ENERG GEO ENeRGY

UNDERGROUND GAS STORAGE FACILITIES IN UKRAINE: "GAS SHIELD" FOR EUROPE

The complex of underground natural gas storage (UGS) facilities in Ukraine consists of 13 storage sites with a total active capacity of 30.95 BCM (billion cubic meters) and a maximum daily productivity of 383.0 MCM (thousand cubic meters). The average level of UGS filling of Ukraine in the injection season (April 1 – September 30) during the period 2012-2021 was 18.8 BCM.

Ukraine has the second largest UGS complex in Europe and the third largest in the world after the U.S. and Russia. The UGS complex attracts about 1000 gas storage customers, of which 100 are foreign companies from 27 countries of the world. The total volume of UGS facilities in Ukraine represents approximately 20-21% of the total volume of UGS in Europe. facilities The Bilche-Volytsko-Uherske UGS (Figure 1) in Ukraine is the largest UGS site in Europe and can store more than 17 BCM of natural gas.

The vast majority of UGS facilities are depleted gas/gas condensate fields and a small proportion are aquifers. The UGS sites are located in all the oil and gas provinces of Ukraine at depths ranging from 400 to 2000 m. The total well inventory as of 01.01.2020 is 1679 wells, of which 1366 are production wells, including 134 wells pending connection to the pipeline network, and 313 - observation and special wells.

According to the location and connection to the system of main gas pipelines in Ukraine, there are four UGS complexes: Western, Central, Eastern and Southern. The Western UGS complex is the most important storage complex in Ukraine and its achieved capacity in terms of active gas volume is about 81% of the total amount of active gas in the country's gas storage facilities.

UGS is one of the most important technological elements of the gas transmission system (GTS) of Ukraine, which ensures its reliable and uninterrupted operation. Ukraine's GTS is the second largest in Europe. It is closely connected with the GTS of neighbouring European countries - Belarus, Poland, Slovakia, Hungary, Romania, Moldova, and through them it is integrated into the European gas network, acting as a bridge between the major gas producing regions and consumers

in Europe. The length of the main gas pipelines is 33,079 km, the number of compressor stations is 57, and the number of gas distribution stations is 1,395.

The potential of the Ukrainian UGS and GTS is assessed as significant, which acts to attract new European partners, increase their efficiency and technical parameters. In recent years, Ukraine has used up to 60% of total UGS capacity for its own needs, which confirms the presence of a significant reserve of active UGS capacity of about 8-15 BCM of the available total storage volume that can be rented out to European partners.

UGS in Ukraine is usually used to regulate the unevenness of gas consumption in seasonal periods. But, in the context of decarbonization, transformation and transition to clean energy, Ukraine is studying the possibility of converting some of UGS facilities into hydrogen transport (pipelines) and storage sites. Hydrogen should not be transported in its clean form, as it can quickly damage the pipes, but mixed with natural gas. Hydrogen concentration of up to 10-20% by volume is considered acceptable. There is the potential to pump around 6-7 BCM of hydrogen per year into the current pipelines. Availability of infrastructure and potential opportunities for "green" generation make Ukraine attractive for future European hydrogen projects, but the most significant obstacle to the development of hydrogen energy in Ukraine is the critical condition of the gas transport infrastructure. The process of attracting hydrogen to Ukraine's UGS and utilities is impossible without a "global" redesign of the main and gas distribution networks and requires legislative and organizational changes.

The above information was detailed in a full report, prepared by Yuliia Demchuk, initiated and supported by the ENeRG network. The report can be found at https://energnet.eu/wp-content/up-loads/2022/06/UGS_facili-ties_in_Ukraine_update.pdf.



Figure 1. Bilche-Volytsko – Uherske UGS

The Newsletter content

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"100 GOOD REASONS FOR USING GEOTHERMAL ENERGY IN HEATING AND COOLING NETWORKS" A NEW INITIATIVE TO MAKE GEOTHERMAL ENERGY MORE VISIBLE IN EUROPE

The EU COST Action CA18219 Geothermal-DHC joined forces with the European Geothermal Energy Council, the EU project Crowdthermal and the German association Geothermie Allianz Bavern to make the use of geothermal energy in heating and cooling networks more visible in Europe. This initiative aims at creating a GIS based web tool to show and briefly characterize existing installations and planned projects across Europe. In a first run, operators and planners of geothermal heating and cooling networks are invited to participate in a survey to build-up the pan-European web tool. The first results will be shown during the European Geothermal Congress 2022 in October, Berlin.

The importance of geothermal energy use in heating and cooling networks

Geothermal energy offers various technological concepts to supply heating and cooling (HC) networks at various temperature and capacity levels. The main benefits of using geothermal energy in heating and cooling networks are obvious:

Reduction of energy imports, high energy conversion factors, low environmental impact and stable costs. These arguments in favour are evident for those who are already familiar with geothermal. However, low visibility and awareness towards geothermal energy still prevails among most political decision makers and investors. Too often, stakeholders still assume that geothermal energy could only be applied under specific geological conditions. Yet the broad range of proven technical concepts in the form of shallow to deep systems highlights that geothermal energy is applicable practically everywhere. However, this is often not known outside the geothermal community.

About the initiative

The "100 good reasons for using geothermal energy in heating and cooling networks" initiative ('100 good reasons initiative') intends to raise the visibility of successfully operating geothermal-DHC networks in Europe in order to inform and inspire future market actors.



Figure 2. Thermal water gained at a successful well test in Vienna, Austria marking the start of integrating geothermal energy into the district heating network in Vienna. Credits: Austrian Geothermal Association (2021)

The initiative intends to create a GIS based web tool application of operating and planned projects linked to informative fact sheets on each site to exhibit the full technological spectrum of geothermal HC networks starting from low temperature local networks towards conventional large capacity district heating networks. The initiative will collect key characteristics of geothermal networks by an electronic survey. The provided answers will be published in a publicly accessible GIS tool with individual fact sheets linked to each application or project. Later on, the assessed information will be transformed into a permanent web-based content management system, to which operators will have full access. During the European Geothermal Congress 2022, there will be a soft-launch showing the first results of the initiative, while the full launch of the full GIS tool and other dissemination material is planned for 2023.

How to get involved

If you would like to support this initiative, please get in contact with operators and planners and invite them to participate in the survey, included in the link below, to build up the web GIS tool. All documents and links related to the initiative can be found at the website of the EU COST Action Geothermal-DHC (https://www.geothermal-dhc.eu). The Action Office will also support you in any matter.

In case of questions, please contact CA18219@geologie.ac.at.

Gregor GÖTZL Project Coordinator Geological Survey of Austria

Geologische Bundesanstalt

CO2GEONET OPEN FORUM

We are delighted to announce that CO2GeoNet is re-starting our annual in-person Open Forum. This event has for some time been a "must-attend" event for stakeholders, including representatives from the European Commission, industry, regulators, public authorities, NGOs, and the research community. The Open Forum offers a unique opportunity to meet and interact directly with Europe's largest group of researchers on CO2 geological storage. Our Association now comprises 27 members from 21 European countries, bringing together key research institutes with CO2 storage research expertise and experience, ready to share the latest global developments in CCS.

This year is an important landmark for the Open Forum since it will be the 15th edition of this event, and the theme will be "Accelerating CCS; transitioning from millions to billions of tonnes of CO2 stored". The 2020 GCCSI "Global Status of CCS"

report observed that, although 40 million tonnes of CO2 is stored every year, this must increase at least 100-fold by 2050 to meet the scenarios laid out by the IPCC. Therefore, the coming Open Forum will seek to explore the theme of how progress in storing CO2 can be accelerated to keep the Paris Agreement climate targets within reach. The entire programme comprises plenary sessions and there is ample opportunity for the audience engage in discussions with the presenters via dedicated interactive panel sessions.

The Open Forum aims to present the latest developments on CO2 storage at high level to engage with a wide range of stakeholders. Therefore, to allow more technical and specialist discussions, workshops are organised before and after the Open Forum to enable experts to hold focused discussions which will help drive progress. The first workshop will

take place before the Open Forum during the afternoon of the 19th of September, "ECCSEL-ERIC industrial workshop on the envisaged service model of ECCSEL ERIC and industrial alignment on the research priorities". The Open Forum itself will take place over the 20th and 21st of September. Following the Open Forum, on the 22nd of September there will be a networking workshop, to bring together projects to look for synergies in use of the subsurface for a sustainable future and consider aspects (e.g. regulatory issues, transboundary CO2 transport) that need to be refined to accelerate the use of the subsurface (CO2, hydrogen and energy storage) for a sustainable future.

More information and registration can be found at: conference2022.co2geonet.com.

Barbara Merson CO₂Geonet secretary



REX-CO2: RE-USING EXISTING WELLS FOR CO2 STORAGE OPERATIONS

The REX-CO₂ project, funded under the 2^{nd} call of the ACT (Accelerating CCS Technologies) program, focused on developing procedures and tools to provide decision makers with mechanisms to evaluate well re-use for CCUS. The 3-year international research project will conclude in August this year.

The main result of the project is the development of a Well Integrity Screening Tool, accompanied by a set of recommendations for reliable and safe re-use of existing wells in accordance with national regulations. The tool will be particularly valuable to operators and regulators in the early phase of CCS project maturation to allow quick identification of wells that require the most attention. The Screening Tool allows assessment using a well-by-well approach, on the basis of five well integrity categories. The final results are presented in the form of a traffic light system for easy visualization.

The Well Screening Tool was applied in 9 case studies, to test, verify and validate the application of the Tool and to develop remediation recommendations to address identified well integrity issues across a portfolio of different sites. The assessments show that the Screening Tool identifies well integrity issues in a consistent manner, in line with engineering assessments. Another finding is that most wells lack sufficient data, whereas data quality and access to it are crucial for robust well screening assessment.

Well Screening

The well screening tool consists of a tool init regarding the user's field and wells, while the then provides the results of the assessment

Load Input

Tool Initialization

Cement Integrity Predictions (beta feature)

£)



Intervention is required to re-purpose all of the assessed wells from the case studies.

To support the Well Screening assessment, laboratory experiments and numerical modelling on innovative sealing concepts, damage processes, cement integrity, material properties are being worked on to address fundamental understanding of key processes.

The technical work is complemented by a regulatory, policy and socio-economic investigation on re-using existing wells for

CO2 storage. It was found that across the participating nations, major differences in permitting exist and that the process for transferring an asset from hydrocarbon operations to CCS is poorly resolved in regulatory frameworks. A key finding is that more national policies need to encourage re-use of wells and assets to accelerate the energy transition.

We see that the REX-CO2 Tool could play an active role in establishing which wells have potential to be re-used and hence overcome some of the regulatory barriers identified. The combination of clear information sharing regarding storage resources and utilization of the REX-CO2 tool, could help to preserve key



implementation of the REX-CO2 screening tool

assets of national importance instead of just decommissioning them.

Please see the project website https://rex-co2.eu/index.html to find all published reports and more. The Well Screening Tool will become freely available to download at the completion of the project.

Maartje Koning Project coordinator



ENeRG – European Network for Research in Geo-Energy

ENeRG - European Network for Research in Geo-Energy ENeRG website: https://www.energnet.eu is maintained by is an informal contact network open to all European organisations with a primary mission and objective to conduct basic Contact person: Dr. Kazbulat Shogenov, and applied research and technological activities in the field kazbulat.shogenov@taltech.ee of sustainable use of the underground for the energy transition. ENerg Newsletter - GEO ENergY is published by Department ENeRG president is Dr. Alla Shogenova from Department of of CO2 Geological Storage, GeoEcoMar, Romania. Geology, Tallinn University of Technology (Estonia),

Figure 3. Impression of the REX-CO2 Well Integrity Screening Tool

REX-CO2 Tool

EX-CC re-using existing wells

The cement integrity predictions tool asks the user for a few inputs and then performs an analysis by running reduced order models for the specified parameters, producing a prediction of the caprock cement integrity. This component is still development and is thus considered a bet feature.

Cement Integrity

Version: 1.0.1 E-mail: info@rex-co2.eu

User Guide Acknowledgements References

Export to File

Well Screening

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ENERG MEMBERS AT 83rd EAGE ANNUAL CONFERENCE & EXHIBITION IN MADRID

A strong community of geoscience & engineering experts, leaders and next-generation talents gathered at the 83rd EAGE Annual Conference & Exhibition in Madrid on 6-9 June, which took place in a hybrid format. The EAGE, as one of the largest subsurface professional's association in the world can be a significant player in the transition of fossil-fuel targeted activities to the renewables and storage-targeted education, research and business.

"Leading Geosciences into a New Era" was a theme for this large world-wide event, where researchers, oil and gas companies, geo-equipment and software providers exchanged their knowledge, presented their advanced and retargeted products and shared their ideas and plans for the energy transition era, enabling their companies to become carbon-neutral by 2050.

Several ENeRG members, including ENeRG President Alla Shogenova, took active part in the conference, where about 4500 people were registered onsite



Figure 5. PGI-NRI booth at the EAGE exhibition.

ENeRG members

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GEUS - Geological Survey of Denmark and Greenland (Denmark) Mette Olivarius mol@geus.dk and 800 presentations were made. PGI-NRI, Heriot-Watt University (HWU), Tallinn University of Technology (TalTech), SHOGenergy and OGS were among active participants of the conference.

One of the most popular themes of the conference was CO2 and H2 Storage, including Joint EAGE/SPE session "Geological Storage of Hydrogen or CO2" on the 7th June. Within this session, M. Awag (HWU) made a presentation on CO2 Plume migration, G. Wang (HWU) presented his research on Numerical study of Underground Hydrogen Storage (UHS) and A. Shogenova presented the situation of Underground Hydrogen Storage (UHS) in Lithuania (Fig.6). On the 8th June, within the session "Natural gas Storage & CO2 and Waste Storage", K. Shogenov (TalTech, SHOGenergy) talked about UHS future outlook for Estonia and Latvia (Fig.7). Next day K. Shogenov was one of the chairs at the session "CCS and Utilization 2". Other important presentations from ENeRG members were made by A. Vesnaver (OGS) on 6th June on shallow velocities



Figure 6. Presentation made by ENeRG president A. Shogenova.

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Institute of Geology and Seismology (Moldova) Dr Igor Nicoara nicoaraigor@gmail.com estimation and by S. Aghabozorgi (HWU) on 9th June on predicting permeability of low salinity injection.

At the PGI-NRI booth in the exhibition area (over 170 booths), information about the Polish Oil and Gas industry, and the (Polish) Ministry of Climate the Environment was presented, and recent ENeRG newsletter were displayed (Fig. 5). A number of institutions were invited to join the ENeRG network, some of which, very active at the Conference, promised to join our network very soon.

Alla Shogenova ENeRG president TalTech





Figure 7. K. Shogenov presenting and chairing session at EAGE annual in Madrid.

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