GEO ENeRGY

STRATEGY CCUS - STRATEGIC PLANNING OF REGIONS AND TERRITORIES IN EUROPE FOR LOW-CARBON ENERGY AND INDUSTRY THROUGH CCUS

STRATEGY CCUS is a three years project (2019-2022) funded by the H2020 research framework of the EC, launched in May 2019 (Figure 1). It comprises 17 partners and is coordinated by BRGM (France). STRATEGY CCUS aims to provide strategic plans from 2020 to 2050 for developing carbon capture, utilisation and storage (CCUS) in Southern and Eastern Europe from regional scale to a Europe-wide connection scale. Eight promising regions, within seven countries, are being studied. They were selected according to criteria relevant for the development of CCUS in Europe: presence of an industrial cluster, possibilities for CO_2 storage and/or utilization, potential for coupling with hydrogen production and use, previous studies already carried out, and a political will. These plans will be based on economic and environmental drivers, technical potential and social acceptance.

The deployment of operational CCUS clusters starts at local and regional level of appraisal. Work Package 2 (WP2) maps the technical potential at the scale of the eight promising regions to state the current development and possibilities of CCUS deployment. Specific objectives of WP2 concern: a) CO_2 sources, nature and longevity; b) CO_2 infrastructure for transport; c) the methodologies and resulting CO_2 storage capacities estimated in previous projects; d) the CO_2 utilisation options, including for EOR purposes and expected development of hydrogen industry and the possibilities of coupling it with CCUS; e) the emission trade system and the CO_2 quotas at individual, cluster and national scale.

Challenges in gaining social acceptance have slowed down the development of CCS and CCU. WP3 is dedicated to stakeholders' perceptions, needs and concerns to enable the early and pro-active participation of all relevant groups in the elaboration of the CCUS development plans. Objectives of WP3 include: a) identification of key stakeholder groups in regional, national and European levels; (b) mapping of stakeholders perceptions, attitudes and interests in CCUS; (c) measuring public acceptance; d) delivering recommendations for stakeholder participation beyond the lifetime of the project.

WP4 aims to provide decision-support for the sustainable development of CCUS. Special attention is paid to the definition of a common methodology for bankable storage capacity, Life Cycle Assessment (LCA), Multiregional Input Output (MRIO) analysis and Techno-Economic Assessment (TEA) designs. Sound insights and a comprehensive diagnosis of the potential local business models associated with the different CCUS options will be provided for each region as well as sensitivity of the business model on storage capacity and injectivity data.

CCUS scenarios (roadmaps) from 2020 to 2050 for each of the promising regions, with optional connections to existing CO_2 infrastructure in the North Sea, will be elaborated in WP5. Scenarios will be based on available relevant data (from WP2, WP3 and WP4) and carried out in close relation with local stakeholders. Economic evaluation of each scenario will provide the main Key Performance Indicators (KPIs) such as cumulated CAPEX/OPEX required for each scenario, the cost breakdown per CCUS stakeholder, or for example the global costs expressed in €/t CO_2 avoided per scenario. Lastly, an economic impact assessment will be performed at national and European levels in terms of volumes of quotas avoided for industries included in the European Emission Trading Scheme (EU ETS), with the CCUS scenarios and in terms of economic impact on the EU ETS carbon price.

Exploitation and dissemination of the project's results and findings will address relevant end-users (industry and policy makers), in order to pave the way for the operational implementation of CCUS clusters. The project will provide targeted information to multiple audiences (including the media and the public) and will favour dialogue, with a public policy perspective.

For more details, including the list of partners, see:
http://www.strategyccus.eu/

Fernanda M.L. Veloso
Coordinator, BRGM, France

Geoscience for a sustainable Earth
brgm

Figure 1. The STRATEGY CCUS team at the project launch in Orleans, May 2019. Credit: BRGM.

The Newsletter content

COST (European Cooperation in Science and Technology) Action A18219 Geothermal-DHC

"Research network for including geothermal technologies into decarbonized heating and cooling grids"
https://www.cost.eu/actions/CA18219/#tabs|Name:overview

The next decade will be crucial for reaching long term climate goals. Inside the energy market, decarbonizing the heating market is crucial, as the current share of renewables is much lower than for the electricity market. Heating and cooling networks will be inevitable to foster the decarbonization of the heating and cooling market and to mitigate urban heat island threats. According to the Heat Roadmap Europe project, the share of district heating inside the heating market might rise by up to 45% by 2050.

Geothermal-DHC aims to address the integration of geothermal technologies to heating and cooling grids based on experiences from case studies across Europe, thus increasing the share of RES (Renewable Energy Sources) by up to 30% in 2030 and 50% in 2050 in heating and cooling grids across Europe. With regard to technological solutions, the Action follows a strong bottom-up approach by considering monovalent or multivalent solutions for heating and cooling. The Action covers networking, knowledge exchange, transfer and training. The results will contribute to raising stakeholders' awareness and acceptance to facilitate the inclusion of geothermal energy in heating and cooling grids at local, national and European level. The scheduled roadmap will support decarbonisation, resilience, climate change strategies and action plans. To maximize the scientific, technological and social impacts, specific activities will be carried out to produce new and useful knowledge, facilitating its diffusion among societal actors and to support young researchers in developing their careers.

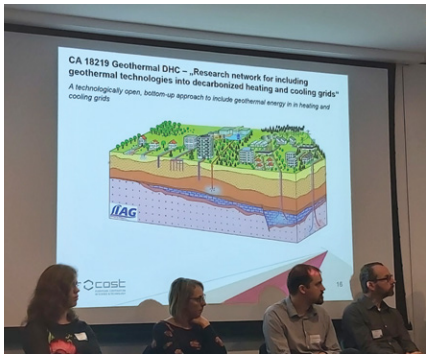

Figure 2. Presentation at the kick-off meeting, October 15, Brussels

Geothermal-DHC started in November 2019 (Figure 2) and will continue until October 2023. Currently, it is supported by 70 experts in various fields of geothermal energy use and is covering 30 European countries. The Action has access to at least 24 different sites in 9 European countries and plans to increase the number of sites to more than 35 during the expansion phase. Participants from countries outside the COST-Action are welcome.

Dr. Nikolaos Koukouzas
Director of Research
CERTH

CERTH
CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

Joint Research Centre of the European Commission (DG-JRC) published the database of European CO_2 storage at:
https://setis.ec.europa.eu/european-co2-storage-database

The database and the associated visualization tool was produced by the European Commission funded CO2StoP project (CO_2 Storage Potential in Europe - Project No. ENER/C1/154-2011-SI2.611598), coordinated by GEUS, TNO and BGS. In this project, in which many of the ENeRG members were involved, a first assessment of the European CO_2 storage capacity both onshore and offshore was made for all EU Member States. This analysis can be the starting point for an updated and comprehensive European CO_2 storage atlas, which will be instrumental for the deployment of CCS in Europe.

Introduction of New ENeRG Member

INSTITUTE OF GEOPHYSICS
OF THE CZECH ACADEMY OF SCIENCES

The Institute of Geophysics of the Czech Academy of Sciences is located in Prague. It performs multiple research activities in most branches of geophysics, with additional investigations in rock mechanics, structural geology and sedimentology.

Research oriented to geothermal energy is performed by the Dept. of Geothermics, with a current project on possible exploitation of geothermal energy in North Bohemia. The target is to provide energy for heating but, if this is successful, also for small scale industrial utilization. The team has long-term experience in measuring temperature at various depths, performing studies on characterization of geothermal gradient and heat flow in different geological conditions, as well as terrestrial heat history related to the paleoclimate. Industrial applications of geothermal energy exploitation may be controlled by micro-seismological networks.

The gravity team was involved in projects monitoring fluids in reservoirs, especially hydrocarbon energy sources. They undertook a specific project related to microgravimetric monitoring of industrial waste CO_2 re-injection into a reservoir, as well as groundwater changes in aquifer formation. They performed multiple modelling cases for microgravimetric monitoring of fluids contact movement in reservoirs (gas-water), which may include CO_2 injection into a subsurface storage. The group has been monitoring of brown coal open pit mines (still primary energy source in the Czech Republic) for mine slope stability and mine safety. They also focus on investigation of volcanoes (structure and monitoring), as the volcanic areas may become geothermal energy source as well. Projects are supported by industry, but also by the Ministry of Education, Youth and Sports, or by the institute itself.

Institute website: www.ig.cas.cz

RNDr. Jan Mrlina, Ph.D.

Big success for the European Workshop on Underground Energy Storage in Paris, 7-8 November 2019

ENeRG proudly presents the results of its first big EU event on Underground Energy Storage (UES), which was organised together with EuroGeoSurveys' GeoEnergy Expert Group, BRGM, and the ANR FLUIDSTORY project.

The workshop was a real success, both in terms of the number of participants (130 from 23 countries) representing research, policy and industry, and of the constructive scientific exchanges. There is a broad consensus that underground energy storage is an important enabler for the transition towards low-carbon energy, complementary to surface flexibility solutions. It offers a wide range of technologies responding to the large-scale needs for seasonal demand (heating/cooling) and increasing shares of intermittent renewables.

An industry perspective and a research perspective for energy storage in Europe highlighted the role of underground options and current developments. Inspiring pilot projects and industrial demonstrators are underway that fit into the ambitions of the new European Green Deal. The coming 5-10 years are needed to mature the technologies and prepare market and system integration.

The workshop addressed the development and application of a wide range of UES options including storage of various energy carriers in rock caverns, old mines, depleted hydrocarbon reservoirs, aquifers. Presentations specifically focused on Underground hydrogen storage, Underground methanogenesis, Compressed air energy storage, Power to Gas/Heat, Underground pump hydro storage, Thermal energy storage, etc.

One session was dedicated to the results of the FLUIDSTORY project funded by the French National Agency for Research (ANR). It studied the energy efficiency and economic profitability of the Electrolysis-Methanation-Oxycombustion (EMO) concept, a Power-to-Gas-to-Power technology, which includes massive storage of O_2 and CO_2 in a salt cavern.

Discussions on the social license to operate concluded that it is important to promote engagement of the various stakeholders in an informed dialogue and to stimulate public participation in order to establish conditions for responsible and accepted implementation. 75% of the audience felt that this should not be postponed until projects are about to start. 80% think that there is a need for guidelines for stakeholder engagement.

Overall, it was felt that UES will play a big role in the upcoming energy revolution and that it will serve both decentralised and centralized system needs. 3D spatial planning and systems integration will require detailed knowledge on the distribution of geological potential and future demand.

Presentations are available on the ENeRG website www.energnet.eu

Isabelle Czernichowski-Lauriol, UES Workshop Co-Chair, ENeRG Past President, BRGM, France

Vit Hladik, UES Workshop Co-Chair, ENeRG President, CGS, Czech Republic

Serge van Gessel, EuroGeoSurveys' GeoEnergy Expert Group Chair, TNO, NL

Behrooz Bazargan-Sabet, FLUIDSTORY Coordinator, BRGM, France

Isabelle Czernichowski-Lauriol, ENeRG Past President in 2016-2017, has been awarded the "Chevalier de la Légion d'honneur" medal (Figure 4), the highest French honour, in recognition for her scientific activities and merits during a touching ceremony at the BRGM in Paris on 18 October 2019

Figure 3. Isabelle Czernichowski-Lauriol and Vit Hladik welcoming participants at workshop opening

Figure 4. Isabelle Czernichowski-Lauriol accepting "Chevalier de la Légion d'honneur" medal

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 related to the exploration and production of energy sources derived from the Earth's crust.
ENeRG president is Sergio Persoglia from OGS, Trieste, Italy spersoglia@ogs.trieste.it
ENeRG secretariat is run by Centre for Research and Technology Hellas, Athens, Greece.
Contact person: Eleonora Manoukian, manoukian@certh.gr

ENeRG website: http://www.energnet.eu is maintained by Tallinn University of Technology,
Contact person: Dr. Alla Shogenova, alla.shogenova@taltech.ee

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Editor: Dr. Alexandra Dudu, alexandra.dudu@geoecomar.ro
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Heriot-Watt University, UK, G.Pickup@hw.ac.uk

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The Institute of GeoEnergy Engineering at Heriot-Watt University

Heriot-Watt University is a world-leading technical university, with campuses in Scotland (Edinburgh, the Borders and Orkney), Dubai and Malaysia. It was founded in 1821, as a college, and was granted university status in 1966. In 1975, the Department of Petroleum Engineering (later the Institute of Petroleum Engineering, IPE) was established to train UK scientists and engineers for careers in the oil industry in the North Sea. During the next few decades, the MSc course grew rapidly and gained a global reputation. On the research side, many geoscientists joined the engineers to carry out multidisciplinary research, such as investigating the effect of geological structure on oil recovery.

Recently, we have realised that we need to change focus. Oil production in the North Sea is declining, and there is a global move to rely less on fossil fuels and use more renewables. Therefore, in September 2019, we became the Institute of GeoEnergy Engineering (IGE). With a multidisciplinary team, we are ideally placed to take a leading role in the research and development of subsurface energy and storage. As stated by Sebastian Geiger, head of the Institute, "We are turning challenges into opportunities".

In fact, over the past 15 years, a number of staff in the IGE have been researching into CO_2 storage in a number of projects. We are founder members of SCCS (Scottish Carbon Capture and Storage, (www.sccs.org.uk), and CO2GeoNet (www.co2geonet.com). Numerous MSc students have undertaken projects in CO_2 storage and CO_2 enhanced oil recovery. We recently took part in the first phase of the ACORN project (www.pale-blu.com/acorn). This project is aiming to be the first UK full-chain CCS project, with CO_2 capture at St Fergus in the NE of Scotland (Figure 5). To cut down costs, existing pipelines will be re-used to transport CO_2 offshore for storage in the Captain Sandstone formation. The aim is to start small, and grow – as in the phrase "mighty oaks form little acorns grow".

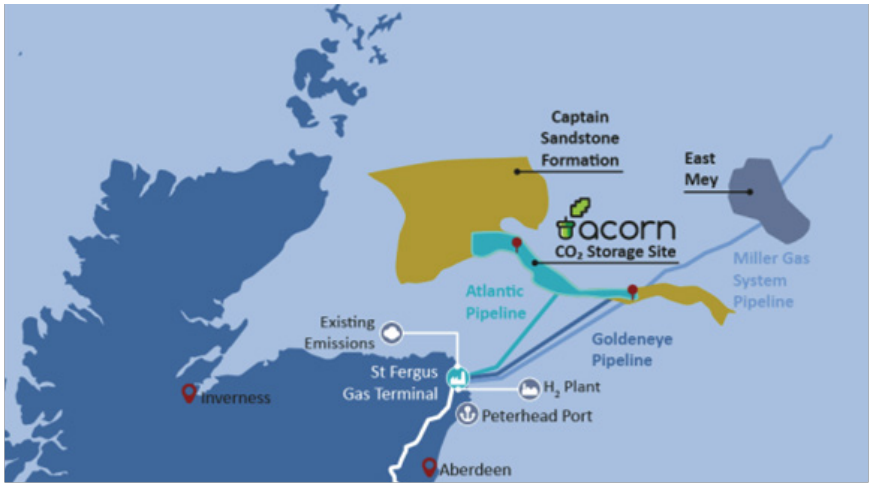

Figure 5. The ACORN Project (https://pale-blu.com/2018/11/27/acorn-ccs-awarded-co2-storage-site-lease-option-from-crown-estate-scotland/).

Other recent initiatives include extending methods developed to quantify uncertainty in hydrocarbon production, to well placement optimisation for geothermal energy (Figure 6). The aim is to maximise heat extraction, whilst taking account of uncertainty in geological structure (Schulte et al, EGU, 2017).

Looking to the future, we wish to train a new generation of students for a zero-carbon future, and in 2020, we are introducing a new MSc course in subsurface energy systems (https://www.hw.ac.uk/study/uk/postgraduate/subsurface-energy-systems.htm).

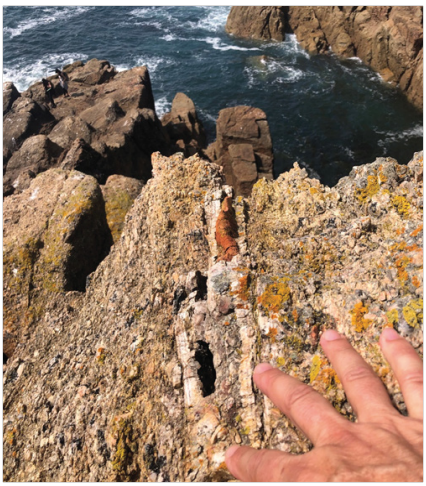

Figure 6. Fractured granite in a Cornwall outcrop analogue for the United Downs Deep Geothermal Power Project (www.uniteddownsgeothermal.co.uk/). Photograph courtesy of Mark Bentley.

Gillian Pickup
Heriot-Watt University
Institute of GeoEnergy Engineering

ENeRG members

University of Tuzla (Bosnia and Herzegovina)
Prof. Sanel Nuhanović
sanel.nuhanovic@untz.ba

Sofia University (Bulgaria)
Prof. Georgi V. Georgiev
gigeor@abv.bg

University of Zagreb (Croatia)
Prof. Bruno Saftić
bruno.saftic@rgn.hr

Croatian Geological Survey (Croatia)
Dr. Staša Borović
sborovic@hgi-cgs.hr

Czech Geological Survey (Czech Republic)
Dr. Vit Hladik
vit.hladik@geology.cz

The Institute of Geophysics of the Czech Academy of Sciences (Czech Republic)
Dr. Jan Mrlina
jan@ig.cas.cz

GEUS - Geological Survey of Denmark and Greenland (Denmark)
Dr. Niels E. Poulsen
nep@geus.dk

Department of Geology, Tallinn University of Technology (Estonia)
Dr. Alla Shogenova
alla.shogenova@taltech.ee

BRGM (France)
Dr. Isabelle Czernichowski-Lauriol
i.czernichowski@brgm.fr

H.S.G.M.E. - Hellenic Survey of Geology and Mineral Exploration (Greece)
Dr. Apostolos Arvanitis
arvanitis@igme.gr

CERTH (Greece)
Dr. Nikolaos Koukouzas
koukouzas@certh.gr

Hellenic Hydrocarbon Resources Management S.A. (Greece)
Yannis Bassias
y.bassias@greekhydrocarbons.gr

OGS - National Institute of Oceanography and Experimental Geophysics (Italy)
Ing. Sergio Persoglia
spersoglia@ogs.trieste.it

Nature Research Centre (Lithuania)
Prof. Saulius Sliaupa
sliaupa@geo.lt

Institute of Geology and Seismology (Moldova)
Dr. Igor Nicoara
nicoaraigor@gmail.com

Polish Geological Institute (Poland)
Dr. Monika Konieczyńska
mkon@pgi.gov.pl

MEERI PAS (Poland)
Prof. Radoslaw Tarkowski
tarkowski@min-pan.krakow.pl

AGH University of Technology and Science (Poland)
Barbara Uliasz-Misiak
uliasz@agh.edu.pl

National Institute for Marine Geology and Geoecology-GeoEcoMar (Romania)
Dr. Constantin S. Sava
savac@geoecomar.ro

VNIGRI (Russia)
Prof. Alexander Ilinsky
alex.ilinsky@bk.ru

GEOINŽENIRING d.o.o. (Slovenia)
Marjeta Car
m.car@geo-inz.si

Middle East Technical University, Petroleum Research Center (Turkey)
Dr Çağlar Sinayuç
caglars@metu.edu.tr

Heriot-Watt University (UK)
Dr. Gillian Pickup
G.Pickup@hw.ac.uk