

# GEO ENeRGY

Promoting *R&D capability* in the service of European Industry

## Inauguration of the Ketzin Facilities

13 June 2007 saw the official start of CO<sub>2</sub> underground storage at Ketzin (State of Brandenburg, Germany). In support of the first CO<sub>2</sub> onshore pilot aquifer storage in Europe, the Zero Emission Fossil Fuel Power Plants Technology Platform (ZEP) organised a scientific workshop, promoting CO<sub>2</sub>SINK Project results and CO<sub>2</sub> storage as a viable option for mitigation of Climate Change.

The CO<sub>2</sub>SINK Project aims to test CO<sub>2</sub> geological storage in situ. After an assessment of CO<sub>2</sub> storage options in the area the most adequate site for CO<sub>2</sub> storage was chosen in a saline aquifer 700 m below the town of Ketzin in the vicinity of Berlin. The CO<sub>2</sub> will be stored in sandstones of the Stuttgart Formation and sealed by clay and gypsum cap rocks above. 60 000 tons of CO<sub>2</sub> will be injected and stored at Ketzin over the next two years.

The CO<sub>2</sub> will be monitored using both surface and underground technologies, using both cores and geophysical techniques. These innovative measures will form the basis for new models to help evaluate the fate of the injected CO<sub>2</sub>, risks and potential remediation actions.

The inauguration of the site on June 13<sup>th</sup> took place in two stages. Starting with a celebration at the GFZ headquarters at Potsdam, and after a warm welcome by Prof Reinhard Hüttel and Prof Kurt Häge, an international seminar was opened by political representatives of the European Commission, State of Brandenburg and German Research Centres. Mr Andris Piebalgs, EU Energy Commissioner, emphasised the importance of test sites of CO<sub>2</sub> storage in onshore Europe and, therefore, indicated CO<sub>2</sub>SINK will be a fundamental project building experience for the future of CO<sub>2</sub> storage.

The opening was followed by presentations by the co-

organizers, GFZ and ZEP, on their status and future activities. This introduced the scientific presentations, chaired by Prof Niels Peter Christensen. Presentations were arranged in two sessions: CCS Projects and CO<sub>2</sub> storage.

The first session focused on the future plans of companies interested in developing CCS as a part of their strategy for CO<sub>2</sub> mitigation. Presentations were made by representatives from Vattenfall, Shell, RWE and E.ON. All representatives pointed to CCS as a fundamental part of their strategies, expressing interest in developing demonstration projects, testing different capture technologies and

different types of storage. These are the necessary steps towards commercial applications of CCS in Europe as well as globally.

The second session consisted of presentations about ongoing projects. Four major CCS projects were reviewed, Otway Basin in Australia, In-Salah Project in Algeria, Sleipner Project in the Norwegian North Sea and Ketzin Project in Germany. Although there are evident similarities, the four presentations showed the wide range of storage possibilities that can be found in the subsurface and how different conditions are caused by many variable factors.

After the international seminar, the participants were transferred by bus to the Ketzin site where a lunch was served, and afterwards the official act of inauguration began. Statements were made by different political representatives, including a keynote speech by Mr Andris Piebalgs who spoke about the Commission goal of launching a CCS Directive by the end of

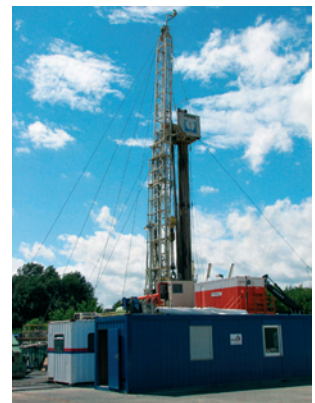


Fig. 2: Drilling rig at Ketzin

2007. After these statements, CO<sub>2</sub>SINK Project participants presented a technical explanation of the Ketzin storage project.

Finally, participants were directed to the site of CO<sub>2</sub> tanks where the official inauguration was carried out by Mr Andris Piebalgs. After the official activities were completed, the participants were allowed to inspect the site and take a look at the project facilities, injection and monitoring boreholes, CO<sub>2</sub> tanks and see what on-shore CO<sub>2</sub> injection project looks like.

The inauguration was a great success with 300–400 participants and very high quality of the presentations. The majority of the most important power companies and oil & gas industries were represented and all expressed a great interest in the developments of CO<sub>2</sub>SINK Project and other activities related to CCS in the near future.

Roberto Martínez &  
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Fig. 1: CO<sub>2</sub> storage tanks

# Carbon Dioxide Storage Opportunities in EU New Member States & Candidate Countries

The first estimations of CO<sub>2</sub> storage opportunities in Bulgaria, the Czech Republic, Croatia, Hungary, Poland, Romania, Slovenia and Slovakia were carried out in 2004–2006. The work was part of the CASTOR project (CO<sub>2</sub> from Capture to Storage) that was partially funded by the EC under the 6th Framework Programme. This work was part of Workpackage 1.2 "Geological storage options for CO<sub>2</sub> reduction strategy". The activity was lead by Geological Survey of Denmark and Greenland (GEUS). The main goals of the project were:

- To identify and collate new information from Eastern Europe and countries not covered by the former

GESTCO project;

- To update European CO<sub>2</sub> Capture and Storage GIS. The storage capacity assessment was built on the methodology developed for 8 European countries in the EU-FP5 GESTCO research project. The work aimed to unify, refine and fill data gaps to secure comparable data throughout Europe.

According to the first estimates made within CASTOR, the overall CO<sub>2</sub> storage capacity in the countries in question is more than 17 Giga (billion) tonnes. More detailed results are presented in Table. 1. Annual CO<sub>2</sub> emissions from big stationary point sources in these states are ca. 540

Million Tonnes (Mt). Using the estimated storage capacities, the region has a potential to store its CO<sub>2</sub> emissions for an average of 28 years. Looking at this figure as a total may present the picture that the CO<sub>2</sub> storage options are limited. If the storage capacity is considered on the basis of individual capture and storage projects there are a range of opportunities to capture and store the emissions for the largest point sources for a number of years, and so CCS has the potential to make large reduction in total CO<sub>2</sub> emissions of individual countries. The numbers presented should be considered as the first rough estimates and as a starting

point for more objective (site specific) and precise investigations and calculations in follow-up projects. A major outcome of this work was, that the topic of CCS was opened to expert and public discussion in EU New Member States and Candidate Countries.

The activities started in CASTOR WP 1.2 continue in several follow-up projects, especially in EU GeoCapacity, a FP6 R&D project entitled "Assessing European Capacity for Geological Storage of Carbon Dioxide" (introduced in GEO ENeRGY No 12/2005) as well as in several national and bilateral project funded by national governments. The path breaking work within CASTOR was, however, really the first step towards CCS awareness in this region.

Ludo Kucharic, Vit Hladik & Niels Peter Christensen



Country	CO <sub>2</sub> storage capacities (Mt)			CO <sub>2</sub> emissions	Duration (years)
	aquifers	hydrocarbon fields	coal fields	point sources (Mt)	
Bulgaria	821	3.5	0	41	15.5
Croatia	351	148.5	0	6	64
Czech Republic	2863	32.6	294	97	25.3
Hungary	5000	408	240	28	17.8
Poland	3752	572	470	205	18
Romania	3000	2500	0	120	35.3
Slovakia	1349	137	0	40	28.6
Slovenia	147	2.2	0	7	16.4

Tab. 1: Estimated CO<sub>2</sub> storage capacities in individual countries

## ENeRG Student Prizes

Two ENeRG Student Prizes for the best presentations in the field of geo-energy applications were first announced in 2006 based on presentations at the EAGE/SPE EUROPEC conference in Vienna. The first prizewinners were Francois Schaub (Ecole des Mines de Paris) in category "The best paper" and Milana Ayzenberg (Norwegian University of Science and Technology) for "The best poster".

The winners were awarded the prizes and certificates by the ENeRG president Alla Shogenova and ENeRG members Endre Hegedüs

and Patrick Corbett. The presentation was held on 12 June 2007 during the Student Reception of the EAGE/SPE EUROPEC 2007 Conference in London (see Fig. 3).

In addition, the London conference saw the judging of the second round of ENeRG Student Prizes; the results will be announced later this year.

The ENeRG Steering Committee wishes to announce the third ENeRG Student Prize competition worth 1000 Euro. The competition will be judged on research results in one of the many fields of geo-energy.



Fig. 3: Milana Ayzenberg and Francois Schaub – the first ENeRG Student Prize winners at the EAGE Student Reception in London

The EAGE/SPE EUROPEC 2008 Conference in Rome has been selected for the next competition. Prizes will be awarded for the Best Student Paper and the Best Student Poster. The ENeRG Steering Committee will select the prizewinners on the basis of the evaluations carried out by the EAGE for the Best Paper and Best Poster Awards. The awards will be given to the primary authors of the best contributions from a student in each category in a geo-energy related field.

Alla Shogenova  
ENeRG President 2007

### ENeRG – European Network for Research in Geo-Energy

#### ENeRG president

ENeRG president for 2007 is Dr. Alla Shogenova from Institute of Geology at Tallinn University of Technology, Estonia. Contact: alla@gi.ee

**ENeRG secretariat** is run by Dionyz Stur State Geological Institute, Bratislava, Slovakia. Contact person: Dr. Julia Kotulova <kotulova@gssr.sk>

**ENeRG website:** <http://www.energnat.com> is maintained by National Institute for Marine Geology and Geoecology – GeoEcoMar, Bucharest, Romania. Contact person: Andrei Todea <andrei.todea@macrodiesign.ro>

#### ENeRG Newsletter – GEO ENeRGY

The Newsletter is published by Czech Geological Survey (CGS), Prague, Czech Republic

Editor: Dr. Vit Hladik <hladik@gfb.cz>

Layout: Hana Převrátilová

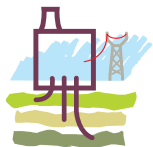
Computer typesetting: Petr Maděra

Language review: Michelle Bentham (British Geological Survey)



# Paris CCS Week in the Limelight

In the first week of October 2007 Paris became the spotlight of worldwide CO<sub>2</sub> Capture and Storage community. Three important events took part here, attracting stakeholders of all categories – industry representatives, researchers, NGO environmentalists, politicians and regulators.



On 3 October the historical building of Salons Hoche hosted the 2<sup>nd</sup> General Assembly of the European Technology Platform on Zero Emission Fossil Fuel Power Plants (ETP ZEP), a grouping of European industry, NGOs, scientists and environmentalists, set up 2 years ago by the European Commission. The platform presented the European Flagship Programme, a series of 10–12 full-scale demonstration fossil fuel power plants fully equipped with the CO<sub>2</sub> Capture and Storage (CCS) technology that should be in operation by 2015. This is the first step towards fulfilling the ETP ZEP Vision “To enable European fossil fuel power plants to have zero CO<sub>2</sub> emissions by 2020”.

The introductory speeches (among others by Ms Joan Ruddock, the UK Minister of Environment, and EC representatives, Mr Jan Panek and Mr Piotr Tulej) declared political support to the CCS technology both by national governments and the European Commission. The Commission is ready to support the Flagship Programme indirectly, by providing incentives like incorporation of CCS into the European Emission Trading Scheme, by modifying existing and adopting new legislation

making CCS possible, by co-financing CCS-focused research or by allowing the Member States to provide direct support to CCS projects. No direct financial EC support, however, should be expected.

The Flagship Programme is a big opportunity, and a big challenge at the same time, for the European geo-energy R&D community, which is expected to provide the necessary knowledge for preparing sufficient and safe storage sites for the captured CO<sub>2</sub>.

The second part of the event was devoted to presentations of industrial CCS initiatives, the candidates for the Flagship Programme, and was concluded by an interesting panel discussion. In the evening, around 250 delegates of the Assembly enjoyed a joint cocktail dinner with the participants of the 2 other events (see below) at the Le Meridien Etoile hotel. The presentations can be found online at <http://www.zero-emissionplatform.eu/website/eventarchive/GA2programme.html>.



On the same day, in one of the neighbouring conference rooms of Salons Hoche, the CO2GeoNet Network of Excellence, the leading European grouping of CO<sub>2</sub>-storage-oriented researchers, organised a Training and Dialogue Workshop on CO<sub>2</sub> geological storage entitled “What does CO<sub>2</sub> geological storage really mean?”. Around 170 participants could listen to 6 presentations providing comprehensive answers to the basic questions connected with

geological storage of CO<sub>2</sub>:

- How much CO<sub>2</sub> can be stored and where?
- How to inject CO<sub>2</sub>?
- What will be the fate of the injected CO<sub>2</sub>?
- Could CO<sub>2</sub> leak and affect ecosystems?
- How to monitor the stored CO<sub>2</sub> and potential leakages?
- What safety criteria should be applied?

The audience, embracing researchers, students, technicians and regulators, obtained a very good overview of the principles, advantages and still open questions of the final step of the CCS process. The presentations can be found online at <http://www.co2geonet.com/NewsData.aspx?IdNews=21&type=Actual>.

four sessions covering all the important parts of the CCS deployment process: Issues and strategies for controlling greenhouse gas emissions, Industrial achievements in the field of CO<sub>2</sub> capture and storage, Future developments: positioning of the industry and technological breakthroughs, and The structuring of the CO<sub>2</sub> sector: market, regulations and societal perception. The speakers represented the real leaders of the CCS community. In addition to European points of view, the presenters from the USA, Australia, Canada and Brasil brought interesting perspectives from other parts of the world.

With around 400 participants, 26 presentations and the final



Fig. 4: ETP ZEP General Assembly at Salons Hoche

On 4–5 October the Le Meridien Etoile hotel witnessed the 2<sup>nd</sup> International Symposium on Capture and Geological Storage of CO<sub>2</sub>, organised jointly by IFP, ADEME and BRGM, under patronage of several French ministries, the European Commission, the International Energy Agency and the Ile-de-France region. The Symposium was divided into

summarizing session in the presence of Mr Jean-Louis Borloo, the French Minister of Ecology and Sustainable Development, this Symposium is becoming one of the most important CCS events in Europe. The presentations are now available online at [http://www.colloqu coast.com/IFP/en/CO2site/program\\_va.htm](http://www.colloqu coast.com/IFP/en/CO2site/program_va.htm).

Vit Hladik

## ENeRG Is Supporting the Balkan Geophysical Society Congress 2008

On 5–8 October, 2008, the 5<sup>th</sup> Congress and Technical Exhibition of **Balkan Geophysical Society (BGS)** will be held at the Sava Congress Centre, Belgrade (Serbia). The motto of the Congress will be “Geophysics at the Cross-roads...”. The Congress will be organized and hosted by BGS, Association of Geophysicists of Serbia and NIS (Petroleum Company of Serbia), in cooperation with EAGE, SEG, SPE, AAPG and ENeRG.

The conference will also be under the patronage of UNESCO and City of Belgrade. Co-organizers are: Ministry of Mining and Energy of Serbia, Ministry of Science of Serbia and Ministry of Environmental Protection of Serbia. Co-sponsors are: National Tourist Organization of Serbia, Tourist Organization of Belgrade, Cultural Heritage Preservation Institute of Belgrade and Institute for the Protection of Cultural Monuments of Serbia.

This promises to be an exciting event that will cover topics related to Energy, Environment and Education, but also special sessions: HSE, Journalism and PR in energy industry, CO<sub>2</sub> sequestration and climate change mitigation, Geotourism and geoheritage. More information will be soon available at <http://www.savacentar.com>.

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# GEO ENeRGY Country Profile – Romania



## ENeRG members

The ENeRG national representative is The National Institute of Marine Geology and Geo-ecology, GeoEcoMar (<http://www.geocomar.ro>); the other members are the former CCPEG – The Geological Exploration Research and Design Center, nowadays a research group under the management of Exploration Division of Petrom, and The “Sabba S. Stefanescu” Institute of Geodynamics of the Romanian Academy (IG“SSS”AR) (<http://sabba.geodin.ro/~prezentare>). All of them were introduced in GEO ENeRGY No 9/2004.

## Other institutions

On the state level the greenhouse gas management is dealt at the Ministry of Environment and Water Management (<http://www.mmediu.ro>). The National Agency for Mineral Resources (NAMR – <http://www.namr.ro>) is a specialized body of the central public administration that is in charge of applying the provisions of the Mining and Petroleum laws in the field of prospecting, exploration and exploitation of all mineral

resources, including oil deposits and petroleum transportation by the national pipeline system (still in state ownership).

Petrom (<http://www.petrom.com>), now part of Austrian OMV group, is the main player in oil business in Romania, while in the gas sector the primary company is Romgaz (<http://www.romgaz.ro>). The other main company in the oil sector is Rompetrol (<http://www.rompetrol.ro>), a Romanian private oil company. Several domestic and foreign oil companies are also engaged in various activities of prospecting, exploration, development and exploitation of hydrocarbons. The practical activities are carried out by Romanian and foreign operators (geology, seismic, drilling, well logging, testing etc).

## Current activities in the field of geo-energy

Romanian territory is very geologically complex. Its backbone is the Carpathians Mountains composed of a large variety of igneous, metamorphic and sedimentary rocks. Beyond the Carpathian the territory covers parts of the Moesian and East European Platforms, the Dobrogea promontory as well as a part of the Pannonian basin. The

Transylvanian Basin and numerous intra-mountain basins are enclosed by mountains.

The country has a long and rich history in oil exploration and production. In fact Romania was the first country to register crude production (in 1857). It reached peak production of 14,7 million tonnes/year in 1976 and now produces around 5–6 million tonnes/year. Romania also has important gas deposits (peak production of 36,2 billion cubic meters in 1986, today around 13 billion cubic meters/year) and coal and so might be considered well endowed in geo-energy resources.

84.6 Mt CO<sub>2</sub> emission allowances have been allocated to 249 industrial installations for the year 2007. If only installations (or point sources) emitting over 0.1 Mt/year of CO<sub>2</sub> are considered this leaves 80 major industrial sources (53 power stations, 7 oil refineries, 7 cement factories, 6 in metallurgy, 5 in limestone processing and 2 glass factories). The biggest emitter of CO<sub>2</sub> in Romania is the ArcelorMittal steel plant situated in Galati in the eastern side of the country, emitting approximately 12.5 Mt/year.

There are many potential opportunities for geological CO<sub>2</sub> storage in the country. The most promising storage sites are in the many depleted oil and gas fields scattered over a large area of the country. Saline aquifers are present in a number of sedimentary basins such as the Carpathian Foredeep or Transylvanian Basin and have possibilities for further geological storage of CO<sub>2</sub>. However, data in these areas is limited and they would require further study. Unmineable coal seams have relatively poor potential for CO<sub>2</sub> storage in Romania.

Romanian scientists are actively participating in several EU CCS-focused projects including CO2NET EAST and EU GeoCapacity. To boost the activity in this field this year a CO2 Club was established. It is organized as a NGO, officially registered at the competent authorities and its main intention is to get together all the organizations interested in the field in order to facilitate exchange and disseminate ideas and to make the general public as well as policymakers aware of the problems put by CO<sub>2</sub> emissions and the means to solve them.

*Constantin Sava and  
Amuliu Proca*

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