

RAG Austria AG: Seasonal electricity storage in the form of hydrogen ready for scale-up

The demo operation of hydrogen production and storage in the USS2030 project has been successfully completed, showing that it is technically possible to offer hydrogen storage services on a scaled and commercial basis in depleted underground gas reservoirs.

- Operation of the Rubensdorf/Gampern hydrogen storage facility, which was opened in 2023, was completed very successfully.
- The results confirm the technical feasibility of large-volume summer electricity storage in depleted porous sandstone gas reservoirs and enable the ramp-up of the hydrogen infrastructure.
- Around 500,000 m³ of hydrogen were stored for several months and extracted from the reservoir in high purity.
- The stored hydrogen is already being used for the production of CO₂-free electricity and CO₂-free heat by RAG's own combined heat and power (CHP) plant at the Gampern site.
- Start further storage cycles in the EU follow-up project "EUH2STARS".
- A commercial application example is shown with the municipality of Gampern in the "Seasonal Storage for Energy Communities" project.

Significant milestone for large-volume energy storage

Summer electricity production in May already clearly shows that the peak production of solar energy, the associated low to negative prices and the competition between solar power production and hydropower require a suitable storage solution in order to produce renewable electricity in an economically viable way. Battery and pumped storage systems cannot take over and store these electricity volumes and outputs in the long term and on a large scale. In RAG's view, the only suitable technological solution that can bring the green surplus into the winter is power-to-gas and hydrogen as an energy carrier.

In 2023, the world's first hydrogen storage facility was opened in an underground sandstone gas reservoir as part of the flagship project Underground Sun Storage 2030 (USS 2030) in the municipality of Gampern, Upper Austria. The project operation, consisting of two storage cycles, has been successfully completed. The technical feasibility of this promising and large-volume hydrogen storage technology was once again confirmed. Safe technical operation comparable to natural gas storage was achieved over the entire operating period. The hydrogen quality achieved during storage meets the requirements for injection into a hydrogen pipeline infrastructure. This means that RAG Austria AG, together with the project partners

involved, has taken a significant step towards the commercial application of safe, seasonal and large-volume storage of renewable energy in the form of hydrogen in natural underground reservoirs.

Head of Green Gas Technology Stephan Bauer on the project:

"With the completion of the last hydrogen storage cycle as part of the Underground Sun Storage 2030 project, a very successful project for RAG Austria AG is coming to an end. For the first time worldwide, we have succeeded in proving that large-volume storage in the form of pure hydrogen in gas reservoirs works in a real environment. This allows us to disprove the claims that this storage technology is not technologically mature enough. I am also pleased that we can now continue operating the Rubensdorf / Gampern hydrogen storage facility directly as part of the "EUH2STARS" project. My thanks go to the entire team who made this achievement possible in the first place."

Ramp-up of the hydrogen economy

As part of the Underground Sun Storage 2030 project, RAG and its project partners have mapped the entire value chain of the hydrogen economy on a demonstration scale. In addition to hydrogen production by means of electrolysis and storage, a hydrogen purification and pipeline infrastructure to a hydrogen consumer was also set up.

In RAG's own hydrogen combined heat and power plant, CO₂-free electricity and CO₂-free heat are produced from the stored hydrogen and used for the RAG site in Gampern.

This experience also confirms that large-volume and seasonal energy storage is an integral part of the value chain and can make a decisive contribution to the energy transition.

"The USS 2030 project impressively demonstrates that the seasonal storage of renewable energy in the form of hydrogen in our underground pore storage facilities is a feasible and forward-looking solution. The knowledge gained proves the service of summer electricity storage and the relevance for the development of a secure hydrogen economy in Austria and Central Europe," emphasizes Markus Mitteregger, CEO of RAG Austria AG.

Scaling in the EU follow-up project EUH2STARS

The successful completion of USS 2030 forms the starting point for four further storage cycles in the follow-up project EUH2STARS, which will continue immediately. Furthermore, the signals are clearly pointing towards scaling. The detailed planning for the scaling of energy storage in the form of hydrogen is now being developed in the feasibility studies of the EUH2STARS project. The real implementation of the first hydrogen storage systems can start immediately if there is sufficient demand and a suitable market environment.

Cooperation with the municipality of Gampern and its energy community

At the RAG site in Gampern, an exemplary commercial application of the USS 2030 project is being demonstrated in the "SeasonalStorage4EG" project in cooperation with the Gampern energy community and the 100% hydrogen storage facility in Rubensdorf (Gampern).

As part of this project, the added value of seasonal storage until the energy is returned in winter as electricity and heat for these communities will be demonstrated through exchanges with energy communities and other stakeholders and supported by the infrastructure created and described above (electrolysis, storage, pipeline, combined heat and power plant). In addition, the existing legal framework and regulatory hurdles will be analyzed. A final report is expected in the coming weeks. This will set the course for targeted support for energy communities in their key role in the energy transition.

"This good cooperation shows how it is possible to keep distances short and use regionally produced and stored energy directly on site. Seasonal storage thus contributes to the creation of a sustainable, regional and independent energy supply," explains Jürgen Lachinger, Mayor of Gampern.

About USS 2030:

The lead project "Underground Sun Storage 2030" (USS 2030) implemented the safe, seasonal and large-volume storage of renewable energy in the form of hydrogen in underground gas reservoirs. The project was funded as part of the FTI initiative **"Vorzeigeregion Energie"** of the Klima- und Energiefonds, endowed with funds from the Federal Ministry for Innovation, Mobility and Infrastructure (BMIMI). Under the leadership of RAG Austria AG, renowned industrial and university research partners were involved, including Axiom Angewandte Prozesstechnik GmbH, Energie AG Oberösterreich, Energieinstitut an der Johannes-Kepler-Universität Linz, EVN AG, HyCentA Research GmbH, K1-MET GmbH, Vienna University of Technology, University of Natural Resources and Life Sciences Vienna, VERBUND, Verein WIVA P&G and voestalpine Stahl GmbH.



About EUH2STARS:

EUH2STARS is an ambitious, industry-driven flagship project to demonstrate competitive, complete and qualified underground hydrogen storage (UHS) in depleted porous natural gas reservoirs at technology readiness level (TRL) 8 by the end of the decade. The project consortium, comprising of gas storage system operators, technology providers, utility, research- and governmental organisations, is supported by the Clean Hydrogen Partnership and its members after successfully applying for the HORIZON-JTI-CLEANH2-2023-02-1 – Large-Scale Demonstration of Underground Hydrogen Storage funding programme. The project is scheduled to run until September 2029.

PARTNERS



FUNDING



More information on the “Underground Sun Storage 2030” project

www.uss-2030.at

More information on the “EUH2STARS” project

www.euh2stars.eu

More information on the "Seasonal Storage 4 EG" project

www.seasonalstorage4eg.at

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