

GEO ENeRGY

ENeRG at the fourth EAGE Sustainable Earth Sciences Conference in Malmö

ENeRG co-organised the fourth Sustainable Earth Sciences (SES) conference together with the EAGE, the European Association of Geoscientists and Engineers. It took place on 3-7 September 2017 in Malmö, Sweden, in parallel with two other EAGE conferences, the 23rd European Meeting of Environmental and Engineering Geophysics and the 2nd European Airborne Electromagnetics Conference. Registration to one conference gave participants the opportunity to participate in the two other conferences and engage in the exciting developments in the field of Deep and Near Surface Geoscience.

The objective of the SES conference was to enable geoscientists to discuss how the underground can contribute significantly to the transition to a clean, efficient and secure energy system, compatible with the requirements of environmental protection, climate change mitigation and sustainable use of the Earth and its limited resources. The technical programme highlighted progress in research and innovation with respect to key subsurface technologies such as geothermal energy, underground energy storage and CO₂ geological storage.

A special session was devoted to "Energy transition and life after Paris COP21". It started by a keynote speech from Jens Birkholzer (Lawrence Berkeley National Laboratory, USA) on crosscutting subsurface challenges and insights from dedicated subsurface energy field observatories. Then, brief perspectives were presented by a panel of invited speakers. Firstly, the views from the ENeRG and CO₂GeoNet European research networks were profiled by Isabelle Czernichowski-Lauriol (BRGM, France), followed by national perspectives from Sweden by Emina Pasic (Swedish Energy Agency), Scotland by Prof. Stuart Haszeldine (University of Edinburgh), Germany by Frank Schilling (Karlsruhe Institute of Technology), and Norway by Philip Ringrose (NTNU/Statoil). Finally, a panel debate chaired by Prof. Iain Stewart (University of Plymouth, UK) and moderated by Birgit Müller (Karlsruhe Institute of Technology) and Prof. Maria Ask (Luleå University of Technology, Sweden) gave the opportunity for the audience and the panel to debate and share views.



It was felt that the energy transition challenge needs restructuring of society and that decentralised solutions may be easier and faster to implement. It will be important to develop integrated energy schemes at regional, territorial, and super-city levels. There will be different solutions for different locations. 3D planning, integrating the subsurface dimension, will be key for the future. However, this requires long-term planning, in contrast to the often preferred short-term planning, due to the long lead-time needed to plan, licence and construct an underground facility.

It was reemphasised that the subsurface is an essential compartment for producing energy but also for providing the storage options needed for decarbonising energy and balancing energy demand and production. To start with, the best underground sites need to be used, not the local ones. With time

and further experience, it will be possible to develop more complex sites. Pilots for field testing are crucial for accelerating the development of subsurface technologies, with management of induced microseismicity being one of the key themes. Interaction between technologies must also be studied, as this may improve the economical business models. Finally, the need to be much better at communicating geo-energy to stakeholders and the public was shared, based on some excellent examples from Prof. Iain Stewart (Professor of Geoscience Communication and Director of the Sustainable Earth Institute at the University of Plymouth).

Isabelle Czernichowski-Lauriol
ENeRG President
BRGM, France



and
Philip Ringrose
Chair of the EAGE
SES 2017 Conference

NTNU/Statoil, Norway



Find out more:

www.eage.org/event/SES-2017



Fig. 1 Panel discussion on the 6th September at the SES Conference in Malmö, Sweden. From left to right: Iain Stewart, Philip Ringrose, Emina Pasic, Frank Schilling, Isabelle Czernichowski-Lauriol and Stuart Haszeldine

The Newsletter content

Page 2: Maintaining the Sustainability of Fast Geothermal Energy Boom in Turkey

Page 3: ENeRG member leads CO₂ storage study in the Horizon 2020 CLEANER project

Page 4: Spring School announcement

Maintaining the Sustainability of Fast Geothermal Energy Boom in Turkey

Turkey has great potential for geothermal energy owing to her favorable geologic conditions. The most prominent region, Western Anatolia, possesses the largest potential for geothermal energy production in Turkey. Extensional tectonics in the region and related normal faults have resulted in crustal thinning. N-S oriented extension formed E-W trending grabens bounded by normal faults. The faults bounding these structures created suitable conditions for the deep circulation of meteoric water and heating at certain depths. The highest regional heat flow, approximately 100–120 mW/m² exists in this region and several medium to high enthalpy geothermal reservoirs with reservoir temperatures of 120–287°C lie in Büyük Menderes, Gediz and Simav grabens (Fig. 2). The acceptance of the Law for the Use of Renewable Energy Resources for Electricity Production in May 2005 has caused an acceleration of the utilisation of renewable energy (geothermal, hydro, wind, biomass and solar) in Turkey. A feed-in-tariff price of 0.105 USD/kWh is assigned for the electricity produced from geothermal resources. Law on Geothermal

Resources and Natural Mineral Waters (June 2007) and its Implementation Regulation (December 2007) provide solutions to the problems concerning legislative matters and obligations of the exploration and production concession rights, technical responsibility, control and protection of the geothermal areas. All these favorable conditions attracted the private sector to invest on geothermal projects especially on electricity production. This resulted in the highest increasing rate of installed power capacity in the world since 2010. There is more than a ten-fold increase in total installed capacity in seven years from 91 MWe in 2010 to 1053 MWe in 2017. This rapid increase in development is not free of problems, as expected. Sustainability is the main concern since the geothermal fluid production rates far exceeds the natural discharge of the fields and the fluid budget of the field must be optimized through reservoir management studies. Other concern is on the fate of carbon dioxide produced along with hot water. Geothermal fluids of Western Anatolia have 2-4% by weight of dissolved carbon dioxide. Dissolved carbon dioxide comes out from solution during the ascent of the

geothermal fluid along the wellbore, and therefore acts as a natural pump. On the other hand, carbon dioxide separated at the surface possesses two adverse effects. Release of separated carbon dioxide is an environmental concern. On the other hand, re-injection of power plant effluent without dissolved carbon dioxide results with the dilution of reservoir fluid with respect to carbon dioxide. Reduction in dissolved carbon dioxide of geothermal fluid reduces the productivity of the field. Re-injection of separated carbon dioxide is the most promising solution to mitigate these two adverse effects. Middle East Technical University is currently funded by the Scientific and Technological Research Council of Turkey. A multi-disciplinary team will study in a pilot project the technical feasibility of carbon dioxide re-injection into a geothermal reservoir producing from carbonates with reservoir temperature of 230–240°C.

Mahmut Parlaktuna

Middle East Technical University

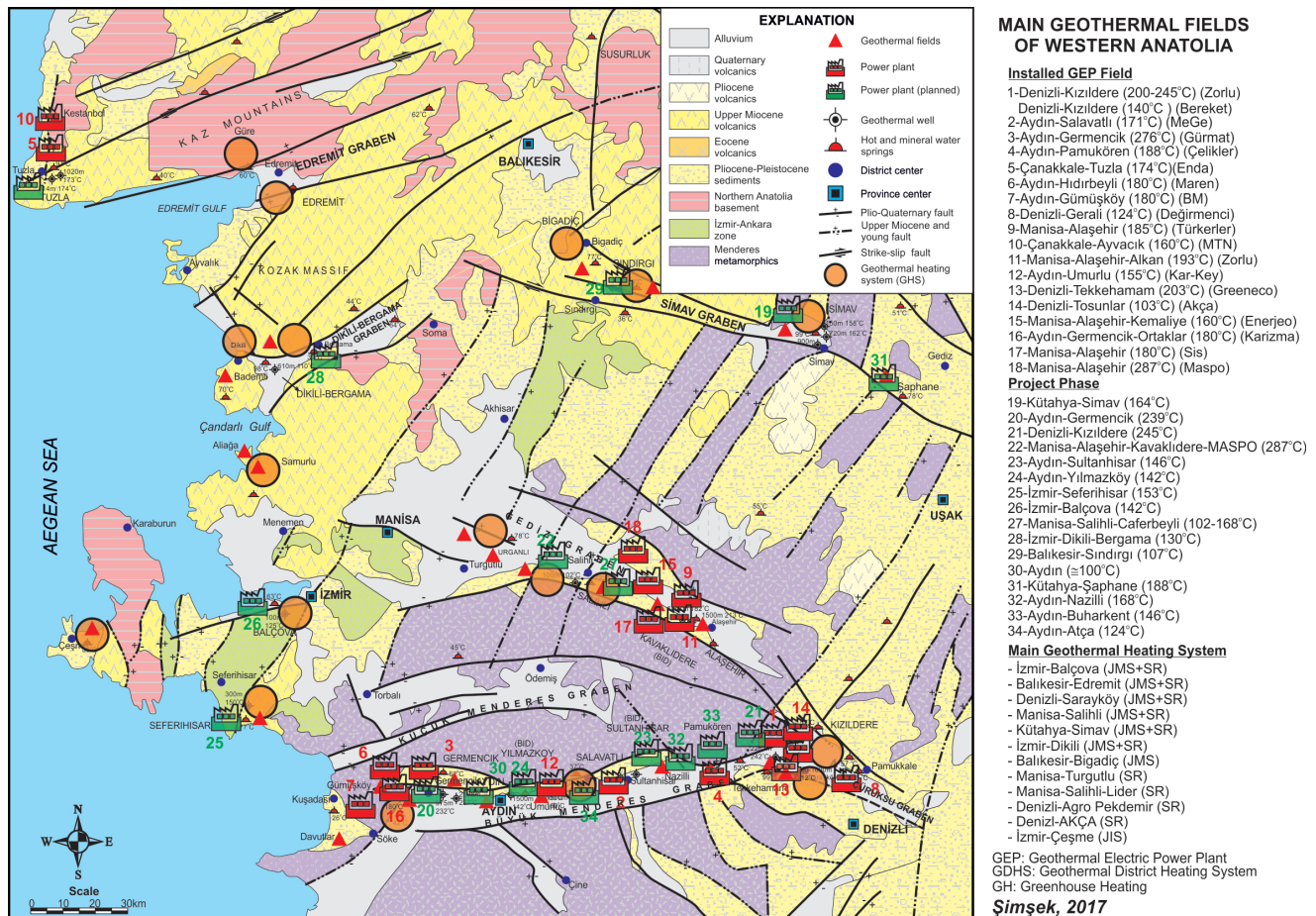


Fig. 2 Main geothermal fields and geothermal applications in Western Anatolia of Turkey. Source: Mertoğlu, O., Şimşek, Ş., Başarır, N., Geothermal Energy Use, Country Update for Turkey, European Geothermal Congress, 19-24 September 2016, Strasbourg, France

ENeRG member leads CO₂ storage study in the Horizon 2020 CLEANKER project

A new project CLEANKER (CLEAN clinker production by Calcium looping process) got EC support from October 2017 to September 2021 under the Horizon 2020 call LCE 29 – 2017 (Enabling decarbonisation of the fossil fuel-based power sector and energy intensive industry through CCS). The project is coordinated by LEAP (Laboratory for Energy and Environment) from Italy and integrates 13 research organizations from seven countries: five representatives from the academia, three research centres, one SME, one technology provider, two end users and one environmental organization (Fig. 3). Among academic partners is Tallinn University of Technology, represented in the project by Department of Geology (ENeRG member, TTUGI) and Department of Materials and Environmental Technology (TTUMKI). The cement industry is a key-sector for the reduction of CO₂ emissions. Cement production is responsible for about 27% of global anthropogenic CO₂ emissions from industrial sources worldwide. According to IEA and ZEP studies, the cement industry should contribute to the largest CO₂ emission reduction through CCS in Europe,

in order to meet the target of 2°C of global temperature increase (IEA 2DS scenario).

The focus of CLEANKER is demonstrating the feasibility of the integrated Calcium looping (CaL) concept at industrial scale in a new demo system treating flue gas emitted by a real cement plant. The core activity of the project is design, construction and operation of a CaL demonstration system, which will capture the CO₂ from a portion of the flue gas of the cement plant, using as CO₂ sorbent the same raw meal used for clinker production.

Other activities will include: (i) screening of different raw meals to assess their properties as CO₂ sorbent, (ii) reactors and process modelling, (iii) scale-up study, (iv) economic analysis, (v) life cycle assessment, (vi) CO₂ transport, utilisation and storage study (vii) demonstration of the complete value chain, including mineral carbonation of waste ash with the CO₂ captured in the pilot system; (viii) exploitation study for the demonstration of the technology at TRL>7 and for its first commercial exploitation based on CO₂ transport and storage opportunities.

The CLEANKER project aims at demonstrating at TRL7 the CaL concept in a configuration highly integrated with the cement production process, which allows achieving high energy efficiencies, with CO₂ capture efficiency over 90%. The overall energy consumption can be kept low by proper integration with raw meal preheating and cooling of kiln flue gases. The adoption of entrained flow gas-solid reactors is particularly suitable and familiar to the cement industry, because the same raw material used for clinker production (CaO) is used for CO₂ sorption.

For the first time the full CCUS value chain study was included into the capture-focused project. The ENeRG member TTUGI is leading WP7 (CO₂ transport, utilisation and storage study) and is responsible for techno-economic modelling of the Baltic regional and Italian local CCUS scenarios, methodology and CCUS regulation study. These scenarios will include two Heidelberg cement plants (Kunda Nordic Cement in Estonia and Slantsy in Russia) and Buzzi Unicem cement plant, CO₂ utilisation options and storage sites in the Baltic Region and northern Italy. Cooperation with other ENeRG members is envisaged in this task.

TTUMKI will make laboratory experiments and modelling of CO₂ mineral carbonation process with alkaline waste materials (oil shale ash and cement demolition waste) to enable the possibility of concrete production from CO₂ captured using CaL process and carbonated waste materials at the pilot plant. Captured CO₂ will be finally trapped in the concrete containing the cement of the selected cement plant.

Public results and progresses will be available through the project's website www.cleanker.eu.

Martina Fantini
LEAP (Laboratorio Energia Ambiente Piacenza)
Italy

Alla Shogenova
TTUGI

TALLINNA TEHNILIKALIKOOL
GEOLOGIA INSTITUUT

LEAP
Laboratorio Energia e Ambiente Piacenza

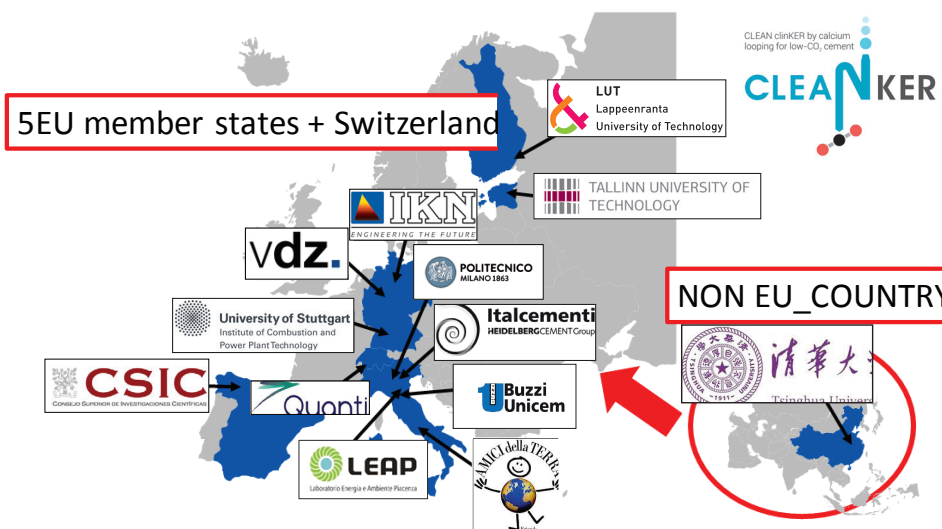


Fig. 3 CLEANKER consortium partners consisting of 13 organizations from five EU Member States plus Switzerland and China. ENeRG member, Department of Geology from Tallinn University of Technology, is a leader of the WP7 (CCUS study)

CLEANKER has received funding by the European Union's Horizon 2020 research and innovation programme under grant agreement number 764816



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 Dr. Isabelle Czernichowski-Lauriol from BRGM, France, i.czernichowski@brgm.fr

ENeRG secretariat is run by the Faculty of Mining, Geology and Petroleum Engineering, University of Zagreb, Croatia. Contact person: Zeljka Kurelec, zeljka.kurelec@rgn.hr

ENeRG website: <http://www.energnet.eu> is maintained by the Czech Geological Survey

Contact person: Dr. Vít Hladík, vít.hladík@geology.cz

ENeRG Newsletter – GEO ENeRGY

The Newsletter is published by Department of Geology, Tallinn University of Technology, Estonia.

Editor: Dr. Alla Shogenova, alla.shogenova@ttu.ee

Layout and computer typesetting: Dr. Kazbulat Shogenov

Language review: Dr. Gillian E Pickup

Heriot-Watt University, UK, G.Pickup@hw.ac.uk

Copyright © All rights reserved/ENeRG

Spring School announcement

Advanced course on geological storage of carbon dioxide

ENOS 1st Spring School on CO₂ Geological Storage

Date & place: 14 - 19 May 2018 at Latera, Italy



The overall objective of this ENOS Spring School on CCS in Italy at the ECCSEL NatLab at Latera is to communicate knowledge and understanding of CO₂ geological storage that are required to respond to our climate warming at an alarming and unprecedented rate, and we have an urgent duty to respond and meet the growing demand for near zero emissions. In this pursuit special emphasis will be

- storage without compromising other operations
- Assessment of storage capacity
- Safety precautions and consideration
- Monitoring and reporting guidelines
- Information strategy and public awareness

The thematic approach will be lectures, exercises, colloquia, study groups and an excursion to the Latera natural lab to study the on-shore monitoring systems measuring natural gas emissions, especially CO₂.

The ENOS Spring School on CO₂ Geological Storage will be open during one concentrated week – Monday May 14th to Saturday 19th 2018 with arrival on afternoon Sunday 13th in Rome and departure Saturday 19th afternoon. Key lecturers will be available throughout the week to take part in active discussions.

Selection and grants

Students eligible to attend the ENOS Spring School on CO₂ Geological Storage will be selected upon qualifications that must be duly documented in the application

Application information will be on the ENOS website from December www.enos-project.eu

The ENOS project (ENabling ONshore CO₂ storage in Europe), that unites 29 research institutes, including 11 EneRG members, was launched in September 2016. The main objectives of the European Horizon 2020 project are to increase field experience relevant to geological storage of CO₂, refine techniques and tools used for site selection and monitoring, and to advance communication between science and society on the geological storage of CO₂. The project will run until August 2020.



Niels Poulsen
GEUS

placed on the European context.

Target group

The target group is 15 young scientists, e.g. PhD students and post-docs with background in geology, engineering and geotechnologies. Master students will be considered on free chairs.

Programme of Study

The ENOS Spring School on CO₂ Geological Storage shall provide the theoretical and practical knowledge on CCS based on recent international research and development work. Vital elements are:

- Climate change
- CO₂ geological storage aspects
 - identifying, mapping and completing geological storage sites for the CO₂
 - aquifers, enhanced oil and gas recovery
 - multiple underground usage



ENOS has received funding by the European Union's Horizon 2020 research and innovation programme under grant agreement number 653718

The EneRG Network – Country Representatives

BOSNIA AND HERZEGOVINA

Prof Sanel Nuhanovic
University of Tuzla
sanel.nuhanovic@untz.ba

BULGARIA

Prof Georgi V. Georgiev
Sofia University
gigeor@abv.bg

CROATIA

Prof Bruno Saftic
University of Zagreb
bruno.saftic@rgn.hr

CZECH REPUBLIC

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

DENMARK

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

ESTONIA

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

FRANCE

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

GREECE

Dr Apostolos Arvanitis
Institute of Geology & Mineral
Exploration (IGME)
arvanitis@igme.gr

ITALY

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

LITHUANIA

Prof. Saulius Sliupa
Nature Research Centre
sliupa@geo.lt

MOLDOVA

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

THE NETHERLANDS

Dr Serge van Gessel
Netherlands Institute of Applied
Geoscience TNO – National
Geological Survey
serge.vangessel@tno.nl

POLAND

Dr Adam Wojcicki
Polish Geological Institute
awojci@pgi.gov.pl

ROMANIA

Dr Constantin S. Sava

National Institute for Marine
Geology and Geoecology –
GeoEcoMar
savac@geocomar.ro

RUSSIA

Prof Alexander Ilinsky
VNIGRI
alex.ilinsky@bk.ru

SLOVENIA

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

TURKEY

Dr Çağlar Sinayuç
Middle East Technical University
Petroleum Research Center
caglar@metu.edu.tr

UK – Scotland

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