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ENeRG GEO ENeRGY

Educational activities of COST Action 18219 Geothermal District Heating and Cooling

The EU COST Action CA18219 "Geothermal-DHC" (2019 – 2024) aimed to establish a network dedicated to integrating geothermal energy into decarbonised heating and cooling systems across Europe. It adopted a technologically driven strategy that encompassed all aspects of geothermal energy, from early design to ongoing operation and monitoring. To maximise the use of geothermal energy, both existing heating and cooling networks were retrofitted, and new grids were established.

The Action had four permanent working groups (PWGs). PWG1 - Technology published technical fact sheets on various areas of geothermal energy, addressing technological and environmental considerations. PWG2 - Outreach and Communication organised multiple webinars and stakeholder events and we communicated our concepts to stakeholders through a digital knowledge portal and video . Several joint scientific publications were also prepared. PWG3 - Promoting young careers supported an interdisciplinary education of young researchers, who are expected to become the future generation of engineers, decision makers and planners, through four training schools and 15 short term scientific missions.

Figure 1. Field demonstration at groundwater well of Geological Survey of Sloveniain Ljubljana (photo by: Amelia Letvin)

PWG4 - Capitalisation and Uptakes developed a position paper, eight proposals for new projects and promoted knowledge dissemination to areas facing challenges in reducing greenhouse gas emissions in the heating and cooling sector. CA18219 Geothermal-DHC acknowledged that there is still much room for improvement in raising public awareness and understanding of the benefits of diversifying the energy sector and there is also a need for interdisciplinary programs aiming to offer knowledge on geothermal energy sources and technologies. In that regard, we designed a comprehensive educational approach for various technology-readiness generations and temperature levels of a geothermal resource. Within networks of 4th and 5th generation, the subsurface is used as a source of heating and/or cooling (geothermal energy) or as a heat storage reservoir (underground thermal energy storage). The educational framework adopted a multidisciplinary approach, integrating research insights from geosciences, engineering (including thermodynamics), economy and social sciences to address the entire process of integrating geothermal energy into heating and cooling networks.

Four training schools were organised, primarily for PhD students. Out of 89 trainees, about 40% were women. An 8-day summer school in Slovenia and Croatia in 2021 focused on coupling shallow and mid-depth geothermal resources; a 5-day training school in Cyprus in 2021 focused solely on shallow geothermal energy use; and a 5-day summer school in Delft in 2022 focused on designing renewable district heating and cooling systems with the implementation of underground thermal energy storage. The fourth 6-day summer school in Slovenia in 2023 discussed higher-temperature resources applicable also for electricity production.

All four events received great appreciation and were a huge success. Additionally, the trainees imparted valuable recommendations that could be useful for future organisers of similar events. First and foremost, it is essential to embrace modern teaching approaches that include fieldwork, practical exercises (i.e., hands-on learning), and the analysis of real-world data. Secondly, it is important to allocate ample time for discussions. Thirdly, fostering networking opportunities by planning collaborative projects, fieldwork activities, or networking events is crucial. Fourthly, ensuring a multidisciplinary approach is advocated. Finally, supporting participation and advertising the training events beforehand, particularly to those outside the geoscience community, is crucial for outreach and inclusivity.

Drawing on our experience, the General Educational Concept has been developed for training initiatives aiming at integrating geothermal technologies into heating and cooling grids. The main outcomes of the COST Action CA18219 are also available at the "Geothermal-DHC" web portal: https://www.geothermal-dhc.eu/

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GeoZS Geološki zavod Slovenije

The Newsletter content

CO_2 Transport and Storage directly from a ship: flexible and cost-effective solutions for offshore storage

CO_2 Transport and Storage directly from a ship: flexible and cost-effective solutions for offshore storage (CTS) is a Clean Energy Transition Partnership (CETP) project set to demonstrate the techno-economic applicability of direct injection from ship into offshore storage sites, through the use of a cost-effective technical solution, offering a high degree of flexibility and versatility to the CCS value chain. The project has a two-year funding period (2023-2025) and is overseen by NORCE (Norwegian Research Center AS). The consortium includes partners from Norway, Denmark, Portugal, Estonia, Romania and Ukraine; some the partners are also members of ENeRG.The project objectives are:

- To design and evaluate CCS value chains, as well as compare various modes of transportation and storage, including direct ship injection for offshore storage in designated areas.
- To develop standards for determining the ideal circumstances at each stage of the value chain for the application of the direct injection in offshore CO_2 storage projects worldwide.
- To establish the dialogue with the stakeholders towards identifying the challenges and factors influencing the direct injection from ship technology in the selected regions, as well as to draw conclusions about the technology's benefits and drawbacks for other regions of Europe.
- To move forward with the technology's piloting and demonstration as quickly as possible, in line with the European goals for reducing CO_2 emission and enabling CO_2 storage.

The project addresses four geographical areas: the North Sea, Black Sea, Baltic Sea and Atlantic Coast of Portugal, where the project team has acquired significant knowledge and experience from previous projects, such as the Strategy CCUS H2020, PilotSTRATEGY H2020, ACT ECOBASE, CLEANKER H2020, NEMO IPN, CCUS ZEN Horizon Europe. The goals of the project are to determine the best conditions for implementing direct injection from ship, establish scenarios in the selected geographical regions and conduct Life Cycle Assessment/ Technical Economical Assessment (LCA / TEA) analysis that compares the direct ship injection to traditional approaches using fixed infrastructure.

Figure 2. Kick-off project meeting of the CTS team in Brussels, February 2024 (photo by Nataliya Zachariy)..

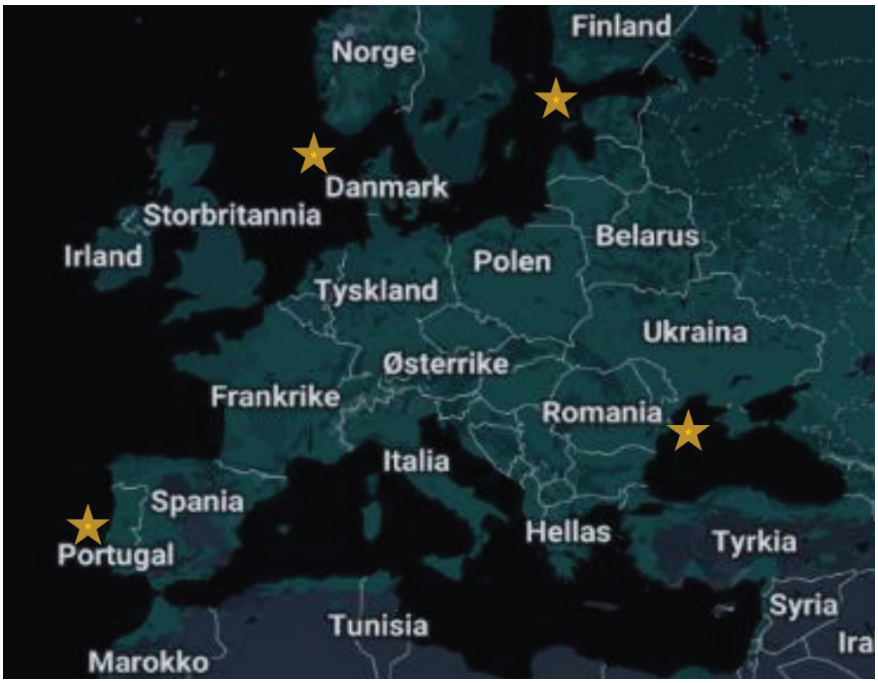

Figure 3. Target geographical areas of the CTS project.

The direct injection from ship for permanent CO_2 storage aims to provide a low-cost, scalable and flexible solution that can be applied worldwide with a short implementation time. Overall, this solution has a potential to transform and boost CCUS in Europe and globally due to: decentralization and, hence, more flexible and effective matching emitters and storages, faster deployment and circumventing limitations of pipeline transport, enhancing CCUS adoption by connecting smaller emitters and regions lacking storage capacity and contributing to creation of all-European (and, potentially, global) market for on-demand CO_2 storage.

The main impact of the project is to provide a technology that will allow to decrease costs, reduce conflicts with other marine activities and increase flexibility for early start of CO_2 injection in offshore regions, therefore addressing some of the major issues that can hinder the deployment of CCS in Europe on a scale able to deliver required mitigations before 2030.

For more information, please visit the LinkedIn page of the project: https://www.linkedin.com/company/cts-cetp-project.

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CCUS ZEN project meetings in Madrid: How to make a CCUS value chain fly?

The CCUS ZEN project research and networking partners met together in Madrid for a two-day meeting and event entitled ''How to make a CCUS value chain fly?“ on the 21st and 22nd of February.

The CCUS ZEN project, coordinated by Eirik Falck da Silva (SINTEF, Norway), is a communication and dissemination action funded by EC Horizon Europe Programme for two and a half years. Its goal has been to develop the full CCUS value chains in two sea regions: the Baltic (Denmark, Sweden, Finland, Germany, Estonia, Latvia, Lithuania and Poland) and the Mediterranean (Spain, France, Italy, Greece, Turkey).

About 100 researchers, industrial stakeholders, and policymakers gathered to debate future scenarios developed by researchers for the two European areas during the first day, as well as practical developments presented by policymakers and industrial companies during the second day.

Presentations of the first day showcased a large database compiled by the CCUS ZEN project partners, including CO_2 emissions sources, CO_2 storage sites, CO_2 use options and accessible pipeline infrastructure, which were used to generate full chain CCUS scenarios, the majority of which were cross-boundary. A framework for high-level CCUS value chain screening was presented by A. E. Lothe (SINTEF). The technical database collected in GIS was used to create comprehensive value chain CCUS scenarios. Two presented cross-border scenarios in two regions were selected for techno-economic analysis. The Mediterranean scenario was presented by I. Gravaud (BRGM, France) and the Baltic scenario by L. H. Sousa (Ramboll, Denmark). Nontechnical concerns such as social, financial and political for two regions were highlighted by M. Honegger, and nontechnical regulatory aspects were reported by I. Ombudsvedt (IOM law, Norway).

Integration of technical data with nontechnical parameters, applied jointly to evaluate eight selected scenarios in the Baltic and Mediterranean regions, and definition of technical and nontechnical advantages and challenges, using SWOT analysis, were presented by A. Shogenova.

At the end of the first day, the discussion was ongoing in ten world cafe tables, trying to answer the main question of the Madrid events.

The project meeting emphasised the need for cross-sectoral collaboration among policymakers, industry, and academia. Significance of the regulatory frameworks and public perception, exploration of CO_2 storage sites and risk assessments were all considered as critical components for the successful implementation of CCUS projects.

During the second day, the focus shifted to CCUS activities in Spain. Spanish stakeholders, including IGME (Geological Survey of Spain), Technological Platform of Spain for CO_2, Tecnicas Reunidas, Ministry for the Ecological Transition and oil company REPSOL, made presentations on CCUS developments in Spain As a best practice of CCUS development in Europe, presentations were made by Danish Energy Agency and The Porthos project in the Netherlands. The latest planned European CCUS regulations were presented by CCSA.

The event was concluded with a Panel discussion about' How to make CCUS to fly in Spain? '.

The panel was led by Eirik Falck da Silva and represented by cement industry (HOLCIM, CEMEX EMEA), Ministry of Industry, Commerce and Tourism of Spain and all speakers from the second day.

Some key conclusions for Spain were drawn from the discussion. The country needs to enhance its capacity for storing CO_2 and control emissions effectively. Cooperation of researchers and industry, public engagement and political support and cross-border access to storage sites are crucial for CCS deployment in the country. Spain can become a key player in CCUS technologies by encouraging collaboration among government, industry, and civil society.

Alla Shogenova
(TalTech-DG)

Roman Viguier
(SCCS)

Eirik Falck da Silva
(SINTEF)

Figure 4. Participants of CCUS ZEN project meetings in Madrid on 21-22 February, 2024.

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.
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Baltic Carbon Forum 2024 - Vilnius, 3-4 October

Baltic Carbon Forum is an annual conference organized by BASRECCS. In 2024 the Baltic Carbon Forum will be held on 3-4 October in Vilnius, Lithuania.

Address:
Radisson Blu Hotel Lietuva, Vilnius, Konstitucijos Av. 20, Vilnius, LT-09308, Lithuania

Location:
Vilnius, Lithuania

Sessions:
5 sessions planned over 1.5 days.

The Baltic Carbon Forum 2024 (BCF 2024) invites pertinent experts from the Baltic Sea Region (BSR) and neighbouring countries, such as policymakers, financial institutes, industry representatives and academics, to share experiences, discuss and brainstorm for identifying gaps when expediting the deployment of a large-scale CCUS projects in the BSR.

The BCF 2024 convenes leading academics, policymakers, and industry leaders to address crucial challenges pertaining to carbon management and climate mitigation strategies across the BSR. By emphasising cutting-edge technologies, sustainable practices, and collaborative initiatives, the forum aims to accelerate the Baltic Sea Region's transition to carbon neutrality and resilience. Through interdisciplinary discussions and knowledge exchange, participants explore pathways for accomplishing ambitious carbon reduction targets while fostering economic development and environmental stewardship in the region.

The BCF-2024's location in Lithuania is essential for drawing the attention of Lithuanian government and policymakers in order to push for the country's CO_2 storage prohibition. Among the Baltic states, Lithuania is the only one where CO_2 injection tests were conducted successfully between 2013 and 2015. The EU CCS regulations were fully implemented in 2013, and Lithuania was granted permission to store CO_2. Unfortunately, since 2020, injecting CO_2 has been illegal throughout the country.

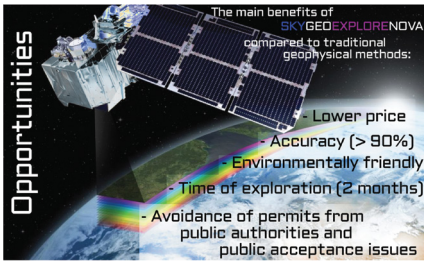
BCF-2024 is funded by Nordic Energy Research and will be additionally sponsored by Schwenk Latvija, Minijos Nafta and Akmenes Cementas.

BCF2024 website and registration is available at https://www.baltic-carbon-forum.com/2024

Prof. Mayur Pal and Dr Alla Shogenova

Satellite Exploration of Earth Resources Using Nuclear Magnetic Resonance Phenomenon

An innovative technology named "SKYGEOEXPLORENOVA-NMR" (SGEN-NMR) is being developed for the exploration of underground resources. This novel technology employs the Nuclear Magnetic Resonance (NMR) to identify hydrocarbon, diamonds, metals, rare elements, critical raw materials, water, and geothermal energy. SGEN-NMR is specifically designed to explore geological resources for underground energy storage, including hydrogen storage, compressed air energy storage (CAES), CO_2 storage, or radioactive waste storage. This innovative method entails meticulously examining an area point-by-point from NASA satellites utilising frequency spectra that excite resonance in the target material.



The radio-frequency radiation is highly directional to ensure that the transmitter's power is concentrated in the appropriate direction. Deposits may be explored and characterised by subterranean contours and geological sections by inspecting each resonance location point individually. Then, it is possible to select optimal drilling locations and estimate the geological resources of the deposit.

The Earth's magnetic field is utilised to generate NMR conditions in the molecules of a target material at depths of up to 5 km. The current approach has several advantages over standard geophysical methods, including high accuracy (up to 95%), shorter exploration time (2-3 months), avoidance of permissions from public authorities and public acceptability concerns, reduced costs, and environmental friendly technology.

The obtained results aid in the exploration of the deposit remotely, without the need for drilling exploration wells and include faults, the contour map of the deposit or geothermal reservoir, a geological section with reservoir and cap rock depths including the volume of water, pressure, rock porosity, a geothermal map, and geothermal gradients of the studied area.

The obtained results allow for drilling wells in the centre of the anomaly, or on the top of the structure.

The era of Earth's underground exploration has entered a new phase, which will soon surpass all known geophysical techniques. Be the first to use this novel technology, saving time and money while also protecting the environment. SHOGenergy is prepared to demonstrate the effectiveness of the SGEN-NMR method in the field www.SHOGenergy.eu.

No more words, only genuine results!

Kazbulat Shogenov & Alla Shogenova
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