energy innovation austria

4/2023

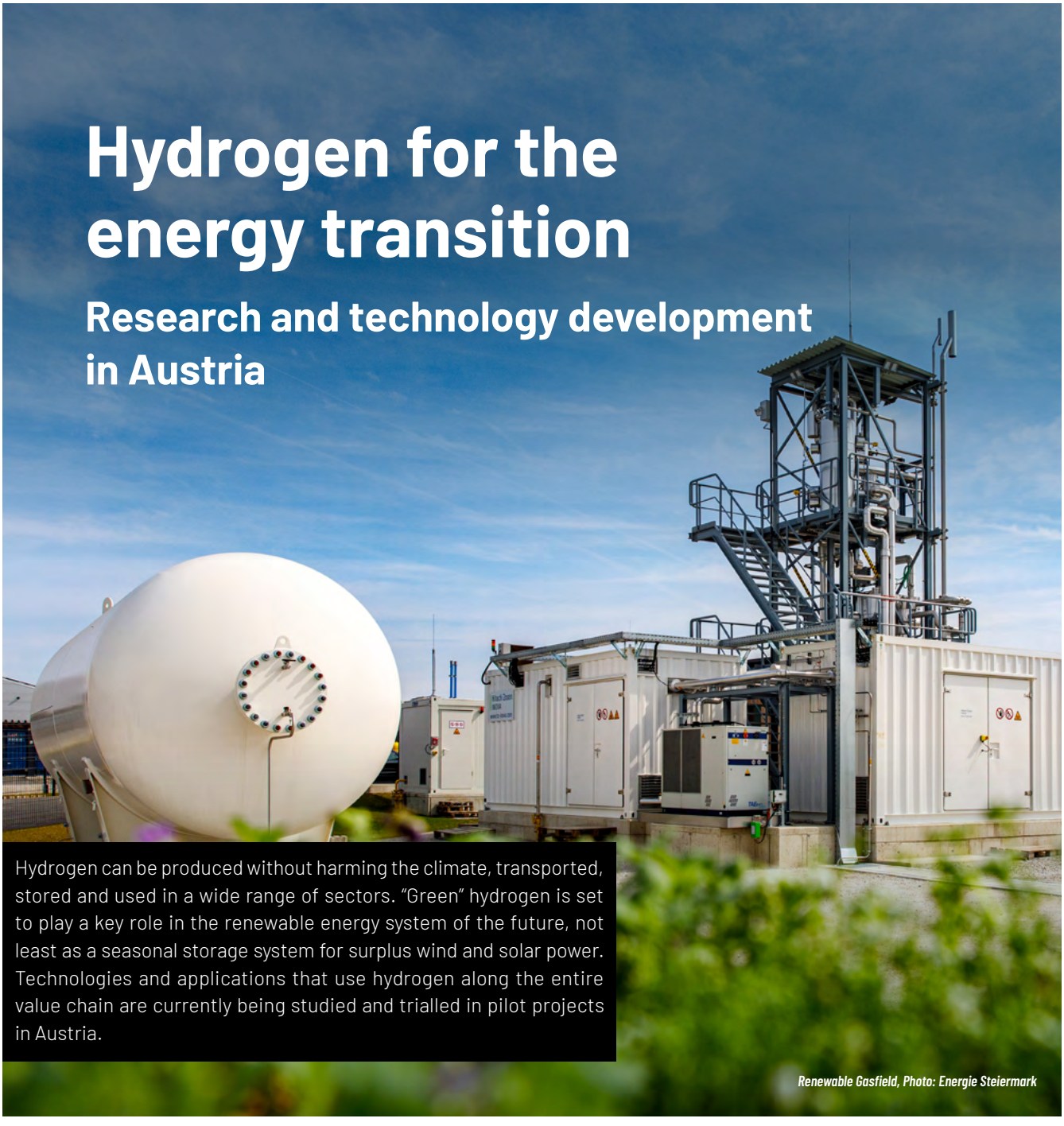
Current developments and examples of sustainable energy technologies

klima+ energie fonds

Federal Ministry
Republic of Austria
Climate Action, Environment, Energy, Mobility, Innovation and Technology

Hydrogen for the energy transition

Research and technology development in Austria



Hydrogen can be produced without harming the climate, transported, stored and used in a wide range of sectors. "Green" hydrogen is set to play a key role in the renewable energy system of the future, not least as a seasonal storage system for surplus wind and solar power. Technologies and applications that use hydrogen along the entire value chain are currently being studied and trialled in pilot projects in Austria.

Renewable Gasfield, Photo: Energie Steiermark

Climate-neutral hydrogen production

in the energy system of the future

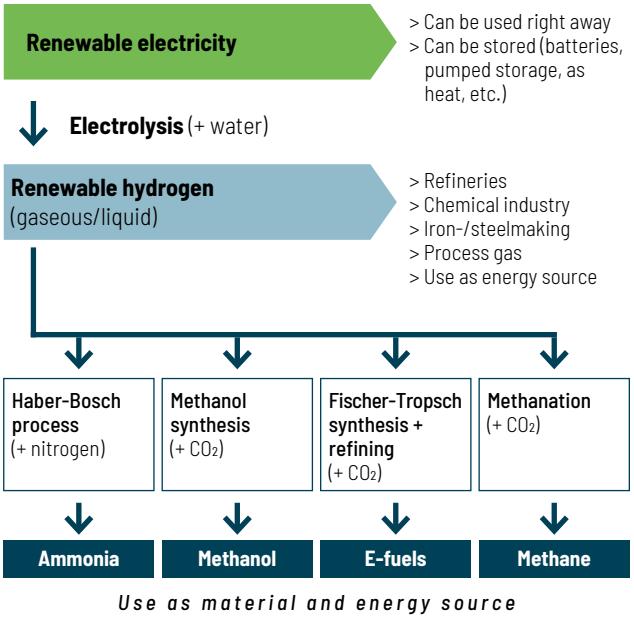
Hydrogen (H_2) is a flexible energy carrier with the potential to become a key component of the energy transition. Up until now, it has primarily been used in refinery processes and in the chemical industry and produced mainly from fossil energy sources. On an industrial scale, it is generally obtained through a process known as natural gas reforming, which involves the catalytic steam cracking of methane.

However, hydrogen produced in a climate-neutral way is expected to replace that generated from fossil fuels in the future in order to drive forward the decarbonisation of industry. Many other energy-intensive industrial processes that cannot be electrified either easily or at all, such as steelmaking, could be converted from coal and natural gas to hydrogen, thus saving large quantities of carbon emissions.

Hydrogen is poised to play a major role in the energy system of the future. Energy conversion using "power-to-gas" technology opens up a wealth of options such as storing renewable energy from the summer into the winter or integrating the power, heat and mobility sectors. Surplus wind and solar power can be converted into hydrogen by means of electrolysis. The "green" hydrogen that this produces can then be used by industry (as either an energy source or a material) or stored (e.g. in disused natural-gas storage facilities) and fed back into the grid later on.

Hydrogen is also a base product for a wide variety of derivatives such as ammonia, methanol, e-fuels and synthetic methane. In the mobility sector of the future, hydrogen and/or energy carriers derived from it could replace fossil fuels in heavy-duty transport in particular as well as in aviation and shipping.

Electricity-based renewable hydrogen and potential derivatives
(Source: Austrian Energy Agency)



MAKING GREEN HYDROGEN

There are currently two main ways to produce green hydrogen commercially: electrolysis and biogenic hydrogen production using biomass gasification processes. Electrolysis has a particularly important role to play as a technology of the future that harnesses sector integration.

It uses an electrical current to split water (H_2O) into hydrogen (H_2) and oxygen (O). In the process, the electrical energy is converted to chemical energy and stored in the hydrogen. If this electrolysis is done using electricity from renewable energy sources, no CO_2 is produced that could harm the climate. Fuel cells can then be used to convert the energy that had previously been stored chemically inside the hydrogen back into electricity. Integrating electrolysis plants into the energy system also opens the door to system services that benefit the grid by balancing energy generation and energy consumption within the power system.

HYDROGEN IN AUSTRIA

132,000 tonnes of H_2 amount of hydrogen currently needed every year in Austria (according to the Fuel Cells and Hydrogen Observatory)

13,2 megawatts installed electrolyser capacity in Austria (as of May 2023)

EUR 60 million research spending on hydrogen in Austria (2021 and 2022)

AUSTRIA'S HYDROGEN STRATEGY

The federal government unveiled a national hydrogen strategy in 2022 to kick-start the expansion of Austria's hydrogen industry. The aim is to make hydrogen production an integral part of the energy system. Climate-neutral hydrogen and its derivatives are chiefly to be used in sectors that lack an alternative decarbonisation pathway, e.g. via electrification. Alongside "green" hydrogen, the term "climate-neutral hydrogen" also includes hydrogen produced from natural gas using complete carbon sequestration as soon as the relevant technology is sufficiently mature ("blue hydrogen") as well as that generated using pyrolysis ("turquoise hydrogen"). The aim by 2030 is to build 1 GW of electrolysis capacity and replace most of the hydrogen generated from fossil fuels with its climate-neutral equivalent in energy-intensive industry sectors. The strategy also sets out to develop the necessary hydrogen infrastructure and forge international partnerships for climate-neutral hydrogen. In addition, research and technology development along the entire hydrogen value chain are intended to help strengthen Austria as a technology hub and business location.

www.bmk.gv.at/themen/energie/publikationen/wasserstoffstrategie.html

HYDROGEN PARTNERSHIP AUSTRIA (HYPA)[1]

This joint initiative by the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) and the Federal Ministry of Labour and Economy (BMAW) is pooling Austria's strengths to deliver its national hydrogen strategy. The platform is conducting an overarching dialogue process in order to incorporate views from business and industry leaders, researchers and civil society representatives into the design of regulations and funding mechanisms in a productive way. HyPA is supplying facts and information on the latest developments in the hydrogen field, organising events and providing an international showcase and an overview of funding opportunities. Its other services include giving initial and funding advice to companies and organisations, running study tours to trial sites and facilitating participation in trade fairs. The initiative is assisted by a high-calibre advisory board that draws up recommendations for the attention of the competent ministries, thus lending efficient and effective support to efforts to ramp up Austria's hydrogen industry.

www.hypa.at

AUSTRIA POWER & GAS MODEL REGION HYDROGEN INITIATIVE (WIVA P&G)

The aim of the WIVA P&G model region (working on behalf of the Climate and Energy Fund) is to trial the Austrian economy's switch to a largely hydrogen-based energy system. The WIVA P&G research association is encouraging innovative developments in application, grid and storage technologies for hydrogen and renewable gases, coordinating the various activities and helping to communicate project results.

www.wiva.at

Current R&D projects in Austria are studying hydrogen technologies and applications along the entire value chain, i.e. from the production and storage of climate-neutral hydrogen through to its distribution and consumption, and are trialling them in the first pilot plants. We introduce some of these pioneering projects in this issue.

[1] The "Hydrogen Partnership Austria" (HyPA) platform merged the two previous initiatives "H2Austria" (BMK) and "Hydrogen Austria" (BMAW). It is being implemented by the Austrian Energy Agency and the Standortagentur Tirol.

H2REAL

Launch of the Hydrogen Valley East Austria

The H2Real project aims to develop a "Hydrogen Valley"[1] in eastern Austria and trial the creation of an integrated value chain – from hydrogen production and storage through to distribution and consumption – under real-life conditions. Numerous partners from industry and research[2] are collaborating on the project to drive forward efforts to develop a hydrogen industry in Austria. H2Real plans to facilitate large-scale trial runs of hydrogen technologies and applications before going on to instigate upscaling projects.

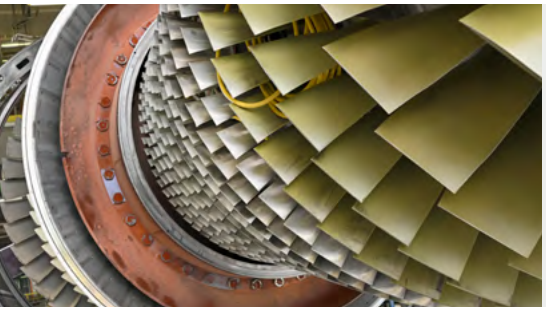
The following timetable has been drawn up based on the economic and environmental requirements of the individual industry partners:

> Joint investments and coordinated infrastructure projects covering several federal states and regions
> Developing, implementing and optimising innovative hydrogen concepts and new technical solutions (including several demonstrator models)
> Harnessing synergy effects throughout the value chain in order to push down the price of hydrogen

WORLD'S FIRST TRIAL RUN OF HYDROGEN IN A VIENNESE GAS TURBINE

One current trial project forming part of H2Real is Wien Energie's trial run using hydrogen in its Donaustadt power plant. Working together with VERBUND, RheinEnergie and Siemens Energy, it is testing out co-firing hydrogen into the gas turbine of a combined heat and power plant. This trial is the first in the world to be run on a commercial gas and steam turbine power plant in this performance class. The first set of interim results indicate that the trial run is going well: it has already been possible to increase the amount of hydrogen used to power the gas turbines to 15 per cent by volume on some days.

The gas turbines used by Wien Energie, RheinEnergie and VERBUND are virtually identical. Depending on what is required and how they are operated, they can generate either electricity or heat, which can be fed into district heating networks. The gas turbines can be started up and shut down quickly, enabling them to balance out fluctuations in the power grid that occur when wind and solar power is generated. All three companies use a Siemens Energy gas turbine (model SGT5-4000F).



15% percent hydrogen by volume is to be mixed in with the natural gas at the start **33,000 t carbon dioxide** could be saved every year

"Using green gases in our power plants will play a key role in the heating transition and in climate protection in our city. By holding the world's first trial run using hydrogen in a gas turbine, we're taking that decisive step from the drawing board to the plant floor. This international joint project will set an example for the entire industry to follow."

MICHAEL STREBL
CHAIRMAN OF THE BOARD OF MANAGEMENT, WIEN ENERGIE

Photo: Wien Energie/ Stefan Joham

Donaustadt power plant,
Photo: Wien Energie/Max Kropitz

Gas turbine at the Donaustadt power plant site, home to the first-ever trial of cofiring hydrogen for energy generation,
Photo: Wien Energie/Johannes Zinner

The trial run involved cofiring different quantities of green hydrogen with the natural gas currently used on around ten test days (between mid-July and mid-September). Having started with 5 per cent hydrogen by volume, the project partners gradually increased this to as much as 15 per cent. They will analyse the data that they have collected on the plant's operational behaviour in detail between now and spring 2024. The aim is to get these gas turbines certified to have up to 15 per cent hydrogen by volume added into them in day-to-day operations. There are plans for a follow-up project to increase this figure to around 30 per cent. Even just co-firing 15 per cent green hydrogen would save some 33,000 tonnes of CO_2 a year at the Donaustadt power plant.

Green hydrogen will play a key role in the energy supply of the future. The hydrogen trial run at the Donaustadt power plant will supply some vital insights and data on the efficiency of cofiring hydrogen. The findings will be highly pertinent to the continued development of next-generation gas turbines and a major milestone on the path to climate-neutral district heating networks.

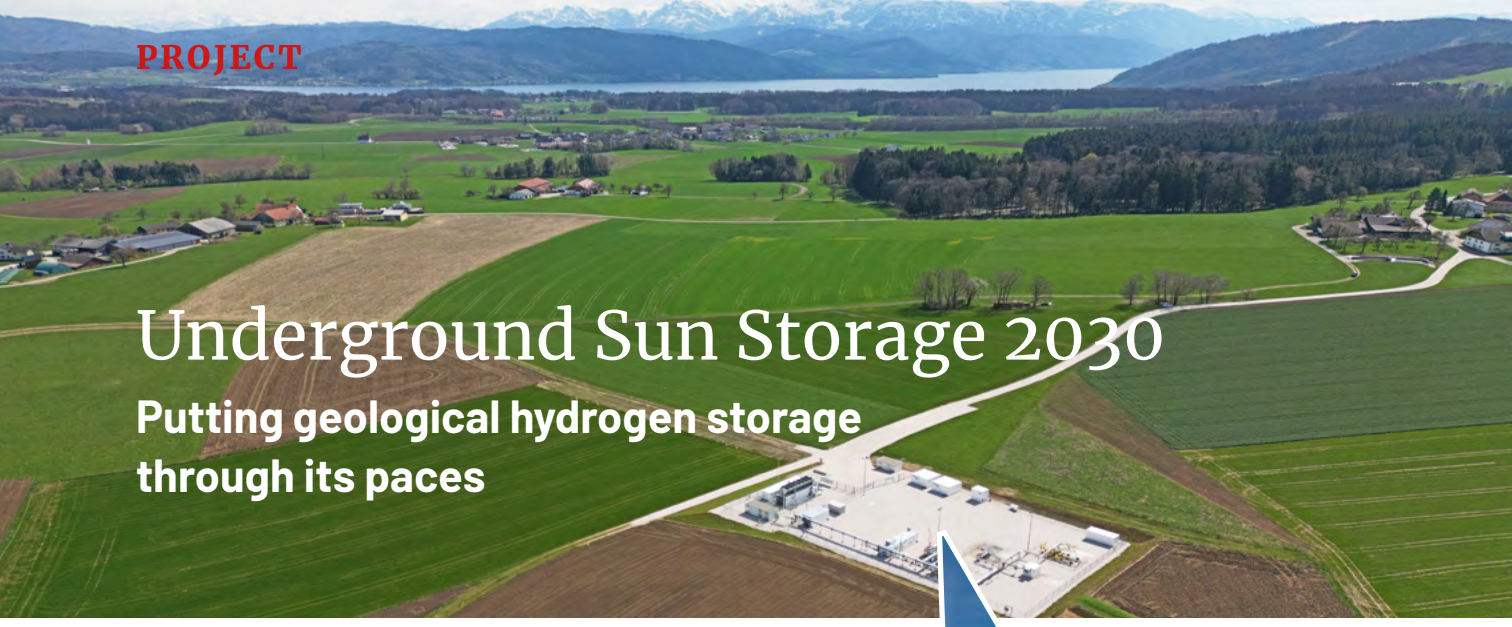
Yet the trial run is also breaking new ground in the decarbonisation of the gas industry at international level, because the model of gas turbine used in the Donaustadt power plant can be found in over 115 plants in Europe and 360 worldwide.

- www.wiva.at/startschuss-fuer-das-projekt-h2real
- positionen.wienenergie.at/projekte/waerme-kalte/gruenes-kraftwerk-donaustadt

[1] www.clean-hydrogen.europa.eu/get-involved/mission-innovation-hydrogen-valleys-platform_en

[2] **INDUSTRY PARTNERS:** Wien Energie, Austrian Power Grid AG, Energie Burgenland AG, Energienetze Steiermark GmbH, Gas Connect Austria GmbH, Hafen Wien GmbH, Linde, movingpower GmbH, Netz Burgenland GmbH, NÖ Netz, Wiener Linien, Wiener Netze GmbH, Wiener Wasserstoff GmbH, Windkraft Simonsfeld AG
RESEARCH PARTNERS: AIT Austrian Institute of Technology GmbH, Energy Institute at Johannes Kepler University Linz, HyCentA Research GmbH, TU Wien

The H2Real project forms part of the WIVA P&G – Austria Power & Gas Model Region Hydrogen Initiative research initiative.
www.wiva.at



Underground Sun Storage 2030

Putting geological hydrogen storage through its paces

Two years after the launch of the "Underground Sun Storage 2030" project led by RAG Austria (see eia issue 5/2021) and following commissioning in April 2023, the project is now undertaking the seasonal storage of 100 % green hydrogen in an underground natural-gas storage facility under real-life conditions for the first time. Storing wind and solar power over the long term is one of the core challenges in renewable energy systems. Converting surplus solar and wind power into gaseous energy carriers that can be stored seasonally and in large volumes has the potential to become a key technology for a reliable energy supply based on renewable sources. Underground gas storage facilities are established large-volume energy storage facilities with high storage capacities. The natural-gas infrastructure – pipelines and storage facilities – is to be used in the future to store green hydrogen underground.

RUNNING A DEMO PLANT

This pioneering concept for energy storage has been studied over the past few years in the Austrian flagship project entitled "Underground Sun Storage 2030". The ability of underground pore storage systems to handle hydrogen has already been investigated and demonstrated extensively in previous projects. Now, for the first time anywhere in the world, the concept of storing 100% hydrogen in such underground facilities is being implemented under real-life conditions and perfected between now and 2025.

In RAG's cross-sector demo plant in Gampern in Upper Austria, solar energy is being converted into green hydrogen via electrolysis and stored in its pure form in a disused natural storage facility for natural gas. The facility is big enough to store the surplus summertime energy produced by around 1,000 solar panels on single-family homes. This unneeded energy is put into storage. In the winter, the gas generated by climate-neutral means can either be used as a material or energy source in the local area or supplied directly for heating or power via hydrogen powered combined heat and power plants.

The Rubensdorf hydrogen storage facility – Underground Sun Storage 2030
Photos: RAG Austria AG

INSIGHTS FOR THE FUTURE OF ENERGY

A consortium of corporate and research partners[1] is supporting the project with extensive interdisciplinary technical and scientific studies. Working together, the partners are aiming to gain valuable technical and economic insights for the development of a secure hydrogen supply in Austria.

These investigations are being supplemented by the development of suitable processing technologies, the modelling of future energy scenarios and additional technical and economic analyses, focusing on the following areas: hydrogen as a replacement for fossil natural gas, the direct use of hydrogen in energy-intensive industry sectors, processing requirements and technologies, and options for using hydrogen with a high degree of purity.

www.uss-2030.at
www.wiva.at/project/uss2030

[1] **PROJECT PARTNERS:** RAG Austria AG (project management), Axiom Angewandte Prozesstechnik GmbH, Energie AG Oberösterreich, Energy Institute at the Johannes Kepler University Linz, EVN AG, HyCentha Research GmbH, K1-MET GmbH, TU Wien, University of Natural Resources and Life Sciences Vienna, VERBUND, voestalpine Stahl GmbH

The Underground Sun Storage 2030 project forms part of the WIVA P&G – Austria Power & Gas Model Region Hydrogen Initiative research initiative.
www.wiva.at

International collaboration

The European Union launched its Important Projects of Common European Interest (IPCEIs) in order to strengthen European value chains of strategic importance. The instrument is intended to encourage international partnerships and enable value chains to be mapped from the applied research and technology development stage through to first-time application on an industrial scale.

The **Hy2Tech IPCEI** focuses on promoting innovative ventures along the entire hydrogen value chain and is currently supporting the following projects in Austria:

> AVL List, Christof Systems (1 MW high-temperature electrolyser based on metal-supported cells (MSCs) and transition to series production)
> Plastic Omnium New Energies Wels (hydrogen fuel cell system for heavy-duty commercial vehicle applications as a product ready for series production plus the requisite production processes)
> Bosch (injection equipment for using alternative fuels such as hydrogen and methanol in large engines)

The second hydrogen IPCEI, **Hy2Use**, is all about decarbonising industry. Two Austrian companies are amongst the twenty-nine taking part: Borealis and VERBUND are developing a technique that uses green hydrogen to make fertiliser, melamine and technical nitrogen products in Austria. They will be building a 60 MW electrolysis plant in Linz for this purpose, which will also be able to provide services for the power grid. Austria's involvement is being funded via Next Generation EU, Europe's recovery fund.

www.bmk.gv.at/themen/innovation/internationales/ipcei/aktive_teilnahmen/h2

An overview of current European and international initiatives and committees relating to hydrogen can be found on the HyPA website:

www.hypa.at/politik/internationales

HYCENTA – COMET-K1 COMPETENCE CENTRE FOR APPLIED HYDROGEN RESEARCH

HyCentA - an extra-university research institution at Graz University of Technology - has been researching and developing green hydrogen technologies since 2005; conducting projects on the production, distribution, storage and use of renewable hydrogen in cooperation with companies and scientific partners. HyCentA has been awarded a COMET centre with begin of 2023 under the FFG COMET funding programme.

COMET Competence Centres engage in top-level applied research in areas of strategic importance to the Austrian economy and come up with solutions for the key challenges of tomorrow.

www.hycenta.at
COMET_Factsheet_HyCentA_DE_bf.pdf

Photo: HyCentA

ALEXANDER TRATTNER

CEO AND RESEARCH DIRECTOR OF HYCENTA

"Hydrogen technologies and the use of renewable hydrogen as a renewable energy carrier are becoming increasingly important across the world, and Austria is well placed to benefit from this trend and contribute to the global hydrogen industry thanks to its renewable energy sources, research capacity and industrial expertise. We at HyCentA want to bring hydrogen technology on leaps and bounds, because we firmly believe that green hydrogen has to form part of the solution for a climate-neutral energy system. The COMET K1 Centre, which opened in 2023, allows us to research three hydrogen technologies that will be particularly relevant in the future: electrolysers, storage systems and fuel cells. We're now also able to focus more on taking a holistic view of hydrogen across multiple fields – electricity, heating, transport and industry. In all, there are some 40 leading scientific partners and companies from Austria and further afield collaborating with HyCentA in the COMET programme. We see ourselves as the linchpin linking research and industry. It's important for the latest scientific findings to find use in industrial applications."

Renewable Gasfield
Photo: Energie Steiermark

Renewable Gasfield

Green gas from Styria

The first external production facility for "green" hydrogen in Austria went on stream in the municipality of Gabersdorf in southern Styria in May 2023. The pilot project by Energie Steiermark[1] is pursuing a holistic "power-to-gas" approach and trialling the integration of green-hydrogen production with load-flexible methanation and the storage and distribution of the renewable hydrogen and the green natural gas produced by synthetic means. The plant on the 10,000 m² site consists of a large-scale PV facility with 6,000m² of collectors, an electrolyser to produce green hydrogen, a trailer filling system and the methanation unit, which is connected to an existing biogas plant.

PROJECT FACTS & FIGURES

- Start of construction: March 2022
- Commissioning: May 2023
- Total invested: around EUR 10.5 million (including EUR 2.6 million in funding)
- Size of the power-to-gas plant: 10,000 m²
- Large-scale PV facility with collectors covering 6,000 m² (850 kW_p)
- Up to 300 t of hydrogen produced per year
- Around 5,200 t CO_2 saved per year
- Operating hours, electrolysis: 7,000 hours per year
- Operating hours, methanation: 1,000 hours per year

A SUSTAINABLE ENERGY CYCLE

Using electrolysis, water is split into its constituent elements – hydrogen and oxygen – with the help of electricity from renewable sources. The hydrogen thus released can be fed straight into vehicles or used for a range of industrial processes as a CO_2-free energy carrier without having to be converted into anything else. Alternatively, it can be converted into methane gas in a carbon-neutral way by adding raw biogas and then fed into the existing natural-gas grid. In other words, hydrogen enables a closed, sustainable and emission-free energy cycle.

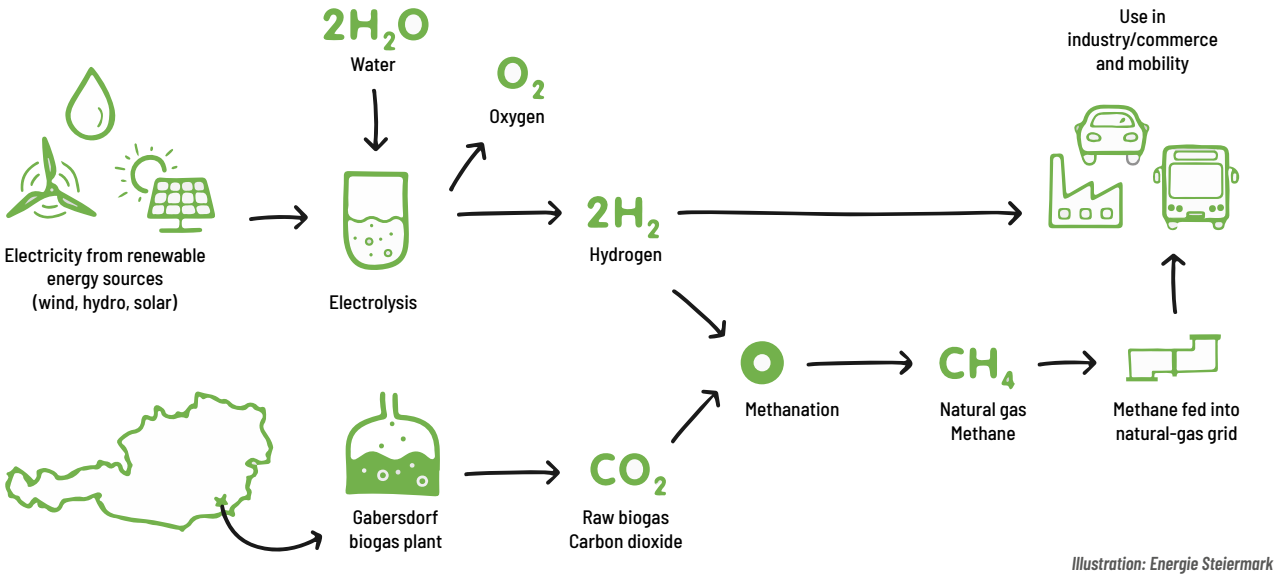


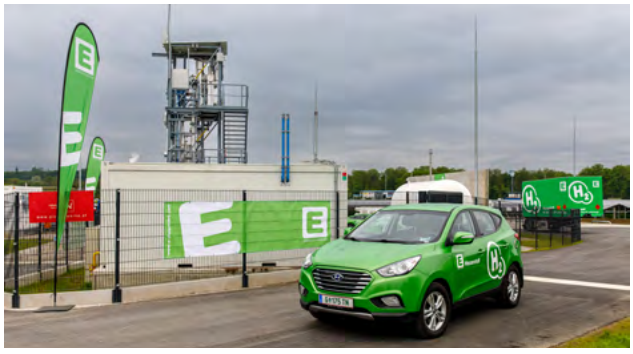
Illustration: Energie Steiermark

”Green hydrogen is a key component of the energy transition. Building on the experience gained from our Gabersdorf pilot project, we’re planning to expand hydrogen production systematically together with industry partners – we’re looking at 150 megawatts as the first step. At the same time, we’re working on making our existing natural-gas grid infrastructure compatible with the integration of green gases. We’re eyeing up pipelines with a total length of some 200 kilometres for a technical upgrade.“

CHRISTIAN PURRER UND MARTIN GRAF
MANAGING BOARD OF ENERGIE STEIERMARK

Photo: Energie Steiermark

Renewable Gasfield, Photo: Energie Steiermark



Renewable Gasfield, Photo: Energie Steiermark

INTEGRATION WITH A BIOGAS PLANT

The methanation technology used was developed and applied at laboratory scale in a previous project. This technology is now being trialled on a large scale as part of the “Renewable Gasfield” project, including direct integration with a biogas plant. Only substances that would damage the catalyst are separated out by means of adsorption when the biogas is pre-treated, allowing the biogas to be added directly into the methanation process. This does away with the usual costly carbon separation process prior to feeding into the natural-gas grid.

RESULTS AND PROSPECTS

The modular design of the infrastructure concept enables it to be expanded independently and all parts of the system to be adapted to fit future requirements and business models.

When it has reached its full size, the plant is expected to generate up to 300 tonnes of green hydrogen a year. The green gas is piped into trailers, allowing it to be stored and transported, and is available for use in a range of industry sectors. The first major customer is the industrial company Wolfram Bergbau und Hütten AG, a subsidiary of the global Sandvik Group. The St. Martin-based firm is the global market leader in tungsten powders and will be purchasing around 70 tonnes of green hydrogen a year for its energy processes.

Energie Steiermark is planning to expand its electrolysis capacity to 150 MW by 2035 to produce green hydrogen at “on-site” plants for industrial customers and run Styrian “Energy Hubs” at strategic nodes in the grid. The energy supplier intends to build around 200 km of hydrogen grid infrastructure to enable the efficient and safe transport as well as the distribution and integration of green gases.

As well as in industry, Energie Steiermark’s green hydrogen is also to be used in the mobility sector in the future, with heavy-duty transport seen as harbouring great potential in this regard. The first customers for ultra-pure green hydrogen could potentially be freight forwarders or construction firms that are currently launching pilot projects and/or buying their first trial vehicles in a bid to decarbonise their fleets.

www.wiva.at/project/renewable-gasfield

[1] **PROJECT PARTNERS**: Energie Steiermark Technik GmbH (project coordination), Energienetze Steiermark, University of Leoben/Faculty of Process Engineering in Industrial Environmental Protection, HyCentA Research GmbH, Energy Institute at Johannes Kepler University Linz, Energieagentur Steiermark, Government of the State of Styria, A15 – Energy and Housing Department

The Renewable Gasfield project forms part of the WIVA P&G – Austria Power & Gas Model Region Hydrogen Initiative research initiative.
www.wiva.at

Photo: voestalpine Donawitz

Virtual Industry Lab for the decarbonisation of industrial processes, photo: NEFI

NEFI–Green Steel

Climate-neutral steel processing using renewable gases

The decarbonisation of energy-intensive industry sectors is key to achieving climate targets as well as one of the biggest challenges along the way, and the steel industry has a vital role to play here. Steelmaking uses fossil fuels (coke, coal and natural gas). Its production processes require very high temperatures and large amounts of energy and make up a large share of total carbon emissions.

voestalpine, the world's leading steel and technology corporation, is pursuing an ambitious multi-stage plan for climate-neutral steelmaking that it calls "greentec steel".[1] The group has also partnered with researchers to develop climate-friendly production technologies based on renewable electricity and hydrogen. Besides the production of crude steel, therefore, it is also tackling the decarbonisation of steel processing head on.

CARBON-NEUTRAL HEATING FOR INDUSTRIAL FURNACES

Steel processing requires a lot of energy, with natural gas accounting for nearly 30 per cent of the voestalpine Group's final energy consumption. Most of this gas is needed to heat up primary products to make them malleable and/or bring about microstructural changes. Various kinds of gas-fired industrial furnaces are currently in use on forging, hot rolling or press hardening production lines.

The NEFI Green Steel[2] project is devising solutions for replacing natural gas with carbon-neutral energy carriers for a wide range of products, including furnaces. One key aim of the project is to supply 5,000 GWh a year of carbon-neutral energy carriers such as green electricity, hydrogen, biogas and synthetic fuels, to be available around the clock, 365 days a year. This relates to facilities in Austria as well as import options.

In a second step, the project will investigate the possibility of converting these renewable energy carriers into heat using sophisticated electrical heaters and multi-fuel burners to be developed as part of it. This will enable a sustainable and efficient process to be guaranteed. The industrial-scale solutions required to supply carbon-neutral energy carriers and convert them into heat for heating various different industrial furnaces are to be devised at 14 pilot sites operated by voestalpine.

The NEFI Green Steel project will also focus on implementing energy efficiency measures such as insulation, process optimisation and the utilisation of waste heat in order to cut overall energy consumption. Selected furnaces at various voestalpine sites in Austria, Germany and Sweden will then be converted in order to trial these solutions.

Milestones in the NEFI Green Steel project

- Calculating the potential for carbon-neutral alternatives to natural gas and evaluating the scope for producing and transporting them
- Devising concepts for reducing energy consumption and harnessing the potential offered by waste heat, and implementing these in selected direct- and indirect-fired furnaces
- Trialling selected direct-firing-compatible industrial furnaces in an industrial setting and the impact of carbon-neutral firing on product quality
- Developing high-efficiency burners powered by various carbon-neutral fuels and conducting experimental tests in an industrial setting
- Sharing expertise within and outside the voestalpine Group

www.nefi.at/de/projekt/greensteel-carbon-neutral-steel-processing-via-alternatives-to-fossil-natural-gas

[1] www.voestalpine.com/greentecsteel/en

[2] **PROJECT PARTNERS**: AIT Austrian Institute of Technology (project management), AICHELIN GmbH, Buderus Edelstahl, NOXMAT GmbH, Uddeholms AB, Villares metals, voestalpine Automotive Components Schwäbisch Gmünd GmbH & Co KG, voestalpine Böhler Aerospace GmbH & Co KG, voestalpine Böhler Bleche GmbH & Co KG, voestalpine Böhler Edelstahl GmbH & Co KG, voestalpine Böhler Profil GmbH, voestalpine Metal Forming GmbH, voestalpine Rail Technology GmbH, voestalpine Rotec GmbH, voestalpine Stahl Donawitz GmbH, voestalpine Tubulars GmbH & Co KG, voestalpine Wire Rod Austria GmbH

NEFI Green Steel is part of the NEFI (New Energy for Industry) model region, which is promoting the decarbonisation of industrial companies through innovation and technology development.
www.nefi.at

Photo: VERBUND/Vyhnalek

Wolfgang Anzengruber

Chair of the Advisory Board of Hydrogen Partnership Austria

GREEN HYDROGEN AND ITS ROLE IN THE ENERGY TRANSITION

Green hydrogen is seen as a beacon of hope in the fight against the climate crisis. What role do you think hydrogen can play in the energy system of the future?
Green hydrogen is a key component of the energy transition because it has the capacity to solve problems for which there aren't any other good alternatives. Hydrogen can be used as a reducing agent in iron production, as a raw material in the chemical industry, in high-temperature applications or to cover peak loads in electricity generation and heating. As things stand, it'll also have a key role to play in long-haul transport, such as in shipping or aviation. In many cases, however, hydrogen isn't used "as is". Instead, it serves as an intermediate product for producing other energy carriers or feedstock like methanol, ammonia or synthetic methane.

Austria already uses over 130,000 tonnes of hydrogen a year. However, all of this hydrogen – which is mainly used for fertilizer production and refining – is based on natural gas, which is harmful to the climate. In addition to developing new areas of application, these quantities need to be replaced by green hydrogen as a matter of priority within the next few years.

How important is research and technology development? What are Austria's strengths in this field?
Because we want hydrogen to help reduce emissions, it has to be climate-neutral. One tonne of hydrogen containing 33 MWh of energy requires around 50 MWh of electrical energy and more than 9,000 litres of water. In other words, a third of energy input is lost. And, if the hydrogen is methanised or synthesised in combination with CO_2, then you'll have further losses due to the conversion process. These production processes for hydrogen – as well as its storage and transport – are an important area in technology development.

Whether or not we make rapid progress also hinges on actually getting the many applications and possible uses out into the field testing them in large-scale trial projects. Austria already has a high percentage of renewables in its electricity mix, is a key region for energy storage, a hub for energy transport and is industrially strong – this makes it the perfect testbed for a wide range of key solutions for a climate-neutral future powered with the help of hydrogen and its derivatives.

What are the biggest challenges facing efforts to build an Austrian hydrogen industry?
Our existing gas infrastructure evolved over a period of more than five decades. Within the next 20 years, it will need to be completely rebuilt or converted, in order to handle hydrogen. Consequently, domestic production needs to be ramped up, reliable partnerships for imports need to be established and innovative solutions for using green hydrogen need to be scaled.

The short time available for building a hydrogen based part of the economy calls for a proactive and decisive approach in an extremely fast-paced environment. Well-coordinated cooperation between all stakeholders is vital to avoid falling behind. Cooperation is needed within Austria but also further afield, with European and international partners.

Supported by funding and an environment that reduces their risks, producers, transporters, storage companies and consumers must act together to overcome the crucial barrier to ramping up the hydrogen industry. You can sense this unifying spirit in Austria – and it's something that we need to keep building on, including within the Hydrogen Partnership Austria (HyPA).

INFORMATION

H2Real
Wien Energie
Contact:
Lisa Grohs
lisa.grohs@wienenergie.at
Alexander Hoor
alexander.hoor@wienenergie.at
www.wienenergie.at

Renewable Gasfield
Energienetze Steiermark GmbH
Contact:
Klaus Neumann
klaus.neumann@e-netze.at
www.e-netze.at

Underground Sun Storage 2030
RAG Austria AG
Contact:
Stefan Pestl
stefan.pestl@rag-austria.at
www.rag-austria.at

NEFI-Green Steel
AIT Austrian Institute of Technology
Contact:
Christoph Zauner
christoph.zauner@ait.ac.at
www.ait.ac.at
www.nefi.at

Hydrogen Partnership Austria (HyPa)
www.hypa.at

Austria Power & Gas Model Region Hydrogen Initiative (WIVA P&G)
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For change of your shipping address contact: versand@projektfabrik.at