

# GEO ENeRG

## ENeRG Celebrates 25<sup>th</sup> Anniversary

It is not a common phenomenon in these turbulent times – a quarter century of a research network. But it is true - ENeRG, the European Network for Research in Geo-Energy, celebrates its 25<sup>th</sup> anniversary. ENeRG was created in 1993 by European organisations involved in research and technology development focused on fossil energy sources, especially oil and gas. It was formed to promote the capability of European research institutions to support the European geo-energy exploration and production industry and its associated service and supply sectors.

In the beginning, the network consisted entirely of institutions from the “old EU-15” countries. By the way, two of its founding members - GEUS, the Geological Survey of Denmark and Greenland, and OGS Trieste - are still on board.

During the first years, ENeRG was quite successful in its interactions with the European Commission, suggesting - through its Position Papers - research topics of major interest, some of which were then included in the European Framework Programmes 4, 5 and 6.

A significant milestone in the history of the ENeRG came in autumn 2001 when the Steering Committee invited new research partners from, at that time, EU Candidate Countries of Central & Eastern Europe to participate in the joint activities. This enabled a smooth and quick involvement of these new partners in European geo-energy research networking, supported by participation in international projects. It has been impressive to follow the research careers of some colleagues based on their growing knowledge and international overview started and facilitated by ENeRG. The pioneering role of their institutions brought their geo-energy research leaders not only to



positions of project coordinators, evaluators and scientific reviewers but also to roles of government and ministry advisors or first-ever university teachers of subjects like CO<sub>2</sub> storage or CCS technology.

Another milestone in ENeRG history with long-term consequences was the famous “project-writing day” spent by a core group of 5 members in Brussels in spring 2003. Its goal was to prepare the final version of a proposal for a Network of Excellence named CO<sub>2</sub>GeoNet. After more than 24 hours of hard work and a sleepless night, the proposal was delivered by hand to the EC offices (inconceivable today), just a few hours before deadline. In the end, the project was awarded an EC grant that entailed the beginning of CO<sub>2</sub>GeoNet, a leading European scientific body on CO<sub>2</sub> geological storage that is now acting as a Scientific Association, with many ENeRG members on board.

The strong and long-lasting relationship among its members has enabled ENeRG to act as a very efficient “incubator” for research proposals. Let us mention just three other examples of success stories – international projects that pushed the geo-energy research in Europe forward. EU GeoCapacity (2006-2008), a project funded by the 6<sup>th</sup> Framework Programme of the EU (FP6), has been the most comprehensive attempt to map the European potential of CO<sub>2</sub> geological storage so far. CO<sub>2</sub>NET EAST (2006-2010), another FP6 project, extended the international

networking in the field of CCS to Central & Eastern Europe and made a significant awareness-raising job in the area. And recently, the ESTMAP project (2015-2016) funded from the current EU Horizon 2020 programme, created the first-ever European database of subsurface energy storage potential.

ENeRG has changed a lot during its 25 years of history. It has now 20 members from 17 countries, representing a unique mixture of research institutes, universities and national geological surveys with complementary focus, skills and experience. Although CCS and geological storage of CO<sub>2</sub> still belong to the main ENeRG focus areas, other topics like geothermal energy, geological energy storage and subsurface management are becoming more and more important.

You can meet ENeRG members in many international projects and activities in these fields, and initiatives are ongoing to increase their number. Another important effort is directed at inclusion of new European research partners from outside the EU with the vision to repeat the success story of the ENeRG enlargement in the 2000s. The planned first-ever European event focused on subsurface energy storage to be organised by ENeRG in 2019 will be a visible evidence of these new research directions. Recent approval of membership of three new partners (more information on page 2 of the newsletter) is clear evidence of the vitality of the network.

### Happy birthday, ENeRG!

Vit Hladik & Sergio Persoglia

Visit <http://www.energnet.eu/documents> to read the ENeRG 'Strategy and Achievements' document.

### The Newsletter content

Page 2: Introduction of New ENeRG Members

Page 3: Deep Geothermal Energy in Denmark – Utilisation of Subsurface for Green Energy

Page 4: ENOS 2<sup>nd</sup> Spring School and International Master on CO<sub>2</sub> Geological Storage

# Introduction of New ENeRG Members

## **CENTRE FOR RESEARCH AND TECHNOLOGY HELLAS - Chemical Process and Energy Resources Institute**

The Centre for Research and Technology Hellas, Greece (CERTH) founded in March 2000, is the largest research centre in Northern Greece. CERTH is a non-profit organization that directly reports to the General Secretariat for Research and Technology (GSRT) of the Greek Ministry of Development.

The mission of CERTH is to carry out fundamental and applied research with emphasis on development of novel products and services of industrial, economic and social importance in the fields of Chemical and Biochemical Processes and Advanced Functional Materials, Environmental Friendly Technologies for Solid Fuels and Alternative Energy Sources, Informatics and Telecommunications, Land, Sea and Air Transportation. CERTH has participated

successfully in more than 1,000 competitive research projects financed by the European Union, leading worldwide industries and the Greek Government via the General Secretariat of Research and Technology (GSRT). The Chemical Process & Energy Resources Institute (CPERI) operates at CERTH and is the



Figure 1. ENeRG President Vit Hladik congratulating Nikolaos Koukouzas, representative of Centre for Research and Technology Hellas, on approval of CERTH membership in ENeRG (Vienna, 6 November 2018, photo Caglar Sinayuc).

main Greek organization for the promotion of research and technological development aiming at improved and integrated exploitation of all types of fuels and different forms of energy, with special focus on sustainable forms of geo-energy, particularly geothermal and all activities associated with it. CPERI contributes to the increased competitiveness of the Greek and European industry by providing unique and innovative solutions to research problems of technological and/or commercial interest. CPERI's R&D results have led to the development of new products and services that have found applications in many international and Greek industries.

More information can be found at [www.certh.gr](http://www.certh.gr) and [www.coalbypro.eu](http://www.coalbypro.eu).

Dr. Nikolaos Koukouzas  
Director of Research CERTH



**CERTH**  
CENTRE FOR  
RESEARCH & TECHNOLOGY  
HELLAS

## **MEERI PAS (Mineral and Energy Economy Research Institute of the Polish Academy of Sciences)**

MEERI PAS is an institute from Poland which has over 30 years of activity with the mission to provide modern, economically viable, environmentally friendly and socially attractive scientific solutions for the sustainable development of the country and its regions in the field of raw materials and energy. This mission is implemented under the motto "Raw materials and energy for society". This is delivered through rationally designed actions and interrelated research, as well as organizational, technical and economic activities.

The scientific activity of the institute covers four departments and several specialized divisions, carrying out 70-90 projects each year, including 5-10 international ones. Thanks to its high academic standard, demonstrated, among others, by ca. 150 scientific publications per year, the Institute is accredited to confer the degree of Doctor of Mining and Engineering Geology.

The Division of Geotechnology of the MEERI PAS has existed since 2003. Its activity is focused on various aspects related to the underground storage of industrial gases (CO<sub>2</sub> and hydrogen). The aspects related to the identification of industrial sources of CO<sub>2</sub> emissions in

Poland, the assessment and modelling of geological structures for underground storage and the broadly understood assessment of the environmental impact of projects related to gas capture and geological sequestration play an important role in the research and development activities of the team. More information can be accessed at: <https://min-pan.krakow.pl/en/>.

D. Sc. Eng. Radoslaw Tarkowski  
Professor MEERI PAS



Mineral and Energy  
Economy Research  
Institute  
Polish Academy of Sciences

## **Croatian Geological Survey (Hrvatski geološki institut)**

HGI-CGS is the largest public research institute in the field of geosciences and geological engineering in Croatia. It was founded in 1909, so it has over a century-long tradition of geological research and geological mapping at diverse scales and for various purposes. In addition to research, HGI-CGS also acts as the national geological survey. The institute has 113 employees, out of which 37 are PhD degree researchers and additional 37 are geology engineers. The institute is organized into three departments, with additional technical personnel (<http://www.hgi-cgs.hr/eng/departments.htm>).

Geo-energy topics are being investigated

in all three departments of the HGI-CGS. Coal deposits – which were more important in the past – were investigated by researchers at the Dept. of Mineral resources. Hydrocarbon research and CCS have been conducted at the Dept. of Geology, although not on a larger scale. Historically, specialists in the geology of hydrocarbons were recruited by national petroleum company, so HGI-CGS was less active in the topic. However, due to changing research and market landscape, some experts are specialising in those topics. Geothermal energy and thermal waters are predominantly investigated in the Dept. of Hydrogeology and Engineering Geology, specialised in applied geological research. The most important geothermal research topics are hydrothermal systems ([\[reg-danube.eu/approved-projects/darlinge\]\(http://reg-danube.eu/approved-projects/darlinge\); <http://geoera.eu/projects/hotlime>\) and conditions for ground- and groundwater-source heat pump installations \(\[http://geothermalmapping.fsb.hr/?page\\\_id=262\]\(http://geothermalmapping.fsb.hr/?page\_id=262\); <http://geoera.eu/projects/muse>\). Moreover, researchers of the HGI-CGS take part in the Panel of Experts on geothermal energy in the scope of European Federation of Geologists, as well as in the Geo-Energy Expert Group established by the EuroGeoSurveys network.](http://www.inter-</a></p></div><div data-bbox=)

Staša Borović, Ph. D.  
Scientific Associate HGI – CGS



# Deep Geothermal Energy in Denmark – Utilisation of Subsurface for Green Energy

The Danish onshore subsurface contains huge geothermal resources, but at present only a very limited fraction of these resources are utilised in three existing geothermal heating plants in Thisted, Sønderborg and on Margretheholm near Copenhagen (Figure 2).

In order to stimulate the exploitation of the geothermal resources and thus the transformation to a more sustainable energy mix in Denmark, a major mapping campaign has been deployed during the past few years. The campaign has shown that several sandstone-rich formations in the Norwegian-Danish Basin and the North German Basin have a substantial low-enthalpy geothermal potential in the depth interval of interest (800–3000 m). The regional temperature gradient is typically 25–30°C/km and both basins are characterized

by long-term subsidence and infilling by sediments. The widely distributed, mainly fluvial Lower Triassic Bunter Sandstone Formation and the mainly marginal marine Upper Triassic–Lower Jurassic Gassum Formation constitute important geothermal reservoirs which are utilized in the present geothermal plants.

For better planning and use of geothermal energy resources, GEUS has constructed a regional 3D geological model that outlines the structural-stratigraphical evolution of the Danish onshore subsurface from the Late Permian through Late Cretaceous, as well as the lateral extent of the lithostratigraphic units known to contain geothermal reservoir sandstones and the location of major faults. In addition, the 3D geological model has

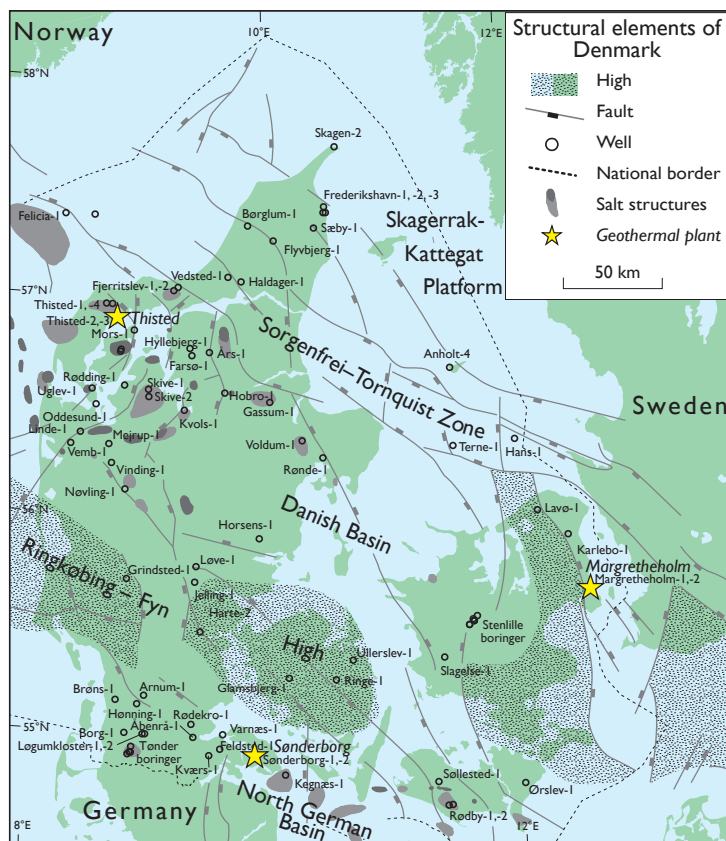


Figure 2. Structural elements in Southern Scandinavia, with the location of the three geothermal plants at Thisted, Sønderborg and Margretheholm near Copenhagen (stars).

formed an important basis for setting up a regional 3D temperature model.

Maps from the 3D model are accessible from a user-friendly WebGIS portal, as well as a number of seismic cross-sections and an interactive 3D tool that exemplify the structural distribution of the onshore subsurface units (<http://DybGeotermini.GEUS.dk>). The portal contains maps outlining the most promising areas in terms of geothermal potential based on current level of knowledge, directing future exploration to these areas. Still, more comprehensive estimates of the geothermal potential are needed for the local geothermal license areas, which must be based on detailed geological models. Therefore, for the assessment of selected city areas with geothermal potential, GEUS has built local 3D reservoir

models and simulated potential flow rates for a more precise estimation of the geothermal resource, optimal well configuration, production capacity and thermal lifecycle.

Recently there has been an increasing interest also for using the subsurface for seasonal heat storage. Several ongoing projects are investigating technically and economically viable solutions which combine heat storage with geothermal exploitation. An ongoing three-year project (GEOTHERM) under the Innovation Fund Denmark, initiated in 2017, also aims to address heat storage issues and removal of geological, technical and commercial obstacles for utilization of the geothermal resources.

Just recently, A.P. Møller Holding has concluded an agreement to produce green district heating in Denmark's second largest city Aarhus, making it the biggest large-scale investment in geothermal utilisation. The plan is to supply more than 100 000 consumers with geothermal heat from the Danish subsurface. The project is, based on extensive geological studies carried out by GEUS, concluding that the subsurface under Aarhus has potential for using geothermal energy for district heating. According to the agreement, A.P. Møller Holding will drill exploration wells within the next years. If the subsurface conditions are as expected, the first geothermal facilities can be built in the period 2021–2024.

Anders Mathiesen on behalf of the GEOTHERM project management

Geological Survey of Denmark and Greenland (GEUS)



## 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. Vit Hladik from Czech Geological Survey, [vit.hladik@geology.cz](mailto:vit.hladik@geology.cz)

**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:** <http://www.energnet.eu> is maintained by Tallinn University of Technology, Contact person: Dr. Alla Shogenova, [alla.shogenova@taltech.ee](mailto:alla.shogenova@taltech.ee)

### ENeRG Newsletter – GEO ENeRGY

The Newsletter is published by Department of CO<sub>2</sub> Geological Storage, GeoEcoMar, Romania. Editor: Dr. Alexandra Dudu, [alexandra.dudu@geoecomar.ro](mailto:alexandra.dudu@geoecomar.ro) Layout and computer typesetting: Point Media Concept SRL Language review: Dr. Gillian E Pickup, Heriot-Watt University, UK, [G.Pickup@hw.ac.uk](mailto:G.Pickup@hw.ac.uk) Copyright © All rights reserved / ENeRG

## ENOS 2<sup>nd</sup> Spring School on CO<sub>2</sub> Geological Storage

**Date & place:** May 22<sup>nd</sup> to 29<sup>th</sup>, 2019 at Hontomin, Spain

The overall objective of the ENOS Spring School on CCS is to communicate knowledge and understanding on the geological storage of CO<sub>2</sub> – a technology needed to respond to the challenge of providing sufficient amounts of low-carbon energy to the society and, at the same time, limiting the greenhouse gas emissions causing climate change. In this respect, special emphasis will be placed on the European context.

**The course will give an introduction to:** Global warming and climate change, greenhouse gases (methane, CO<sub>2</sub>...), sources, capture (focus on CO<sub>2</sub>), transport, trap types & storage options, coal seams, depleted hydrocarbon structures, enhanced hydrocarbon recovery, deep saline aquifers. Reservoir geology & rock properties, basic reservoir concepts, storage concept and mechanism, geochemical aspects, injection, CO<sub>2</sub> storage economics, monitoring, numerical modelling, verification and legislation, health & safety, risks.

**Language:** The official language of the ENOS Spring School on CO<sub>2</sub> Geological Storage will be English. This implies that

all lectures will be delivered in the English language.

**Target group:** The target group is young scientists, e.g. PhD students and post docs with background in geology, engineering, geotechnologies. Master students will be considered on free chairs. The attendance will be free of charge. ENOS funding will be available for transport within Spain and for board. However, the students themselves will carry direct expenses for travel to Madrid and back.

The due date for submitting the application is January 31<sup>st</sup> 2019. More information can be found at <http://www.enos-project.eu/> or by contacting Niels E. Poulsen, GEUS, email: nep@geus.dk.

## International Master on “CO<sub>2</sub> Geological Storage” Sapienza and Zagreb Universities

The scientific community of the H2020 project ENOS (Enabling Onshore CO<sub>2</sub> Storage in Europe) announces that the application for the International Master Course on “CO<sub>2</sub> Geological Storage” is open. The course is hosted by Sapienza and Zagreb Universities, that signed the agreement for a double title diploma, and involves several Universities and Research Institutes, partners of ENOS:

Heriot Watt University (UK), Tallinn University of Technology (Estonia), GEUS (Denmark), University of Nottingham (UK), CIUDEN (Spain), Sotacarbo (Italy) and NORCE (Norway).

The goal of the course (60 credits, one year) is to provide the participants with the scientific and technical knowledge that needs to be addressed for the successful storage of CO<sub>2</sub> in geological formations.

The programme covers all aspects of the geological storage of CO<sub>2</sub> so that the students can both understand the work of all specialists who will be involved in CCS projects (such as reservoir engineers/geologists, sedimentologists, stratigraphers, geophysicists, structural geologists, geochemical modelers, regulators, etc.) and further develop their own field of specialization.

The application deadline is 31/01/2019. More information is available at:

<https://www.uniroma1.it/it/offerta-formativa/master/2019/co2-geological-storage-internazionale>  
<https://www.uniroma1.it/en/offerta-formativa/master/2019/co2-geological-storage-internazionale>

Niels Poulsen  
GEUS



GEUS



Figure 3. Hontomin Technology Development Plant, Northern Spain



ENOS has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 653718

### ENeRG members

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

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

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

**Croatian Geological Survey** (Croatia)  
Dr Saša Borovic  
sborovic@hgi-cgs.hr

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

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

**CERTH** (Greece)  
Dr Nikolaos Koukoulas  
koukoulas@certh.gr

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

**Nature Research Centre** (Lithuania)  
Prof. Saulius Sliupa  
sliupa@geo.lt

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

**Polish Geological Institute** (Poland)  
Dr Adam Wojcicki  
awojci@pgi.gov.pl

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

**National Institute for Marine Geology and Geocology-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  
caglar@metu.edu.tr

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