What is hydrogen?

Hydrogen is nothing new – and certainly not a new "invention". It has always been everywhere around us: The element with the symbol H and atomic number 1 is the most common chemical element in the universe and was identified as long ago as the 18th century. Hydrogen has been an important raw material in the chemicals industry for 100 years. Today, however, it is more and more in demand as an energy source, especially in the energy industry. For us at E.ON, hydrogen is essential for the energy revolution – and thus would play a major role for a sustainable future in harmony with the climate, resources and the environment.

What makes this ancient building block of life a building block for a sustainable and new energy supply? There are various general properties that make hydrogen so attractive – and not just as an energy source for E-Mobility.

- CO_2-neutral: the combustion product of hydrogen is water
- Infinitely available: 90% of all atoms in the universe are hydrogen
- Rich in energy: high mass-related energy density

We provide solutions and the energy networks for one of the greatest challenges facing humanity; the collective change to a decentralized, digital and sustainable energy world.

Leonhard Birnbaum, CEO

"In my view, hydrogen has the potential to become the industrial policy response to a real energy turnaround"

Our natural gas network is becoming H_2-ready: What needs to be considered in the process

In addition to the production of hydrogen, the reliable distribution of the gas to the end customer is also a decisive factor for a future hydrogen economy. Existing gas distribution networks play an important role here. In combination with new regional hydrogen pipelines to be built, they can and shall ensure safe transport and must be prepared accordingly for local customer needs.

Today, according to the valid regulations of the German Technical and Scientific Association for Gas and Water (DVGW), up to 10 percent by volume of hydrogen may be added to natural gas in Germany as an additional energy carrier - without causing technical or customer-specific problems. Our goal is to prove that a higher admixture of hydrogen of up to 20 percent by volume is also possible without any problems. A current pilot project of the E.ON subsidiary Avacon, which started in 2019, aims to show exactly that. In the Fläming region, we want to add up to 20 percent hydrogen by volume into natural gas from the end of 2021. At the same time, we are also preparing for the possibilities of converting to a pure hydrogen supply. To this end, the project of the E.ON subsidiary Westnetz, which is unique in Germany, started in November 2020: In Holzwickede, an existing natural gas pipeline of the public gas supply is being converted to pure hydrogen.

Hydrogen pure or mixed

Whether pure hydrogen or hydrogen mixed with natural gas is needed differs depending on the application and sector. The industrial and transport sector, for example, prefers to be supplied with pure hydrogen, especially in steel production or in heavy-duty and long-distance transport. Here it is necessary to provide the corresponding regional network infrastructure - either through the targeted conversion of existing gas pipelines or through new construction. In addition to the use of heat pumps, green gas will also enable the targeted CO_2 reduction in the heating market for households and industry.

Hydrogen can be added to the existing gas networks up to a non-critical level and fossil natural gas can be successively replaced by biomethane. The use of synthetic methane or a switch to pure hydrogen are then the long-term solution options for achieving climate neutrality.

hydrogen long-distance pipeline network.

What to consider when converting

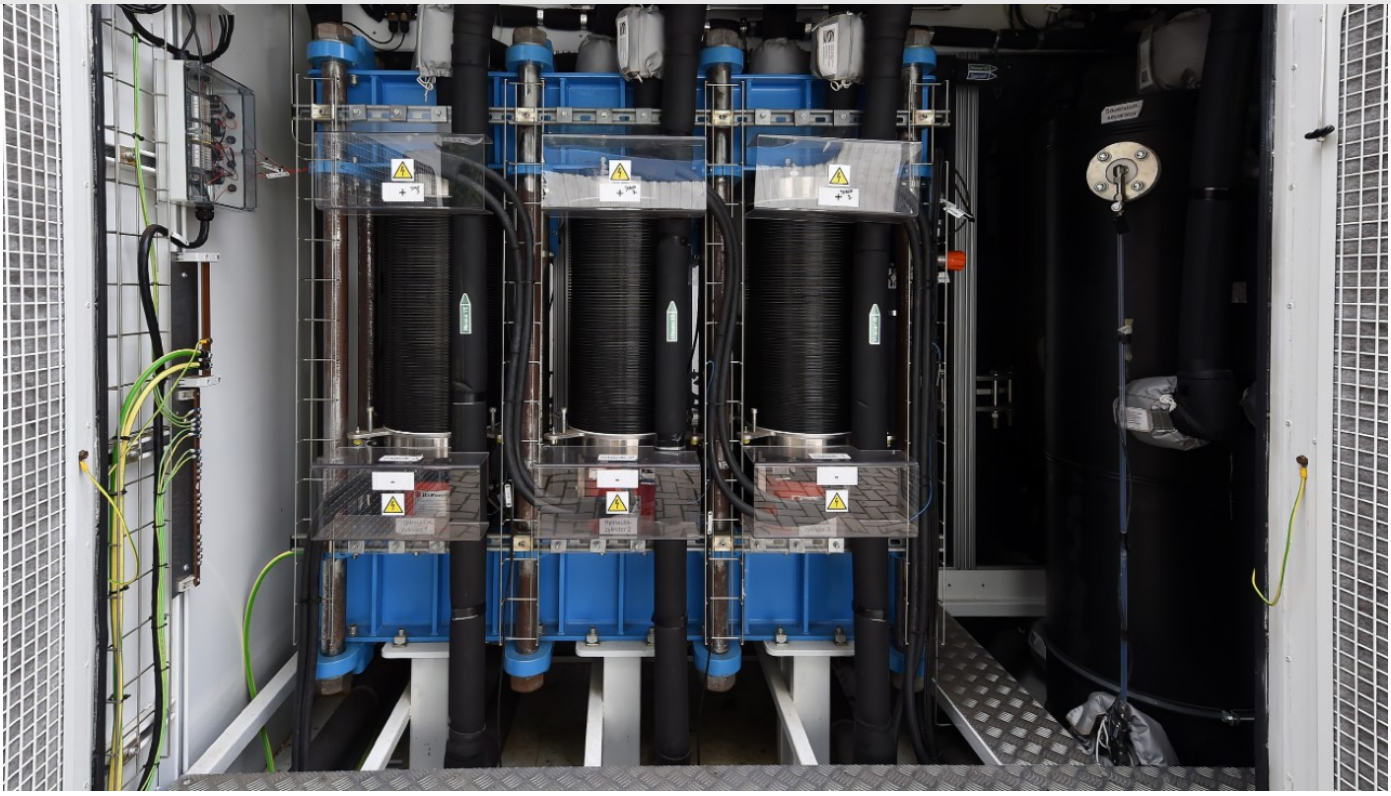
The gas infrastructure of our distribution network is largely suitable for transporting the mixed gas with 20 percent hydrogen by volume. The same applies to pure hydrogen. The pipeline materials used in the distribution network have the corresponding material compatibility in principle. Fittings, for example, must be evaluated according to the rules of technology for the specific application and replaced if necessary.

With the addition of hydrogen up to 10 percent by volume, we ensure that the gas we supply to our customers can largely be utilised without major adjustments to the application technologies. The project in the Fläming region aims at a future feed-in of 20 percent by volume and will provide important findings in this regard. Newer heating systems can already be operated with hydrogen quantities of up to 20 percent by volume. However, this requires prior consultation with the respective manufacturer. For Westnetz's project in Holzwickede with a conversion to 100 percent hydrogen, existing heating systems will be replaced and newly developed, hydrogen-compatible condensing boilers will be used by customers.

The DVGW rules that apply to the gas industry are currently being adapted with regard to the feed-in of 20 percent hydrogen by volume and pure hydrogen.

The projects in the Fläming region and in Holzwickede are real and concrete innovation projects with which we are checking how natural gas pipelines, but also end appliances such as gas boilers react to hydrogen. These and other activities in the field of hydrogen support our goal of making our gas networks H_2-ready.

How do we use hydrogen?



Hydrogen production in the PtG project in Ibbenbüren

For us at E.ON, one of the main challenges is to find ways and means to expand hydrogen technology and infrastructure. We are in the process of advancing development on many levels – away from unprofitable niche technology towards the efficient, mass-market and cross-sector use of this universal element. We are in the process of advancing the following hydrogen projects:

- Significant participation in decentralised, integrated H_2 B2B solutions (e.g. Norddeutsches Reallabor, SmartQuart, PtG project in Ibbenbüren)
- Development of future heating systems with heat pumps that are operated with electricity from H2
- Retro-fitting the gas infrastructure to make it H_2-ready
- Developing an electrolysis industry
- Digitalisation of our networks to intensify sector coupling for efficient use of renewables
- Partnerships with politics and business for the energy transition

Outlook

There is no question that hydrogen as a bridging and future technology is one of the most important energy carriers to help make our world independent of fossil fuels. In particular, green hydrogen will enable us in the near future to significantly reduce CO2 emissions, especially in industry and transport. And that's why, together with our customers and with numerous experts and our partners from business and politics, we are setting out to establish green hydrogen and its secondary products for further decarbonisation wherever it makes sense – for the energy transition, for climate protection, and for all of us.

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