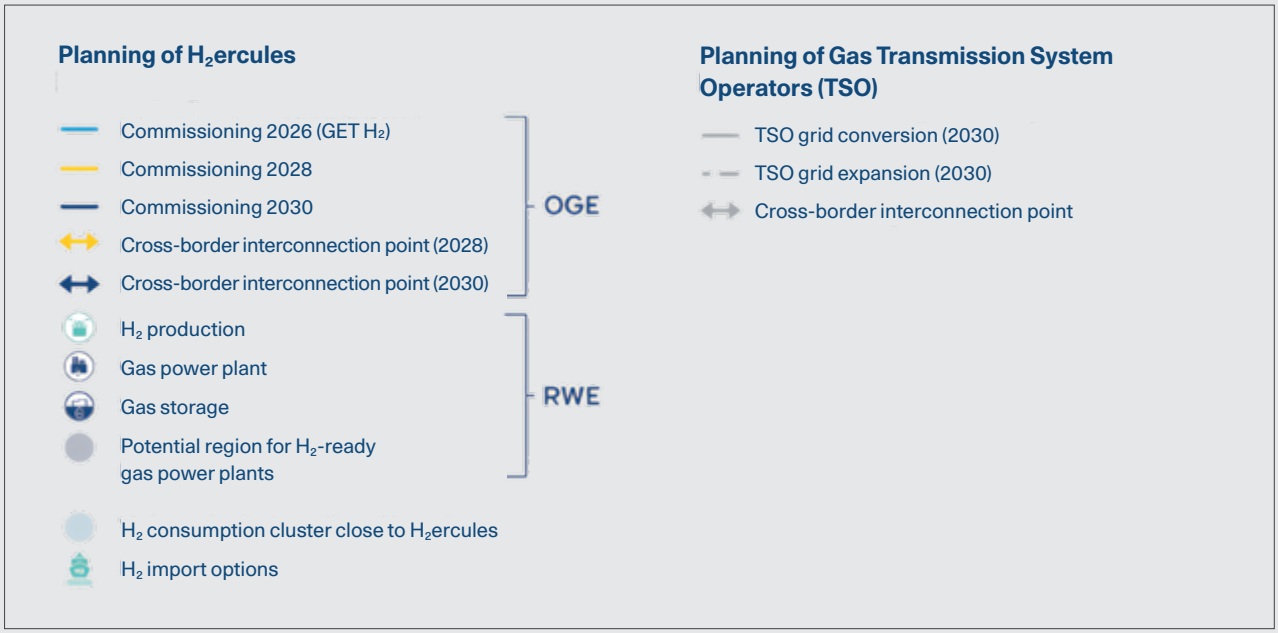
The H_2ercules initiative aims to create the heart of Germany's hydrogen infrastructure in XXL format by 2030. With this goal in mind, OGE and RWE in the future are working together across the value chain to quickly supply consumers in southern and western Germany with hydrogen from the north.

As well as hydrogen production on a gigawatt (GW) scale, import routes for green hydrogen are also to be opened up. The transport is to be implemented via around 1,500 kilometers of pipeline network, most of which is based on converted gas pipelines.[15]

The H_2ercules network is intended to connect electrolyzers and storage and import facilities for green hydrogen in the north with industrial end users in the west and south of Germany. Other import routes under development from the south and east are expected to be connected by 2030. Thus, H_2ercules can become the backbone of a hydrogen infrastructure from the North Sea coast down to southern Germany.

Implementation of the project is expected to require investments of around 3.5 billion euros. Since most of H_2ercules is based on converting existing gas pipelines, the proposal is, on balance, less expensive and much faster to implement than entirely new construction.[16]

The H_2ercules project is based on a cooperation between the companies OGE and RWE, but this cooperation is not exclusive. Rather, the two companies are on the lookout for other partners motivated to join the project and who wish to actively shape the future of the hydrogen economy within this framework.



15 OGE, RWE.

16 OGE.

Quelle: OGE, RWE.

New Gases will be Available in Sufficient Quantities and at Reasonable Cost

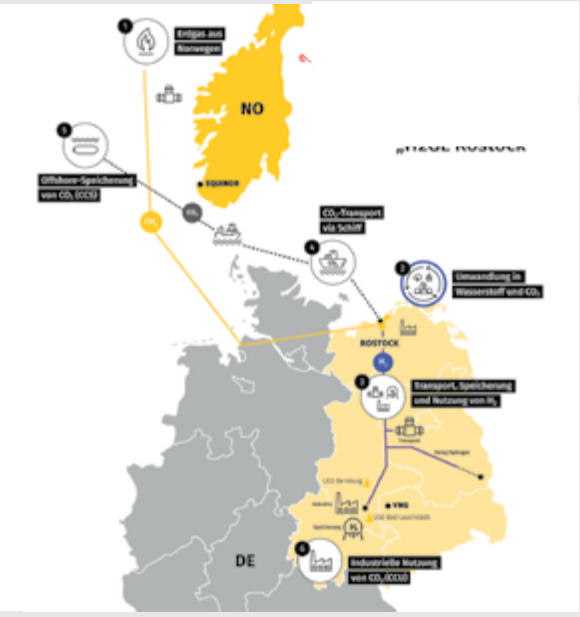
A meta-study commissioned by us indicates that the demand volumes of new gases required for climate neutrality and resilience can presumably be provided in sufficient quantities and at reasonable cost.

Accordingly, the availability of 207 to 599 TWh of new gases (biomethane and hydrogen from imports and domestic production) is expected in 2030, with 631 to 1,029 TWh in 2045. The volume potentials determined take into account green, blue and turquoise hydrogen.

Cost estimates for new gases range from 37.5 to 134 EUR/MWh for 2030 and from 36 to 93 EUR/MWh for 2045.

Rostock Becomes a Hub for Hydrogen and CO_2

Together with the Norwegian energy company Equinor, the Leipzig-based gas company VNG is asessing the import, production and distribution of blue hydrogen (H_2) and ammonia. Under the name H2GE Rostock, options are being evaluated for the production of low CO_2 hydrogen in Rostock. In addition to the planning, construction and operation of a hydrogen production plant, technologies for the capture and use of CO_2 on an industrial scale are to be used. The joint efforts form the basis for a hydrogen and CO_2 hub in the Rostock region and thus for local and regional value creation in eastern Germany. In the future, a base load supply of low CO_2 hydrogen to industry and the reduction of CO_2 emissions can be ensured.[17]



17 VNG Handel & Vertrieb.

Wilhelmshaven Becomes a Hub for New Gases

As Germany's only deep-water harbour on the North Sea coast, Wilhelmshaven offers easy access for large ships to import hydrogen in the form of ammonia. The region will also be the future landing point for large offshore wind farms being built in the German North Sea. This makes the location ideal for large electrolysers and helps to reduce the load on the electricity grids through local electricity production.

More than 50 national and international companies, institutions and scientific organisations are working together in the ENERGY HUB Port of Wilhelmshaven - including many member companies from the gas and hydrogen industry. Together they are realising hydrogen projects in the Jade-Weser region. The aim is to provide climate-friendly hydrogen and support the industry with decarbonisation. One particular advantage of the region is its proximity to salt caverns such as Etzel or Krummhörn, which are ideal for the large-scale storage of hydrogen. The location also benefits from an early connection to the 'European Hydrogen Backbone' - the planned hydrogen distribution network in Europe.

The other activities in the region illustrate the great potential that Wilhelmshaven has as a unique location. Both an ammonia import terminal and a 1GW electrolysis plant for hydrogen production are to be built in Wilhelmshaven by the end of the decade. This could cover 40 - 60 per cent of the hydrogen demand expected throughout Germany in 2030.[18]

Efficient Supply of New Gases

The MOSES (Modular Standardised Feed-in System) project optimises the feed-in of new gases such as hydrogen and biomethane into the gas grid. It relies on standardised plant modules in container format, which guarantee fast installation, low costs and high availability. MOSES significantly reduces planning and construction costs, lowers maintenance costs and promotes scalability. The project thus contributes to the accelerated integration of renewable energies into the gas infrastructure and to the energy transition.[19]

18 ENERGY HUB Port of Wilhelmshaven.

19 OGE.

The Transformation to New Gases Requires the Right Political Framework

All stages of the value chain in the gas industry, as part of their transformation, are facing modifications. Policymakers must set the course for the far-reaching decisions and associated investments that this will require. First of all, this concerns the development of the expected demand for new gases, also in resilience applications. Additional important steps include the expansion of climate protection contracts in industry, the labeling of climate-neutral products, the incentivization of H_2-ready gas-fired power plants and the establishment of a lead market for climate-neutral products by means of public procurement among other measures.

The more demand, infrastructure and trading centers grow, the faster the global hydrogen supply will expand. At the same time, however, the development of national potential has to be considered. The accelerated expansion of renewable power generation forms the indispensable basis for this. Building on this, further steps are needed to achieve the declared goal of 10 GW of electrolysis capacity in 2030. Increased support is also needed for biomethane production. All of this applies to both large, centralized projects and to smaller, decentralized ones.

To ensure that the growing demand can also be met by a corresponding supply, the framework for infrastructure transformation must be adapted. This requires planning across all energy systems (natural gas, hydrogen, electricity). At municipal levels, close interaction between distribution network operators and municipal heat planning must be ensured. Planning and approval procedures must also be brought up to the new 'Germany speed'. At the same time, it is necessary to shape the transformation of the gas industry, also with a view to regulating the networks, in such a way that initial investments in hydrogen infrastructure, which can be started quickly, are ensured.

We are the Partner of Politics and Society for the Transformation Towards Climate Neutrality

With its expertise, capital and willingness to shape the future, the gas industry is available as a partner for the transformation of the energy system toward climate neutrality: we have substantial experience from the conversion of L-gas areas to H-gas and from town gas to natural gas. We are also able to contribute DVGW innovation research, a large number of transformation studies as well as numerous demonstration and pilot projects from the gas industry.

Fundamentally, there is nothing to prevent a successful and speedy transformation of the infrastructure.

We also offer our expertise for the newly emerging field of carbon management, i.e. the capture, transport, storage and reuse of CO_2. We are continuously expanding our knowledge, testing solutions for the transformation and already launching initial business models in practice.

It is not only the provision of expertise that the gas industry can provide: Naturally, it has the ambition to implement the transformation of the gas system both technically and in terms of business opportunities. For example, we test the hydrogen compatibility of applications and advise the industrial sector in this area.

We are establishing H_2 readiness of the gas infrastructure, conducting market surveys on infrastructure usage, developing the hydrogen backbone at transmission level and driving the evolution of current gas distribution networks to build the hydrogen distribution network structure. We are also establishing purchasing expertise in international markets and producing biomethane and green hydrogen on a decentralized basis. Last but not least, we are committed to establishing an EU-wide verification and trading system for renewable and decarbonized gases.

Planning and approval procedures must be brought up to the new 'Germany speed'.

Above all, however, we are convinced that the transformation of the energy system towards climate neutrality can only succeed in an integrative manner and in extensive cooperation with the entire energy industry and all relevant political, social and scientific protagonists. This is why we look forward to exchanging concepts and ideas with you, and we are happy to contribute our expertise and experience in implementing creative solutions to ensure the success of the transformation.

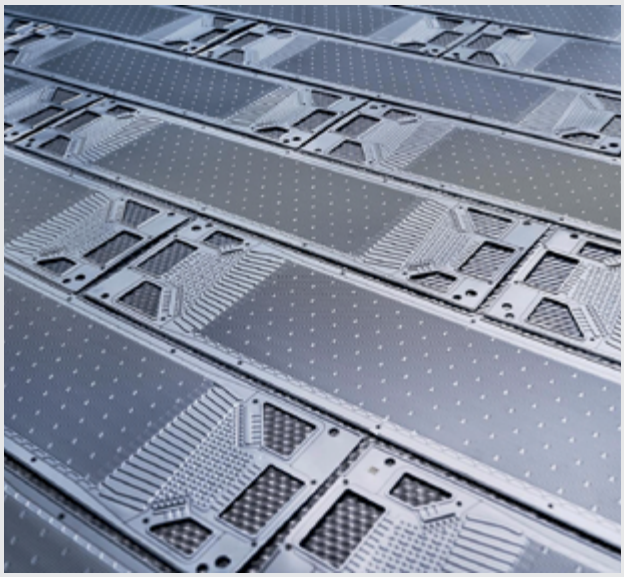
Innovation Award New Gases

The gas and hydrogen industry is in the midst of the transformation to climate neutrality. This means that the use of fossil, non-decarbonised natural gas will become increasingly irrelevant by 2045. Instead, new gases will take its place: Hydrogen and its derivatives as well as biogas. Innovative ideas are needed to successfully realise this transformation. This is why the German gas industry honours pioneering energy concepts and innovative applications with the Innovation Award. The event provides a platform for companies in the gas and hydrogen industry to exchange ideas with stakeholders from politics, the media and science in order to discuss the potential of new gases for the resilient and climate-neutral energy system of 2045. The prize has been awarded every two years since 1980. In the past, it has already demonstrated the future potential of gas as an energy source. It is sponsored by the three industry associations BDEW, DVGW and DIE GAS- UND WASSERSTOFFWIRTSCHAFT. ASUE supports the project as a competence partner.

The following projects, among others, were recognised in the New Gases 2024 Innovation Award.[20]

More Efficient Hydrogen Production with Innovative Coatings

The Enertect PC+ and Enertect CT+ coatings developed by Schaeffler in Herzogenaurach improve the performance of metallic bipolar plates in PEM electrolysers. By dispensing with precious metals and using low-cost steels instead of titanium, manufacturing costs and CO_2 emissions are significantly reduced. The nanostructured coating ensures high electrical conductivity and corrosion resistance over the entire service life. Schaeffler is thus contributing to the sustainable and economical use of hydrogen technologies.[21]

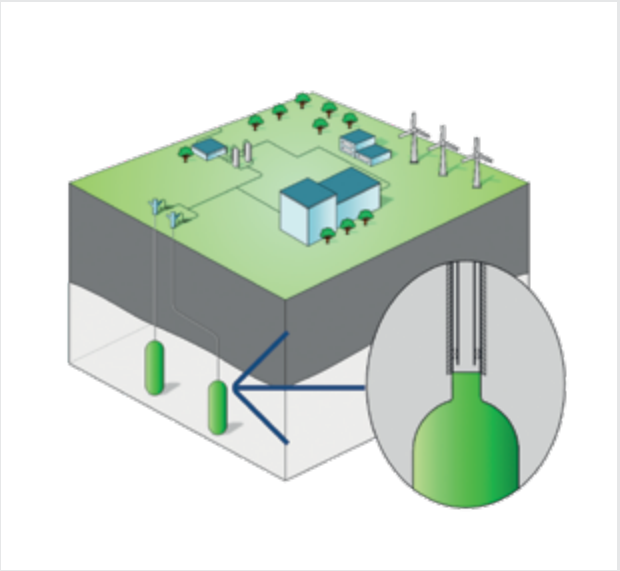


20 Innovationspreis Neue Gase.

21 Schaeffler Gruppe.

H_2 Storage Epe: Securing the Hydrogen Supply

The Epe H_2 storage plant from RWE Gas Storage West stores hydrogen in underground salt caverns. A large amount of energy can be flexibly stored and withdrawn - an advantage that results from the utilisation of caverns. The aim is to ensure a constant supply of the gaseous energy carrier, even during periods of low production, and to balance out fluctuations in demand. As Germany's first commercial hydrogen storage facility, the project contributes to the development of the H_2 market and enables existing gas storage facilities to be repurposed.[22]



100 percent Hydrogen in Glass Production: Pioneering Work for the Energy Transition

For the first time, SCHOTT has produced special optical glass with 100 per cent hydrogen on an industrial scale. This groundbreaking technology replaces fossil fuels with hydrogen, significantly reducing CO_2 emissions. Despite technical challenges, the test confirmed the unchanged high glass quality and the stability of the melting process. The project shows that climate-friendly alternatives are possible in energy-intensive industries. It provides important findings for future long-term tests and underlines the potential of green hydrogen as a central component of the energy transition and the decarbonisation of industrial processes.[23]

22 RWE Gas Storage West.

23 SCHOTT.

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