

N°4 – October 2006

Editorial - Strasbourg workshop	1
Happy Birthday ENGINE	3
Geothermal Resources Council annual meeting	3
International dimension of the co-ordination action	4
Next ENGINE meetings	6
Potsdam workshop flyer	7

<http://engine.brgm.fr>

Editorial - Strasbourg workshop

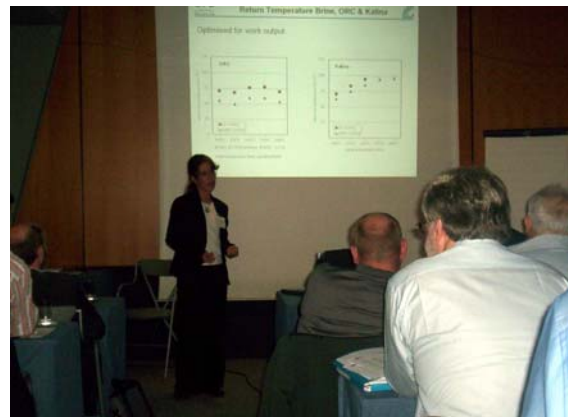
Workshop 5 of the ENGINE project dealing with "Electricity generation from Enhanced Geothermal Systems" was hosted from 14th to 16th of September 2006 in the charming quarter "La Petite France" in Strasbourg, France where 56 participants coming from 15 countries could be welcomed. Thereof 18 ENGINE representatives from a dozen partner organisations (more than one third of the overall partners) were sent to present and debate with numerous external participants (38) mostly coming from industry and private companies (34).



Industry and academic participants.

20 presentations were given and various debates conducted based on openness, courtesy and also conciseness. Apart from this general convenient understanding in discussing also sharpness demanding mutual information exchange and insisting on accurate phrasing came up at times. The driving force for all participants however was clear:

geothermal power production from low enthalpy resources – and hence average geological conditions - needs to be carried on in order to make the huge geothermal potential within Europe accessible.



Thermodynamics is the key for electricity generation from EGS.

Based on this fact the main conclusions of the workshop - more detailed information as well as all presentations are provided on the [website](#) - can be summarized as follows:

- Power plant optimisation was so far mainly thought to be a question of thermodynamics. But regarding geothermal projects this is only one part of the whole picture, in which technical and economic aspects as well as the site specific frame conditions need to be included in order to provide high availability and economic feasible plants. Therefore the simple discussion about the

pros and cons of ORC vs. Kalina cycle, of air vs. water cooling, of axial vs. radial turbines, of fancy vs. proven technology and of power vs. CHP in terms of a further development of geothermal energy use will not lead to any results.

- However, geothermal electricity production from low enthalpy resources is still a young technology and needs further technical development also regarding a power plant technology not being trivial at such low temperature levels. But new and innovative technology is always connected with technical and financial risks. Before being able to break into the market these technologies need to be proven which is generally not possible on a purely commercial basis. Here the government is asked to support the market access of such new and innovative technologies which are definitely needed for further establishing geothermal electricity production in Europe.
- Another approach to promote geothermal electricity production from low enthalpy resources - and also evidence that promoting geothermal energy use needs open minded project developing - was stated as combination with other energy sources. New concepts of combining different energies supplying heat on different temperature levels can result in a higher overall profitability and hence be decisive for realising geothermal based electricity production.

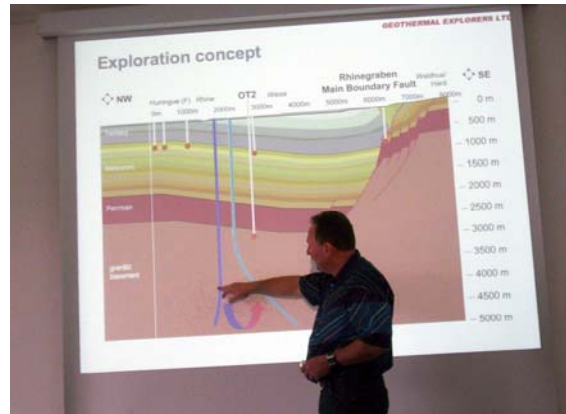
Talking about electricity production from geothermal energy is therefore perfectly fitting into the vast debates about energy which the whole world is dealing with. Workshop 5 of the ENGINE project has certainly made an important contribution.



The group at the Basel drill site.

After the Strasbourg Engine workshop, 11 scientists have visited the Basel drilling site in

Switzerland which is operated by Geopower Basel AG. Dr. Markus Häring from Geothermal Explorer made an overview of the main goals and expected achievements from this EGS drilling located in the Southern part of the Rhine graben. This site is located within an industrial part of the city of Basel. The energy concept of this project is quite challenging because it is the first EGS project derived from crystalline rocks aiming to produce both electricity and heat, combined with a gas turbine within an area densely urbanised.



Markus Häring from Geothermal Explorer presenting the EGS Basel project.

During the exploration phase (2006 to 2007), two deep bore holes will be drilled to a depth of 5,000 metres at the Kleinhüningen site. The projected pilot plant is designed for a capacity of 6 MW electrical power and 17 MW heat. This would make it possible to cover the heating requirements of 2,700 and the power requirements of 10,000 households of average size. It is technically and economical sensible to support the transformation of geothermal energy into electrical power and heat using a gas turbine. This would enable an increase of the electrical power generating capacity to a total of 14 MW. The total costs for the project in Basel amount to about CHF 108 million. Additional costs of CHF 10 million would be incurred for the natural gas turbine (<http://www.geopowerbasel.ch>).

Geopower Basel AG was established in February 2004 to advance the preparatory work for the Deep Heat Mining project in Basel. It will build and operate the power and heat generation plant. The founding members are IWB, EBL, GVM AG, and Geothermal Explorers Ltd. In the meantime, three additional Swiss energy providers, Axpo, ewz, and AET, as well as the German company Energiedienst AG have joined the venture.

Happy Birthday ENGINE

ENGINE was born 1 year ago in Potsdam, Germany, during its kick-off meeting on the 10th of November 2005.

The management team wishes a happy birthday to every ENGINE partner and related.

After one year of activity, BRGM will ask soon to each partners and workpackage leaders some information for the periodic activity report and the periodic management report which includes a detailed justification of the costs and resources deployment by each contractor.

Geothermal Resources Council annual meeting

San Diego, CA, USA, 11-13 September 2006

The ENGINE Coordination Action has been presented during the Geothermal Research Council 2006 ([ENGINE in GRC](#)). The GRC meeting has been attended by more than 300 participants. Exploration of new resources and assessment of geothermal fields have been among the most successful sessions (sessions The Americas, Basin and Range, Coso, Exploration, International, Resource assessment, Resource characterization, Salton trough). Thus, teams from US have presented a lot of multidisciplinary works of great interest concerning resources from Western US while teams from Central America focused their talks and posters about assessment and extension of the exploited geothermal fields (Mexico, Costa Rica, El Salvador...).



Prof. Alexander Kalina (here at Husavik, Iceland) attended the GRC 2006.

A special session was dedicated to Enhanced Geothermal Systems and the closure session was named "EGS feasibility panel". This last session has been well attended and constituted an important moment of this GRC meeting. A MIT-led interdisciplinary panel, chaired by J. Tester, has presented an assessment of the future of geothermal energy and its impact on the United States in the 21st Century. This panel, chaired by J. Tester, Professor of Chemical Engineering at the Massachusetts Institute of Technology, is

composed of 18 members and associates and was sponsored by the US Department of Energy. The objective of this work, which started in September 2005, was to evaluate the technical and economic feasibility of EGS becoming a major supplier of primary energy for US base-load generation capacity by 2050. A summary report, including the synopsis and executive summary, has been distributed and presents the table of contents for the remaining chapters of the full report that is currently under press. The findings can be summarized as follows:

- EGS is one of the few renewable energies that can provide continuous base-load power with minimal visual and environmental impact;
- The resource is vast and contained in a continuum of grades from today's hydrothermal systems through high- and mid-grade EGS resources to conduction-dominated contributions in basements and sedimentary basins;
- Ongoing work on both hydrothermal and EGS resource development complement each other;
- Experiments since 1970, of which Soultz is the most outstanding, have shown that EGS is technically feasible in terms of producing net thermal energy by circulating water through stimulated regions of rock at a depth ranging from 3 to 5 km;
- If US field demonstrations for EGS have been constrained by external issues, the situation in Europe and Australia provides a more favourable climate for the development of new experiments;
- Research, development and demonstration could greatly enhance the overall competitiveness of EGS especially for drilling, power conversion and reservoir technologies;
- EGS systems could provide thousands of MWe of base-load capacity and be

easily deployed in larger-scale district heating and combined heat and power application;

- Geothermal recovery from existing oil and gas operations has wide application with relatively low risk and could generate more than 11GWe;
- A cumulative capacity of more than 100,000 MWe from EGS can be achieved in the United States within 50 years with a modest investment in R&D, evaluated at 300 to 400 M\$ over 15 years, in several field projects.

The panel specifically recommends that:

- There should be a federal commitment to supporting EGS resource characterization and assessment;
- High-grade EGS should be developed first at targets of opportunity on the margins of existing hydrothermal systems or in oil fields with high temperature water and abundant data;

- Demonstration of the repeatability and universality of EGS technologies in a number of sites in different geologic environments is needed to reduce risk and uncertainties;
- Like all new energy-supply technologies, EGS will have to benefit from policies similar to those that oil and gas and other mineral-extraction operations have received in the past. The success of this approach would parallel the development of the US coal-bed methane industry.
- The United States should actively participate in ongoing international field projects, such as the EU project at Soultz in France and the Cooper base project in Australia.
- A commitment should be made to continue to update economic analyses as EGS technology improves with field testing and EGS should be included in the National Energy Modelling System portfolio.

International dimension of the co-ordination action

The ENGINE (ENhanced Geothermal Innovative Network for Europe) co-ordination action is approaching the end of its first year of existence. Its objectives were initially focused on strengthening the European geothermal community by restoring political support and defining spin-off projects. The development of links with international funding agencies and associations was also mentioned as a secondary objective. In this context, ENGINE has taken several initiatives:

- The European Community has offered possibilities to associate new partners from third countries with ongoing projects through INCO (International cooperation). This opportunity has been successfully taken up by inviting research institutes and private firms that have experience in stimulation of natural or provoked reservoirs in geothermal fields to join the consortium. This will be the case for Filtech Energy Drilling Corporation (Philippines), Instituto de Investigaciones Eléctrica (IIE, Mexico), Centro de Investigación Científica y Educación Superior de Ensenada (CICESE, Mexico), and LaGeo S.A. de C.V. (El Salvador) after negotiations before 13 October.
- The Executive Group is presently developing links with international

agencies. Thus, L. Rybach, C. Fouillac and the co-ordinator have intended an action, supported by the President of the BRGM, P. Vesseron, to facilitate the adhesion of France to the International Energy Agency-Geothermal Implementing Agreement (IEA-GIA) and to nominate the co-ordinator of the ENGINE project as France's Representative within this committee. The request is presently being processed by the ministry and a positive reply is expected within the next few weeks. The co-ordinator has already participated in the IEA-GIA's Executive Committee meeting in Paris (March 2006) and in San Diego (September 2006).

- ENGINE was presented at the Geothermal Research Council 2006 Annual Meeting. A session dedicated to EGS feasibility was chaired by J. Tester, president of a MIT-led interdisciplinary panel (see summary in Annex 2). Among others, it is recommended that the US should actively participate in ongoing international field projects, such as the EU project at Soultz (France). Taking this opportunity, the co-ordinator has proposed to the chairman a presentation of the main findings and

recommendations during the ENGINE mid-term conference in January 2007.

- Each ENGINE meeting attracts participants that are not officially members of the network, some of them from non European countries. Thus, the second workshop, held in Strasbourg (14-16 September 2006) gathered together more than 56 participants, representing 15 countries. One of the particular aspects of this meeting was the participation of 10 private companies that are not ENGINE partners, but who wanted to benefit from the audience provided by the co-ordination action to present their results and projects. Such a meeting constitutes an exceptional opportunity to develop new contacts with industry and stakeholders that are concerned by the scope of the project.

It can be considered that these initiatives, along with the information system of the project and the actions of the Executive Group and Steering Committee, have already made the ENGINE project visible and sparked at least the interest of the international community.

Following these remarks, several major trends can be identified:

- **The feasibility of the exploitation of the geothermal resource.** Development of the thermal resource of the Earth, especially in Europe, relies on the sound scientific and technical knowledge that has been acquired during the 20th century, ranging from the first production of electricity in Italy to the exploitation of shallow aquifers in the Paris basin. Conventional geothermal energy still benefits from ongoing technological improvements in conversion and heat distribution and should, therefore, become increasingly cost-effective because of the inevitable rise in energy prices and new environmental constraints. The diversity of developments worldwide is a very strong argument, as it provides numerous case histories that can be used for attracting investors.
- **The need for long-term collaborative research on international projects to develop**

Enhanced Geothermal Systems. The community is aware that the development of geothermal energy requires, in addition to short-term projects, medium-to-long-term projects concerning Enhanced Geothermal Systems, including extended active geothermal systems and geothermal recovery from existing oil and gas operations that has a wide application with a relatively low-risk. EGS development requires the mobilisation of the international community. The Soultz experiment is considered as the international reference by Australian investors and by American scientists, for whom EGS is one of the few renewable energies that can provide continuous base-load power. Furthermore, the extension of existing geothermal fields in Italy, Mexico, Costa Rica and El Salvador is considered a priority issue by these countries. The co-ordination of these short- and long-term projects requires a well organised scientific community at international level.

- **The need for restored 'political' support.** The valorisation of existing knowledge and know-how, the development of renewable energies in a new economic and environmental context and the definition of ambitious projects are essential for the development of geothermal energy and for restoring political support. This conviction is shared by a very large scientific community and the ENGINE co-ordination action, along with other initiatives such as the working groups of the European Commission, IEA-GIA, MIT or the International Geothermal Agency and EGEC, are striving to increase the audience and impact of geothermal energy. Thus, one of ENGINE's major objectives is now to contribute to the construction of an international strategy for promoting Geothermal Energy by consolidating the available information systems and proposing spin-off projects that will receive the support of stakeholders, decision makers and private investors.

Next ENGINE meetings

[Potsdam, workshop 1, 6-8/11/2006](#)

Deadline for registration: 27/10/2006

The workshop on "Defining, exploring, imaging and assessing reservoirs for potential heat exchange" will be held at the GeoForschungs Zentrum in Potsdam, Germany on the

6th and 7th of November, followed by a field trip to the drill site for the geothermal well Groß-Schönebeck 4 North of Berlin on Wednesday the 8th of November.

The workshop is planned as a forum for discussion, with mainly poster presentations and only few invited speakers on specific topics.

These topics range from basic scientific questions on the signature of temperature field for defining and exploring potential geothermal reservoirs to state of the art in exploration, monitoring of processes occurring in geothermal reservoirs, and national databases on geothermal potential. Experts from academia and industry will contribute both through talks and posters.



Potsdam, Sanssouci Palace and Terraces.



Drilling at Groß-Schönebeck 4.

Logistics information:

- Registration is mandatory to attend the workshop. [Online registration](#) is available on [the workshop pages](#). Deadline for registration: 27/10/2006.
- Travel to GeoForschungsZentrum Potsdam is explained in detail on their [website](#).
- The accommodation has to be managed by every participant. Feel free to contact the [Potsdam Tourist Office](#).

The programme of the Potsdam workshop is on the next pages.

[Mid-Term Conference, Potsdam, 11-13/01/2007](#)

ENGINE partners will convene for the mid-term conference at Potsdam, Germany.

The location of the conference will be the campus of [GeoForschungsZentrum Potsdam](#). The conference will give an opportunity to summarise what we have learned and discussed at the first workshops and what we have accomplished in the individual workpackages of the project so far.

There will be plenty of opportunity to discuss the further direction of the project as well as future options in research.

The conference will also provide the first opportunity for most partners to meet the new members of the consortium from outside Europe, which joined the project through the EU's INCO programme for targeted third countries.

The backdrop for this meeting is the historic city of [Potsdam](#) with its magnificent palaces and parks close to Germany's capital Berlin.

More information will be available soon on the [Mid-Term Conference Web pages](#).



ENGINE

Enhanced Geothermal Innovative
Network
For Europe
<http://engine.brgm.fr>

Workshop 1

***Defining, exploring,
imaging and
assessing
reservoirs for
potential heat
exchange***

**November 6th – 8th 2006
Potsdam, Germany**

BACKGROUND

The workshop is organised within the framework of the BMU geothermal Advisory Board and the EU ENGINE-project

AIM OF THE WORKSHOP

The aim of the workshop is to discuss the definition and to establish the state of the art in exploration, imaging and assessment of geothermal reservoirs. Experts from both academia and industry will meet to define what future directions in research and development are required in the areas discussed at the workshop.

To give room and time for intensive discussion, the emphasis of the workshop will be on poster presentations. Each thematic session will be introduced by two introductory talks, followed by short “commercials” (3 minutes) for posters associated with the session. A general discussion will mark the end of each session.

PROVISIONAL PROGRAMME

**Monday, November 6th 2006
Sessions I and II**

9:00 a.m. – 1:00 p.m.

Session I “Signatures of temperature field for defining and exploring potential geothermal reservoirs”

➤ Keynote addresses

1. A. Förster et al. (GFZ): Temperature and heat flow techniques in exploration ...
2. K. Schulmann (U. Strasbourg): Variscan belt: new model for lithological and thermal ...

➤ Poster presentations

➤ Discussion

Lunch

2:00 – 6:00 p.m.

Session II “Signatures of fluid transport in Earth's crust”

➤ Keynote addresses

1. J. Faulds (U. Nevada): Geologic and geophysical analyses of geothermal fields in USA ...
2. A. Gudmundsson (U. Göttingen): Mechanical behaviour, natural permeability and ...

➤ Posters presentations

➤ Discussion

8:00 Dinner

Tuesday, November 7th 2006
Sessions III and IV

9:00 a.m. – 1:00 p.m.

Session III “State of the Art in the exploration of potential geothermal reservoirs”

➤ Keynote addresses

1. A. Fiordelisi (ENEL): State of the art in geothermal exploration in Italy
2. M. Weber (GFZ): First results from the IGET project on integrated geophysical exploration.

- Poster presentations
➤ Discussion

Lunch

2:00 – 5:00 p.m.

Session IV “Processes in geothermal reservoirs”

➤ Keynote addresses

➤ Poster presentations

1. S. Oates (Shell): Microseismic monitoring of hydraulic stimulation ...
2. P. Johannessen (GEUS): Reservoir characterization of hydrocarbon bearing ...

- Poster presentations
➤ Discussion

5:30 – 7:00 p.m. **Steering Committee Meeting (perhaps next day)**

Wednesday, November 8th 2006

9:00 a.m. – 2:00 p.m.

Site visit Groß Schönebeck (optional)

- (site visit schedule)

Place

GeoForschungsZentrum Potsdam (GFZ)
14473 Potsdam, Telegrafenberg,
Germany
Room: Building H, conference rooms

Registration

For registration please use online registration fom at
<http://conferences-engine.brgm.fr/confRegistrationFormDisplay.py/display?confId=1>

Registration deadline: 27th October 2006

Contact

David Bruhn
Tel.: +49-331-2881374
email: dbruhn@gfz-potsdam.de

Adele Manzella
Tel.: +39 050-3152392
email: manzella@igg.cnr.it
www.igg.cnr.it