

# ENeRG GEO ENeRGY

## Involvement of ENeRG members in ACT program

ACT – Accelerating CCS Technologies – is an international initiative started in 2016 as an ERA-NET Cofund under the Horizon 2020 programme, with the aim to facilitate accelerating and maturing CCUS technology through targeted innovation and research activities. The program, coordinated by the Research Council of Norway, was opened to countries outside Europe in 2018 and became independent of EU funding. Nowadays, the ACT member funding agencies are from the Alberta province in Canada, Denmark, France, Germany, Greece, India, Italy, the Netherlands, Norway, the Nordic Region, Romania, Spain, Switzerland, Turkey, UK, and the USA.

Throughout the three calls of the ACT program, many projects have been and are being funded, giving a great opportunity to some ENeRG members to be involved in important supported projects and to extend their focused expertise on CCUS.

**Heriot-Watt University (HWU)**, in the first ACT call, contributed to the Acorn, ALIGN-CCUS (Accelerating Low carbon Industrial Growth through CCUS) and DETECT (Determining the risk of CO<sub>2</sub> leakage along fractures in caprocks using an integrated monitoring and hydro-mechanical-chemical approach) projects.

Within **Acorn** (<http://www.act-ccs.eu/acorn/>), the university's team, under coordination of Eric Mackay, performed reservoir engineering calculations to evaluate injectivity, storage capacity, migration pathways and storage security for the primary storage complex in the Captain sandstone formation, and for the secondary store in the Mey sandstone formation.

In **ALIGN-CCUS** (<https://www.alignccus.eu/>), colleagues of the Research Centre for Carbon Solutions (RCCS-HWU), headed by Prof Susana Garcia, evaluated market readiness of amine-based CO<sub>2</sub> capture technologies for both power and industrial applications.

For **DETECT** (<https://geoenergy.hw.ac.uk/research/detect/>), teams of Andreas Busch and Florian Doster, combined field, laboratory and multi-scale multi-physics modelling studies to provide relevant parameters for a robust CO<sub>2</sub> leakage risk assessment from faults.

Within the ACT second call, RCCS-HWU team headed by Prof Susana Garcia, is

coordinating the **PrISMa** (Process-Informed design of tailor-made Sorbent Materials for energy efficient carbon capture) project (<https://prisma.hw.ac.uk/>), which aims to develop a technology platform to tailor cost-efficient carbon capture solutions for a range of different CO<sub>2</sub> sources and CO<sub>2</sub> use/destinations.

RCCS-HWU participates also in the **SCOPE** (Sustainable OPERATION of post-combustion Capture plants) project, financed in the third ACT call, by investigating the behaviour of amine-based capture plants and performing techno-economic analyses of emission control strategies for specific use cases based on pilot campaigns.

**CERTH** is currently participating in three ongoing projects, ANICA (Advanced Indirectly Heated Carbonate Looping Process), AC2OCem (Accelerating Carbon Capture using Oxyfuel technology in Cement production) and LOUISE (Low-Cost CO<sub>2</sub> Capture by Chemical Looping Combustion of Waste-Derived Fuels).

The **ANICA** (<https://act-anica.eu/>) project (ACT second call) focuses on the development of a novel indirectly heated calcium looping (IHCaL) concept for lowering the energy penalty and CO<sub>2</sub> costs during CO<sub>2</sub> capture from lime and cement plants. The CERTH team is developing novel concepts, from design and concept-proof to integration of improved processes into an existing lime plant from Greece.

The **AC2OCem** (<http://ac2ocem.eu/projects.de>) project (ACT second call) aims to integrate, through simulations and techno-economic feasibility studies, the oxyfuel technology in the cement industry as one of the most cost-effective carbon capture solutions.

The **LOUISE** project (ACT third call) aims to prepare the pre-commercial demonstration of Chemical Looping Combustion (CLC) for CO<sub>2</sub> capture from waste-to-energy (WtE). CERTH will develop simulation tools for the up-scaling of the proposed CLC-based technology at industrial level.

**GeoEcoMar**, in the first ACT call, was involved in ECOBASE (Establishing CO<sub>2</sub> enhanced Oil recovery Business Advantages in South Eastern Europe) and ALIGN CCUS projects.

In **ECOBASE** (<https://ecobase-project.eu/>), the institute assessed the CO<sub>2</sub>-EOR potential of Romania and the related CCUS chain in Oltenia region.

Within **ALIGN CCUS**, GeoEcoMar coordinated realization of a blueprint for CCUS in the Oltenia region, by identifying potential CCUS chains with multiple transport and storage options, including transport along the Danube River and storage in the Black Sea.

In the second ACT call, GeoEcoMar is involved in the **REX-CO<sub>2</sub>** (Reusing existing wells for CO<sub>2</sub> storage operations, <https://rex-co2.eu/index.html>) project, analysing the technical and social aspects and the permitting requirements in the field of hydrocarbon well reutilization for CO<sub>2</sub> storage.

In the third call, ACT is financing the **ACTION** (Advanced Multitemporal Modelling And Optimisation Of CO<sub>2</sub> Transport, Utilisation And Storage Networks) project, in which GeoEcoMar will be involved in development of models, building on the case study of GETICA CCS.

**The Middle East Technical University Petroleum Research Center (METU-PAL)** has been involved in the first and second calls of ACT. In the first call METU-PAL has evaluated, within the ECOBASE project, the CCUS potential in Turkey. Among the possible options, a selected case was assessed technically, economically, and even considering legal and regulatory conditions.

**OGS (the Italian National Institute of Oceanography and Applied Geophysics)** and METU-PAL have then contributed, within the second ACT call, to the **SUCCEED** (Synergetic Utilisation of CO<sub>2</sub> storage Coupled with geothermal Energy Deployment, <https://www.imperial.ac.uk/energy-futures-lab/succeed/>) project, aimed at performing a CO<sub>2</sub> injection into a geothermal field at pilot scale. The concept of using CO<sub>2</sub> for the sustainability of a geothermal field is a rather new but promising method, especially for the fields that contain large amounts of non-condensable gases.

For more information on the projects, please contact the above-mentioned members. Their contact details are on the ENeRG website [www.energnet.eu](http://www.energnet.eu).

Alexandra Dudu & Sergio Persoglia

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# Introduction of new EneRG members

**SHOGenergy** is a new consulting company founded in 2021 by Dr Alla Shogenova and Dr Kazbulat Shogenov, well-known leaders, experts and educators in the field of CCUS (CO<sub>2</sub> Capture, Transport, Use and Geological Storage) and petrophysics in the Baltic States.

The company is registered in Estonia and provides expertise-based consulting related to new technologies and their synergies, projects preparation, training and education activities for stakeholders and policymakers, students of all levels and schoolchildren.

The fields of expertise, covered by SHOGenergy, are geological, technical, economic, regulatory and educational aspects of climate change mitigation technologies. Techno-economic and techno-ecological modelling of CCUS scenarios; CCUS for the cement industry,

cluster projects and hubs, synergy with the circular economy, geothermal energy and hydrogen production; geological storage of CO<sub>2</sub>, hydrogen, energy and radioactive waste; numerical and seismic modelling of CO<sub>2</sub> geological storage (CGS) and negative emission technologies are included in their expertise. Composition and petrophysical properties of reservoir and cap rocks are covered by the largest Estonian database, collected and applied during previous decades for research and feasibility studies. E-learning, digital and on-site education could be provided for the innovative technologies.

SHOGenergy has already started a collaboration with Baltic enterprises to create a consortium for developing CCUS projects in the region.

Working as senior researcher and researcher for decades in academic institutions, A.

Shogenova and K. Shogenov took part in many projects, education and dissemination activities, participating in many international conferences, including GHGT conferences in 2008-2021. K. Shogenov defended his PhD in CGS in 2015. A. Shogenova was visiting Professor in CGS at the University of Warsaw in 2013 and an ENOS professor in CGS in 2020. In 2018-2021 three Master theses in CCUS for the cement industry were supervised and defended in TalTech. A. Shogenova was ENeRG president in 2007-2008, later Alla and Kazbulat produced the ENeRG Newsletter and at present they are in charge for the ENeRG website management.

Alla Shogenova  
Kazbulat Shogenov



## The Public Organization Ukrainian Association of Geologists (UAG)

is a voluntary, independent, transparent, and all-Ukrainian public self-regulatory organization, which unites its members on the basis of common interests to implement and protect rights and freedoms and to meet public needs, in particular economic, social, cultural, environmental and so on. Its main mission is to promote geological science, represent the professional interests of geologists and spread awareness among citizens about the importance of geological science for society.

The main activities of UAG refer to: organization of scientific meetings and conferences, educational programs, publication of scientific and popular science journals and books, research grant accomplishment, manufacturing and proposing awards for outstanding merits in geology, teachers/leaders of geological/natural sciences clubs, professor-oriented student support and promoting awareness in geological sciences.

UAG is currently involved in 3 projects, ENGIE - Encouraging Girls to Study Geosciences and Engineering (<https://www.engieproject.eu/>), CROWD THERMAL - Community-based Development Schemes for Geothermal Energy (<https://www.crowdthermalproject.eu/>) and REFLECT - Redefining Geothermal Fluid Properties at Extreme Conditions to Optimize Future Geothermal Energy Extraction (<https://www.reflect-h2020.eu/>). These projects are funded under EU Horizon 2020 programme and are implemented jointly with the European Federation of Geologists (EFG) and numerous European partners.

As part of promoting knowledge of geology, UAG publishes the quarterly full-scale digital 'Ukrainian Geologist' Journal. The Journal is freely available on the website <http://journal.geologists.org.ua/issue/view/14409>. The organization is also media partner of major industry events.

UAG is deeply involved in promoting geological knowledge among young people

in Ukraine. The Council provides different activities in schools to educate, care for the environment and increase the prestige of geologists. Many lectures, seminars, workshops, scientific conferences were held.

To celebrate the personal merits of UAG members and others in the field of its activities, the UAG has developed and manufactured awards - silver and gold lapel badges, medals for merit (I, II and III degree), and a medal 'For Contribution to Mineralogy' designed by Yeuhen Lazarenko, and a geological hammer engraved with the recipient's name.

For more information, please visit <https://geologists.org.ua/en/>.

Hanna Liventseva

Chairman of the Board of Public Organization 'Ukrainian Association of Geologists'



## International Master on CO<sub>2</sub> Geological Storage

The call of the second edition of the "International Master on CO<sub>2</sub> Geological Storage" is open. The deadline of application is 17<sup>th</sup> January 2022. Accordingly, lessons will start in February 2022. The course lasts one year.

This postgraduate specialist university course is offered jointly by the University of Rome and University of Zagreb and includes the participation of professors from the Tallinn University of Technology

(TalTech), Heriot-Watt University (HWU), Geological Survey of Denmark and Greenland (GEUS) and CO<sub>2</sub>Geonet, The European Network of Excellence on the Geological Storage of CO<sub>2</sub>.

The program will cover all aspects of the geological storage of CO<sub>2</sub>, so that the students can understand the work of all specialists who will be involved in CCS projects, such as reservoir engineers, geologists, geophysicists,

geochemical modelers, economists, regulators, etc.

Candidates are required to have a MSc degree in Earth Sciences or Petroleum Engineering according to the European Qualification Framework.

More information can be found at: <https://web.uniroma1.it/masterco2/> and <https://www.uniroma1.it/en/offerta-formativa/master/2022/co2-geological-storage>.

# CO<sub>2</sub> Geological Pilots in Strategic Territories

PilotSTRATEGY, funded under EU Horizon 2020 program, focuses on advancing understanding of deep saline aquifer (DSA) resources for geological CO<sub>2</sub> storage in five European industrial regions (Fig. 1.) in Southern and Eastern Europe. DSAs are very promising and have a great potential for CO<sub>2</sub> storage, but despite their high potential storage capacity, they are not well studied. There is a need to increase confidence and maturity of understanding of these sites.

PilotSTRATEGY will investigate DSA in detail in three regions of Southern Europe: Paris Basin (France), Lusitanian Basin (Portugal) and Ebro Basin (Spain). This will include acquisition of new data, detailed geo-characterisation, feasibility studies and preliminary design or pre-front end engineering and design studies. At the end of the project, the level of site characterisation in these three



regions will be sufficient to allow a final investment decision to be made for a CO<sub>2</sub> storage pilot and for storage permitting and project approval to be obtained.

In two further regions of Eastern Europe, West Macedonia (Greece) and Upper Silesia (Poland), PilotSTRATEGY will increase the maturity and confidence level of understanding of DSA storage resources, based on new available data, reprocessing of old data and new dynamic simulation studies. This will enable these regions to start planning to develop their storage resources.

Recognising the social challenge of implementing geological CO<sub>2</sub> storage, PilotSTRATEGY will take a systemic approach

and analyse the factors that influence societal acceptance of storage sites, to develop methods for societal engagement. Regional stakeholders and the local public will be involved in developing recommendations and concepts as part of the pilot conceptualization and design. At the same time, PilotSTRATEGY will run a series of dialogues, "Talk with Authorities," to support capacity building in local authorities and build policy makers' awareness of geological CO<sub>2</sub> storage, particularly the role of CCUS in just, net-zero transitions in all regions.

More information can be found at <https://pilotstrategy.eu/>.

Fernanda De Mesquita Lobo Veloso  
Project coordinator



Fig. 1. The five industrial regions investigated in PilotSTRATEGY and supporting countries (Germany and UK)

## 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 Alla Shogenova from Department of Geology, Tallinn University of Technology (Estonia), [alla.shogenova@taltech.ee](mailto:alla.shogenova@taltech.ee)

**ENeRG secretariat** is run by Centre for Research and Technology Hellas, Athens, Greece. Contact person: Eleonora Manoukian, [manoukian@certh.gr](mailto:manoukian@certh.gr)

**ENeRG website:** <https://www.energnet.eu> is maintained by SHOGenergy, Estonia.

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# CO<sub>2</sub>-SPICER – preparation of a CO<sub>2</sub> storage pilot in Czechia

CO<sub>2</sub>-SPICER (CO<sub>2</sub> Storage Pilot In a CarbonatE Reservoir) is a Czech-Norwegian research project aiming to speed up the development of carbon capture and storage (CCS) in the Czech Republic. Its main objective is to prepare implementation of a CO<sub>2</sub> geological storage pilot project at the mature Zar-3 oil & gas field in the SE part of the Czech Republic. To achieve this main objective, a set of partial project goals has been set:

- construction of a 3D geological model of the storage complex;
- dynamic modelling and simulations of CO<sub>2</sub> injection in the reservoir using various scenarios;
- evaluation of geomechanical and geochemical properties of the storage complex;
- assessment of the risks related to CO<sub>2</sub> storage on the pilot site;
- preparation of a site monitoring plan;
- development of scenarios for future site development, including design of CO<sub>2</sub> injection facilities;
- strengthening of Czech-Norwegian cooperation in the field of CCS.

The target structure – Zar-3 – is a hydrocarbon field situated in an erosional relic of fractured carbonates of Jurassic age on the south-eastern slopes of the Bohemian Massif, covered by Paleogene deposits and Carpathian flysch nappes. The field was discovered in 2001 and it is now nearly depleted. This relatively “young age” of the field, together with the ongoing hydrocarbon production, provide many advantages, such as direct access

to the reservoir, availability of field monitoring data, generally good condition of wells, well-preserved core material and detailed reservoir description. However, the geology of naturally fractured carbonates brings specific research challenges.

The project has now finished the first year of implementation out of a total duration of 3.5 years. The main activities performed so far were archive data collection, verification and harmonisation; core sampling and laboratory analyses of samples focusing on mineralogy, rock physics, geomechanical properties and geochemistry; construction of the 3D static geological model (Fig. 2.) of the storage complex and baseline monitoring. Intensive dissemination and awareness-raising activities have been started from the very beginning of the project, and a very good national media coverage has

been achieved regarding information about the project existence and its objectives. This is also reflecting the increased general interest in CCS as a promising climate change mitigation technology.

The CO<sub>2</sub>-SPICER project benefits from a € 2,32 mil. grant from Norway and the Technology Agency of the Czech Republic. Two ENeRG members are participating in the project consortium - Czech Geological Survey as project coordinator and Institute of Geophysics of the Czech Academy of Sciences that is responsible for seismic monitoring. Other partners are NORCE Norwegian Research Centre, MND a.s. – the largest Czech oil & gas company and VSB Technical University of Ostrava.

Vít Hladík  
Czech Geological Survey

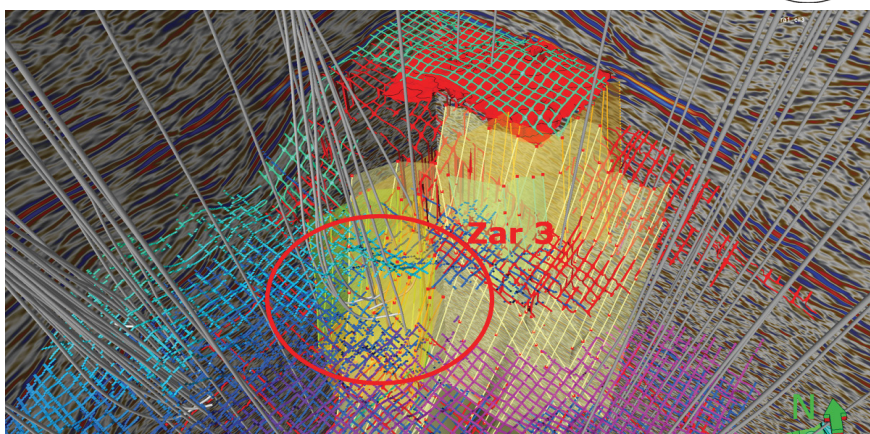


Fig. 2. Construction of 3D geological model of the storage complex based on interpretation of 3D seismic and well data. Image courtesy MND a.s.

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