

**N°6 – March 2007**

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<http://engine.brgm.fr>

## Editorial – Mid-Term Conference at Potsdam

The main objective of the ENGINE Co-ordination Action (ENhanced Geothermal Innovative Network for Europe) is to co-ordinate present research and development initiatives for Enhanced Geothermal Systems, ranging from the resource investigation and assessment stage through to exploitation monitoring. From the very beginning, the focus has been on the organisation of high quality meetings. By mid-term, the project has organised 2 conferences and 3 specialised workshops, following what was defined in the work plan. In this context, the mid-term conference was hosted by the GeoForschungsZentrum Potsdam (GFZ), and held in the buildings of the GFZ from 9-12 January, 2007 organized by BRGM France

and GFZ Potsdam. The focus of the conference was to bring together European partners active for the environmentally friendly exploitation and use of geothermal resources. The conference, which was attended by about 130 experts from 28 countries, was an important forum in geothermal research for the communication and exchange of information and experience between experts from academia, industry and policy makers. It provided the opportunity to present recent developments in the environmental-friendly exploitation and utilization of geothermal resources and allowed participants to meet with experts from around the world who have a shared interest in the promotion of geothermal energy.



Family photo at the Mid-Term Conference.

This conference also marked a new step in the development of the Co-ordination Action as the new partners from Targeted Third Countries, from Philippines, Mexico and Salvador, broaden the international impact of the project and brought, through their expertise, critical information and practices that complement what is available in Europe.

While the priority is given to promotion of experiences and discussion during the

specialised workshops, the mid-term conference has been designed in order to present preliminary synthesis on the main topics of interest of the project. Thus, the conference included the presentation of the current status of geothermal technology world wide and the definition of future research requirements such as cost reduction, productivity increase and efficiency in the development and use of geothermal resources.

After one year, this goal has been achieved and materials available on the web site already show the work that has been completed. This is the case of the articles concerning [Electricity generation from Enhanced Geothermal System](#) by L. Le Bel and M. Kaltschmitt, [Environmental impacts by the use of geothermal energy](#) by S. Frick and M. Kaltschmitt, [Stimulation of reservoir and microseismicity](#) by E. Huenges and T. Kohl, [Defining, exploring, imaging and assessing reservoirs for potential heat exchange](#) by D. Bruhn and A. Manzella and [The ENGINE information system birthday](#) by P. Calcagno. Studies and analysis performed during and between the workshops will continue during the second year of the project while group of experts will start to prepare the different chapters of the Best Practice Handbook.



ENGINE Project Officer J. Schuppers insisted on the role of the expert groups.

A major input has been given during this conference by the Project Officer, J. Schuppers. Presenting [Geothermal energy R&D in the 7th framework programme](#), he has insisted on the fact that expert groups will have to establish priorities in research themes that will be recommended by ENGINE, by quantifying the innovative character of each EGS technology to be developed.

The ultimate goal of the conference was to strive for an increased utilization of geothermal energy in Europe and the initiation of joint future research activities. In this respect, cooperation between countries already advanced in the exploitation of geothermal energy with nations who are still at the beginning of geothermal energy development plays an essential role. Countries with particularly favourable geological conditions such as Italy or Iceland, with their steep temperature gradients in many regions have already a lot of expertise in the use of geothermal energy and profit from low risk and costs. Such countries are, thus, in a much better geological situation than for example Germany or Poland which are - in most regions

-distinguished by normal geothermal gradients. However, the exploitation of geothermal energy from low-enthalpy resources is of particular importance as it will open -literally and in the figurative sense - new horizons in the application of this renewable energy.

There is a noticeable increase in interest from industry in geothermal energy. ENGINE Coordination Action is an opportunity to establish contacts with private firms and other authorities either already involved in geothermal energy, or possibly interested in the near future. Therefore, a committee has been established in order to enhance links between R&D teams and stakeholders. The first meeting of this committee with the Steering Committee and the Executive Group has been held during the Mid-Term Conference. It has been stated that there is a need to show what geothermal energy is now and that there are new attractive practises. For that, as for promoting new projects, it is fundamental to collect and synthesise the existing knowledge. Thus, although it is necessary to define an ambitious strategy for the next decades and to promote new demonstration projects at the scale of Europe, the Coordination Action remains first a scientific exchange platform for promoting past and on-going experiences by making them visible and reproducible. Through such stakeholder committee, ENGINE could also become a "political" platform by contributing to establish a lobby group that will have the technical and economic background to propose and support new projects. One possible objective of such a "political" platform could be the building of an industrial and public European consortium defining an ambitious strategy for 2030 and proposing shared-risk projects at the scale of the continent. The proposal to evaluate the potential of former oil and gas field, presented in the synthesis of the MIT expert panel dedicated to the future of EGS in USA, could also be one way to limit the risk and start new demonstration projects.



Welcome from Ernst Huenges at the gala dinner at Mövenpick.

# From the state of the art towards the expert phase in the workpackages

## ***Introduction***

The expert phase of the ENGINE Coordination Action has started during the mid-term conference. According to the Document Work, this synthesis phase corresponds to an expertise strategy for defining the best practices and priorities for research investment. The expert groups of work packages 6, 7, 8 and 9 will perform specific studies and strengthen links between the geothermal community and financial and political institutions. The Steering Committee has agreed on a first list of expert that will be

submitted for approval to the Executive Group within the next weeks. The integration phase, i.e. the bottom-up and federative strategy aimed at providing an updated framework of activities and developing motivation within the scientific and technical community will of course continue during the second year and will be marked by 4 specialised workshops. The ability of ENGINE to reach its objectives will be particularly linked to the fit and complementarities between the integration and synthesis phases.

## ***Investigation on UGS and EGS (WP3 & WP6)***

In the first phase of the ENGINE CA (integration) the activity performed in WP3 had mainly focused on providing an updated framework of activities and know-how concerning geothermal exploration. This activity took the form of exchange of documents among the partners; partner's expertise and Institutions facilities were collected and will contribute to the preparation of inventories which will be delivered at the end of 2007. Two inventories are foreseen: one for collecting information concerning database, maps and models on heat in the upper crust, and another related to geothermal exploration facilities among Engine partners/collaborators. During Workshop 1 "Defining, exploring, imaging and assessing reservoirs for potential heat exchange", held in Potsdam on November 2006, all parameters that should be known before drilling for exploitation of potential geothermal reservoirs were discussed. The workshop was strongly focused on debates about the definition of targets, characterization of reservoirs and optimization of investigation methodology for EGS. Following the workshop, it was stated that heat, temperature, stress and pathways as well as chemical and mineralogical composition of rocks hosting the geothermal system are besides the structural inventory of the subsurface the key elements that could be put as priority for research needs. Exploration Methodological Reviews were presented during the Mid-Term Conference in Potsdam on January 2007, while Review Articles will be prepared during this year

regarding "Mechanical behavior of the upper crust and knowledge on European lithosphere / exploration of EGS", "Exploring different types of geothermal reservoir", and "Technological challenge of the investigation phase". The activities performed during the Integration Phase will contribute to the Synthesis Phase, i.e. to WP6, whose main objectives are: 1) to evaluate the most pertinent methods for resource investigation of UGR and EGS using information collected during the integration phase; 2) to realize generic studies for these resources in contrasting geo-environments in Europe; 3) to write chapters 1a and 1b of the Best Practice Handbook for defining innovative concepts for investigating geothermal resources (incl. generic studies) and 4) to contribute to the "European Reference Manual for the development of UGR and EGS. In order to perform this task, an Expert Group will be established, limited to less than 10 participants chaired by T. Kohl (GEOWATT, Switzerland). It will be composed of the leader and some members of the WP3 and will include distinguished experts among the European geothermal community.

The Workshop in Volterra will be the occasion to discuss the details of the activities during this second year of the Coordination Action. The Meetings for WP3 and WP6 will take place on April 3 2007 in Volterra, Italy, at the SIAF Campus. Further details about the Workshop are available on the [Volterra workshop Web pages](#).

## ***Drilling, stimulation and reservoir assessment (WP4 & WP7)***

The objective of the first phase is to integrate scientific and technical know-how and practices related to the drilling, stimulation and reservoir assessment of Unconventional Geothermal

Resources and Enhanced Geothermal Systems. The state-of-the-art must be established in order to identify and analyse the best practices to be adopted, the innovative concepts to be applied or

developed, as well as the main gaps in knowledge and/or technology. The first phase of our WP Drilling, stimulation, and reservoir assessment is almost finished-at least in the section stimulation as summarized in a workshop last year. During this workshop 3 "Stimulation of reservoir and induced microseismicity", which was hosted by GEOWATT AG and held in Ittingen near Zurich from 29 to 30 June 2006, enhanced (or engineered) geothermal systems (EGS) were defined as engineered reservoirs that have been created to extract economical amounts of heat from low permeability and/or porosity geothermal resources. This includes all geothermal resources that are currently not in commercial production and require stimulation or enhancement. The implications of a review of HC-Stimulation and EGS-development and others were discussed as well as lessons learnt from the investigations of the parameters that play a role in the failure mechanism such as fluid pressure development in the reservoirs and stress field, that is different for each EGS site. The next workshop to this workpackage will be

held in Reykjavik in June 2007 as announced below. The Mid-Term-Conference stands for the start of WP7. The main task in the beginning was to nominate an expert group to help the WP leaders. To bring together the different experiences from different sites, a structure was chosen given respect to geology (granites, deep sediments, metamorphic rock, and volcanic rocks) and to the « enhancing task » such as drilling, stimulation, testing, and reservoir assessment. In our ENGINE concept it is foreseen that we have an expertise phase of the work packages. The first phase of our WP Drilling, stimulation, and reservoir assessment is almost finished-at least in the section stimulation as summarized in the Ittingen workshop last year. It is foreseen that the expert acts as the leading scientist for the given field. His task is to bring together the references of this field and create a practise handbook. At the end, we also need to formulate the action needed respectively what research has to be done to fulfil the gaps in the technology.

### ***Exploitation, economic, environment and social impact (WP5 & WP8) & Risk evaluation for the development of geothermal energy (WP9)***

The objective of work package 5 is to integrate scientific and technical know-how as well as practices and non-technical aspects related to the development and management of exploiting geothermal energy. During the first integration phase different approaches to accomplish this objective have been launched.

Based on **Workshop 5**, which was organised by BRGM and IE last September, several determining conclusions could be stated. Against this background the overall goal was defined to successfully develop (i.e. technologically promising, economically viable, environmentally benign and socially acceptable) geothermal power plants. Project development and optimisation is hence a task of having a look on the overall picture. During the upcoming expert phase these statements could be outlined more specifically in a European context.

The article about socio-economic benefits was turned to the **analysis of non-technical barriers** which are more appropriate to consider on a European scale. Based on respective questionnaires and the contributions during the Mid-term Conference an article was prepared which will be tried to publish in one of the next issues of the Geothermics Journal. The aim of this paper is the identification and analysis of non-technical barriers which could hinder the wider use of geothermal energy within Europe. First, the financial challenges to carry out a

successful project are discussed. Then the problems, which could arise due to legal and administrative reasons and affect the construction and operation of a geothermal energy provision plant, are identified. This is also true for the organisational and perception challenges which influence the further use of geothermal energy. Finally, instruments and measures to overcome these non-technical barriers to reduce the risk of non-technical delays or failures are presented. The expert phase will then work on more detailed strategies to overcome these problems.

The aim of the **article about an economic approach of geothermal energy use** was clarified as a comparison between case studies of different European countries concerning their current situation of energy production from geothermal resources. Within this comparison power as well as heat production are addressed in order to analyze the driving respectively prohibiting forces. In order to provide a comprehensive economic overview for the expert phase, data is still being gathered and will be composed by the end of the 2<sup>nd</sup> integration phase.

The article about environmental impacts as well as the paper about raising policy makers' awareness and public acceptance in connection with workshop 6 upcoming September will also be composed during the 2<sup>nd</sup> integration phase.

## Next ENGINE meetings

### [Volterra, workshop 2, 1-4/04/2007](#)

Deadline for registration: 09/03/2007



Volterra downtown.

The ENGINE Workshop 2 “Exploring high temperature reservoirs: new challenges for geothermal energy” will be held at SIAF (International High Formation School) in Volterra, Tuscany on April 1<sup>st</sup> – 4<sup>th</sup> 2007.

The workshop aims are to review existing information regarding high temperature geothermal resources including new areas of research such as supercritical fluids and discuss about improved exploration tools.

In addition, it will be occasion to analyse what are the actual R&D needs and launch a common platform for sharing information and tools.

Presentations of qualified invited speakers, posters from the different session topics, discussions, workgroup meetings and a field trip to Larderello high enthalpy geothermal area - pioneer in exploitation for geothermal

power generation - will take place in the workshop pointing to these aims.

Registration:

The online registration is mandatory for the participation. Detailed information and the [online Registration Form](#) are provided on the [workshop website](#)

The registration deadline is March 9, 2007.



SIAF Campus, Volterra.

Organising Committee:

IGG-CNR, Italy

Scientific Committee:

Adele Manzella, IGG-CNR, Italy;

Ómar Friðleifsson, ISOR, Iceland;

Thomas Kohl, GEOWATT, Switzerland.

### [Reykjavik, workshop 4, 28/06-1/07/2007](#)

ENGINE workshop 4 on “Drilling cost effectiveness and feasibility of high-temperature drilling” will be held in Iceland. The aim of the workshop is to bring together experts to exchange ideas on EGS and high-temperature drilling. The focus will be on:

1. Case histories of EGS and high temperature drilling.
2. Innovative technology.
3. Drilling effectiveness.
4. Well design and cementing in high temperature drilling.
5. Stimulation operations and well testing.
6. Safety.

There will also be a special session for technology providers to the geothermal drilling industry. Such industrial contributions are welcome.

The location of the conference in Reykjavík will provide the participants with an opportunity to see how this small country of 300,000 inhabitants has successfully tapped the geothermal resource to heat 89% of all buildings and has an active programme of building power plants for electricity generation. There will be visits to a new power plant, and drill site on Saturday following the workshop and on Sunday an optional day-trip by plane to the north to visit a Kalina power plant at Húsavík and the Mývatn area known for its striking geology, birdlife and abundant geothermal activity. For further information on the workshop, travel and lodging go to the website [workshop 4 Web pages](#).

## BACKGROUND

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The workshop is organised within the framework of the EU ENGINE Coordination Action

<http://engine.brgm.fr>

No registration fee is requested, and the workshop is open to whoever is interested in the matter.

## AIM OF THE WORKSHOP

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The main aims of the workshop are to review existing information regarding high temperature geothermal resources, including new areas of research such as supercritical fluids, and to discuss about improved exploration tools.

The workshop will be the occasion to analyse what are the actual R&D needs, and to launch a common platform for sharing information and tools.

Discussions, workgroup meetings, a field trip to learn about exploration and exploitation of the famous Larderello high enthalpy geothermal area, will concur to these aims.

## Place

*SIAF Campus,  
Strada Provinciale del Monte Volterrano  
Località "Il Cipresso"  
56048, Volterra (PI) Italy  
<http://www.siafvolterra.eu>*

## Registration and Abstract submission

**For registration please use online registration form at:**

<http://conferences-engine.brgm.fr/conferenceDisplay.py?confId=2>

## Registration deadline:

9<sup>th</sup> March 2007

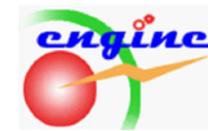
## Abstract submission deadline:

2<sup>nd</sup> March 2007

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# ENGINE

ENhanced Geothermal Innovative  
Network for Europe

## Workshop 2

*Exploring  
high temperature  
reservoirs:  
new challenges for  
geothermal energy*

**April 1<sup>st</sup> - 4<sup>th</sup> 2007  
Volterra, Italy**



## PROVISIONAL PROGRAMME

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### Sunday, April 1<sup>st</sup> 2007

#### Arrival and ice-breaker

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6:00 p.m. Shuttle Pisa Airport-Volterra

7:30-9:30 p.m. **Ice-breaker at SIAF**

\* Reception at SIAF closes at 9:00 pm

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### Monday, April 2<sup>nd</sup> 2007

#### Session I

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7:30 a.m. Shuttle Pisa Airport-Volterra

10:00 a.m. - 10:30 a.m.

**Opening address**

10:30 a.m. - 12:30 p.m.

**Session I "Signatures of high temperature condition"**

12:30 p.m. - 1:30 p.m.

**Lunch**

1:30 p.m. - 5:00 p.m.

**Session I (continuation)**

5:30 p.m. - 7:30 p.m.

**Steering Committee Meeting**

8:00 p.m. **Gala Dinner**

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### Tuesday, April 3<sup>rd</sup> 2007

#### Session II to III

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8:30 a.m. - 12:30 p.m.

**Session II "Modelling and reservoir stimulation of high temperature systems"**

12:30 p.m. - 1:30 p.m.

**Lunch**

1:30 p.m. - 4:30 p.m.

**Session III "Supercritical fluids: a new frontier for geothermal"**

5:00 p.m. Shuttle Volterra-Pisa

4:40 p.m. - 7:30 p.m.

**WP3 and WP6 Meetings**

8:00 p.m. **Dinner at Campus**

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### Wednesday, April 4<sup>th</sup> 2007

#### Field trip

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9:00 a.m. - 4:00 p.m. (6 p.m. in Pisa)

**Site visit to Larderello and geothermal area**

- Larderello power stations (ENEL)
- Geothermal Museum
- Lunch
- Other visits to be defined
- Return to Pisa (foreseen by 6 p.m.)

**All the sessions will include invited speaker(s), poster presentations and discussion.**