Issue N° 9 The Newsletter of the ENeRG Network May 2004

GEO ENeRGY

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

ENeRG view on European geo-energy policy and technology

ENeRG, the network of European Research Institutes on Geo-Energy, is involved in European energy policy development & subsequent technological innovation related to new subsurface energy infrastructures.
It encompasses hydrocarbon and coal exploration and production, geological storage of CO_2, underground production and storage of thermal energy and nuclear waste disposal. As the new president I am happy to share with the readers of this newsletter some views of ENeRG on important research and development issues in the various geo-energy areas.

Hydrocarbon systems

Hydrocarbon exploration and production policy in Europe is adapting and refocusing as:

- predictions of IEA (http://www.iea.org) and DG TREN (http://europa.eu.int/comm/dgs/energy_transport/) tell us that world wide consumption of hydrocarbon energy resources will increase with 1.7%/yr. World wide necessary investments in the coming 30 years will amount to almost 3 trillion euro, being an opportunity for export of European technological services and know how;
- major European hydrocarbon basins are mature with soon declining production profiles according to ASPO (http://www.peakoil.net) therefore urging for innovations in enhanced recovery technologies (including EOR and EGR), in unconventional hydrocarbon resource (CBM, tight gas and oil shales) development and supporting policies for small fields development.

All together the security of supply of hydrocarbons will decrease as import dependencies grow. ENeRG support the view expressed in the Technology Master Plan of Eurogif (http://www.eurogif.org) that more European research and development is required to sustain a favorable position for Europe in the oil and gas sector.

Coal

Coal exploration and mining policy has been declining for several decades, mainly in favor of gas production. As the environmental problems are becoming less through the application of controlled coal gasification and SO_x, No_x and CO_2 capture and hydrocarbon resources become scarcer a future growth of coal usage can be expected. Major challenges are the development of deeper coal formations and management of earth movements and use of co-produced methane. Coal is not part of the 6th framework program.

CO_2 capture and geological storage systems

In order, for Europe, to fulfil Kyoto CO_2 reduction targets 2010 and beyond, and given a continuing growing consumption of fossil fuels, large scale CO_2 capture and storage is a promising solution for deep reductions, 30% or more. Research is focussing currently on the one hand on developing capture technologies with lower costs as capture costs are the large part of total CO_2 reduction costs and on the other hand on environmental and safety assessment technologies to build confidence in the long term management of geologically stored CO_2 (http://www.ieagreen.org.uk). The 6th research framework program of the EU is (with 30 million euro) strongly stimulating and coordinating the research in this area through funding various projects and networks.

Geothermal production and thermal storage systems

Heat is an important percentage of energy consumption in Northern Europe. As was shown at the EEF debate in January (http://www.f-e-e.org), in a large part of Europe (Poland, Czechia, Denmark, Sweden) central district heating systems connected to combined heat and electricity production or waste heat are dominant. Some of the heat is produced by low enthalpy geothermal or soil (solar) heat storage systems. In other countries with gas (Netherlands, UK, Norway, Germany) heat is generated decentralized with hydrocarbons, mainly gas. In general, much more summer waste heat could be available for heating in winter, but without subsurface storage it is not possible to make a step change in efficiency.
In Southern Europe the demand for cold energy is a growing requirement which can also be produced by low enthalpy systems. High enthalpy heat (>150 degrees Celcius) is mainly used in volcanic areas and used for electricity production. At the moment large scale high and low enthalpy geothermal production and thermal energy storage systems are not a major research topic despite the fact that major clean heat production, energy efficiency and CO_2 reduction could be obtained.

Nuclear energy

Nuclear energy is expected to remain an important source of electricity in Europe.
Mining nuclear material and storage waste residues are main geo-energy issues to be solved in the coming decades. Knowledge about the natural safety barriers or potential migration mechanisms of radio nuclides have to be further developed as well as tools for modeling coupled processes to be able to perform commonly accepted environmental and safety studies. In a specific part of the 6th framework program there is place for nuclear waste storage.

All in all it is clear that much European geo-energy R&D, amongst others funded in the 7th Framework Program, is required to further develop various industrial geo-energy solutions needed for the transition towards a more sustainable energy future.

Ipo Ritsema
ENeRG president 2004

ENeRG – European Network for Research in Geo-Energy

ENeRG president
ENeRG president for 2004 is Drs Ipo Ritsema from the Netherlands Institute of Applied Geoscience TNO – National Geological Survey, Utrecht, the Netherlands.
Contact: i.ritsema@nitg.tno.nl

ENeRG secretariat is run by the Netherlands Institute of Applied Geoscience TNO – National Geological Survey, Utrecht, the Netherlands.
Contact person: Ms Cobie van Duijn <j.vanduijn@nitg.tno.nl>

ENeRG website:http://www.energnet.com
The website is maintained by National Institute of Oceanography and Experimental Geophysics (OGS), Trieste, Italy.
Contact person: Ing Sergio Persoglia <spersoglia@ogs.trieste.it>

ENeRG Newsletter – GEO ENeRGY
The Newsletter is published by the Czech Geological Survey (CGS), Prague, Czech Republic
Editor: Dr. Vít Hladík <hladik@gfb.cz>
Layout: Hana Převrátilová
Computer typesetting: Petr Maděra

Reserves, Resources, and Availability of Energy Resources: 2002

The new energy study from the Federal Institute for Geosciences and Natural Resources (BGR), Hannover, Germany

The non-renewable energy resources crude oil, natural gas, coal and uranium are the predominantly used fuels world-wide. They account for more than 90 % of the global primary energy supply. Despite enormous increases in the proportion of renewable energy resources used in the last several years, non-renewable energy resources will continue to dominate in the coming decades.

In view of the finite amount of non-renewable fuels, the question arises as to how long the different resources will last. The question also arises as to the extent to which the different fuels can be substituted in the medium and long term, particularly in view of the increasing sensitivity of the public to environmental aspects. These problems have been analyzed in the current study, published in March 2003.

Reserves and resources of the individual fuels at the end of 2001 are described for individual countries and regions, as well as globally. Accordingly, reserves at the end of 2001 were at the same level as given in the previous BGR energy study for the end of 1997. However, there is a distinct reduction in the amount of resources (Table 1).

Reserves (i.e. the amount currently technologically and economically recoverable) of non-renewable fuels at the end of 2001 amounted to about 1200 gigatonnes coal equivalents (Gtce) or 35,500 EJ, about the same level as at the end of 1997. The largest increase was for hard coal, due to a sharp increase in Russian reserves; there was a small increase for conventional hydrocarbons. Reserves of non-conventional oil, lignite and of uranium decreased.

Resources (i.e. those amounts either currently technologically and/or economically not recoverable, or geologically indicated ["yet-to-find"]) of non-renewable fuels at the end of 2001 amounted to about 6600 Gtce or 194,000 EJ. This is about 40 % less than 1997 (i.e. about 4400 Gtce or 130,000 EJ less). Like for the reserve amounts, the changes differed for the different fuels. Resource amounts decreased for nearly all of the energy fuels, except for conventional oil.

Coal has the largest reserves and resources of all the non-renewable fuels, with shares of about 55 % and 60 %, respectively.

The static lifetimes – a static picture of a dynamic system of reserves vs. annual production – of the individual fuels are shown in Figure 1. Especially crude oil and natural gas have relatively short static lifetimes. This is particularly the case for the conventional reserves. For both fossil fuels, increasing demand is expected and will even shorten the lifetimes. A longer lifetime can be expected only if non-conventional resources are included.

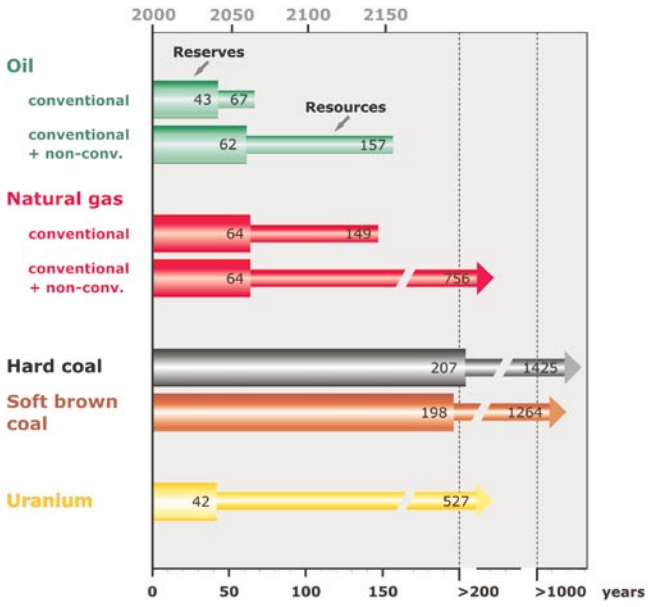

Fig. 1: Static lifetimes of the reserves and resources of the non-renewable fuels

Table 1: Reserves and resources of non-renewable fuels in 1997 and 2001 (in the conventional units for the respective resources)

	Reserves		Resources	
	1997	2001	1997	2001
crude oil	151 Gt	152 Gt	76 Gt	84 Gt
natural gas	153 T.m³	161 T.m³	226 T.m³	217 T.m³
conventional hydrocarbons	272 Gtoe	279 Gtoe	254 Gtoe	255 Gtoe
heavy oil	33 Gt		77 Gt	
oil sands/extra heavy oil	100 Gt	65 Gt	15 Gt	50 Gt
oil shale	1Gt	1 Gt	481 Gt	200 Gt
non-conventional oil	134 Gtoe	66 Gtoe	574 Gtoe	250 Gtoe
tight gas	1 T.m³	1 T.m³	113 T.m³	90 T.m³
coal-bed methane	2 T.m³	1 T.m³	85 T.m³	143 T.m³
aquifer gas	-	-	1500 T.m³	800 T.m³
gas hydrates	-	-	1540 T.m³	500 T.m³
non-conventional gas	~ 3 T.m³	~ 2 T.m³	3237 T.m³	1533 T.m³
non-conventional hydrocarbons	137 Gtoe	68 Gtoe	3131 Gtoe	1716 Gtoe
total hydrocarbons	409 Gtoe	347 Gtoe	3385 Gtoe	1661 Gtoe
hard coal	487 Gtce	603 Gtce	5021 Gtce	3546 Gtce
soft brown coal	71 Gtce	57 Gtce	1089 Gtce	417 Gtce
total coal	558 Gtce	670 Gtce	6110 Gtce	3963 Gtce
uranium	2.32 Mt U[1]	1.57 Mt U[2]	5.94 Mt U[3] 12.36 Mt U[4]	5.67 Mt U[3] 12.52 Mt U[4]
thorium	2.16 Mt Th	2.16 Mt Th	2.35 Mt Th	2.35 Mt Th

totals can differ due to rounding
[1] RAR (reasonably assured resources) recoverable for less than $80/kg U
[2] RAR recoverable for less than $40/kg U
[3] sum of RAR recoverable for $40–$130/kg U plus EAR (estimated additional resources) I + II
[4] speculative resources

The reserves of both hard coal and soft brown coal have static lifetimes of about 200 years. Each has a resource lifetime of more than 1000 years. Both fossil fuels are supposed to receive increasing importance as primary fuels in the coming years, especially for power plants. This depends primarily on successful efforts to develop emission-free power plants, or at least ones with less emissions than at present.

The static lifetimes shown in Figure 1 for uranium reserves and resources (42 years and about 527 years, respectively) are not directly comparable to those of the fossil fuels. Only about 50 % of the annual demand for uranium has been met by mining production. The remaining amount has been covered by the reprocessing of spent fuel rods and weapons uranium, as well as from stockpiles. Weapons uranium and stockpiles will have been exhausted in about 20 years.

The reserve figures given in this study indicate a sufficient supply of nearly all types of energy resources in the medium-term, assuming a stable price structure and moderate increases in consumption. Only crude oil is expected to become short in supply after 2015.

An extended abstract – in German and in English – can be downloaded from http://www.bgr.de/saf_energie/energiestudie_en_2002.pdf

The German version of the energy study (including all data on a CD ROM) is published in the series "Rohstoffwirtschaftliche Länderstudien", Volume XXVIII (ISBN 3-510-95900-0) with "Schweizerbart'sche Verlagsbuchhandlung" (http://www.schweizerbart.de/pubs/series/rohstoffwirtschaftliche-laenderstudien207.html) and can be purchased for € 49,90.

Peter Gerling

ENeRG joins European Energy Foundation

In 2003, ENeRG has become an associate member of the European Energy Foundation (EEF).

The European Energy Foundation is an informal and neutral forum where topical energy related subjects linked to the European Union political dialogue are presented. The purpose of the Foundation is to facilitate the reciprocal exchange of information between parliamentary representatives, members of the European Commission, European civil servants and other authorities and, principally, the industrial and scientific sectors and all other interested parties.

EEF organises, inter alia, meetings, conferences, seminaries, dinner-debates, industrial site visits, and delegation visits to third countries with members of the European Parliament, members and representatives of the European Commission and of other EU institutions, as well as experts from industries, associations and organisations involved in the energy sectors.

Recent interesting events organised by EEF:

- 15 October 2003 – a dinner-debate on the topic "The Big-Bang: Energy and EU Enlargement"
- 22 October 2003 – a dinner-debate on Reduction of CO2 Emissions by Underground Sequestration
- 20 January 2004 – a dinner-debate on Combining Ecology & Economy Challenges for Combined Heat and Power/ District Heating Companies in the New EU Countries
- 18 February 2004 – a seminar and dinner-debate on Energy Regulation and Investment in the New Member States
- 24 February 2004 – a dinner-debate on The Role of Research in the Oil and Gas Sector – Ensuring Security of Supply and Sustainable Development

Information source:
EEF website
<http://www.f-e-e.org>

Introduction of New ENeRG Members

Czech Geological Survey (Czech Republic)
http://www.geology.cz
Czech Geological Survey (CGS) is a state research institute supervised by the Ministry of Environment of the Czech Republic. Its main areas of interest include geological research and mapping, environment and pollution, mineral resources and mining impact, prevention of natural risks and management and delivery of geodata.
Geo-energy related activities of CGS embrace, among others, regional raw material policies, coal bed methane studies, environmental mining impact assessment, national high level radioactive waste repository development, geothermal energy studies, remedial activities for old environmental loads connected with mining activity, etc.
Contact person: Dr. Vít Hladík <hladik@gfb.cz>

Dionyz Stur State Geological Institute (Slovak Republic)
http://www.gssr.sk
Dionyz Stur State Geological Institute guarantees geological research and exploration of the territory of the Slovak Republic and creation of information system in geology, collects, registers and makes available the results of geological works carried out within the Slovak Republic, administers functions as a central geological library, edition and sale of maps and professional geological publications.
Dionyz Stur State Geological Institute tacks to the tradition of former State Geological Institute, which was established in 1940 (later Slovak Central Geological Institute, Dionyz Stur Institute of Geology). The Institute represents an independent contributory organisation of the Ministry of the Environment of the Slovak Republic.
Contact person: Dr. Ludovit Kucharic <kucharic@gssr.sk>

GeoEcoMar (Romania)
http://www.geoecomar.ro
The National Institute of Marine Geology and Geo-ecology, GeoEcoMar, is a governmental research-development institution, co-ordinated by the Ministry of Education and Research. Its scientific departments are: Marine Geology and Sedimentology, Seismo-acoustics and Physics of the Sea, Marine Gravity and Magnetic, Marine Geo-ecology and Biogeochemistry as well as GIS and Databases Group.
The scientific activity of the GeoEcoMar is directed at geo-ecological studies of the macrogeosystem River Danube – Danube Delta – Coastal Zone – Black Sea, geological and geophysical survey of the Black Sea (mainly of the Romanian continental shelf), land-sea interactions in the Coastal Zone and its integrated management as well as studies, technical assistance and consulting for littoral and offshore marine engineering, industrial and environmental impact studies.
Contact person: Dr. Constantin S. Sava <savac@fx.ro>

Geological Exploration Research and Design Center (Romania)
http://www.petrom.ro/engleza/en_cercetare.htm
The Geological Exploration Research and Design Center (CCPEG) is managed by the Exploration Division of Petrom S.A. During its long activity of near 50 years, developed under various names and organization forms, the CCPEG provided geological substantiations and designing of the whole amount of hydrocarbon exploration activities performed throughout Romania.
The CCPEG activity directly supports PETROM S.A. oil and gas exploration programs, e.g. in form of integrated geological studies, interpretation of seismic and well-logging data, complex analyses on field samples and fluids, risk analyses, consulting, etc.
Contact person:
Dr. Vasile Sindilar
<vasindilar@yahoo.com>

"Sabba S. Stefanescu" Institute of Geodynamics of the Romanian Academy (Romania)
http://sabba.geodin.ro/~prezentare
The „Sabba S. Stefanescu" Institute of Geodynamics of the Romanian Academy (IG"SSS"AR), founded in 1990, continues the tradition of the Geophysical Research Centre of the Romanian Academy started in 1961.
Since its foundation, the IG"SSS"AR focused its interest on fundamental research imposed by the tasks implied by the Priority Program of the Romanian Academy "Complex geophysical research in geodynamically active areas concerning especially the Vrancea seismogenic area".
This Program concerns e.g. earthquakes, crustal deformations monitoring, tectonic hazard studies, etc.
Contact person:
Dr. Crisan Demetrescu
<crisan@geodin.ro>

Sofia University "St. Kliment Ohridski" (Bulgaria)
http://www.uni-sofia.bg
For details see GEO ENeRGY country profile of Bulgaria on page 4.
Contact person: Prof. Georgi V. Georgiev <gigeor@gea.uni-sofia.bg>

University of Zagreb – Faculty of Mining, Geology and Petroleum Engineering (Croatia)
http://www.rgn.hr
Apart from the primary activity in high education, the staff is engaged in exploration funded by government (25 active projects) and in various expert tasks for commercial investors. This is a wide range of activities related to the three principal fields – mining & geotechnics (blasting, soil and rock mechanics, mine room completion, open pit exploitation etc.), geology (industrial minerals, petrography, structure geology, petroleum geology, engineering geology, hydrogeology etc.) and petroleum engineering (drilling, well fluids, reservoir management, production of HC's and geothermal water, gas management, safety techniques etc.).
Contact person: Prof. Bruno Saftic <bsaft@rgn.hr>

GEO ENeRGY country profile – Bulgaria

ENeRG member: Sofia University "St. Kliment Ohridski" – Department of Geology
The Sofia University "St. Kliment Ohridski" is the largest and most prestigious educational and scientific centre in Bulgaria. The main university building (Rectorat) is a spectacular architectural sight, listed as a monument of culture in the register of UNESCO. At present, the University consists of 16 Faculties and offers 70 degree subjects. More than 15 000 students are enrolled for full-time study, 1300 of them from abroad.

The Sofia University started in 1888 as the first Higher School in Bulgaria with a single Historical-Philological department. During the following years, the structure was enlarged with the faculties of Physics and Mathematics, Law, Medicine, Theology, Veterinary Science and Agronomy. Teaching of Geology began in 1891. In 1904, departments of Geology and Palaeontology and of Mineralogy and Petrography were established.

The present Faculty of Geology and Geography has existed since 1963. The number of undergraduates during the last years is about 700, from which about 120 study Geology. Currently, the education in Geology takes place in two departments: Dept. of Geology and Palaeontology and Dept. of Mineralogy, Petrology and Economic Geology.

The Petroleum & Coal geology section (now part of Dept. of Geology and Palaeontology) existed as a separate department for a long time (since 1955 up to 1992), and solved or coordinated almost all research focused on petroleum & coal problems. Presently, this section is continuing to be of national importance in geo-energy research and strategy, working in good coordination with many government, research and industry (state and private) institutions and companies. The staffs participate in number of national and European projects and programs (as PTP, IGSP, EUROPROBE, MEBE), as well as in various expert tasks for commercial investors.

Other institutions:
Besides the Sofia University, the Mining & Geology University (Sofia) and Bulgarian Academy of Sciences – Geological and Economics Institutes are the main Bulgarian institutions engaged in geo-energy oriented research. On the governmental level, Ministry of Energy, Geology Agency in Ministry of Environment and Water and National Energy commission should be mentioned. Oil & Gas Exploration & Production Co. – Pleven (OGEP), Bulgargas – Sofia (enterprise for gas supply, transport and distribution) and the private company Overgas (construction of public gas-supplying system) represent the industry in the geo-energy branch.

Main present activities in the field of geo-energy:
- continuing of oil & gas exploration in Bulgaria by Bulgarian OGEP Co. and several foreign companies (after 1990 a few new oil & gas discoveries onshore and offshore have been made)
- development of newly discovered oil & gas fields and putting them into exploitation
- production of oil, gas and coal from national fields
- national gas supply from Russia and Ukraine and transit through the national gas-pipeline system to Turkey, Greece and Macedonia;
- construction of some new strategic pipelines for export of Caspian oil (Burgas – Alexandropolis or Burgas – Flore) and for gas transit from the Iran region through Turkey to Europe
- effective exploitation and enlargement of existing Tchiren gas-storage and preparing for construction of new ones
- enlargement of public gas-supplying system in Bulgaria

Important energy problems of the country:
- partial privatization of the state energy sector
- the future of the Bulgarian nuclear power station Kozloduj
- quick modification and equalization of national energy legal base in conformity with European standards
- complete acceptation of national geo-energy strategy

Georgi Georgiev

The ENeRG Network

Country representatives

AUSTRIA
Prof Karl Millahn
University Leoben
karl.millahn@unileoben.ac.at

BULGARIA
Prof Georgi V. Georgiev
Sofia University
gigeor@gea.uni-sofia.bg

CROATIA
Prof Bruno Saftic
University of Zagreb
bsaft@rgn.hr

CZECH REPUBLIC
Dr Vit Hladik
Czech Geological Survey (CGS)
hladik@gfb.cz

DENMARK
Niels Peter Christensen
Geological Survey of Denmark and Greenland (GEUS)
npc@geus.dk

ESTONIA
Dr Alla Shogenova
Tallinn Technical University
alla@gi.ee

EUROPEAN COMMISSION
Dr Jan Erik Hanssen
jan-erik.hanssen@cec.eu.int

FRANCE
Georges D. Mosditchian
Institut Francais du Petrole (IFP)
georges.mosditchian@ifp.fr

GERMANY
Dr J. Peter Gerling
Federal Institute for Geosciences & Natural Resources (BGR)
peter.gerling@bgr.de

GREECE
Dr George H. Hatziyannis
Institute of Geology & Mineral Exploration (IGME)
ghatziyannis@igme.gr

HUNGARY
Endre Hegedüs
Eötvös Lorand Geophysical Institute (ELGI)
hegedus@elgi.hu

IRELAND
Prof John J. Walsh
University College Dublin (UCD)
john@fag.ucd.ie

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

THE NETHERLANDS
Drs Ipo L. Ritsema
Netherlands Institute of Applied Geoscience TNO – National Geological Survey
i.ritsema@nitg.tno.nl

NORWAY
Prof Jan-Erik Karlsen
RF – Rogaland Research
jan-erik.karlsen@rf.no

PORTUGAL
Joao T. Pacheco
Geological and Mining Institute of Portugal (IGM)
Joao.Pacheco@gpep.min-economia.pt

ROMANIA
Dr Constantin S. Sava
National Institute for Marine Geology and Geoecology – GeoEcoMar
savac@fx.ro

SERBIA AND MONTENEGRO
Prof Miroslav Starcevic
University of Belgrade
stari@EUnet.yu

SLOVAKIA
Dr Ludovit Kucharic
Dionyz Stur State Geological Institute
kucharic@gssr.sk

SLOVENIA
Dr Zeljko Vukelic
University of Ljubljana
zeljko.vukelic@uni-lj.si

SPAIN
Prof Guillermo Montes Canete
Instituto Superior de la Energia
gmontesc@repsol.ypf.com

UK
Prof Patrick Corbett
Heriot-Watt University
patrick.corbett@pet.hw.ac.uk

Other members

ARMINES (France)
British Geological Survey (UK)
Chalmers University of Technology (Sweden)
Christian-Albrechts-University Kiel (Germany)
ENERGI E2 A/S (Denmark)
EniTecnologie (Italy)
Flemish Institute for Technological Research – VITO (Belgium)
Freie Universität Berlin (Germany)
Gasunie Trade & Supply (The Netherlands)
Geoinzeniring d.o.o. (Slovenia)
Groupement Europeen de Recherches Technologiques sur les Hydrocarbures – GERTH (France)
Hellenic Petroleum S.A. (Greece)
Hungarian Geological Survey (Hungary)
KEANE Offshore Integrity Ltd. (Ireland)
National Observatory of Athens (Greece)
National Technical University of Athens (Greece)
NIS-Naftagas (Serbia and Montenegro)
Odegaard A/S (Denmark)
PETROM – Geological Exploration Research and Design Center (Romania)
Politecnico di Milano (Italy)
Przedsiebiorstwo Badan Geofizycznych – PBG (Poland)
Premogovnik Velenje d.d. (Slovenia)
Robert Gordon University (UK)
Romanian Academy – „Sabba S. Stefanescu" Institute of Geodynamics (Romania)
RTH – Rudnik Trbovlje-Hrastnik d.o.o. (Slovenia)
Technical University Clausthal (Germany)
Technical University of Denmark (Denmark)
University of Aberdeen (UK)
University of Durham (UK)
University of Milano (Italy)
University of Patras (Greece)
University of Porto (Portugal)
University of Trieste (Italy)
Vrije University Amsterdam (The Netherlands)