

ENeRG GEO ENeRGY

In Memorandum of Vit Hladik – two decades in the ENeRG

At the beginning of February 2023 we lost Vit Hladik - our great colleague and friend with whom we cooperated during 20 years in ENeRG, in international projects, in other networks, as co-author of publications and reports, and just spending nice evenings after the condensed working days at the conferences, workshops and meetings, at concerts, in small restaurants or just investigating historical sites and castles during excursions between or after these events.

Vit was a very special man: he was always patient, often with a smile and positive constructive proposals. He always had his own opinion and clear understanding of all discussed issues. I do not remember any conflict situations or criticism from his side, even, when the situation was complicated. He always could find the way and could be helpful.

Vit had MSc degree in applied geophysics from Charles University in Prague, and Master in Business Administration from Nottingham Trent University / Brno Business School. In 1994-2003 he was working as a Division Manager in Geofyzika, Brno and since 2003 in Czech Geological Survey (Brno Division) as a Senior project manager.

He represented the Czech Republic as a Steering Committee member in ENeRG since 2002. Vit was in charge of the GEO ENeRGY newsletter of ENeRG from 2004-2011, and worked as an editor of the ENeRG website from 2012-2017. He was the ENeRG president for 2018-2019, when he organized, together with BRGM, the First European Underground Energy Storage (UES) Workshop in Paris.

I remember the ENeRG project which Vit organised, prepared, managed and



Figure 1. Vit Hladik in Madrid in 2019 during his ENeRG presidency, among Alla Shogenova, Niels Poulsen and Isabelle Czernichowski (all were ENeRG presidents)

coordinated. It was the CO2NetEast project (CO₂ Capture and Storage Networking Extension to New Member States), coordination action of the 6th Framework Programme (2006-2010). It was a pleasure and great experience to work under his leadership in this project. I consider Vit the best project coordinator I have known, so far. Because of his special personal features he also had a talent to attract industrial sponsors and owing to this, the CO2NetEast project was extended by one year in 2010 supported by well-known companies.

Vit was a Management Board Member and work package leader in CGS Europe project (FP7 Pan-European Coordination action on CO₂ geological storage, 2010-2013) and ENOS (Horizon 2020

project – Enabling onshore CO₂ storage in Europe, 2016-2020).

The last years, months, weeks and days of his life he was very active, coordinating a Czech-Norwegian research project on CO₂ Capture and Storage (CO2-SPICER) (ENeRG NL 44, page 4), representing CGS in the Geo Energy Expert Group of EuroGeoSurveys and the CO2GeoNet network and started to organize the 2nd UES workshop. He was a Management Committee member in the COST Action Geothermal-DHC and organized at least two ENeRG workshops on the Underground Storage of Radioactive Waste and wanted to proceed with a larger network activity in this area.

Vit was one of the first authors and editors of the first and second versions of the CO2GeoNet Reports, the last one State-of-play on CO₂ geological storage in 32 European countries - an update - the unique and very informative report was issued in 2021.

Many of Vit's activities were ongoing and not finalized including the CO2-SPICER project. It is very complicated and mostly impossible to replace Vit in his life and his professional activities. Vit was a very good husband, father and grandfather and excellent partner and coordinator in all his professional activities.

We will never forget our dear colleague Vit Hladik and his input into our professional activities, research in new technologies and social part of our events.

Alla Shogenova
ENeRG President 2007 and 2022

SHOGenergy



The Newsletter content

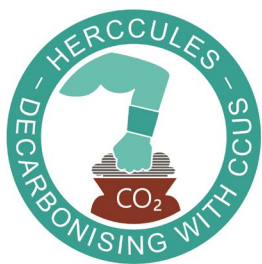
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HERCCULES - Heroes in Southern Europe to decarbonise industry with CCUS



HERCCULES

full CCUS chain demonstration

The Horizon Europe project HERCCULES coordinated by LEAP (Piacenza Energy and Environment Laboratory) is an Innovation Project funded for 5 years (2023-2027). The consortium includes 23 partners and will demonstrate the feasibility of the entire CO₂ Capture, Utilisation and Storage chain (CCUS) in the regions of southern Europe with a high industrial density (Po Valley and Greece). The project is funded by about €30 million and €10 million will be supported by industrial partners, including Italian companies - A2A, Buzzi Unicem, Eni, Eucore and Tecno Project Industriale - and Italian divisions of multinational groups - Air Liquide, Energean, Boston Consulting Group.

HERCCULES will aim to accelerate the application of the CCUS in Mediterranean

Europe, based on the transport and storage initiatives already under construction in Italy and Greece and developing new capture technologies. Innovative CO₂ capture processes will be demonstrated in two cement plants (Buzzi Unicem and TITAN Cement Group) and a waste-to-energy plant in Milan (A2A) based on advanced oxy-combustion and post-combustion capture technologies such as Calcium Looping combined with cryogenic purification processes able to separate CO₂ with efficiencies and purities close to 100%. A part of the pure CO₂ flow will be used in mineralization for the production of new cementitious materials that could replace conventional concrete and be used in the technical gas sector.

CO₂ will be transported from the industrial capture sites to the two geological storage

sites of Ravenna (Eni) in Italy and Prinos (ENERGEAN) in Greece. Owing to the capture of biogenic CO₂ and its reuse and/or storage, HERCCULES will demonstrate negative CO₂ emissions, transforming industrial clusters from CO₂ emitters to CO₂ absorbers.

Educational and training events for schools, stakeholders and policy makers will be organized by Fraunhofer ISI, SHOGenergy, Eucore and the Clust-ER Energy and Sustainable Development association to raise the awareness of the CCUS theme and make local communities an integral part of the project.

The HERCCULES will capture 3500 t CO₂ (3 plants), use CO₂ (3 CO₂ use plants), transport and store 1000 t CO₂ in two storage sites and produce 8000 t of low-carbon concrete.

Maurizio Spinelli (LEAP)



Alla Shogenova
(SHOGenergy)



Introduction of New ENeRG Member

'Geothermal Ukraine' (further - GU) is a non-profit R&D organization founded in April, 2022 in response to challenges caused by Russia's invasion of Ukraine that has accelerated a roll-out of renewable energy to replace Russian fossil fuels and to tackle the climate crisis. GU is registered in Ukraine and combines professionals in the field of petroleum engineering, geoscience and other academic/research expertise in fields related to geothermal energy.

The mission of GU concerns: accumulation of the best world practices and experience in obtaining geothermal resources, taking into account the local geological structure and legacy oilfield infrastructure in order to apply them in Ukraine; promotion of the Ukraine's energy transition to renewable energy (geothermal) resources and motivation of decarbonization initiatives; development of the R&D basis for the Geo energy potential and provision of active support for the Ukraine's energy sector modernization.



The main activities of GU refer to R&D projects in O&G orphan wells, repurposing them for geothermal use; promotion of geothermal energy for heating and cooling purposes; feasibility study for electricity generation as well as balneology scope; and shallow geothermal opportunities and underground thermal energy storages in Ukraine. The GU promotes the most efficient application of technologies for E&P geothermal resources within

the energy sector to ensure energy independence of Ukraine.

GU is currently involved in a grant project supported by the Icelandic Sustainable Development Fund to obtain geological and technical information for the legacy P&A wells (both O&G and geothermal) database development as well as verification of potential geothermal areas.

The organization is establishing collaboration with scientific organizations, universities and relevant companies through membership of geothermal associations to support experience sharing on a partnership basis, publish scientific publications and seminar/training organization as a knowledge transfer to Ukrainian energy community.

Taras Popadynets,
Head of the Geothermal Ukraine

Yuliia Demchuk, Board member
info@geothermalukraine.org

Hystories Project Results

Technical developments

Over two and a half years of research work, the Hystories team has brought technical developments to enable the deployment of Underground Hydrogen Storage (UHS) in porous reservoirs (aquifers and depleted fields):

- it developed and published a database of European geological hydrogen storage opportunities through addition of data of specific relevance to UHS
- it assessed the capacity of 800+ porous traps in EU-27 and 4 neighboring countries, finding a total storage resource of 5 800 TWh onshore (18 000 TWh with onshore and offshore)
- it collated a dozen different brines and rocks samples from gas storage sites to feed an extensive experimental microbiological investigation, over a wide range of relevant UHS conditions, leading to an operational flowchart to assess the microbial activity risk.
- it used these experimental results and historical industrial town gas experience to develop geochemical models of the bio-reactivity, in box models prior to applying them in large scale 3D models



to assess the expected impacts at operational storage scale.

- it tested up to a dozen casing steel grades in hydrogen atmosphere, under constant or cyclic load conditions, analyzed localized corrosion, damage, hydrogen uptake and permeation, and finally assessed their applicability for storage wells conditions.

Socio economic results

UHS and transportation networks are infrastructure assets that typically require decades to develop, including planning, social acceptance and financial security. Hystories has developed insights to inform decision makers in government and industry that will face these deployment decisions:

- a comprehensive modelling of the European energy system in various scenarios and time horizons enabled to analyze optimal UHS sizing and operation cycles. Within the investigated scenarios, overall demands for hydrogen storage capacity is between 280 and 325 TWh for

EU-27+UK in 2050 (corresponding to about 5 to 18% of overall hydrogen demand). These values are orders of magnitude less than the estimated capacities of 6 900 TWh in onshore porous storage resources (Hystories result) or 13 800 TWh salt caverns (public result)

- the regulation readiness for UHS was assessed based on surveys to stakeholders, showing that it was developed or under development for only 6 of the 17 European countries reviewed.

- An Environmental life cycle analysis of UHS provides a reference assessment for 7 impact categories including Climate change and shows that the main environmental hotspots derive from the use of electricity during operation

- UHS public perception was analyzed firstly by surveying stakeholders who had been involved in several hundred potential projects, finding that two projects were adversely affected by public pressure. Secondly, they carried out a general public survey which suggested a possible "Not in My Back Yard" syndrome.

- A parametric and hydrogen-specific cost model with properly defined boundary limits was developed and applied to hundreds of UHS candidate sites, including hundreds of porous traps and dozens of onshore salt deposits. This led to an estimation to an estimation of the Levelized Cost Of Storage (LCOS) as low as 1.1 €/kg (seasonal) or 2.6 €/kg (fast cycles) in porous media, or 2.3 €/kg (seasonal) or 2.0 (fast) in salt caverns.

- A suitability mark reflecting relatively higher maturity and the lower technical risk, was also estimated, finding higher marks for salt caverns, followed by existing natural gas storage sites and then depleted gas fields.

- Finally, case studies for specific UHS sites in France, Germany, Italy, Poland and Spain enabled a more detailed look at the implementation of UHS projects, notably by assessing economic opportunities and identifying most relevant business case-related factors.

Arnaud Reveillere
Geostock Green Storage,
Project coordinator

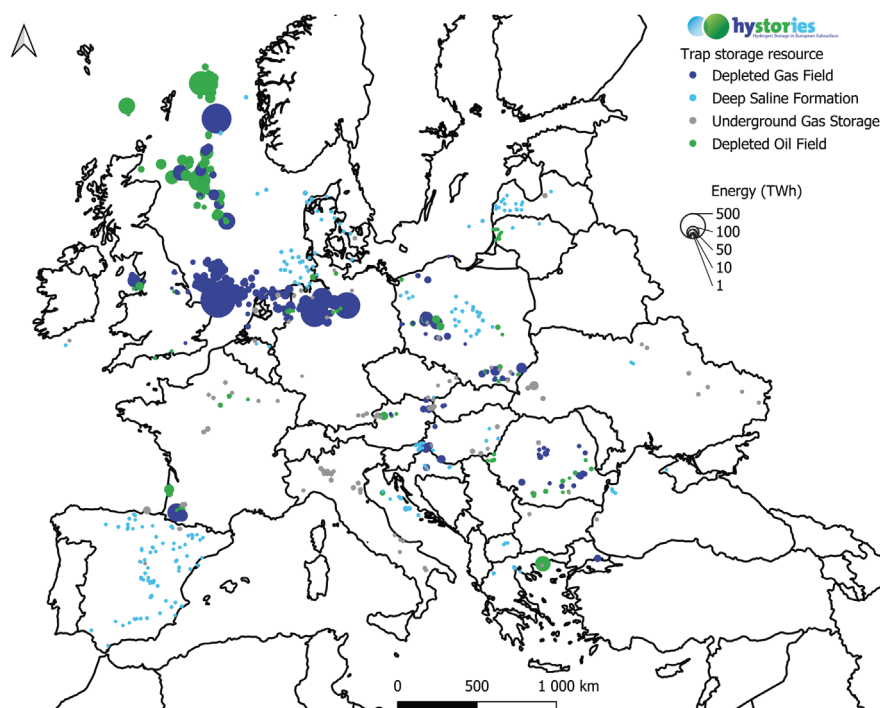


Figure. 2 Onshore and offshore depleted fields and aquifer hydrogen resources (TWh)
<https://hystories.eu/hydrogen-storage-resource-for-depleted-fields-and-aquifers-in-europe/>

ENeRG – European Network for Research in Geo-Energy

ENeRG – European Network for Research in Geo-Energy is an informal contact network open to all European organisations with a primary mission and objective to conduct basic and applied research and technological activities in the field of sustainable use of the underground for the energy transition.

ENeRG president is Dr. Alexandra Dudu, the Head of the CO₂ Geological Storage Department in GeoEcoMar (Romania), alexandra.dudu@geoecomar.ro

ENeRG secretariat is run by Centre for Research and Technology Hellas, Athens, Greece.

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2nd European Underground Energy Storage Workshop

23 - 24 May 2023, Paris, France

OVERVIEW

The 2nd European Underground Energy Storage Workshop is dedicated in the memory of ENeRG colleague from the Czech Geological Survey – Vít Hladík who contributed enormously to the organization of the first workshop and initiated the 2nd event.

Building on the success of the 1st European Underground Energy Storage Workshop, held in Paris in 2019, the ENeRG network, COST Action Geothermal-DHC and EuroGeoSurveys are pleased to invite you to the 2nd European Underground Energy Storage Workshop.

WORKSHOP LOCATION

HOTEL L'ECHIQUEUR OPERA PARIS
38 rue de l'Echiquier, 75010 Paris,
www.lechiqueurparis.com

OBJECTIVES

The objectives of the workshop are to discuss current technological status and

research needs for the development of the subsurface energy storage technologies, and exchange with energy producers and consumers who need energy storage solutions.

MAIN TOPICS

- Need for energy storage
- Advances in the research for underground energy storage
- Pilot and demo projects
- Research projects
- Underground Thermal Storage (special session organised by EU COST Action CA18219 GEOTHERMAL DHC)

ORGANIZING COMMITTEE

- Alexandra Dudu, GeoEcoMar and ENeRG President 2023-2024
- Alla Shogenova, TalTech, SHOGenergy, ENeRG President 2022-2023
- Eleonora Manoukian, CERTH and ENeRG secretary
- Gregor Goetzl, Geosphere Austria, Chair of the Cost action "Geothermal DHC"

- Arnaud Reveillere, Geostock
- Jessica Chicco, University of Turin, MC member of Cost action "Geothermal DHC"
- Barbara Merson, OGS
- Annamária Nádor, EuroGeoSurveys, chair of the GeoEnergy Expert Group

The 2nd European Underground Energy Storage Workshop is organized back-to-back with HyStorLES final conference in Paris on 25-26 May. More info on this conference can be found at <https://hystories.eu/final-conference/>

REGISTRATION

<https://energnet.eu/workshops/2nd-european-underground-energy-storage-workshop/>

CONTACT

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Presentations of the 1st UES Workshop are available: <https://energnet.eu/european-workshop-on-underground-energy-storage-presentations/>

2nd European Underground Energy Storage Workshop

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