Press Release 22 January 2021

"Underground Sun Conversion – Flexible Storage": sustainable storage for the renewable energy system of the future

From December 2020, the "Underground Sun Conversion – Flexible Storage" (USC-FlexStore) project will investigate seasonal storage of large quantities of renewable energy to be made available year round.

This innovative international project is aimed at developing a seasonal, high-volume transformation and storage solution for erratic renewable generation. Energy will be stored safely in gaseous form in underground facilities at depths of over 1,000m.

The aim of the project is to take RAG Austria AG's patented "Underground Sun Conversion" (USC) technology (which involves methanation of CO_2 and green H_2) to the next level, and to design services based on it. Field tests will be carried out at RAG's research facility in Pilsbach (Upper Austria).

In collaboration with Swiss energy supplier Energie 360° and research partners (Wiva, BOKU Vienna, Empa, University of Bern, OST) working on this multi-disciplinary, transnational project, know-how and specific capabilities will be bundled. The research will focus on devising solutions to one of the biggest challenges facing the energy system of tomorrow: how to expand fluctuating generation of renewables such as wind and solar power while at the same time maintaining high levels of security of supply, especially in winter, when the possibility of generating power is low and demand is high?

Investigations will centre on the technological, commercial, energy-sector and legal requirements for a cross-sector approach that can reduce the current need for substantial imports and use of fossil energy in winter, when demand is stronger.

The goal is to enhance the interseasonal capacity of the **"USC-FlexStore"** storage system with a view to developing a commercial service. Compared with batteries or complementary storage services at pumped storage power plants, "USC-FlexStore's" main advantages are its greater flexibility and much higher capacity. And this is what makes interseasonal energy storage possible in the first place.

In summer, ERA-NET recommended that the international "USC-FlexStore" research project receive funding. Subsequently, a transnational consortium agreement could be concluded between the partners as well as regional funding agreements with the respective state funding agencies - in Switzerland the Federal Office of Energy - BFE, and in Austria the Research Promotion Agency - FFG on behalf of the "Bundesministerium für Klimaschutz" (BMK) and the "Klima- und Energiefonds". The project was launched in December 2020 and is scheduled to last for two and a half years.

Project information

This project is based on the "Underground Sun Conversion" (USC) technology developed by RAG Austria AG in collaboration with the University of Natural Resources and Applied Life Sciences, Vienna (BOKU), and represents the next step in implementing this new, innovative and unique storage technology.

"Underground Sun Conversion" involves injecting CO_2 and H_2 into a porous underground gas storage facility (a depleted gas reservoir), where microbial methanation has been found to occur, meaning the biological conversion of CO_2 and H_2 to methane, the main component of natural gas. This storage technology which is based on renewable gas enables seasonal storage of large volumes of energy, which will not only enhance the stability of European

energy networks and energy supply, but is also essential for ensuring that the continent's energy mix includes a higher proportion of (gaseous) renewables.

The project will provide a first estimation of the potential for geological storage of energy in Switzerland using the "USC FlexStore" approach. This process serves as a blueprint for future expansion to other regions around the world, and in turn as a model for the internationalisation of the concept.

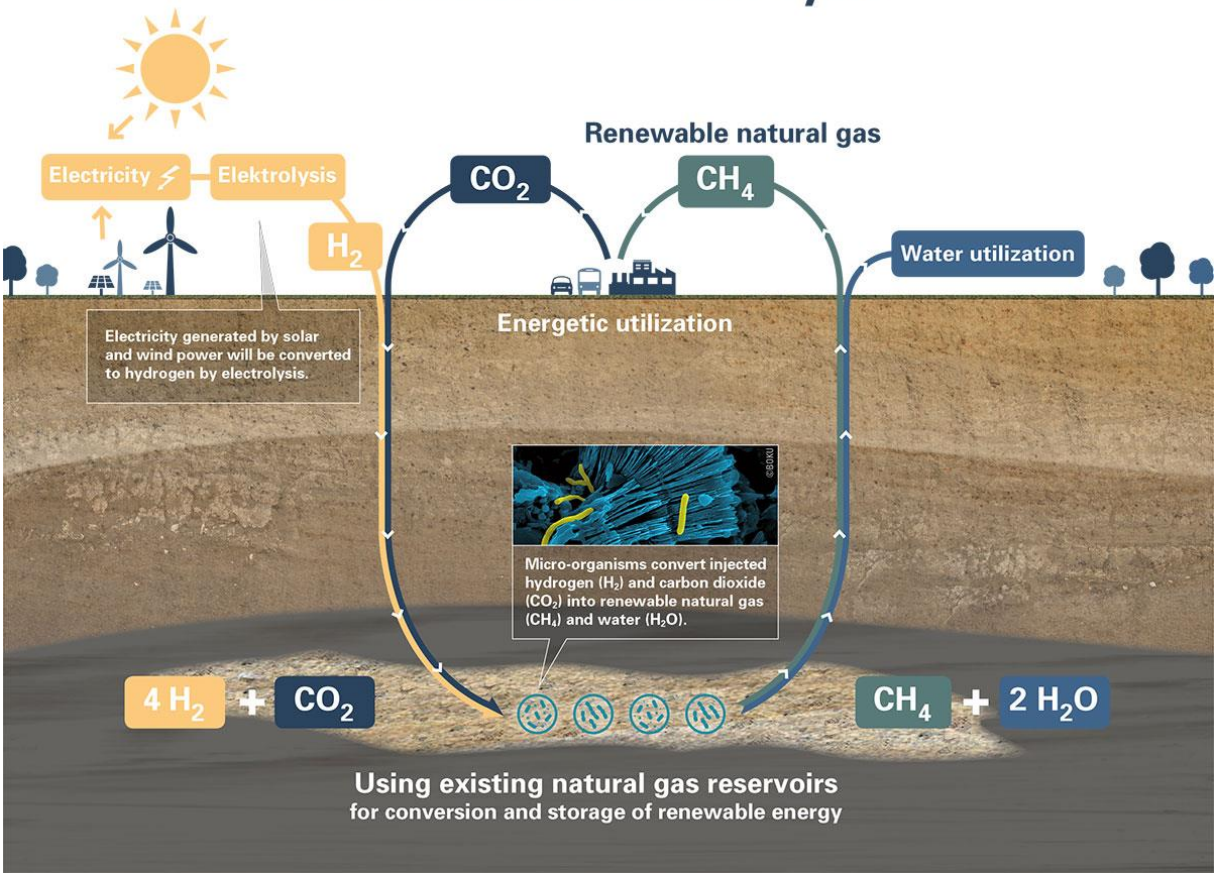
In line with European initiatives intended to promote sector coupling and the integration of electricity and gas grids, with a view to making the energy system more stable and flexible, the "USC-FlexStore" project is designed to contribute to achieving the overarching goals of the Strategic Energy Technology Plan and the ETIP SNET (European Technology and Innovation Platform – Smart Networks for the Energy Transition).

ERA-Net RegSys

This project is funded under the Joint Programming Initiative "ERA-Net Smart Energy Systems" under the priority "Integrated Regional Energy Systems" with support from the European Union's Horizon 2020 research and innovation program. The Austrian participation in the ERA-Net Smart Energy Systems is funded by the "Bundesministerium für Klimaschutz" (BMK) and the "Klima und Energiefonds".

For further information on the "Underground Sun Conversion" technology, visit www.underground-sun-conversion.at/flexstore.

Sustainable carbon cycle



RAG Austria AG: contact

Stefan Pestl
Head of Corporate Communications
Schwarzenbergplatz 16
1015 Vienna
Tel. +43 (0)50724 5460
stefan.pestl@rag-austria.at

Stephan Bauer
Project Manager, Green Gas Technologies
Schwarzenbergplatz 16
1015 Vienna
Tel: +43 (0)50724 5377
stephan.bauer@rag-austria.at

Project partners

RAG Austria AG is Austria's largest gas storage company and one of Europe's leading gas storage facility operators. With storage capacity of more than 6.2 billion cubic metres, RAG makes a major contribution to security of supply. The company develops innovative and pioneering energy technologies around "green gas" that act as partners to renewables. Our focus is on storage, conversion and demand-based conditioning of energy in the form of gaseous energy carriers.
RAG Austria AG is playing a vital role in achieving Austria's ambitious climate goals, and in the sustainable stewardship of the country's raw material and energy supplies. Without the energy in RAG's storage facilities, phased decarbonisation would not be possible, so they are key to future energy security.

www.rag-austria.at

Contact: Stephan Bauer stephan.bauer@rag-austria.at

Energie 360° makes renewable energy available across Switzerland. Its 280 employees collaborate with customers, partners and local authorities to promote renewable energy and eco-friendly mobility. The city of Zurich owns 96% of the company, which supplies the city and 42 other local authorities with increasing volumes of renewable gas.
The company designs, builds and operates facilities for energy solutions, invests in electric vehicle charging stations and gas filling stations, and is a leading supplier of biogas and wood pellets. Every day, Energie 360° plays a significant part in realising the 2000-watt society – today and for the benefit of future generations.

www.energie360.ch

Contact: Andreas Kunz andreas.kunz@energie360.ch

The Wasserstoffinitiative Vorzeigeregion Austria Power & Gas (Hydrogen Initiative Flagship Region Austria Power & Gas, WIVA P&G) research association coordinates and implements the Vorzeigeregion Energie programme, which is based on a nationwide and supraregional structure with a strong international profile. As a central energy storage region, energy transportation hub and a key location for renewables, Austria is ideally placed to play the part of a flagship region for energy.
Over the coming years, WIVA P&G will demonstrate how Austrian technologies trialled on the domestic market can contribute to reducing greenhouse gases, support the Austrian economy as a key export, and aid global efforts to cut greenhouse gas emissions. The "USC-FlexStore" project will be embedded in WIVA P&G's information sharing activities and steps

aimed at capitalising on the programme outcomes, and will also be listed on the www.wiva.at website as an associated project.

Contact: Horst Steinmüller steinmueller@energieinstitut-linz.at

At IFA-Tulln, University of Natural Resources and Applied Life Sciences (BOKU), Vienna, microbiological metabolic processes are researched to ensure the quality of life and to preserve natural resources. The institute has well-equipped laboratories with state-of-the-art analytical equipment and corresponding infrastructure such as anaerobic high-pressure reactors, sterile areas, incubation and cold storage rooms, workshops, large-scale test facilities and a pilot plant for fermentations. These prerequisites enable numerous research cooperations with industrial partners and their successful implementation.
In the Department of Geobiotechnology (Andreas P. Loibner) microbial processes in soils, aquifers and oil/natural gas deposits are comprehensively investigated and analyzed with respect to their technical importance and potential use. Metabolic capabilities and interactions of specific microorganisms are scientifically researched and optimized with regard to an industrial application. During the forerunner project “Underground Sun Conversion”, a comprehensive portfolio of methods was compiled which will now be used to fine-tune the geomethanation approach in the “USC-FlexStore” project.

Contact: Andreas P. Loibner andreas.loibner@boku.ac.at

Empa
Materials Science and Technology

The Swiss Federal Laboratories for Materials Science and Technology (Empa) is a research institute focused on applications-driven materials science and technology. Founded in 1880, over the past 140 years Empa has developed from a conventional materials testing institute into an interdisciplinary research centre.
In its role as the interdisciplinary research institute of the ETH Domain for materials science and technology, Empa functions as a bridge between research and practical application. The organisation aims to find innovative solutions for the main challenges facing industry and society, with an emphasis on materials, the environment, energy and technology.

Contact: Martin Rüdisüli martin.ruedisueli@empa.ch

The Rock-Water Interaction research group at the University of Bern in Switzerland has been carrying out applied research in the energy and environment sector for 20 years.
It employs a wide range of scientific methods, including collecting rock and groundwater samples, observing drilling programmes and performing experiments in in-house labs and underground field labs, as well as geochemical analysis and computer simulations. Its research focuses are underground radioactive waste disposal, CO_2 sequestration, the potential and implementation of geothermal projects, as well as the rehabilitation of contaminated groundwater.

www.geo.unibe.ch

Contact: Larryn Diamond diamond@geo.unibe.ch

More than 110 people work in energy and environmental technology at the Eastern Switzerland University of Applied Sciences' (OST) Rapperswil campus, spread across four institutes: the Institute for Energy Technology (IET), Institute for Solar Technology (SPF), Institute for Environmental and Process Engineering (UMTEC) and Zug Institute of Knowledge, Energy and Raw Materials (WERZ). At IET, two research teams are investigating power-to-gas and alternative fuels. Their work is geared towards practical application of these new technologies.
IET has its own research facility for new power-to-gas technologies. It is involved in numerous national and international projects, and has close ties with energy suppliers – the users of power-to-gas technologies – and industry, where the emphasis is on developing new products and services.

Contact: Markus Friedl markus.friedl@ost.ch

ERA-NET

The European Research Area (ERA-NET) supports the coordination of national and regional funding programmes in Europe. National and regional authorities select programmes that will receive research grants; funding is then coordinated with other countries and the programmes are opened up to transnational research projects.
Based on this guiding principle, the ERA-NET instrument was developed as part of the EU's Sixth and Seventh Framework Programmes and has been given greater significance in the

current Horizon 2020 programme, so that it will continue to facilitate cross-border cooperation on research and technology.

Further information can be found at https://era.gv.at/ and www.eranet-smartenergysystems.eu.