Services along the hydrogen value chain

Storage:

Gas tanks

HydroHub

H_2 competence @ HydroHub

Our services run along the entire value chain in the hydrogen industry – from generation through transport and storage to use in various fields of application.

Energy generation

Renewables (e.g. wind, solar)

Conventional power plants

Geothermal

H_2 generation

Electrolysis

Seawater desalination plants

Reforming processes

Methane pyrolysis

Distribution/transport

Electrical grid

Pipelines

District heating

Intelligent networks

Refuelling stations/ filling systems

Tankers (lorry, train, ship)

Storage

Battery storage

Gas tanks

Cavern storage (H_2 and CO_2)

Pressure vessels

H_2 hydride storage

Consumption/use

Fuel cell system

Methanol synthesis unit

Carbon capture and utilisation

Mobility (e.g. e-fuels)

Reconversion to electricity

Power to gas (gas, heat, liquid)

Industrial applications (e.g. refinery)

H_2 competence @ HydroHub

We give comprehensive support to hydrogen projects and offer a broad spectrum of services in the concept/planning, production, operation and decommissioning/disposal phases.

Concept/planning

We support you from the start with research and project planning measures and specific tasks. Already at the conception phase, we are there at your side with feasibility studies, strategic and financial consultation and a broad range of organisational and technical services. Alongside concept creation with consideration for legal, technical and economic conditions, we take on the task of analysing the requirements and support you in the process of determining feasibility through basic and design planning all the way to the approval process.

Production

For over 150 years, it has been one of our tasks to analyse and manage technical sources of risk. With our wide range of specific services, we are thus able to offer you competent help in the integration of hydrogen technologies into the industrial value chain. Our range of services runs from fact-finding and construction through project management, administering documentation and operator's obligations, basic and detailed process engineering all the way to project support through geological, environmental and engineering services during the production process.

Operation

We support frictionless operation with our extensive range of services and our primary goal of optimising operational reliability and preventing damage. Our services support you in the implementation of your operating strategies and in the accompanying optimisation, maintenance and upkeep concepts. Our safety-oriented process with operational monitoring and the creation of damage-limitation concepts contributes, in the final account, to establishing hydrogen in the popular conception as a safe and controllable technology.

Decommissioning/disposal

Just as we are there for you in the first concept phase, we are also at your side at the decommissioning phase, providing all the required services for dismantling and disposal – including project management and comprehensive services to handle your operational obligations. We create concepts to the current legal requirements, standards and regulations and support you in identifying, analysing and avoiding the potential risks of your intervention.

Gas storage in the transition to the hydrogen economy

Germany only has low occurrences of natural gas and has to import 80 % of its demand. Against the background of achieving reliable energy supplies, gas storage is thus taking on an ever more important role. Powerful, largely underground plants can balance out seasonal demand fluctuations and bottlenecks. Close to a third of Germany's annual consumption of natural gas is thus held in reserve. In addition, day storage is used to manage consumption peaks at a local level and cover industrial needs. In contrast to the large-scale stores of natural gas, hydrogen is kept under high pressure in specific containers and as a liquid at extremely low temperatures. In addition, underground storage of hydrogen offers great potential.

We are your partner for your journey from using fossil gases towards an economy relying on renewable energy and thus, to a great extent, on hydrogen. Our experience in the field of above and below-ground storage of gases helps municipal and industrial actors to fulfil their security of supply obligations. With the most modern analytical methods and competent specialists, we are at your side to carry out your project safely and successfully, and to help you benefit from subsidies as available. Do get in touch.

Overground storage solutions

Overground gas storage makes use of small- to medium-volume gas containers made of metal. Pipe storage sunk in the ground allows high nominal pressures and the storage of large quantities. For the storage of hydrogen, specific high-pressure vessels are used.

STATIONARY LOW- AND MEDIUM-PRESSURE VESSELS

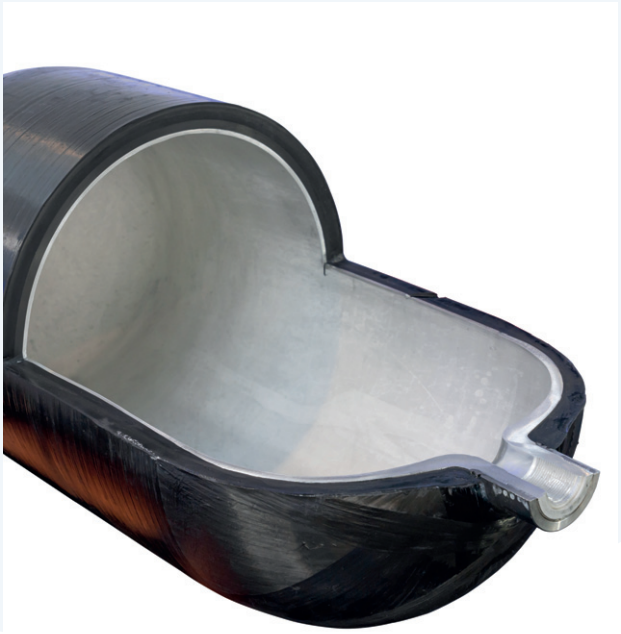
This category includes, above all, classic gas towers and gasometers. Low and medium-pressure vessels only work with nominal pressures in the range from 10–50 bar, sometimes up to 1,000 mbar. For wet gas in the field of crude oil and natural gas drilling, small-scale bell, screw and telescopic gas vessels of simple design are used. To store dry gas in the field of crude oil drilling and to prepare and process gas, disc-type and membrane gas containers of large volume are used.

STATIONARY HIGH-PRESSURE VESSELS AND PIPE STORAGE

These include modern spherical gas tanks with diameters up to 50 m and nominal pressures up to 20 bar. This form of storage is able to balance out short-term demand at a local level and cover the natural, biogas and LNG needs of municipalities and industry. Markedly larger quantities of gas can be taken up in pipe storage of up to 1.6 m in diameter. These pipes are set a few metres deep into the ground and allow pressures up to 100 bar.

STATIONARY AND MOBILE HYDROGEN PRESSURE VESSELS

Because of its physical characteristics, for storage, hydrogen is highly pressurised, sometimes up to 1,000 bar. Liquid hydrogen (LH_2) requires a storage temperature of –253 °C, with larger containers with high-performance insulation required. Gaseous hydrogen (CGH_2) is stored and transported in cylindrical containers made of steel, while in fuel cell vehicles, lighter, carbon-fibre-sheathed containers made of aluminium or plastic are used. In addition, hydrogen can be stored for small-scale use in metal hydride storage or at large scale in liquid organic hydrogen carriers (LOHCs).



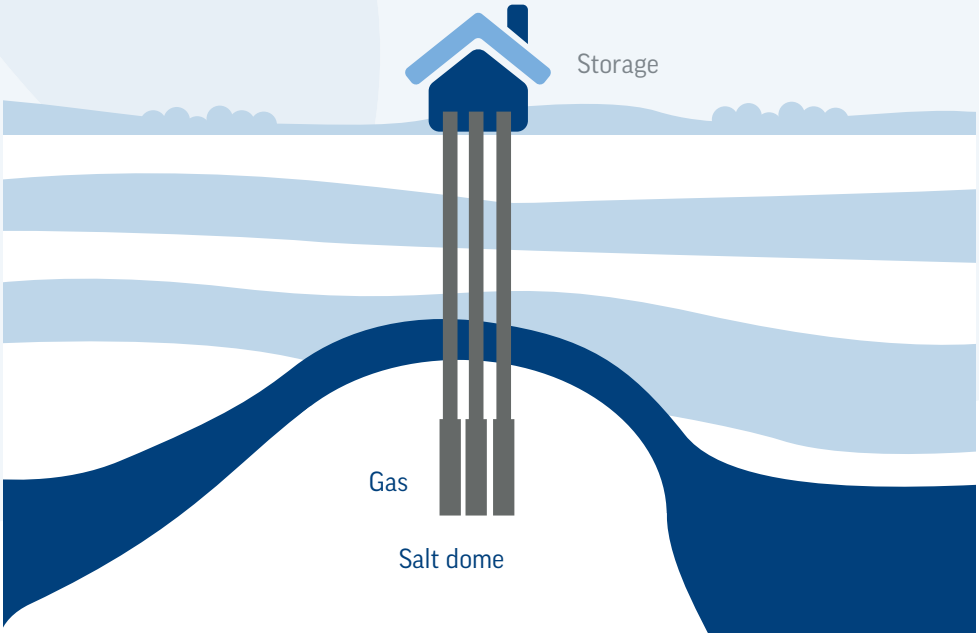
Subterranean storage possibilities

In the field of geological gas storage, the empty spaces of salt domes and hard-to-access porous spaces such as former gas and oil deposits and aquifers are used. It must be noted that the storage volume of an underground facility can only partially be used. The so-called cushion gas (CO_2) ensures the required pressure is maintained at all times and thus ensures geomechanical stability. The remaining volume can be used for working gas – it is stated as the storage capacity and makes up around two thirds of the volume of a cavern, or one third of a porous reservoir.

CAVERN STORAGE

As artificial storage facilities, former salt domes serve to allow the rapid storing and removal of gas, ensuring short-term, severe demand fluctuations can be balanced out. The hollow caverns, up to 100 m wide and cylindrical in shape, can be up to 500 m high and contain between 40 and 100 million standard cubic metres each.

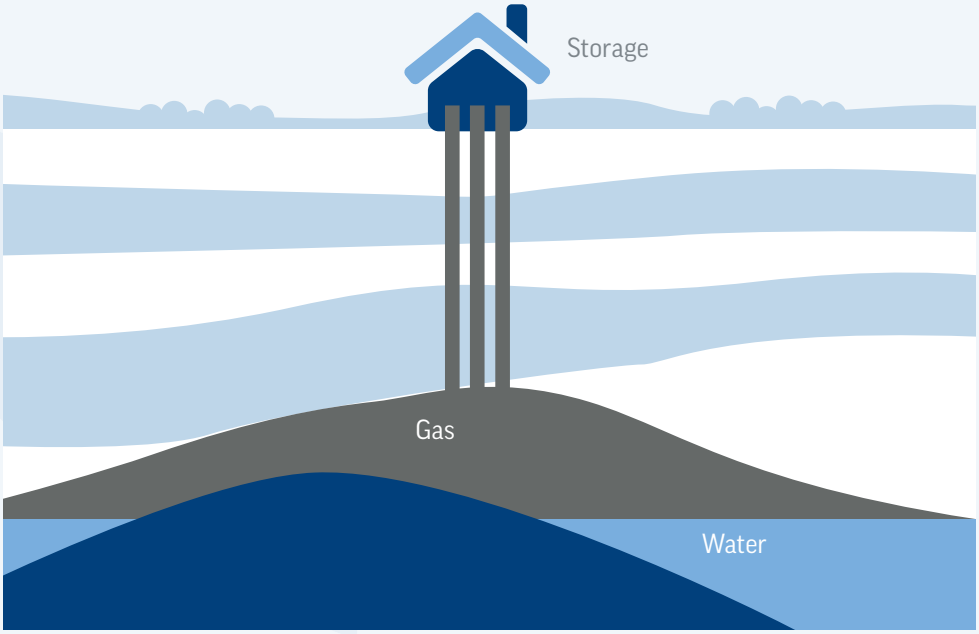
Making capacities of this order of magnitude available for the storage of green hydrogen is essential if we are to lead the energy sector into a new era. With the world's first H_2 research cavern, a pilot project has been created in Saxony-Anhalt to develop and test materials and technologies for large-scale industrial H_2 storage.



PORE STORAGE

Empty crude oil or natural gas deposits, as well as water aquifers, consist of layers of rock that offer both natural hollows and are naturally sealed off from the surface. They can take up large quantities of gas, but gas that can only be inserted at high pressure and can only slowly be re-released, as it always has to flow through the porous rock.

Pore storage is suitable above all to balance out seasonal demand fluctuations. Its volume is unmatched by any other form of storage. Thus, the largest natural gas store in Western Europe, in Rehden, Lower Saxony, runs through three exhausted natural gas deposits at a depth of 2 km, offering a working gas capacity of 4bn cubic metres over an area of 8 km^2.



Our services

We will support you from the start in considering the background legal and technical conditions and will be there for you to create risk analyses and safeguarding concepts all the way to managing the project. To this end, we offer you comprehensive services in the fields of consulting, engineering and training – in all phases of the project at hand:

	Concept/ Planning	Production	Operation	Decommissioning/ Disposal
Creation of concepts to current legal requirements, standards and regulations	●			●
Creating requirements specifications	●			●
Creating technical specifications	●			●
Creating commissioning and periodic inspection concepts	●			
Weak-point analysis, identification and analysis of potential risks	●			●
Creation, consultation on staggered power system protection plans, protection tests	●			●
Conception and consultation (commissioning, periodic inspection) of isolated networks including the incorporation of e.g. decentralised generator units, electrolysers and any necessary storage facilities (on and offshore)	●			
Creation of risk analyses to determine the potential risk of intervention	●			●
Creation of risk analysis and hazard assessments	●			●
Creation of safeguarding concepts	●			●
Consultation, evaluation of electrical and mechanical safeguarding systems	●			●
Consultation, evaluation on installation and operation of alarm receiving stations	●			●
Consultation, evaluation on determination of intervention measures by guarding/security company or police	●			●

	Concept/ Planning	Production	Operation	Decommissioning/ Disposal
Consultation, evaluation on determination of administrative security measures	●			●
Technical advisory services	●			
Project management and document administration	●	●	●	●
Damage assessments and analyses of the causes of damage, creation of avoidance concepts			●	
Analysis and evaluation of damages and measures to prevent comparable faults			●	
Maintenance of breakdown statistics to assess operational reliability in comparable plants/components			●	
Analysis of electrical grids: e.g. short circuit, load flow calculations, efficiency and optimisation assessments			●	

HydroHub

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