

GEO ENeRGY

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

International Year of Planet Earth

On 12 and 13 February 2008, the International Year of Planet Earth (IYPE) was officially launched at UNESCO's headquarters in Paris. The event was hosted by UNESCO's Director General Koïchiro Matsuura and was addressed by several Heads of State.

During the Global Launch Event three conceptual issues were addressed:

- Population growth & climate change: challenges for Planet Earth.
- Earth resources: threat or treat?
- Geohazards: minimizing risk, maximizing awareness.

These issues were discussed by top scientists, CEOs of leading industries and leading politicians. The discussions were preceded by selected essays or poems from a crowd of 200 invited, award-winning students across the globe.

The International Year of Planet Earth is a joint initiative by UNESCO and the International Union of Geological Sciences (IUGS). Twelve founding partners, 26 associate partners and a growing number of international partner organizations from all continents and representing all major geoscientific communities in the world have embarked on this initiative. The Year also enjoys the full political support of 191 UN countries. In 2008, National committees will be established in some 70 countries and regions in the world.

The International Year of Planet Earth aims to ensure greater and more effective use

by society of the knowledge accumulated by the world's 400,000 Earth scientists. The Year's ultimate goal of helping to build safer, healthier and wealthier societies around the globe is expressed in the Year's subtitle 'Earth Science for Society'.

The main activities of the IYPE are coordinated through the science and outreach programmes. Both essentially operate in a response or 'bottom-up' mode. The science programme consists of the following 10 broad, societal relevant and multidisciplinary themes:

- Earth and Health
- Climate Change
- Groundwater
- Ocean
- Soils
- Deep Earth
- Megacities
- Resources
- Hazards
- Earth and Life

The outreach programme is being implemented mainly at the national level. The numerous activities in the many countries are being monitored and registered.



Education is another essential element of the IYPE. Many of the national and international activities involve students, and focus on the participation of secondary and primary school pupils.

IYPE is a once-in-a-lifetime opportunity to highlight the urgent need to improve knowledge about the Earth, which will help to make human societies wiser, safer and healthier.

ENeRG welcomes the activities of IYPE and declares the readiness of its member organisations to actively contribute to success of this global initiative. Many ENeRG members are already actively involved in National committees and national activities.

Moreover, the main focus of the network research activities widely coincides with several IYPE science programme themes: Geological storage of CO₂ – the final phase of the CCS (carbon dioxide capture and storage) process – opens opportunities for one of the most promising climate change mitigation options. Appropriate

and professional selection of suitable storage sites gives the guarantee that this process can be run safely and reliably.

Along with CCS, Earth subsurface offers an important source of renewable energy – the geothermal one. A small part of the world's geothermal energy potential has been used so far. There are a lot of opportunities for the greater use of this renewable energy which offers many advantages over fossil fuels – independence on the imported fossil fuels, mitigation of greenhouse gases emissions and development of new applications. Research is still needed in order to use wisely a vast potential represented by unconventional geothermal resources such as the Enhanced Geothermal Systems and geothermal heat pumps.

Last but not least, new resources of fossil fuels are needed to secure the energy demand of the growing mankind. Research on exploitation of unconventional deposits can significantly help to fulfil these needs. Deeply buried coal seams, coal bed methane, arctic and deep-water oil & gas, tight gas deposits, seabed hydrates, heavy oil and tar sands can provide valuable energy if exploited with skill.

The time is now right to raise new generations of geo-experts, who can better understand the processes that have sustained our planet for 4.5 billion years, and pass that wisdom on to all people of the world. ENeRG is ready to put his shoulder to the wheel.

George Hatzianannis & Vit Hladik



ENeRG – European Network for Research in Geo-Energy

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Unterhaching Combined Heat and Power (CHP) Geothermal Plant

Geothermal rush in Germany is a fact! Many geothermal plants, both for heating and/or electricity production are operating or are in the planned or construction phase.

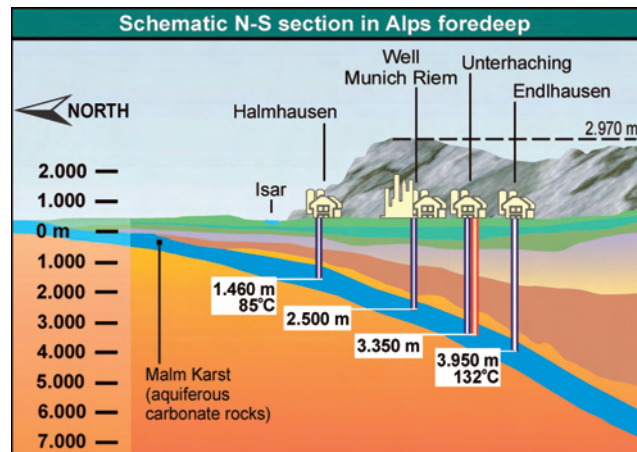
The state of Bavaria is very active in exploitation of the renewable geothermal energy. The most recent addition to the list of geothermal plants in Bavaria is the Unterhaching CHP plant located in the town with the same name. Unterhaching town is located a few kilometers south of Munich and has a population of 22 000 people. The plant began operating commercially in November 2007.

The CHP geothermal project is operated by Unterhaching Geothermie A.G., consisting of the following partners: the Unterhaching prefecture, SIEMENS A.G., Geothermie Neubrandenburg, Rode and Partner, SCHINH Consulting, IGEU, IGH.

Geologically the area is part of the extensive Bavarian molasse basin which is one of the three German geothermal hot spots. Oil and gas exploration boreholes in the area revealed a stratigraphy, temperature and yield of the groundwater (at depth up to 4000 m) suitable for geothermal energy. The sedimentary thickness of the Molasse exceeds 4000 m, it overlies Malm limestone in a monocline structure dipping towards south (Figure 1).

Geological and seismic surveys were undertaken in order to define the position of producing and reinjection wells. Two wells were drilled in 2006 and the

> Fig. 2 The Unterhaching geothermal plant



results were very favorable for the installation of a CHP plant of 3.5 MWe installed electrical capacity. The producing well drilled the hot aquifer at ~3 350 m; the water yield is 150 l/s with a temperature of 122°C and the water level lies at about 100 m below the surface.

The reinjection well, drilled a few kilometers away, encountered even greater temperatures of water (at a depth of 3577 m).

The electric power plant (Figure 2) covering an area of 2000–3000 sq. m has an installed capacity of 3.4 MWe.

< Fig. 1 Schematic N-S geological section of the area

The power plant uses Kalina technology (mixture of NH_3 and water) and the noise during operation amounts to 32 db.

The water coming out of the power plant has a temperature of 60°C and will be used for the heating for most of the town of Unterhaching.

The investment for the whole project (exploration, drilling, power plant and district heating) is in the order of 30–35 m€. With a sale price for electricity ~0.14 € per kWh the capital damping is estimated at 5 years and the net profit after that time will be approximately 5 m€ per year. This CHP plant will reduce the CO_2 emissions by about 40 000 tons per year.

George Hatziyannis



ENeRG Student Prize Awards

Two ENeRG Student Prizes for the best presentations in the field of geo-energy applications were announced and awarded at the EAGE/SPE EUROPEC conference in Vienna in 2006.

At the last EAGE/SPE EUROPEC Conference in London (11–14 June 2007) the ENeRG Board selected the Best Student Paper and the Best Student Poster for the second time. A.S.J. Scott (Aberdeen University)

won the category "The Best Student Paper" with his paper entitled "Reservoir Analogues of Sand Injecties



– Internal Heterogeneties and Implications for Reservoir Modelling". S.R. Ziatdinov (St. Petersburg University) was the winner in the category "The Best Student Poster" with his poster entitled "Tube-Wave- Related Repeatability Diagnostic for Cross-Well Time-Lapse Seismic".

The ENeRG Board announces the third ENeRG Student Prizes worth 1000 Euro for research in one of the applied fields of geo-

energy research. At the EAGE/SPE EUROPEC Conference in Rome (9–12 June 2008) the ENeRG board will once again select Best Student Paper and Best Student Poster. The prizewinners will be chosen on the basis of the evaluations carried out by EAGE. The awards will be given to the students who are the primary authors of the best contributions in one of the applied field related to geo-energy.

EU Climate Action and Renewable Energy Package

On 23rd January 2008 the European Commission proposed a major legislative package called "Climate action and renewable energy package". This bundle of documents is focused on fighting climate change and promoting renewable energy. The proposals demonstrate that the targets agreed last year are technologically and economically possible and provide a unique business opportunity for thousands of European companies. These measures will dramatically increase the use of renewable energy in each country and set legally enforceable targets for governments to achieve them. All major CO₂ emitters will be given an incentive to develop clean production technologies through a thorough reform of the Emissions Trading System (ETS) that will impose an EU-wide cap on emissions.

A proposal of a Directive on the geological storage of carbon dioxide is part of the package. The Directive would imply the creation of new permissions, one for exploration of CO₂ geological storage and one for the use of geological storage. Member States will decide which parts of their territory are usable for CO₂ storage, but

permissions for exploration and use have to be accepted by the EC.

The Directive is also clear in the objectives that should be covered before getting the right to use a storage site: Geological modelling, processes simulation, risk analysis and monitoring and safety plans are some of the demands that will have to be satisfied by a potential user of a storage facility. In addition, several Directives already in force, such as those on water, wastes or pollution, have to be amended in order to make CCS possible.

The package also includes an EC Communication called "Supporting Early Demonstration of Sustainable Power Generation from Fossil Fuels", which stimulates the demonstration of CCS in power plants.

The proposal for a Directive on the promotion of the use of renewable energy sources sets the framework to achieve the target of a 20% share of renewable energy sources in the final energy consumption by 2020 (compared to the share of 8.5% today). Moreover it has other objectives such as:

- To divide the effort fairly between Member States.
- To remove unnecessary barriers to the growth of renewable energy (for example, by simplifying the authorisation procedures for new renewable energy developments).



- To encourage better types of renewable energy (such as the ground source heat pumps).

The attainment of the first target will require the use of the diverse renewable non-fossil energy sources, among which is geothermal energy. Geothermal energy is the heat beneath the surface of the Earth. It is a sustainable, renewable, nearly infinite energy source, delivering heat and power 24 hours a day throughout the year and available all over Europe. It is environmentally friendly and

contributes to reduce CO₂ emissions. It uses very little land, has almost no visual impact and reduces Europe's vulnerability to energy imports. It has considerable economic potential, can foster significant development of enterprises and related job creation.

The Directive particularly makes the useful distinction of heat pumps using shallow geothermal energy (ground and groundwater) from those using ambient heat, two distinct renewable energy sources.

The Directive recognizes the requirement for renewable energy regulations which vary greatly between member states. Therefore common European regulations should be established without delay to standardise and promote procedures for geothermal energy development.

In addition the Directive is accompanied by the staff document "The support for electricity from renewable energy sources".

Roberto Martinez, Vit Hladik & George Hatzilyannis

GEO ENERGY Country Profile – Slovakia



ENeRG member & country representative

SGUDS – State Geological Institute of Dionýz Štúr is a contributory scientific research organization established by the Ministry of Environment of the Slovak Republic in 2000, as a successor of former Geological survey of the Slovak Republic. This was an organisational change only, because the institution influences geological movement in the Western Carpathians since 1940. Now it is entrusted by power of state geological survey in the sphere of research and prospecting the Slovak Republic territory. SGUDS has a long tradition in base geological mapping of

tectonic units, hydrogeological mapping, engineering geology, geofactors monitoring, raw materials evaluation, geophysical measurements and interpretation. The institute is actively creating a range of databases across the whole spectrum of geological sciences, which is an activity of rapidly increasing importance.

Other institutions

Nafta Gbely, a.s. executes mineral exploitation and activities performed using mining methods, prospecting for and exploration of hydrocarbon fields, development of hydrocarbon fields, and hydrocarbon production, treatment and refining. The organization is also involved in the design of underground and surface hydrocarbon and waste storage facilities.

Geo-energy research and investigation is one of subjects for Institute of Geosciences at Technical University Berg in Košice or Institute

of Geotechnics of Slovak Academy of Sciences. The private sector is concentrated at the research in geothermal energy and uranium deposits mainly (e.g. Geoterm, a.s., Kremnica Gold, s.r.o., etc.)

Main activities in the field of geo-energy

The hydrocarbon and pitcoal reserves in the Slovak Republic territory are not of significant value in terms of consumption for the state. Therefore the main geo-commodity is brown coal, which satisfies 19 % of the country's energy production (dominated by nuclear power plants generating 69.5 % of power). The remaining part (11.5 %) comes from hydroelectric power stations. Geothermal energy potential is estimated at the value 5 538 MWt; 27 % of Slovakian territory is suitable for geothermal energy production. 116 geothermal boreholes have been drilled in 26 localities so far. Of this large resource only 83 MWt is currently utilized at 30% efficiency. Many of

the geothermal areas have a temperature of 45–130°C; the water can be utilized for heating (houses, agriculture) and recreational purposes.

Research on CO₂ geological storage

Slovakia is responsible for emitting only 0.2 % world's total fossil fuel-based carbon emissions; the per capita emissions are slightly above the average level. Through SGUDS the country was involved to the solution of EU founded projects (CASTOR, EU GeoCapacity and CO₂NET EAST). A national project on CCS was initiated in autumn 2007, which will investigate "classical" geological storage possibilities as well as research into mineral sequestration. An initial assessment for CO₂ storage opportunities for the biggest producer of carbon dioxide (US STEEL – 10 Mt/year) was finished this year and this activity is likely to continue.

Ludovit Kucharic & Julia Kotulova

Carbon Sequestration Leadership Forum and Its Task Forces

Carbon Sequestration Leadership Forum (CSLF), the voluntary climate initiative of developed and developing nations, was first introduced to GEO ENeRGY readers in issue No 15 of the newsletter in 2007. This article is a continuation of this introduction.

The activities of the CSLF are principally conducted by the Policy Group, which governs the overall framework and policies of the CSLF, and the Technical Group, which reviews the progress of collaborative projects and makes recommendations to the Policy Group on any actions needed. In addition, each of the Groups can create Task Forces. Thus, a Task Force for Capacity Building in Emerging Economies and Financial Issues Task Force are working within the Policy Group, and 5 other Task Forces support the work of the Technical Group.

The Task Force for Capacity Building in Emerging Economies has three main objectives:

- Assist emerging economy Members to develop needed expertise and institutions;
- Develop a set of educational resources that all CSLF Members can utilize;
- Transfer lessons from CSLF Projects and other known CCS Initiatives.

The main activity of the Task Force is organising Capacity Building Workshops three of which have already taken place in Pittsburgh, USA (May 2007), Porto Alegre, Brasil (October 2007) and Al Khobar, Saudi Arabia (January 2008)



and were reported as very successful. Further workshops are planned within the next 2 years in the following countries: China, Colombia, India, Mexico and South Africa.

Two of the "technical" Task Forces – Task Force to Identify Gaps in CO₂ Capture and Transport and Task Force to Identify Gaps in Monitoring and Verification of Geological CO₂ Storage – concluded their activities in 2006 by submitting their final reports, which can be downloaded from <http://www.cslforum.org/taskforces.htm>.

The other three Task Forces – the Projects Interaction and Review Team, the Task Force to Examine Risk Assessment Standards and Procedures and the Task Force for Review and Identification of Standards for CO₂ Storage Capacity

Estimation still continue their work. The latter has recently published its 'Phase III Final Report from the Task Force for Review and Identification of Standards for CO₂ Storage Capacity Estimation'. This publication represents a significant contribution to the CO₂ storage research and will be most probably used as commonly respected guideline for CO₂ geological storage capacity estimations. The report can be downloaded from <http://www.cslforum.org/documents/PhaseIIIReportStorageCapacityEstimationTaskForce0408.pdf>.

The Task Force to Examine Risk Assessment Standards and Procedures is relatively new – established in March 2007. The Task Force mission is to examine risk-assessment standards and procedures relevant to unique risks associated with the injection and long-term storage of CO₂. The risks being assessed are: 1) Risks associated with CO₂ near-term (injection) processes (including fracturing, fault re-activation, induced seismicity); and 2) Risk associated with long-term processes related to impacts of CO₂ storage, including:

- Health, safety, and environmental risks;
- Potential impact on natural resources (such as groundwater, mineral resources, etc.); and
- Return of CO₂ to the atmosphere.

Phase I of the Task Force activities, completed April 2008, entailed review of methodologies and existing literature; review of ongoing and emerging efforts and identification of critical issues in the status of risk assessment.

Vit Hladik with the aid of www.cslforum.org

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