Intelligent Energy Europe

Final Publishable Report

GTRH Project
GeoThermal Regulation – Heat

Grant agreement number EIE/06/007-GTRH

SAVE, ALTENER, STEER, COOPENER and HORIZONTAL KEY ACTIONS

Table of contents

Executive Summary

Overview

Irish based geoservices consultancy SLR Consulting (Ireland) Ltd, together with 7 EU partners initiated the GTRH project (GeoThermal Regulation – Heat) to develop a framework of geothermal heat legislation/regulation. GTRH aimed primarily at 4 target countries, Hungary, Ireland, Northern Ireland and Poland, based on the experience gained from the implementation of geothermal regulation in France, Germany and the Netherlands (Best Practise Countries). The results were used to formulate a geothermal energy regulation framework template to guide the implementation of regulations across the EU The project consortium comprises government bodies, institutions and associations, providing a broad base from which all stakeholders in the sector can be represented. This template and its implementation aim at increasing overall sectoral investment in geothermal energy for the exploration and exploitation of heat across the EU. As such the GTRH results are very timely as they can facilitate the realisation of the National Renewable Energy Action Plans.

Results

Deficient and, in some cases, effectively absent geothermal regulations in Poland, Hungary, Ireland and the UK (Northern Ireland) have been reviewed since the beginning of the project and have been used to identify the barriers in the sector not addressed by regulations and legislation. Legislation and policies regarding geothermal energy in Germany, France and the Netherlands have been identified as providing effective and forward looking and have offered a starting point for the development of a regulatory framework. The key elements of international best practice have been reviewed to place the framework in context. The development of a geothermal framework has been implemented with appropriate consultation and dissemination to maximise the applicability of the results. It is envisaged that there will be broad transferability of the framework to the remaining EU countries and the geothermal energy regulation framework has been published on the GTRH website and partner websites. This project will help increase the geothermal contribution to the targets for renewable energy in the EU by providing a more robust legislative and regulatory infrastructure for geothermal in the EU, contributing to the security of investment, competitiveness and environmental protection and closing the gap between the front runner countries and other EU member states.

Lessons learnt

Though the policy environments were rather diverse in the investigated countries a number of common requirements for a geothermal regulation emerged as follows:

- the necessity of sound and enduring legal structures for ownership and licensing of geothermal heat exploration & production
- the presence of a level playing field for incentives for geothermal energy compared to other renewable energy options
- appropriate organisational structures to develop a vision on geothermal energy potential and the roadmaps to implement this potential

During the course of the project the level of geothermal activities increased strongly. Also the policies and Legal Frameworks in many countries developed – generally in a beneficial direction (for geothermal). Examples are the regulatory and policy progress seen in the four target countries but also the revised feed-in tariffs in Germany, the greatly improved policies for geothermal district heating grids in France and the emergence of guarantee schemes in the Netherlands. There is obviously not a one to one relationship between the GTRH project and these developments but it can be safely assumed that the timing of GTRH was particularly expedient and GTRH therefore could very effectively contribute to this advancement as well as to future developments - e.g. the National Renewable Energy Action Plans As such the IEE/Altener support for the GTRH effort has been instrumental to the success of the GTRH project and the action proved effective as it allowed an excellent interaction and exchange of information between the national efforts.

1. Introduction

The overall objective of the GTRH project was the drafting of a template framework for the regulation of geothermal energy in the EU through a series of reviews of EU best and poor practice, stakeholder focussed study tours, national and international attended roundtable discussions and workshops. The project was designed in such a way as to draw from the experience of a number of the most advanced geothermal centres in Europe, combine this best practice with the experience from the poorly developing geothermal centres and attempt to match the solutions to the barriers that impede the sectoral advancement in the latter and on a broader basis throughout the EU-27.

1.1 Achieved results

- ✓ Partner country geothermal energy sector reviews. These are significantly large documents and therefore have not been included in the appendix here but all are available on the GTR-H website at www.gtrh.eu/downloads . .
- ✓ National stakeholder meetings in each of the Target countries with international presentations and network development of the European geothermal community.
- ✓ Poland workshop to include the partners, polish national stakeholders and invited guests and speakers from the geothermal sector of the partner countries.
- ✓ National and international presentations of the GTRH project and results and EU geothermal networking opportunities.
- ✓ Study tours gave an in-depth insight into the geothermal sector and progressive scenarios for the target countries.
- ✓ Preliminary framework document communication and dissemination and possibilities for geothermal sectoral input.
- ✓ Dissemination and interaction on GTRH framework outside the partner countries and the direct stakeholders of the consortium.
- ✓ The Brussels conference provided exposure and dissemination of the project at EU level.
- ✓ International inputs and comments and overview were crucial to the GTRH framework and were achieved through broad presentation of the framework as it developed at international conferences.
- ✓ Summary overview country specific geothermal framework in English, Polish and Hungarian on the GTRH website.
- ✓ Final framework drafts and Publication.
- ✓ Final international 2 day conference in Dublin provided a great opportunity to gather together a cross-section of the key players in the geothermal sector across government, geothermal associations and industry of the EU.

A number of points in relation to the methodology and aims of the GTRH project are noted here:

1. the importance of networking for the national geothermal stakeholders with other national geothermal stakeholder representatives in enhancing their knowledge of the potential for expansion of their own geothermal sector and how this can impact directly on the success of the sector apart from the impact of the need for regulation.
2. There is really no such thing as a ‘Best Practice’ ideal geothermal regulation and any implementation or amendment of geothermal regulation in an EU state will involve an analysis of the current regulation across a broad sweep of legislation from Natural Resources, Mining, Groundwater, Environment, Planning, and any current geothermal regulation in situ in order to find a best approach to implement the requirements for proper geothermal regulation into the patchwork of existing legislation.
3. It is apparent through this project that for success in geothermal development the government attitude and the legal frameworks in place can be more relevant and crucial than the availability of suitable geological conditions. The current sectoral progress in many countries can be directly attributed to the improvements in the national Legal Frameworks

A number of issues encountered during the GTRH project are listed as follows:

- ✓ The difficulty of reaching the stakeholders and relevant and committed government representatives was sometimes difficult as geothermal was not always at the top of their agenda’s – this was

improved by repeated contact attempts and extra meetings to ensure that a diversity of opinion was included and also to ensure in particular that the study tours were well attended and achieved maximum impact and information transfer potential.

- ✓ Ensuring that the framework was sufficiently broad to include all the issues encountered in the EU-27 while not being too prescriptive and complex was a challenge. Inclusion of presentation from EU countries outside the partner countries helped to ensure there was an understanding of the need to broaden the framework.
- ✓ There was probably more potential for education of stakeholders in target countries than was possible under the project – for instance for **all** stakeholders to go on **all** study tours would have been an extra benefit and may have allowed more effective communication of an overview of different elements of the sector to the target country stakeholders. To address this more time was spent by partners to present the diverse elements of the whole EU geothermal sector to stakeholders and include international presentations wherever possible at workshops and conferences.
- ✓ It became evident that even in the Best Practice countries there are still substantial weaknesses and shortcomings in the Legal Frameworks. Considerable efforts were allocated to address these shortcomings – significantly assisted by the exchange of information between partner countries and the insights and knowledge resulting from the mapping of Best Practise Legal Frameworks (as provided by the Country Reports on Legal Frameworks)
- ✓

1.2 Continuation of activities after the end of the GTRH project

The GTRH framework publication is available on the GTRH website (www.gtrh.eu) along with all other deliverables of the project and the presentations from the various stages of the project. The framework publication is also available on some of the partner websites. A presentation of the GTRH framework has been approved and accepted for the World Geothermal Congress 2010 in Bali (the key 5 yearly conference of the International Geothermal Association (IGA) and the International geothermal industry). A paper with the full text of the final GTRH framework will be available in the proceedings of this conference – which is a key reference for the geothermal community and which includes updates on the status of the geothermal sector in all countries with active geothermal industries. EGEC, as the Brussels based partner of the GTRH consortium, will continue its ongoing work to draw from the findings of the GTRH project as appropriate in future submissions on RE and geothermal in particular and also present aspects of the GTRH framework to its members in industry, government and geothermal associations.

In addition:

EGEC is providing legal recommendations to several Member States where geothermal energy is not regulated. The main approach consists of sending GTRH results and providing inputs for development of their NREAPs. EGEC has already met with officers from National Ministry of Energy from Spain, Portugal, Slovakia and Slovenia. An important current issue is the competition on underground use between geothermal and CCS. EGEC has provided legal recommendations in a position paper in order to solve this problem. Inputs from GTRH were used.

In Ireland, SLR continues its work with the Department of Communications, Energy and Natural Resources in Ireland and presented the GTRH results at another public workshop of the geothermal working group on November 25th 2009. SLR will continue to present the findings of the GTRH project as input to the planned geothermal regulation in Ireland. It is hoped a draft of these regulations will be available in the first half of 2010 and may be in place by late 2010. In the Netherlands, SPG has developed a "Dutch Country Specific Addendum" to the Framework Regulation, focusing on those Framework Regulation sections which will be the Dutch priority issues in policy development for the next years. In Hungary in the end of 2009 several legislative actions were accomplished, partly engineered by the momentum generated by the GTRH activities and framework recommendations.

2. The GTRH project terms of reference

A number of key aspects of the GTRH consortium makeup and input which contributed to the success of the GTRH project are listed:

The matching of Target countries and Best Practice countries for the study tours and closer cooperation on information transfer and some more in dept stakeholder interaction worked out very satisfactorily due to the matching of needs, issues, policy and experience in both countries.

Excellent inputs were provided by all the partners in the consortium who proved to be in prime positions in their national geothermal sector to be able to provide the necessary input and overview to ensure the desired result. There was sufficient familiarity with the national sector in each case to achieve the required dissemination at different stages during the framework document development.

Members of all partners' institutions are generally interacting on other projects or are involved with EGEC or the ETP for Renewable Heating and Cooling - GT panel and the geothermal community nationally and internationally through the IGA and IGA European Regional Branch. This involvement has helped the development of a good network of personal interaction which facilitates successful communication and dissemination. The IEE/Altener funded GEOFAR project is currently developing on some of the GTRH conclusions in relation to its focus on analysis of financial barriers and the need for increased awareness of geothermal energy. Contact has been made with the GEOFAR coordinator to publish the final "Geothermal Regulation Framework" on the GEOFAR website (www.geofar.eu). In addition the IEE/Altener funded GEOTRAINET project is working on a major item of the flanking measures identified in the GTRH framework as needing to be addressed for any geothermal regulation to be successful. EGEC and an associated company to SLR, Conodate, are part of the GEOTRAINET consortium.

EGEC is also liaising with the partners of the REPAP2020 IEE/Altener project on "Renewable Energy Policy Action Paving the Way towards 2020". The specific objective of REPAP2020 is to facilitate the process of implementation of the RES Directive on a national level. EGEC is providing recommendations on geothermal energy.

Project meetings – These provided the opportunities for face to face meetings and proved even more beneficial when combined with other activities. For example MCMs were held in conjunction with a workshop in Poland, with conferences in Brussels and Dublin, with a field trip in Hungary and closely associated with the study tours to Germany.

SLR Consulting (Ireland) Ltd will maintain the GTRH website www.gtrh.eu and data and upload any new presentations on the GTRH project to the website over the two years from November 2009 to November 2011.

3. Key achievements of the GTRH project

A review of impact of the GTRH project related to the performance indicators as set at the start of the project is detailed in this section.

During the time of the GTRH project (2007-2009) real progress has been made in most of the 'Target' countries in the consortium in various degrees of implementation of new or reviewed geothermal regulation. Some details of this key performance indicator of note to be achieved in the last period as stated in the contract are as follows:

New geothermal regulations have already been drafted and put in place in Hungary during the 2008 period. In Poland some better regulations related to geothermal sector (induced both by GTRH tasks and by some other initiatives) were introduced into the new project of Geological and Mining Law (2008). This project is still awaiting for the adoption by the Polish Parliament (2009). On the other hand, some solutions from the best practice countries and relevant information rising from GTRH works served for consultations and proposals by PAS MEERI to the new geological and mining law and to the proposal of the 'principles of geothermal projects' funding from the sources of National Fund for Environmental Protection and Water Management. In addition, during 2007 – 2008 some decrees were issued by the Minister of Environment that simplify and shorten some administration procedures. These followed, among others, the suggestions and best practice examples made on the basis on GTRH process.

In Poland from 2007 to 2009) some growing interest in geothermal development (heating, recreation) has been observed reflected in the growing number of licenses issued per year for geothermal water exploration/assessment (3 – 7 licenses in 2007 – 2009 as compared with single licenses 1-2 in earlier periods). *However -it should be noted that the licensing procedures and issuing body were the same in all cases (all of them were handled at the state level following in general these same acts and provisions). It was not considered a direct influence of to the ongoing GTRH project as many other factors were involved also.*

In Ireland a public consultation process has continued through 2008 into 2009 heavily influenced by the work and results of the GTRH project - latest updates from the Ministry of Communications, Energy and Natural Resources indicates that the geothermal working group are nearing the completion of their work. Northern Ireland/UK has now begun funding of regional geothermal resource assessments, the issue of regulation of the geothermal sector is on the agenda though moving slowly is linked somewhat to the current reassessment of the resources in the region.

In Ireland the process of drafting a regulation which will allow deep geothermal exploration is underway with one company ready to apply and one other possibly interested. GSNI began a programme of assessment of geothermal resources in Northern Ireland and promoting the area of geothermal energy internally in DETI in advance of progress being made on regulation.

At least one company is interested in a geothermal exploration license in Northern Ireland where the resources are betted documented – however legislation is still unclear as to whether this work can be included under current resources licensing. Two new commercially funded EGS projects in the southwest of England are in gestation and have applied for government support from the 'Challenge Fund for Deep geothermal Energy' recently announced (July 2009). The total fund is currently at €6.7M (£6M).

In the Netherlands a decision was made and announced to develop a guarantee scheme to cover (a major part of) the geological risks involved in deep geothermal projects – a direct consequence of the efforts of the Dutch Geothermal Platform (SPG) over the past years in the context of encouraging the adoption of geothermal regulations for the geothermal sector. In the Netherlands the number of license applications for deep geothermal drillings rose from one per year in 2006 to 2008 to > 50 applications in the last year of the GTRH project.

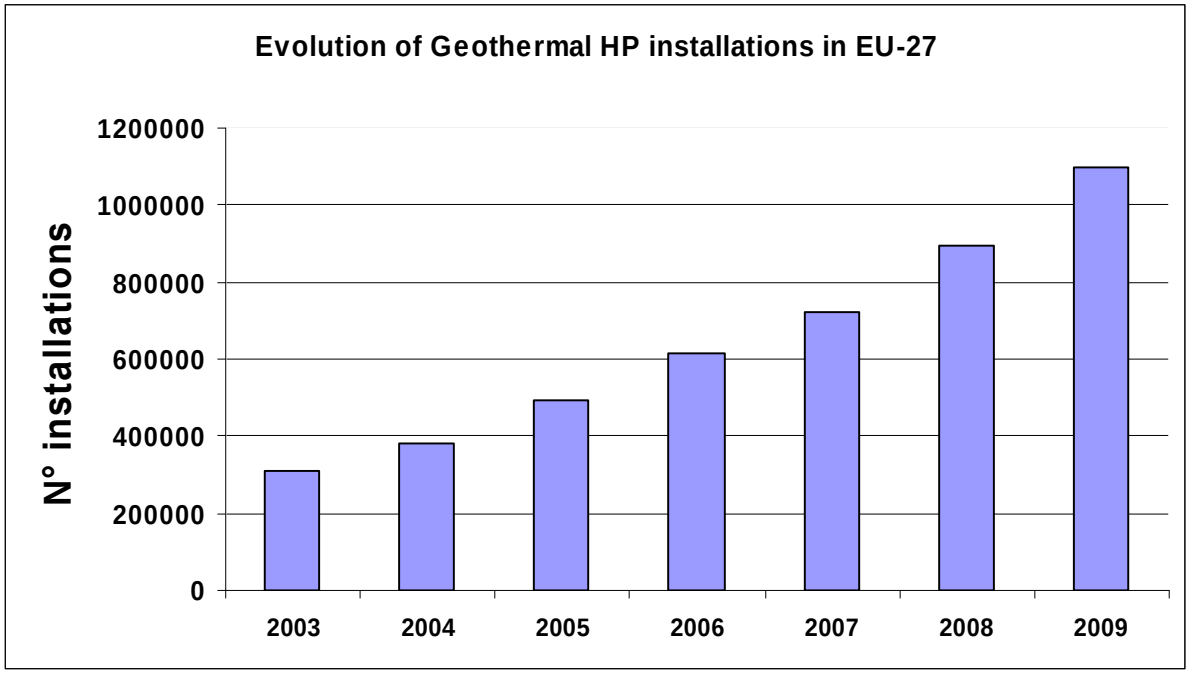
In Hungary Pannergy is developing several deep geothermal projects in Budapest, Miskolc, Pécs, Komló, Szentlőrinc, Bonyhád, Mohács, Tamási, Dombóvár, Kaposvár, Csurgó, Körmend, Nagykanaizsa, Győr, Gödöllő, Gyöngyös, Eger, Mezőkövesd, Füzesabony, Egyek, Debrecen, Nagyrábé, Kaba, Nyíregyháza, Záhony, Csenger, Nyírbátor, Tótkomlós, Kiskunhalas, Jászberény, Tiszaújváros, Csongrád; and in UK, 2 deep geothermal projects are planned in Cornwall, United Kingdom.

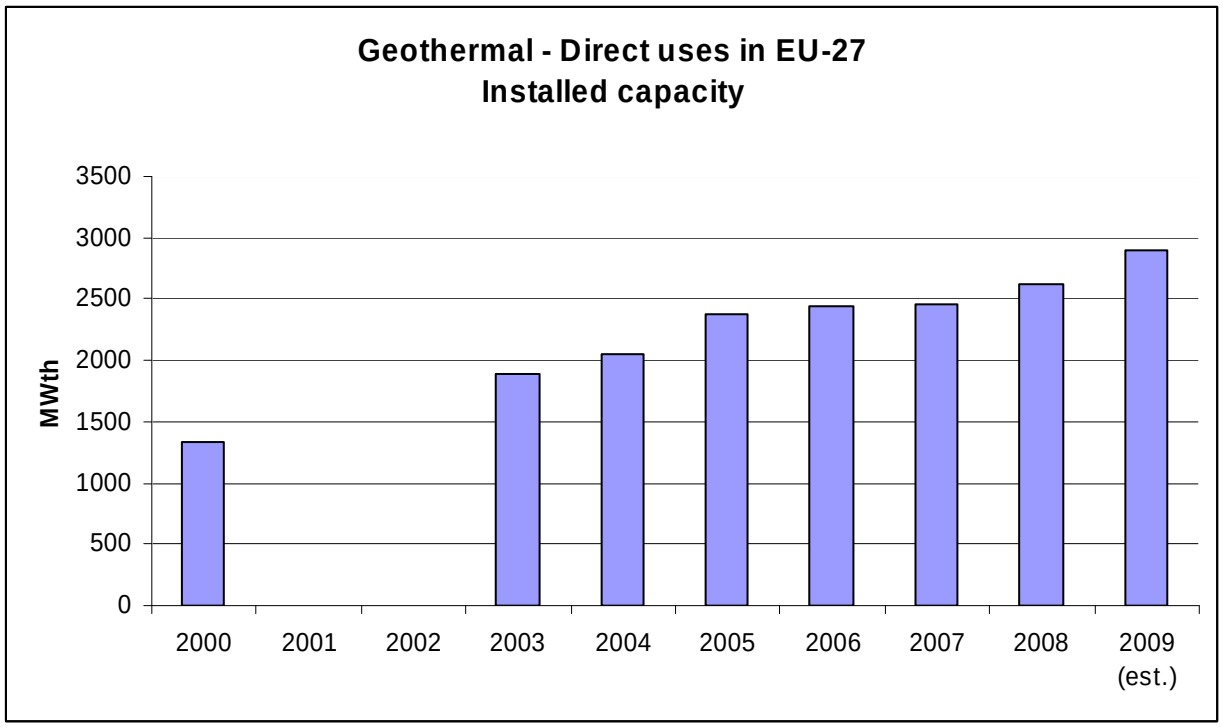
New geothermal regulations have been adopted or are under preparation in some EU-27 countries, not part of the GTRH consortium. EGEC provided key contacts in these countries with the interim results of GTRH and notably the geothermal legal framework.

- Belgium: In June 2009, proposals have been sent by one Belgium EGEC member to the 3 regional authorities asking to integrate a new geothermal framework in the regional policy. EGEC also provided recommendations to the local environmental authority of Brussels (IBGE) and the municipality about regulations for GSHP.
- Italy: EGEC is in close contact with the Tuscany Region and provide suggestions for their regional energy plan 2020. Moreover, EGEC members worked for better geothermal regulations in Italy Permits are based on different practices by region and by province. The closed loop systems legislation is somewhat lacking in clear regulations while in the open loop system procedures are the responsibility of the the Region/Province authority. In some regions like Piemonte and Val d'Aosta the permitting policy for closed loop systems is non-existent.
- Latvia: The city of Riga aims at installing deep geothermal plants, and have asked for information about the different legislation in Europe concerning licensing procedures.

- Lithuania: A new renewable energy law is under discussion, with approval due in December 2009. EGEC provided the GTRH framework to the Geothermal Lithuanian Association consulted by the Government to provide geothermal legal expertise.
- Portugal: EGEC has been contacted by a former EC officer living in Portugal. He installed a gshp installation but his neighbours opposed the drilling. EGEC provided recommendations and legal advice to him because no geothermal regulations exist in Portugal for this kind of project.
- Spain: EGEC member (APPA) has been consulted by the government, and published a National Plan for RES including geothermal. They liaised with EGEC on geothermal regulations.

Statistics 2006 – 2008:





It is not true to say that this is all as a result of the GTRH project but it indicates that the timing for the project was very apt, bearing in mind the stage of development of the sector in each case. Additionally a number of unforeseen events such as problems with gas supply and the cost of hydrocarbons reaching record levels in the period of the project meant that it became easier to access the necessary contacts at government level and attract them to participate in discussion and workshops.

In addition some new deep projects: outside GTRH countries are as follows

- Belgium: the "Geother-Wall" project to enlarge the geothermal district heating in Mons
- Greece: several deep geothermal projects in Greek islands

- Italy: a new geothermal district heating in Milano and deep geothermal projects with binary plants fed by shallow geothermal sources in Campania and Tuscany Regions of Italy
- Latvia: The City of Riga wants to develop its district heating systems with a combined heat & power geothermal plants. An EGS project is under preparation.
- Lithuania: deep geothermal projects to enlarge the geothermal plant in Klaipeda
- Portugal: deep geothermal projects in the Lusitanian Basin
- Romania: deep geothermal projects in Satu Mare, Oradea, Arad, Timisoara
- Slovakia: deep geothermal projects in Velky Meder, Komarno, Kralovsky Chlmec
- Slovenia: deep geothermal projects in Ptuj
- Spain: a geothermal district heating is actually built in Madrid, and other deep geothermal projects are planned Madrid and Barcelona regions.

The increase in the geothermal energy contribution to RES heat in the EU has been 500MWt since the implementation of the framework in the unregulated countries.

3.2 Some success stories relating to the development of geothermal regulation in the consortium countries

1) Geothermal Energy in the RES Directive
An important success of the GTRH project is certainly the adoption of the RES Directive with a clear definition of geothermal energy. This will be the basis of all geothermal regulations in the EU Member States.

During the course of the project the level of geothermal activities increased strongly. Also the policies and Legal Frameworks in many countries developed – generally in a beneficial direction (for geothermal). Examples are the revised feed-in tariffs in Germany, the greatly improved policies for geothermal district heating grids in France. There is obviously not a one to one relationship between the GTRH project and these developments but it can be safely assumed that the timing of GTRH was particularly expedient and GTRH therefore could very effectively contribute to these developments.

2) Regulation in Hungary
In Hungary in the end of 2009 several legislative actions were accomplished, partly engineered by the momentum generated by the GTRH activities and framework recommendations. In November 2009 the Water Act was amended by introducing a waiver for the existing thermal water users in the agri-sector, giving a certain degree of freedom for the competent authorities to judge the absolute obligation for re-injection. On 14th December 2009 the Hungarian Parliament amended the Mining Act by excluding the thermal water extractions from the scope of the Mining Act and by prescribing the concessional (leasing) way of licensing for geothermal energy reserves below 2500 m. In the latter case MBFH is the prime contract preparation and licensing authority, and it remains the major information manager and service provider in the geothermal field (also for installations for groundwater). Unfortunately, a royalty obligation for geothermal energy extractors has remained in force (contrary to the recommendations of the GTRH framework). The detailed, implementing Government Decree is being prepared. During Autumn 2009 the Heat Pump Association separated from the Construction Engineers Society, and became an independent and powerful association. The preferential electricity tariffs for heat pump utilities are now routinely applied all over the country."

3) Geological risk insurance/guarantee scheme in the Netherlands
Even after a thorough research phase there is always a remaining geological risk. This makes the investment in a geothermal doublet relatively unattractive for the investor from a risk point of view. This situation is even more important for a horticulturist or a smaller municipality, that may invest only once or maximum twice in geothermal energy. A large scale investor can distribute this risk over a number of projects and – like the oil & gas industry – can simply accept this risk as inherent to the line of business. But this is not an option for the user of heat. It has been identified as a major item of the flanking measures of the GTRH Framework that there is broader development of risk insurance for geothermal projects. In several places – starting in France, but since then spreading out to Germany and in 2009 in the Netherlands – the solution has been to provide a government guarantee, covering the geological risk. The mechanisms vary somewhat, but

the basic elements are that the investor receives – against a reasonable fee- a financial compensation if his well produces considerably less then could be expected.

The attraction of the scheme is that in > 90% of the cases this compensation is not needed – so the costs to the government is low. The impact on the possibilities of the investor to get financing by his bank is significant: from a risky – or at least uncertain – venture, the project has migrated to a normal risk activity.
This risk assurance is therefore increasingly recognised as the most cost-efficient option to stimulate geothermal investments. The Netherlands (SPG) announced the publication of the guarantee scheme at the Dublin final conference.

Following the developments in Germany and the Netherlands, EGEC has recently started an initiative to develop an European Template for coverage of drilling risks.

4. Key lessons learnt during the GTRH project

Considering the beneficial impact that GTRH has had on policy developments and – through this - on the future growth of the sector, it has become clear that this- or similar – cooperation structures are very cost-effective. Especially the exchange of information on policies between Best Practice and less developed countries (in the sense of Legal Frameworks) proved to be a success factor and continuation should be encouraged – certainly now that new and important 'geothermal entrants' appear to be joining the scene.

An important aspect of the project was the broad consortium as it was important to have all of the project partners available in order to make a full comparison of the European situation and to exchange on best practices. This good consortium with an active participation of all partners allowed us to provide solid legal recommendations on geothermal energy with an European perspective. However there is a need to continue this work with the implementation of RES directive and on future national energy legislation.

4.1 Communication and Dissemination

There were many opportunities for geothermal conference and presentations across the whole of the EU and the demand for GTRH presentations increased during the course of the project. In general there was agreement feedback from these presentations showed that there was agreement on the need for the geothermal framework or regulation initiative and anticipation of the results. But there was also an acknowledgement that some of the recommendations of the framework are positive aspirations or goals but will be difficult/impossible to attain in the short to medium term in many of the country of Europe. However there are many other possible approaches to implementation of the core recommendations of the framework that will work regardless of the current regulatory difficulties in any one country.

The organisation of the GTRH conference in Brussels during the EU Sustainable Energy Week in February 2009 gave the chance to 100 participants to attend this conference.

4.2 Common Dissemination Activities –

In general the following points characterise the general conclusions of the GTRH project:

- There is a need to disseminate the results in each of the EU-27 countries.
- The GTRH project and framework is an important tool to develop geothermal energy.
- The GTRH project was found to be necessary and in perfect timing with EU legislation.

4.3 Conclusions –

Though the policy environments were rather diverse in the investigated countries a number of common requirements for a geothermal regulation emerged as follows:

- the necessity of sound and enduring legal structures for ownership and licensing of geothermal heat exploration & production
- the presence of a level playing field for incentives for geothermal energy compared to other RES
- appropriate organisational structures to develop a vision on geothermal energy potential and the roadmaps to implement this potential

A number of specific conclusions are elaborated as follows:

Barriers to geothermal energy development

The main barrier to enhanced geothermal deployment is a lack of appropriate legislation and financial incentives. A lack of clarity in legal framework and administrative procedures for geothermal exploitation means long lead times for obtaining the necessary permits and licences and uncertainties for investors, such as in the right to own and use geothermal energy.

Needs of the geothermal sector

There is a need for coherency in the various financial support mechanisms already in existence in different Member States, and a need to create additional financial (incentives) and regulatory (standards) support instruments. With regard to administrative barriers; legal frameworks and regulations, concerning the ownership and exploitation of geothermal energy, must be clarified and permit procedures harmonised. Increasing the acceptance of geothermal energy will require education and awareness campaigns at all levels, as well as R&D for minimising the environmental impacts of geothermal exploitation.

Importance of stakeholder engagement process and international cooperation

Despite the fact that various countries of GRT-H consortium are characterised by specific and often different legislation and financial conditions – the basis for geothermal activities and investments, the GTRH common tasks have proved that one can learn from each other, identify common opportunities and barriers, and most importantly – find and elaborate solutions leading to the synergy effect and beneficiary for geothermal deployment both in particular country and EU-level as a whole.

5. Other issues

The adaptation of government policies is a matter of long term efforts and commitment of the geothermal communities. The establishment of geothermal plants – and in particular deep geothermal plants - is also a time consuming affair. The consequence is that feed back on successful new policies requires a long period. In many cases similar policies have been tried and tested in other countries. The information exchange in this field is therefore very useful and speeds up the process of policy development. The IEE/Altener support for the GTRH effort has been instrumental to the success of the GTRH project and proved effective as it allowed an excellent interaction and exchange of information between the national efforts.

Geothermal in competition with other uses of the underground

The European Commission recently approved six carbon capture and storage (CCS) projects worth €1 billion through its Economy Recovery Plan. The technology has also been a hot topic of discussion at the COP 15 in Copenhagen.

The EU Member States will have next year to implement the directive on the geological storage of carbon dioxide (CCS) and the directive on the promotion of the use of energy from renewable Sources. EGEC presented a Position paper in December 2009 addressing the synergies and conflicting issues in both technologies including the following:

- Having regard to the RES Directive, defining geothermal energy as a renewable "*energy stored in the form of heat beneath the surface of solid earth*"
- Having regard to the CCS directive (recital 19 and article 4), "*Member States should retain the right to determine the areas within their territory from which storage sites may be selected. This includes the right of Member States not to allow any storage in parts or on the whole of their territory, or to give priority to any other use of the underground, such as exploration, production and storage of hydrocarbons or geothermal use of aquifers. In this context, Member States should in particular give due consideration to other energy-related options for the use of a potential storage site, including options which are strategic for the security of the Member State's energy supply or for the development of renewable sources of energy*".

EGEC urges public authorities to produce an underground regional planning in order to optimise resource allocation between geothermal energy, carbon storage and possible other underground usages, and therefore maximize the benefits for society.

There is obviously conflicting potential as a result of the competition between CO_2 disposal and geothermal energy projects because they may target the same deep aquifers, or the same areas within sedimentary basins.

Geothermal energy may also be produced from rocks below the depth range for potential CO_2 disposal sites, and investigations are needed to determine if geothermal exploitation beneath CO_2 deposits might be feasible at all.

Zones of dual use capability should be clearly identified and priority should be given to their use for geothermal energy over their use as a carbon storage site.

A list of contact persons for more details on the GTRH project are as follows:

Participant Short name	**Address of Participant**	**Family name, first name**	**Telephone N°**	**Fax N°**	**E-mail**
SLR	7 Dundrum Business Park, Windy Arbour, Dublin 14, IRELAND	Roisin Goodman	+353 1 2964667	+353 1 2964676	rgoodman@slrconsulting.com
GSNI	"Colby House Stranmillis Court Malone Lower Belfast BT9 5BF", NORTHERN IRELAND	Derek Reay	+44 2890 388457	+44 2890 388461	derek.reay@detini.gov.uk
BRGM	39-43, Quai Andre Citroen 75739, Paris FRANCE	Florence Jaudin	+33 2 38643161	+33 2 38643334	f.jaudin@brgm.fr
EGEC	63-65, Rue d'Arlon, B-1040, Brussels BELGIUM	Philippe Dumas	+32 2 4001024	+32 2 4001039	p.dumas@egec.org
PAS-MEERI	Wybickiego, 7 31-261, Krakow POLAND	Beata Kepinska	+48 12 6326717	+48 12 6326717	labgeo_bk@interia.pl
MBFH	Hungarian Office for Mining and Geology (MBFH), 1145 Budapest, Columbus u. 17-23.,	Tamas Hamor	+36 1 2671433	+36 1 2206193	tamas.hamor@mbfh.hu
SPG	Jan van Nassaustraat, 81, 2596 BR The Hague	Victor van Heekeren	+31 70 3244043	+31 70 3244946	heekeren@heekeren.nl
GtV	Gartenstr. 36, 49744 Geeste, Germany	Werner Bussman	+49 5907545	+49 59077379	Geothermische-Vereinigung@t-online.de

APPENDIX I

Country Summaries for Geothermal Energy Sector in Poland and Hungary

Legal Barriers to Geothermal Energy development in Hungary - Summary

Tamás Hámor

Hungarian Office for Mining and Geology
Budapest, March 2007

Introduction, a state-of-art of geothermal industry

During the last four years there have been 12 new geothermal developments in the country (Arpasi, 2005). The main consumers of geothermal heat are in the agriculture industry for the heating of greenhouses, and for spas and pools. Other uses include district heating and the heating of household waters. The number of organizations using geothermal heat is 130, the number of settlements using the heat is 45, and the number of spas is 10. Approximately 2,655 houses in nine cities are heated through district heating systems. Unfortunately, many of the technical installations are old and outdated. In spite of the facts that Prof. Heller patented a geothermal heat pump in 1948, and that thermal water was also used to heat the Hungarian Parliament building up to 1953, geothermal heat pumps are utilized to an insignificant extent in Hungary. The total estimated installed capacity for heat pumps is 4.0 MWt, which should produce 22.6 TJ/yr. The capacity and annual use for other direct-use applications include: space heating (100,6 MWt and 1.016.7 TJ/yr) of which 80 % is assumed to be district heating based on the WGC2000 country update (80.5 MWt and 813.4 TJ/yr), which gives 20.1 MWt and 203.3 TJ/yr for individual use; greenhouse heating (196.7 MWt and 1,502.5 TJ/yr); bathing and swimming (350 MWt and an estimated 5.040 TJ/yr – not reported) and other uses (not specified) (42.9 MWt and 358 TJ/yr), for a total, including heat pumps, of: 694.2 MWt and 7,939.8 TJ/yr. According to the Hungarian Geological Survey the following data were provided for EurObservER to characterize Hungary with regard to geothermal energy profile.

Energy data (with balneology use)

Cumulative geothermal capacity in 2005 for heating application (except geothermal heat pumps) installed.

Capacity	Cumulated in 2004	Installed in 2005*	Cumulated in 2005*
MWth (except geothermal heat pumps)	**680**	**35**	**715**

*estimation

The cumulative geothermal capacity for geothermal heat pumps (in MWth) installed in 2005

Capacity	Cumulated in 2004	Installed in 2005*	Cumulated in 2005*
Number of Geothermal heat pumps	**150**	**80**	**230**
MWth (only geothermal heat pump)	**5**	**1.5**	**6.5**

*estimation

Geothermal energy in 2005 (in GWh)

Energy produced from geothermal resources since 2000 following each application (electricity or heat).

Geothermal energy (GWh)	2004	2005*
Heat (except geothermal heat pump)	1100	1180
Heat (only geothermal heat pump)	4.5	7.5
Electricity	-	-

*estimation

Legislation framework

In Hungary the basic constitutional powers as legislative, judicial and executive are well distributed among the different state bodies. The democratically elected National Assembly (The Parliament) is the highest legislative and political body that makes acts. On the top of the legislation hierarchy pyramid stands the Constitution, the form of which is an act. However, there is another act, the Civil Code, which is somewhat above other acts in the hierarchy.

The Government and its members, the ministers present an overlap between the legislative and executive power because they are authorized to issue Government Decrees and Ministerial Decrees, which shall be in accordance with acts. The same holds true for local governments, which have the right to issue orders, the territorial scope of which is limited to the administrative land of the settlement. The local government decrees represent the lowermost level of legislation. All other quasi-legal forms as orders, guidelines of government agencies, technical standards of national or international organizations (e.g. ISO), individual resolutions of authorities have no universal binding force but have an important role in practice.

The public administration legal procedure has long-standing traditions and defined by the Act CXL of 2004 on the general rules of state administration. This act recognizes the importance of professional task-oriented authorities in a technologically developed society while acknowledging the rights and convenience of interested other parties, as local public, by ensuring their democratic participation and option of appeal in the licensing process and by establishing the legal institution of a single, integrated co-authority license, respectively. The co-authority system means that in a thematic licensing process (e.g. environmental license) the final resolution is issued by the main

professional authority (e.g. local environmental inspectorate) which collects and incorporates the prescriptions of other interested authorities to the higher convenience of clients.

The other important element of the act is that the right of appeal for the client is ensured already within the public administration system, by performing a second instance licensing procedure with the participation of the supervisory level of professional authorities (mostly the central body or ministry of the given authority). It means that it is the third-instance level of legal recourse in public administration when the case comes to the first judicial, the county court level.

Mining legislation

The law on mining called "Act XLVIII of 1993 on Mining" was approved by the National Assembly and published on 13th May 1993. Among the numerous implementing legislation (mainly decrees of the Ministry of Economy and Transportation), the most important one is the Government Decree No. 203/1998. (XII. 19.).

The scope of the Mining Act covers the complete mining-related activity chain, as: geological survey, mining exploration, exploitation, break in operation, mineral processing, closure, remediation. In a horizontal sense it extends to all mineral commodities (including oil and gas); establishment, utilization and termination of waste rock heaps; maintenance, utilization and closure of open spaces of closed underground mines; underground activities of non mineral exploitation purposes using mining methods (as shafts, deep drillings, tunnels and galleries); establishment and operation of pipelines conveying hydrocarbons; **the utilization of geothermal energy with the exception of groundwaters**; all facilities and equipments necessary for the above activities (as mining railways, cableways, stringways, electric cables, explosives). **Water, even groundwater holding geothermal energy, works of water management in general, and manual gold-washing are out of the scope (1st §).**

In Hungary the original owner of mineral resources is the central state as given in the Civil Code (Act IV of 1959) under 96th §, *"The ownership of land shall not extend to the "treasures of the earth, " nor does it extend to natural resources."*; and under 177th §: *"Unless otherwise provided by law, the following shall remain under exclusive state ownership: a) the treasures of the earth, b) underground waters ..."*

This is repeated by 3rd § of the Mining Act that mineral raw materials and geothermal energy in their natural occurrence are the property of the state. As minerals are exploited they are transferred to the property of mining entrepreneurs. The owner is the central state, it practices this right by delegation licensing to local mining authorities (as first instance) or to the Minister of Economy and Transportation (in case of concession contract). Municipalities, local governments are involved in the licensing process as co-authorities.

The **National Mineral and Geothermal Energy Resource Inventory** (and Balance) of Hungary is managed by the Minerals Inventory Department of the Hungarian Office for Mining and Geology and its predecessors since the 1950's, as defined in articles 25, 48 of the Mining Act. It is updated each year. The Inventory includes more than 2700 deposits and mines. The Inventory contains quantitative data (resource, reserve, production, status of mine, etc.) and some qualitative data (type of mineral, main constituents, etc.). However, the present inventory of geothermal energy resources is rather incomplete. It is based on large scale geological assessment of all static resources without taking into account the hydrogeological, technical and economical barriers and the already exploited reserves.

According to article 25 of the Mining Act and article 3 of the Government Decree No. 267/2206 (XII. 20.) on the Hungarian Office for Mining and Geology, the Hungarian Office for Mining and Geology is the National Archive for all geological data. Data are to be submitted on a yearly basis.

According to Annex 4 of Mining Act data to be submitted include primary (field) data, and processed and interpreted data as well as reports, maps etc. Data can be delivered both in traditional (paper or printed) and in digital format.

The following data are public:

Name, address and the legal representative of the concession holder/licensee; The type of mineral raw material(s) concerned; Duration of the concession contract/mining licence; Name and co-ordinates of the area involved.

The Mining Act acknowledges three types of exploration. The first type is a preliminary surface survey (4th §) which does not require a license. The company has to have an agreement with the landowner of the area and to report the locality, duration, methodology, etc. to the mining and the geological authorities 30 days in advance. If the mining authority does not reply in 15 days, the works can start. This type of survey does not pose any exclusive rights for the operator concerning mineral exploitation.

The second type of exploration is defined by articles 5-7 and 22-23. In areas, which are opened for the mining of certain minerals, the mining authority grants exploration licenses with the involvement of other co-authorities (inter alia, Environmental Inspectorate, local municipality). This license gives an exclusive right to the entrepreneur to explore for the given mineral on the defined area and to initiate the establishment of a mining plot within a certain timeframe. In case of two or more applications for the same area and type of mineral, the order of submitting the documentation is decisive if the other requirements are fulfilled equally.

The third type is the concession (or leasing) as prescribed in articles 8-19. In areas, which are closed the only way to access to minerals in the concession contract. The Minister of Economy and Transportation may designate concession areas for which he/she announces an open tender. After evaluation the bids by a ministerial panel, the winner and the Minister shall conclude to a concession contract in which they agree in a work programme and the guarantees of good performance. This contract gives exclusive right to mineral exploitation for longer term than simple exploration license but does not replace other licences which are prescribed e.g. establishing mining plot, submitting technical operation plans, etc.

In both cases of whether the right of exploration was granted by a licensing process or through a concession the first obligatory step to the exploitation is the establishment of a mining plot, as defined by 26th § of the Mining Act. The documentation to support the application is the final report of the geological exploration, which should prove the existence of economic mineral reserve and that the planned mining activity is viable. The permit is issued by the mining authority, with the involvement of professional co-authorities (as listed above), the representative of the local government and the owners of the surface land.

In addition, in order to start the mining activity a technical operation plan (27th §) and construction licenses (31st §) has to be approved by the mining authority based on the consent of other authorities.

The mining act gives provisions for the duration of technical operation plans (TOP). In case of underground mines an accepted TOP is valid for two years, and for five years in case of open pits. However TOPs have to be revised annually and have to be submitted to the mining authority in case of modification either (27th §).

Mining companies have to pay mining royalty as defined by article 20 of the Mining Act after exploited minerals and geothermal energy even if the activity is illegal or was licensed as water works (e.g. dredging), or the mineral is mined during the exploration, or extracted during the secondary use of waste rock heaps. In the case of exploitation licensed by the authorities the rate of the royalty shall be the following, with regard to the value of the quantity of mineral raw material exploited:

a) 12 % for oil and gas,

b) 5 % for non-metalliferous minerals mined in open-pits, with the exception of energy minerals;

c) 2 % for other solid minerals and **geothermal energy**;

d) 100 % for the quantities mined illegally.

The basis of the calculation of the mining royalty is the market value of the unprocessed minerals leaving the mining works. The payment shall be done monthly in the case of hydrocarbons and quarterly for other minerals.

The Minister of Economy may, in agreement with the Minister of Finance, reduce the rate of mining royalty, with regard to the interests of the management of mineral resources or to other public interests. No royalty payment is required after the oil and gas exploited by enhanced recovery methods. **The company does not have to pay royalty after the quantity of geothermal energy, which is above the 50 % efficiency of utilization.**

Specific mining legislation with regard to geothermal energy

According to Act XLVIII of 1993 on Mining, consolidated with Government Decree No. 203/1998. (XII. 19.) issued for its execution, the following articles are the explicit provisions on geothermal energy.

Mining Act Section 1 (1) The scope of this Act shall cover:
h) utilization of geothermal energy;
(5) The following shall not be covered by the scope of this Act:
a) prospection and exploitation of subsurface waters carrying geothermal energy,

Mining Act Section 5 (1) The mining inspectorate shall license
g) the prospection, exploitation and utilization of geothermal energy, including the construction and putting to use of the underground and surface facilities required for this purpose, if this shall not affect the raising to the surface of subsurface waters.

Mining Act Section 20 (1) On the exploited mineral raw materials and geothermal energy the state shall be entitled to a share, a mining royalty.
(2) Mining royalty shall be paid by:
a) the mining entrepreneur, furthermore
b) the party carrying out the activity under Section 1 (2) and (7),
c) the party exploiting geothermal energy for utilization purposes of the generation of energy,
(7) The rate of the mining royalty shall be 2% of the exploited geothermal energy, in case of geothermal energy. No mining royalty needs to be paid on the quantity, utilized in excess of 50%, of the exploited geothermal energy.

Execution Decree Section 4 (1) The basis of the calculation of the mining royalty shall be the value of the mineral raw materials
e) defined by measurement at the casing head of the exploited geothermal energy, or in the absence thereof defined through measurement and re-projecting to the casing head,

Mining Act Section 25 (5) The Hungarian Geological Survey is running the national mineral and geothermal energy inventory, from which upon the request of the entitled personnel issues a certificate against a fee, according to rules provided by another piece of legislation.

Mining Act Section 49 § The several terms used in this Act shall include the following:

11. *'Geothermal energy'* shall mean the inherent energy of the earth's crust.

12. *'Carriers of geothermal energy'* shall mean, for the purposes of this Act, substances in various states (e.g. subsurface waters, steams), which allow the exploitation of the inherent energy of the earth's crust for the purposes of the generation of thermal energy through exploitation or through the application of another technology.

Execution Decree Section 34, For the purposes of this Decree:

10. *Utilized quantity of geothermal energy:* the part, utilized for the purposes of the generation of energy, of the quantity of energy exploited from the energy carrier produced by the mining entrepreneur, with a temperature exceeding +30 °C. In this relation the person using geothermal energy for medicinal, balneology or water supply purposes on the basis of a water license shall not qualify as mining entrepreneur, even if this is used also for the purposes of the generation of energy through secondary utilization.

According to 3rd § (5) k) of the Government Decree 267/2006. (XII. 20.) on the Hungarian Office for Mining and Geology, it is the duty of the Office to operate the register of national mineral resource and geothermic energy resource, and the service of data and issuing certificates from thereof.

Another important legislation is the Government Decree 118/2003. (VIII. 8.) on the calculation methodology of the relative value of solid minerals and geothermal energy.

„Annex I.

In case the exploitation of geothermal energy is coupled with water extraction:

If half of the temperature of the outflow at well plus 15 degrees is greater than the outflow temperature at heat-exchanger:

$G = (TB–TK) \bullet V \bullet P \bullet 0{,}004186 \bullet c \bullet d$, where

G = value of geothermal energy (HUF)

TB = temperature of water at well head (°C)

P = 1300 HUF/GJ

TK = temperature at heat-exchanger outflow (°C)

V = exploited volume of water (m3)

d =density of water (1 t/m^3) c = 1 Mcal/t °C 1 Mcal = 0,004186 GJ

1.2.

If half of the temperature of the outflow at well plus 15 degrees is smaller than the outflow temperature at heat-exchanger :

$G = [(TB/2)–15] \bullet V \bullet P \bullet 0{,}004186 \bullet c \bullet d$

II.

If the exploitation of geothermal energy is via the circulation of secondary heat-exchanger fluids :

$G = (TB-TK) \bullet V \bullet P \bullet c/2$"

According to Annex I of the Ministerial Decree 96/2005. (XI. 4.) on the rules of the mining authority in the sphere of specific construction affairs:

„Facilities authorized by the mining authority:

4.1. facilities for the exploitation and energetic use of geothermal energy without the extraction of groundwater, and excluding the machinery installations of construction."

Energy legislation

The Act CX of 2001 on electricity, in a harmonised structure including Government Decree 180/2002. (VIII. 23.) on its enforcement was adopted in order to provide customers with a secure supply of low-cost electricity of appropriate quality, to develop an objective, transparent and non-discriminatory regulatory regime, to promote the establishment of a competitive market in electricity, to create regulated access to electricity networks, and to approximate the applicable regulations to the legislation of the European Communities, with due consideration of the aspects of energy efficiency, energy conservation and environmental protection requirements. Among the definitions there are relevant terms:

Article 3 For the purposes of this Act:

29. renewable energy*: energy gained from renewable energy source;*

41. green certificate*: a document issued by a generator or by an operator of a small power plant in evidence of the quantity of electricity, or a part thereof, generated by energy from renewable sources or waste;*

43. useful heat*: heat produced in the course of co-generation in order to satisfy some economically justified demand for heat or cooling;*

47. renewable energy source*: non-fossil energy carriers that depend on weather conditions (sun, wind), non-fossil energy carriers that do not depend on weather conditions (geothermic energy, hydro-energy, biomass and energy source produced directly or indirectly from biomass) and gas deriving from waste deposits and waste water treatment plants as well as biogas.*

According to Act LXXXVIII of 2003 on energy tax
„3rd § (1) energy shall be paid
f) …excluding, if the generated electricity id produced by renewable energy sources …"

According to Act XVIII. of 2005 on district heating
„1st § (3) *b)* the provisions of this law shall be applied in harmony with stipulations of the Mining Act and the Water Act in case of facilities for geothermal energy exploitation for district heating. In the definition of the district heating facility geothermal installations and heat pumps are explicitly listed."

Perhaps the most important piece of legislation is the Decree of the Minister of Economy and Transport (GKM) No. 56/2002. (XII. 29.) on the rules of feeding in electricity falling under feed-in obligation and setting of its prices. Among the numerous regulatory instruments set therein, there are provisions on the obligatory acceptance of the electricity from renewables, on the certificate of origin, on the efficiency, on the administrative licensing procedures, on co-generation, on the measurement installations, and on the tariffs. The whole text of the decree is attached in Annex to this report. One important table is enclosed hereby on the actual tariffs from geothermal resources in Hungarian Forints:

	Ft/kWh
High peak period	28,06
Normal period	24,71
Low peak period	10,08

Right to Feed-in Electricity

The Hungarian Energy Agency certifies and controls the energy producing „materials" used by the micro power plant for generation of electricity, provided that these are renewable sources. Certification and classification of a geothermal power plant as a renewable energy technology can be considered as secure. Public utility wholesalers and public utility suppliers are obligated to **accept feeding in of electricity,** which was generated from renewable sources from those micro

power plant, which are obliged to require permits for their establishment and operation respectively and are connected to the transmission network.
The amount of the electricity, that has to be taken over, is described in the operation permit of the micro power plant. The obligation of the public utility wholesaler/supplier to accept feeding-in of electricity relates to:
- energy co-generated with thermal heat **for the purpose** of district heat; or
- energy co-generated with thermal heat **not for the purpose** of district heat, handed out from part of a power plant with a transfer capacity of **not more than 6 MW_e, but less than 50 MW_e;** if the efficiency of the energy-transformation is at a annual level of at least 65 % concerning the part of the power plant.
Geothermal power plants will probably not exceed the 6 MW_e limit given in the regulation, therefore public utility supplier will be obliged to permit the feeding-in of electricity.
The right to feed-in electricity is limited to the net energy production. Therefore the produced energy has to be reduced by the own consumption of the plant module (also electricity consumption of the pumping system), which leads to substantial deterioration of profits of a power generation project. The regulation aims at the co-generation of heat for district heating purposes and the generation of power in the same installation

Environmental and water legislation

The Act LIII of 1995 on the general rules of environmental protection was accepted by the National Assembly on 30th May. For the establishment, suspension, modification and closure of different facilities and activities environmental licensing are defined by the environmental protection act and by Government Decree No. 314/2005. (XII. 25.) on the environmental impact assessment, which is in complete harmony with the EU legislation in force (the amended 85/337/EEC directive).

Hungary has a separate Act LVII of 1995 on the water management which was accepted on 6th June, was issued on 23rd June 1995 and came into force on 1st January 1996. The water management act gives priority to satisfying water demand. According to §15, the order of satisfying the water demand shall be the following:

water uses aimed at subsistence drinking, public health, and emergency response to disasters;

therapeutics, as well as production and service activities serving directly the supply of the population;

livestock watering, fish farming;

nature conservation;

economic activities;

other activities (like ones aimed at sports, recreation, bathing , and tourism).

It means that mining activities as being economic activity are placed at a low level of the hierarchy.
Thermal waters used exclusively for energy utilization must be re-injected.
According to Annex I:
„16. thermal water: all waters originating from groundwater aquifers which have a surface outflow temperetaure higher than 30 °C."

According to the Annex of Government Decree No. 314/2005. (XII. 25.) an environmental impact assessment is obligatory for:
34. Exploitation of underground waters above 5million m^3/year
28. Thermal power plant of greater than 20 MWe
56. Re-injection into groundwater aquifer with more than 3 million m^3/year

EIA obligation depending on the resolution of the green authority (if not indicated already above):
73. Geothermal power plant above 20 MWe capacity on the protected zone of mineral, potable and medical waters
78. Thermal power plant above 50 MWth
80. Exploitation of groundwater above 2000 m^3/day
128. Deep drilling deeper than 650 m on the protected zone of groundwater reserves or nature protection
134. Re-injection into groundwater

In Government Decree 220/2004. (VII. 21.) on the protection of surface water quality article 38th (2) gives a waiver for users of thermal waters
d) in case of existing uses of thermal water for the purpose of energy extraction the period of compliance is 31st December 2012.
(3) the fine during this period of compliance:
- 5 % of the normal fine in the first three years,
- 8 % in the 4th-5th years,
- 12 % in the 6th-7th years,
- 15 % in the 8th-9th years,
- 20 % in the rest.
Moreover, the competent authority may apply a specific limit value in case the natural background of used water exceeds the set thresholds (19th § (3)).

According to the KvVM Ministerial Decree 28/2004. (XII. 25.) on the threshold values of water pollutants thermal water cannot mixed with used waters treated with chlorine. Its Annex provides specific thresholds (please note that the energy utilization has a negative discrimination)

		Energy utilization	**Medical utilization**	**Thermal spa**
Dichromate oxygen consumption	**mg/l**	**-**	**150**	**-**
Total salt content	**mg/l**	**3000**	**5000**	**2000**
Na-equivalence	**%**	**45**	**95**	**45**
Ammonia-ammonium nitrogen	**mg/l**	**-**	**10**	**-**
Sulphides	**mg/l**	**-**	**2**	**-**
Phenolindex	**mg/l**	**1,0**	**-**	**-**
Total barium	**mg/l**	**-**	**0,5**	**-**
Heat load	**°C**	**30**	**30**	**30**

Decree No. 43/1999. (XII.26) KHVM of the Minister of Transport, Communication and Water Management on the calculation of water resource fee obliges also the users of groundwater to pay the water resource fee. The basic fee, defined by the Act on the State Budget yearly, is multiplied by factors depending on the particular water use, the character of the water resource and on the water management situation of the appropriate region. The multiplier factors concerning groundwater-uses can be found in the Table below. The amount of the charge is:
*Charge = "**V**"(m^3) x "**B**"(HUF/m^3) x "**m**" x "**g**"*

where

*"**V**" is the volume of the used water*

*"**B**" is the basic charge*

*"**m**" depends on whether the volume of used water measured or estimated*

*"**g**" depends on the quality of the extracted water, the type of the water resources (surface- or groundwater, karstic water, water from porous media, thermal water, shallow groundwater, bank filtered water), the aim of the water-use (therapeutics, supply of the population, economic). The energy utilization belongs to category "other" which has the highest "g" values. Many consider this as a negative discrimination.*

Multipliers to the water resources fee

Type of water		**Character of water uses**						
Groundwater		**medicinal purpose**	**public purpose**	**Economic purpose**				
				drinking water	**irrigation**	**animal farms**	**Bath**	**other**
medicinal	registered	1,0	5,0	5,0			5,0	**10,0**
thermal water	>or= 30°C	1,0	1,0	3,0			3,0	**7,5**
karstic water	Class I Class II Class III		1,2 1,0 0,5	3,0 2,0 1,0		4,0 3,0 2,0	3,0 2,0 1,0	6,0 5,0 4,0
deep groundwater	Class I Class II Class III		1,0 0,8 0,5	3,0 2,0 1,0	4,0 3,0 2,0	3,5 2,0 1,0	3,0 2,0 1,0	5,0 4,0 2,0
bank-filtrated water	Class I Class II Class III		1,0 0,8 0,5	3,0 2,0 1,0	3,5 2,0 1,0	3,5 2,0 1,0	3,0 2,0 1,0	4,0 3,0 1,0
shallow groundwater	Class I Class II Class III		1,0 0,7 0,5	1,5 1,1 1,0	2,0 1,5 1,0	1,5 1,1 1,0	1,5 1,1 1,0	3,0 2,0 1,5

Class I	Water of quality not exceeding the tolerable levels of the standard
Class II	Water of quality exceeding the tolerable levels of the standard, which may be purificated to drinking water quality with standard treatment technology economically
Class III	Water of quality exceeding the tolerable levels of the standard, which cannot be purificated to drinking water quality with standard economical treatment technology economically

According to Government Decree 219/2004. (VII. 21.) on the protection of groundwater
„9th § (5) Taking into account the provisions of 13th § the following can be licensed:

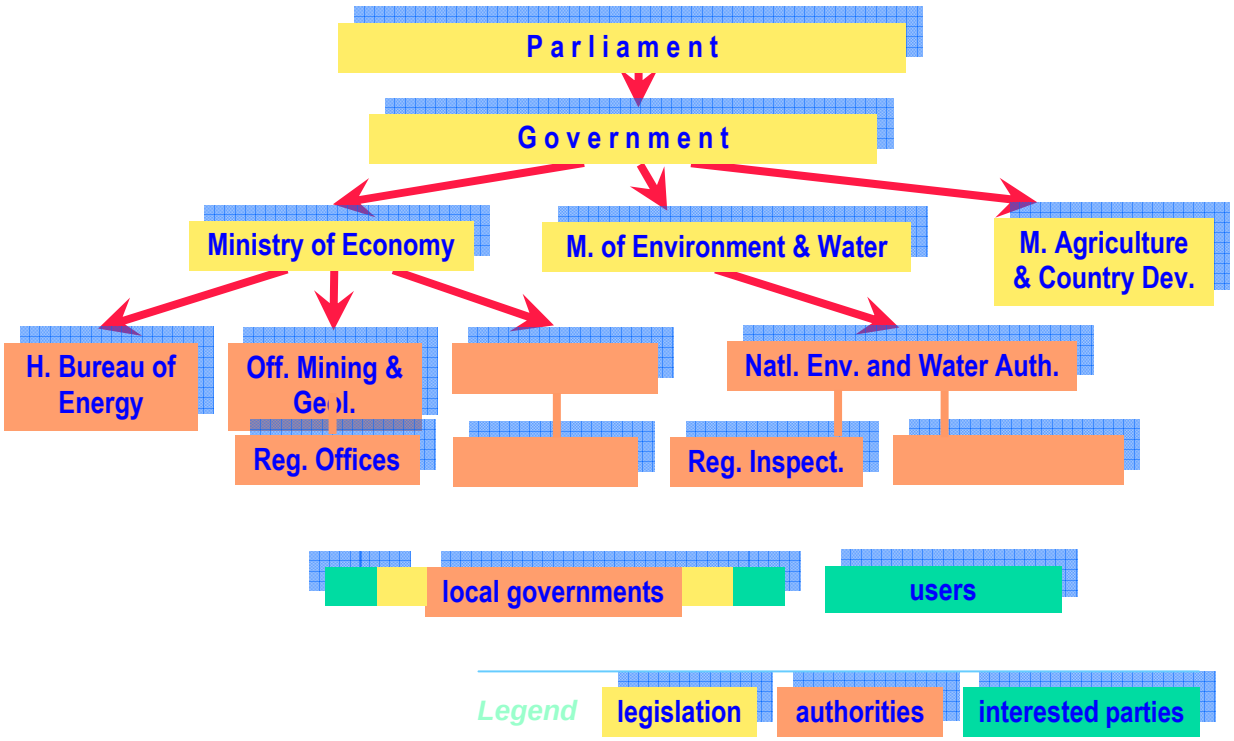
b) the re-injection of groundwater into the same or into another aquifer used for the same purpose, in case the re-injected water does not change the quality of the reserve unfavourably

ba) groundwater used for geothermal energy extraction with closed circuit technology"

Regulatory framework and licensing schemes

In mining and geology affairs the competent designated authority is the Hungarian Office for Mining and Geology with five regional offices (as first-instance authorities). This government agency is supervised by the Ministry of Economy and Transportation. The other important authority is the Environmental Protection, Water Management and Nature Conservation Central Inspectorate (with ten regional inspectorates), called "The Green Authority". Local municipalities also have a decisive role in licensing affairs.

The Hungarian Bureau of Energy has got a prime role in power plants, electricity, gas network issues, and in setting the trade-in prices. It has no regional authorities. The role of the Ministry of Agriculture and Country development and its licensing authority, the Plant and Soil Protection Inspectorate is important but minor role in supervising the geothermal applications.



Exploitation licensing

Utilization of geothermal energy falls within the scope of the Act on Mining (§ 1 h, Act No. XLVIII of 1993). Research and production of subsurface water with geothermal energy content is **not regulated by the Act on Mining** (§ 1 (5) a, Act No. XLVIII of 1993). Licensing procedure related to the utilization of thermal water is therefore conducted mainly at the responsible "green" authority. If the licensing procedure is conducted by the responsible green authority, the expertise of the mining inspectorate is required and it has to be procured by the green authority, but not by the applicant (Principle of „concentration", or the "one stop shop", the permission procedure should be conducted by only one authority (Act No. CXL of 2004 on General Rules of Administrative Official Procedure and Service).

The licensing procedure of the production and the re-injection drilling has to be handled separately but it is rather the same licensing procedure for both drillings. For the surface pre-exploration permit a report to the responsible mining inspectorate has to be submitted at least 30 days prior to the beginning of the activity (§ 4, Act No. XLVIII of 1993 on Mining).

Optional exploration permit

Geothermal plants also fall within the competence of the water inspectorate (Act No. LVII of 1995 on Water Management). First step of the water authorization procedure is an optional exploration permit. Its objective is to receive a prior approval of the responsible water authority for realization of the planned water usage at the concerned site. To procure an optional exploration permit is not compulsory, but in possession of an optional exploration permit the „real" exploration permit can generally be obtained easier and in shorter time, and therefore it is recommendable. An optional exploration permit is valid for one year and can be extended once at most for one year. (§ 2, Government decree No. 72/1996 (V.22.) on exercising the official capacity of water management).

Thermal water exploration permit

The application has to be submitted to the responsible water authority ("green authority"). The Hungarian law system does not contain any statutory instrument which would warrant the **exclusive**

usage of the applied water reservoir of the applicant in a designated area. According to the Act on Mining [§ 49; Act No. XLVIII of 1993 on Mining]: water is not qualified as a mineral resource. Therefore a request for **protection of a mining area** is not possible in the case of thermal water projects. The **green authority** controls the right title usage of the site on the surface, but cannot, and no other authority can neither, secure an exclusive utilization of the concerned water reservoir and of the permission area the applicant; can grant exploration permit to another contractor for the same water reservoir.

Managing the site, real estate legal issues
The realization of a geothermal project requires the security of estates for:

- drilling;
- power plant construction;
- heat plant construction;
- district heating network;

Foreign natural and legal persons are **not permitted to purchase proprietary rights on arable lands.** The prohibition cannot be avoided by founding a Hungarian business company, because foreign natural and legal persons as well as Hungarian legal persons are **not permitted to purchase proprietary rights on arable land.** As defined by the Act, **arable land** is a parcel of land in a non-residential area, which is registered in the real estate register as plough-land, vine-land, orchard, garden, meadow, pasture, reedy, forest or fish pond (§ 3 a), Act No. LV. of 1994 on arable land). In accordance with the Government Decree No. 7 of 1996 a foreign or private or legal person can acquire proprietary rights of a real estate – which is nor qualified as an arable land – only with a permit of the executive of the county administration office. The permit **can be granted,** if the acquisition of real estate does not endanger public interest or interest of the local government. The permit **has to be granted,** if the acquisition of real estate does not endanger public interests of the local government, and

- the proprietary rights of the foreigner was acquired by expropriation; or
- the foreigner exchanged his domestic real estate for another one;
- the aim of the acquisition is the termination of a common propertly settlement; or
- the foreigner has been living in Hungary certified for at least five years (§ 1 (2), Government Decree No. 7 of 1996 (I. 18.)).

Purchase of arable land by foreigners is currently prohibited, and may only by permitted after the transitional period of seven years concerning citizens of EU Member States.

Leasing of arable land is possible, but it can be leased for a maximum period of 20 years and in case of some arable land-types the lease period is even shorter, whereas the utilization period for a well could last 50 years. **Leasing** of arable land by a foreign private or legal person is legally possible, however, the lease contract can be concluded with a maximum period of 20 years. With respect to a geothermal project, the **cultivation profile** of the arable land has to be amended, i.e. withdrawn from the cultivation profile. Alteration of the cultivation profile has to be permitted by the land registry office. It clearly has to be defined in the lease contract, that the maximum period can be exceeded, as the utilization period for a well would last up to 50 years. **A** real estate – except for the arable land – can be leased for a specified or an unspecified term.

The way to use property exclusively owned by the state or by local governments or activities referring to exclusive competence of the state or the local government, has to be assigned by a **contract of concession.** The rules of the concession are strictly regulated by the Act No. XVI. of 1991 on concession, which warrants the same treatment for foreign natural and legal persons, as for Hungarians. Considreing that a leasing contract can be terminated, purchase would be recommendable for securing the real estate, although the cultivation profile (i.e.: eventually arable land) might cause some serious problems.

District Heating

In the field of district heat **two authorities** are empowered:

- the Hungarian Energy Commission
- the local government.

The field of responsibility is clearly regulated by the Act No. XVIII of 2005 on district heat (§ 4-8). The **Hungarian Energy Commission** is the responsible authority in the case, that heat energy and electrical energy are produced in the construction either separately or combined, and heat energy is produced partly or completely for district heating. For this reason a **permit for the installation and a permit for the operation of a heat producing construction** are granted, amended and withdrawn by the Hungarian Energy Commission. In all other cases (i.e. producing only heat energy for district heating but no electrical energy) the **local government** is the reasonable authority. The **validity term of** the permit for the installation of a heat producing facility is included in the installation permit itself. Its validity can be prolonged once by the original validity, but by two years at most. The **operating permit** is guaranteed for an indefinite period. The **permit for supplying district heat** has to be requested at the notary of the local government and it is granted for an indefinite period as well. In the licensing procedure **the administration deadline** takes 90 days. **Resolutions** of the Hungarian Energy Commission and of the local government cannot be appealed. However, a review of their resolutions can be done by the court.

An **approving resolution of the licensing authority is required** for merger or split of the licensee company, such as for reduction of its share capital and also for the acquisition of controlling interest in the licensee company. **District heat retail prices** (for capacity of less than 50 MW)are regulated by a decree of the municipal council, which decides after obtaining the opinion of the Minister of Economy and Transport (§ 7 (5), Act Nr. LXXXVII of 1990 on pricing). **The highest price** is to be settled in such a way, that the expenditures and profits of an efficient operating corporation shall be covered by the regulated prices, also with regard to deprivation and subsidies (§ 8 (1), Act No LXXXVII of 1990 on pricing).

Heat pumps

In the licensing of closed circuit vertical heat pump doublets the mining inspectorate is the major competent authority (GKM Ministerial Decree 96/2005. (XI. 4.) on the rules of the mining authority in the sphere of specific construction affairs**)**. It is obligatory to inform the mining inspectorate 8 days before the actual start of the works. After completion of the works a come-into-use license must be acquired from the mining inspectorate. The licensing procedure for open groundwater doublets is similar but it has to be submitted to the regional green authority.

Expert awareness (Evaluation of the GTR-H questionnaire)

Several organizations answered the questionnaire, such as government agencies/regional authorities, trade & industry associations, banking & financial institutions, industry & technical service companies, investors, geothermal education facilities, exploration & resource assessment consultants, geothermal energy users and others. On the basis of the evaluation of the completed questionnaires, the following conclusions can be drawn.

The '**lack of incentives**' has the 1st place on perceived barriers. Personnel interested and/or active in the field of geothermal energy feel that the biggest barrier to development is this one. Other barriers in a decreasing order:

- 'lack of clarity on legal and regulation requirements' ,
- 'inadequate regulation' ,
- 'lack of specific law/regulation related to geothermal resources',

- ‘geothermal taxes’ ,
- ‘high cost of license/royalty’ ,
- ‘access to geological information on geothermal resources’ and ‘cost of environmental impact assessment (EIA)’,
- ‘access to information on geothermal exploitation systems’.

They had the chance to specify other possible barrier(s) as well. The following special barriers were put on the list: lack of the law on renewable energy, lack of authority supervision, lack of hydrocarbon lobbying, lack of vocational training, lack of re-injection obligation, lack of treatment as sewage, lingering in licensing, shortage in financials, lack of co-management of multifunctional utilisation of water resources, dilettantism of authority and government bodies (!!!), negative attitude from the authorities, low supporting intensity of projects in the field of non-profit goals, lack of standards.

The participants were interviewed on any other comments/remarks that would assist the organisers in the development of a European framework for regulation of geothermal heat. Several comments were made:

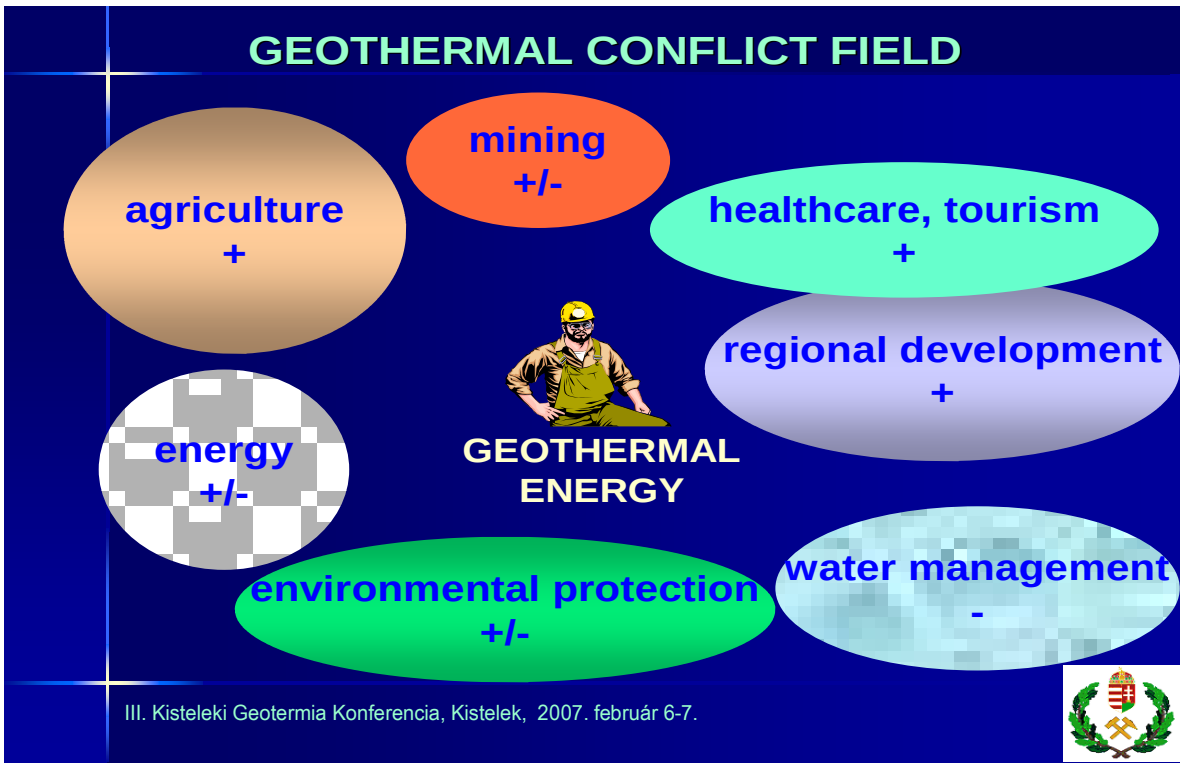
- exploited-altered heat energy should be supported as well, more favourable delivery price is needed;
- not only Geothermal Energy Law but Law on Renewable Energy is needed, too;
- simple, transparent regulation - simplified licensing;
- lobbying + enhancing the role of renewables in energy policy;
- professional stakeholders working group is needed for preparation of regulation in the ministries;
- harmonising national legal rules;
- more intensified collection of experiences from professionals working in energetics;
- applicability of the EU Interreg program;
- stronger professional co-operation of energetics and water affairs;
- more money for geological basic research, and geothermal potential assessment from the mining royalty;
- more research on sustainable exploitation technologies;
- harmonized EU member states legislation;
- more detailed differentiating of thermal waters to classes which would form the basis of licensing & payment liability;
- heat utilisation from heat pumps should be the integral part of the Water Framework Directive;
- to give heat pump energy utilisation a chance in sewage management technologies;
- definition of minimal obligatory quality & technical requirements is needed;
- forming a uniform controlling – regulating concept, and quality assurance requirements;
- clear and available grant/assistance system;
- higher-level supporting of investment costs of re-injection;
- data of re-injection should be made public;
- establishment of new wells should be made easier;
- definition of the reception contingent into surface waters;
- more CEN standards needed.

Concluding remarks

Geothermal energy applications meet numerous challenges in Hungary, not only due to legislation barriers but because of certain opposition by other lobbies and authorities. The mining authority is supportive for the field but some mining companies, especially oil and gas enterprises look at

geothermal energy as a potential competitor, not necessarily by economic means but as an interference and collision on the same natural resource domain (ie. geological formations and groundwater) on which they have certain exploration and exploitation rights. Healthcare, tourism and regional development sector explicitly backs the development of geothermal energy use, mainly because of the hot spas and medical applications. The rural world is supportive too because in Hungary there is a great tradition of thermal water heated greenhouses.

The role of the energy sector is rather contradictive. The officials support the development of geothermal energy as one of the renewables, but biomass has a declared priority among them. Major energy lobbies look at the geothermal field as a minor competitor. The green lobby treats it in a similar way, they acknowledge it as an environment-friendly renewable but the polluting emissions into surface waters, mainly by agriculture users, generate a significant opposition too. The water management supervision is rather aware of the negative impacts of thermal water use, e.g. falling groundwater levels and temperatures of the Pannonian Basin due to overexploitation.



Concerning the legislation in Hungary the exclusive usage of the permit field is not guaranteed. The exclusive usage of the applied water reservoir of the applicant is not secured by the law. Therefore the consequences from the point of view of project development and project related risk management are:

- reservoir can be used by several competitors or projects,
- investments are not secured on a long-term (possible project period of up to 50 years)
- loss of possible revenues if e.g. reservoir temperature is lowered too fast or flow rate declines.

The possible solution is the definition of a permit area with a defined application procedure, and later an exploitation area with a well-defined application procedure including modelling for the evaluation of the reservoir.

Another legal barrier concerns the fixed feeding-in tariff, because the period of its validity is not determined in the act. In this manner, there is a significant risk that an amendment could reduce the feeding-in tariff. As a solution, establishing stable conditions for power generation based on renewable energy is recommended. The security of a long-term fixed feeding-in tariff is especially

important since already the project preparation phase (time till commissioning) could last up to three years. A related issue is that there are no tariff differences between renewable energies (wind, solar, geothermal energy, etc.) with different general attributes.

Concerning the general conclusions of the study on the legal barriers:

- Hungarian legislation relevant to geothermal energy is spread throughout mining, water, environment, energy fields;
- financial burden of geothermal projects is multiple, and likely greater than in other EU Member States;
- the long-term safety/interest of investors is not satisfactory (neither from legal nor financial point of view);
- regulatory authority framework has become simple due to public administration reform of 2006 but many criticise the yet long licensing period;
- near future improvements in legislation are foreseen (e.g. amendment of the Mining Act) but no new economic incentives predicted.

Summary of the current
Status of geothermal energy sector in Poland

September 2009

Mineral and Energy Economy Research Institute
Polish Academy of Sciences

INTRODUCTION

The Summary has been prepared on a basis of the Report on "Deficient Regulation – Poland's Country Report" (Deliverable D6 of GTR-H Project, WP-2: "Deficient regulation").

It highlights the essential legal and regulatory issues / shortages hampering geothermal heating development in Poland as well as the issues which need to be corrected in order to ease and speed up geothermal energy use for heating. Many deficiencies and shortcomings form significant barriers for geothermal energy implementation and do not allow for its wide development which would be adequate for geothermal water reserves found in many areas of the country.
For all GTR-H stakeholders was clear that adequate regulations should act as real milestones for geothermal development on a scale envisaged by several EU-strategies and initiatives concerning RES sector.

GEOTHERMAL HEAT MARKET IN POLAND

Generals

Poland is characterised by significant low-enthalpy geothermal potential, connected mostly with the Mesozoic sedimentary formations. Generally, at the depths from 1 to 4 km reservoir water temperatures vary from 20 to 130°C, while the total dissolved solids (TDS) are from 0.1 to 300 g/dm^3. The proven geothermal water reserves, evidenced on the basis of well flow tests, amount from several l/s up to 150 l/s.
The heating sector represents the most important type of direct uses, as it can play essential role in local energy markets, result in a considerable reduction in fossil fuels' consumption, contribute to environmental protection and sustainable development and to fulfilling the country's obligation to reach 15% of RES in final energy consumption by 2020 (EU RES Directive, 2009).

Geothermal water use for heating was initiated at the beginning of the 1990s while the tradition of using warm waters for balneotherapy in several localities is much older as it originated in the 13th - 14th centuries. Since 1992, six geothermal heating plants have been launched. Some investments in spa and recreation sector were initiated. The investments works have been accompanied by the development of research, many feasibility studies and implementation projects. Moderate but constant development of "shallow

geothermics" based on heat pumps has been also observed. This sector also rises increasing popularity and interest among the investors.

The growing interest in geothermal energy use development (heating, bathing & balneotherapy) has been reflected, among others, in a growing number of licenses issued in recent years for exploration for and exploitation of geothermal waters: in case of exploration 3 – 5 licenses in 2007 – 2009 as compared with single licenses /1-2/ in earlier periods).

Among main factors hampering wider geothermal energy development one should mention deficiencies in existing legal regulations and financial incentives – the problems at which the GTR-H Project was oriented.

Sector of energy industry in Poland is based on traditional fossil fuels such as coal, oil and gas. Current consumption of energy is still dominated by hard coal (over 60%) in the contrary to global situation where other fossil fuels i.e. oil and natural gas have similar contribution like coal, as each of these sources reach some 20 to 35%. The country has low RES' consumption (the market share of all RES, inclusive of waste energy is slightly above 6%). Among the main factors behind low RES share are the competitive prices of traditional fuels, insufficient financing and – last but not least – weak legal regulations.
According to the EU Directive on RES promotion (2009) Poland shall reach 15% of RES share in final energy consumption by 2020. Heating sector forms a very important factor to reach this target. It can be supported by extensive use of geothermal energy the prospective resources of which are located in a number of localities and regions. Among available renewable energy sources in Poland are hydropower, biomass, wind and solar energy. Geothermal has undeniably the greatest potential. However, within the sector of renewables itself, geothermal is still unappreciated since other RES are much stronger promoted. Relatively high investment costs, complicated legal and administration procedures are indicated as the main reason for such a situation.
In 2009, five geothermal space heating plants were operational: in the Podhale region, in Pyrzyce, Mszczonow, Uniejow and Stargard Szczecinski (fig. 1). As each of them uses waters of different parameters, they operate on the basis of different layouts and vary as far as geothermal capacity and heat production are considered. Among them are plants with some gas peaking (Podhale), integrated ones with big gas contribution (Pyrzyce, Mszczonow, Uniejow) and a plant based only on geothermal heat (Stargard).

At the end of 2008 the installed geothermal capacity (heat pumps excluded) totalled ca. 110 MW_t while geothermal heat sales was ca. 480 TJ/y. In case of geothermal heat pumps using low-temperature ground heat or water, the capacity was roughly estimated as ca. 180 MWt and heat production as ca. 1000 TJ.

Geothermal water temperatures in the heating plants vary from ca. 40 to 87°C. In most cases, their implementation for heating purposes has to be done with the support of peak sources and heat pumps. The necessity of their use results from the characteristics of heat consumers – the majority of central heating systems was designed and are operating on the basis on nominal inlet parameters 90/70°C, at the outside calculation temperatures from –16 to –24°C (depending on location). Rare are medium-temperature heating systems designed for inlet 55/45°C and low-temperature systems for heating of large surfaces – e.g. floor-heating (often adjusted to parameters of 35/28°C). So far, no electricity generation installation based on geothermal energy has been launched in Poland.

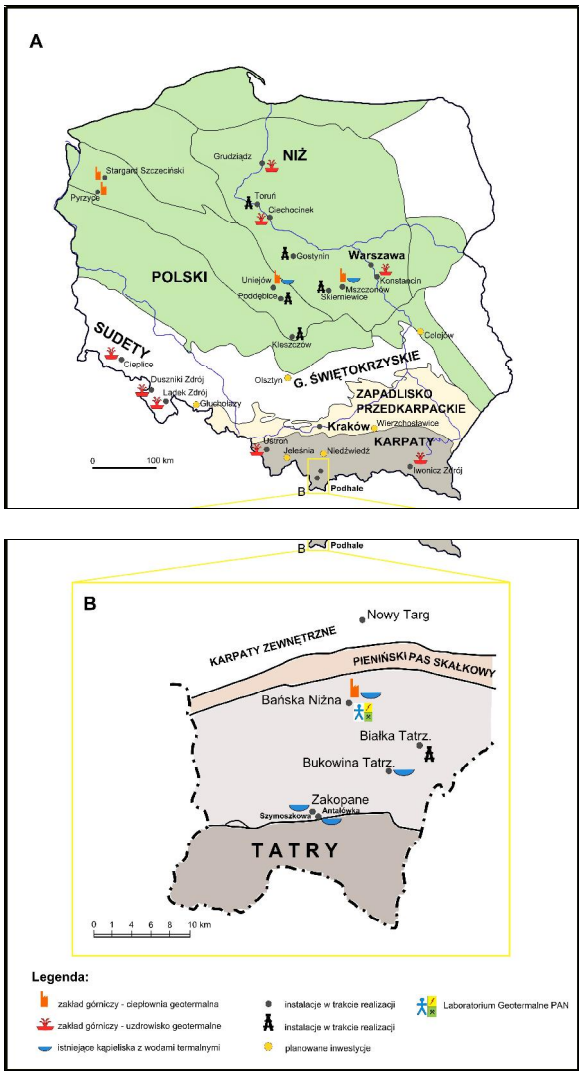


Fig. 1. Poland, 2009: geothermal heating plants (orange symbols), 1. spas using geothermal water for balneotherapy (red), 3. bathing centers using geothermal water (blue), 4. geothermal projects underway (black), 5. investments planned (yellow)

LEGISLATION & REGULATORY FRAMEWORK RELATED TO GEOTHERMAL HEATING SECTOR IN POLAND

In Poland, the activities related to geothermal energy sector are regulated by several legal acts (with Geological and Mining Act, Environmental Act, Energy Act as the basic ones):
Geological and Mining Law (new proposal under consultation and Parliamentary proceedings in 2009); Energy Law; Building Law; Act on Spatial Planning and Land Development; Environmental Act; Act on Freedom of Business Activity; Water Law; Act on Proceedings in State Aid Cases; Act on the Amendment to the Act on the Conditions of Admissibility and Supervision over Public Aid.

Taking into account management of geothermal energy, the above acts can be assigned to the following issues:

1. prospecting for, documentation and exploitation of geothermal energy,
2. production and distribution of energy by geothermal plants,
3. economical support for production of clean energy.

3 REGULATIONS FOR GEOTHERMAL - SHORTAGES AND BARRIERS

The main shortages and barriers hampering deployment of geothermal energy use for heating (and for other uses) in Poland identified and highlighted during several activities of GTR-H Project by representatives of various groups of stakeholders can be summarized as follows:

- Legal regulations are not tailored to geothermal specifics (as it is oriented to mining sector mostly) so they do not facilitate long – term investments in geothermal sector
- Too many, complicated and long legal and administration procedures,
- Many fees and taxes (up to 20 – 30% of geothermal heat price),
- Shortage of economic incentives and tools,
- Lack of Risk Guarantee Fund,
- No „green certificates" for geothermal heat /and heat from other RES),
- Lack of an independent body coordinating the support of geothermal projects from public sources (on a basis of selection the best and most feasible projects),
- Lack of a body similar to Technical / Geothermal Committee in France serving as a technical and scientific background for operators and investors of geothermal plants.

4 THE ISSUES NEEDED TO BE CORRECTED BY THE NEW / AMENDED LEGISLATION OR BY THE IN INTRODUCTION OF THE FRAMEWORK ELABORATED BY GTR-H

Several recommendations and proposals were suggested to be introduced in the new /amended legislation (if any) or by the introduction of the framework elaborated by the GTR-H works, following, among others, the GTR-best practise cases. i.e.:

Transfer some procedures to lower administration level,

- Simplify and shorten the procedures concerning all stages of geothermal projects and investments,
- Cancel or limit several fees and royalties,
- Lower VAT for geothermal heat price (now 22% comparing with 5.5% in case of France),
- Introduction of the „green certificates" for geothermal heat,
- Establish a Risk Guarantee Fund,
- Establish a system /body to coordinate public support for geothermal on a basis of professional selection the best feasible projects.

Among import flanking measures one should listen the following:

- Comprehensive support and assistance for investors to gain the financing (state, international) and to create a quick and streamline path,
- Introducing geothermal research, R&D works in the area of financing by the Ministry of Science and Education; so far the financing by the Ministry of Science and Education is very limited

(being mostly provided by the Ministry of Environment, National Fund for Environmental Protection and Water Management).

Recent initiatives undertaken by the Ministry of the Environment and National Fund for Environmental Protection and Water Management to simplify the regulations and hampering some obstacles for geothermal development (2008 - 2009) include:

- 2008 - 2009: New Geological and Mining Law – a proposal by the Minister of Environment (under public consultations and than under proceeding process in the Parliament in 2009):
  - transfer some procedures from governmental to regional administration levels,
  - introducing a 0% fee for geothermal water exploitation,

- 2007: Decree by the Minister of Environment – introducing a decreased fee for use of geological information for geothermal water exploitation (1% of nominal well value) from 01.01.2007 to 31st Dec 2010,

- 2009, June: decree by the Minister of Environment – introducing new conditions of public financial support of geothermally-related activities provided by the National Fund for Environmental Protection and Water Management. This regulation is addressed to micro- and SMEs and introduces, among other, the support up to 50% of first geothermal well drilling costs.

All of the-above-listed shortages and barriers which do hamper geothermal deployment in Poland (despite prospective low-enthalpy resources suitable for heating in many localities) had been considered and taken into account during the realization of GTR-H project. They have been addressed in the Final Regulatory Framework (D15) presenting the changes and new solutions required to be introduced in order to change the legal regulations as well as introduce indispensable flanking measures. One shall expect that they will be taken into account during further amendments and improvements of legislation and regulations related to geothermal sector in Poland following the global and regional documents and requirements (e.g. EU-Directive on RES promotion and NREAPs).

5 FINANCING GEOTHERMAL FROM THE PUBLIC SOURCES – THE NFEPWM CASE

In order to meet the EU - accession treaty requirements and the tasks of energy policy of the EU (including the EU-Directive on RES and related documents), the institutions must be established and the financial mechanisms must be created, which would run and support the relevant projects. One of the priorities of the National Fund for Environmental Protection and Water Management (NFEPWM) since its establishment in 1989 has been the financing of projects related to implementation of renewable energy sources in Poland. Financial support was and still is directed to utilization of all renewable energy sources, i.e.:

- solar energy,
- wind energy,
- geothermal energy,
- biomass energy,
- hydroenergy.

Taking into account over 15-year-long experience in financing of environment protection activities, the NFEPWM is now and can be in the future the principal source of support for development of RES and geothermal in Poland. The NFEPWM has the relevant institutional structure, significant financial resources and knowledge of investors and investment needs in the field of the RES.

As mentioned above, recently (2009) the Fund has elaborated some new principles of public financial support for geothermal projects, including drilling of wells. These works have been resulted in a new regulation issued by the Minister of Environment on new conditions of support for geothermally-related activities provided by the National Fund for Environmental Protection and Water Management. This regulation is addressed to micro- and SMEs and introduces, among others, the support up to 50% of first geothermal well drilling costs.

APPENDIX II

Overview of Geothermal Regulations in EU-27 Member States

OVERVIEW GEOTHERMAL REGULATIONS IN EU-27 MEMBER STATES

Deliverable D 14

European Perspective:

The RES-directive gives a clear definition of the geothermal energy, something asked for long time by the geothermal industry.

The RES-e directive 2001 allowed some renewable electricity technologies like Wind and PV to really develop. For the production of electricity from geothermal energy, the growth is slower. The first plant has been built in 1904 in Italy. But the conventional technology allows the production of electricity only in regions with high enthalpy (> 150 °C). In the EU, it concerns: Italy, Açores, Guadeloupe, Canaries etc. Today ca. 0,9 GWe are installed in the EU.

But two innovative break-through technologies will boost this geothermal production:

- Binary plants to use medium and low enthalpy sources for geothermal power (> 80°C).
- Enhanced Geothermal Systems could be installed everywhere in the EU

Geothermal electricity has really the potential to be developed in each Member States. In consequence, a target 2020 for geothermal electricity must be written in all NREAPS. Geothermal electricity will be a main contributor in the future, notably to provide the base load (with an availability > 90% !) and to have a smart green grid: It is the perfect complement to PV and Wind. There is an important need to change the impression geothermal power is confined only in some areas.

The RES heating and cooling sector suffered to not have a European legal framework to accompany its development. This RES-directive considers for the first time this sector, representing 50% of our energy consumption.
This frame will allow a sustainable development of the geothermal sector:

- the deep geothermal energy, for direct uses: district heating and cooling, applications in agriculture (greenhouses, drying…), process heat…

The RES directive must help the full use of the geothermal potential for district heating and cooling, especially in Eastern Europe. Heat from geothermal cogeneration will also be a large h&c contributor. This European framework proposes also an administrative simplification.
In the Member States where a potential exists for deep geothermal, targets 2020 have to be high because of the high economic competitivity of this technology.

- the shallow geothermal heat pump systems for heating and cooling of housings, buildings, industry…

It is important to have a clear distinction of the different HP systems, as they don't have the same characteristics. Geothermal HP can provide heating and cooling everywhere in the EU with a high efficiency. Targets for 2020 must be ambitious.

2. Sector Perspective:

Geothermal Electricity

Today, geothermal energy produces electricity only in 5 Member states: Italy, France, Germany, Portugal and Austria. In 2020, we expect that ca 20 EU countries produce geothermal power. Indeed, not only conventional technologies but also binary technologies and EGS will help the development. In consequence, The NREAPs must mention a target 2020 for geothermal electricity, although they are conservative, as it will allow to further developing in longer term. One suggestion is to point out the two well-known families of electric conversion systems from geothermal source: Conventional geothermal steam plants (with or without flash and direct use of steam in turbine) and Binary plants (ORC-Organic Rankine Cycle, Kalina etc.).

The potential is not enough known. Member States have to proceed to resource identification for geothermal energy assisted by Geological Surveys. It will be a great support to increase awareness and to communicate for promoting this RES technology.

Countries will need to adopt geothermal regulations for simplifying the procedures:

- clarify the geothermal resource ownership
- reduce time for planning permission
- provide license procedures for EGS exploration
- allow grid access
- give priority to geothermal energy versus carbon capture and storage for underground use

One important barrier is the high upfront costs for exploration, and the exposure to risk of failure for the drilling. Innovative financial tools must be proposed in each Member States to cover this geological risk which hampers the geothermal development.

If we want to develop further the geothermal electricity technologies and notably the EGS, the education and training system should be adapted to consider these aspects.

Another issue is the lack of drilling rigs available for geothermal projects as they are in competition with the oil and gas sector. A geothermal industry must be created, and the creation of national associations will help to constitute it.

Geothermal heating and cooling

- Deep geothermal (excluding low temperature geothermal heat in heat pump applications)

The potential for direct use of geothermal energy to heat and cool is far from being fully exploited. A major issue it to increase awareness about this technology and notably for the development of geothermal district heating and cooling in Eastern Europe. A big communication plan could be launched, but the main toll will be to propose ambitious targets for 2020.

The adoption of geothermal regulations, implementing notably the RES directive with the definition about geothermal energy, is necessary for a sustainable development of the market. These regulations must take into account:

- the clarification of the geothermal resource ownership
- the simplification of the procedures
- the adoption of a licensing system
- the nomination of a single administrative body

The barriers for the development of cascade uses should be removed, with a promotion of this system: District heating, heat process for industry, agriculture…
A methodology to collect the statistics for direct uses must be adopted in coordination with Eurostat, in order to take into account all the different systems.

- Shallow geothermal heat pump systems:

These systems can be installed everywhere in the EU. The main barrier is the lack of awareness. A national communication plan must promote this heating and cooling technology to: architects, local energy agencies, engineering and design companies, building industry, consumers.

An exchange of best practices will help to install good systems. Regarding the possibilities given by these systems, the NREAPS must propose ambitious targets for 2020 to assure its development. Regulations of these small scale installations can be simplified in adopting a licensing system with a single regulatory authority. The RES directive says that Member States must have a certification scheme by 2012. For geothermal heat pumps, it will concern the planners and installers (drillers).

An education program and training courses must be developed all over the EU, following an European framework in order to create areal trans-european market.

A major issue is concerning the statistical data as in this moment it is not clear what is the starting point at the European level about the number of geothermal heat pumps installations: no national / regional / European information and databases regarding all the functional applications, capacities, performance, savings, efficiency, implementation year, owner etc.

Eurostat and the EU countries must adopt a clear methodology to account the heat from these systems, and to monitor the heating and cooling production.

3. Country Perspective:

See Excel table for D14 on www.gtrh.eu

4. Good Practices, Instrument Perspective:

Geothermal electricity

There are several instruments and incentives to bring favorable conditions for geothermal development:

- feed-in tariffs
- geological risk coverage
- risk insurance schemes
- additional measures like portfolio standards, tax credits, public support (EU, governmental, local…)

The geological risk exists especially at sites with only partially known subsurface conditions: the geothermal resource is below expectations, the fluid is insufficient… Risk coverage schemes aim at the reimbursement of a certain percentage of the investments. Governmental risk coverage schemes exist in France and Switzerland.

In Germany, an insurance scheme has been applied by the commercial insurance sector. A scheme at the European level is lacking. It could be developed in cooperation with the European Investment Bank.

The World Bank provides a geological risk mitigation instrument for geothermal projects, supplied partly by the Global Environmental Facility (GEF) and the GeoFund program. The scheme comprises a GEF grant backed experimental instrument in a contingent grant scheme, the grant is payable on geologic risk event during the exploration phase, and an envisioned collaboration between the WB and the private sector for possible co-insurances.

A good legislative example to regulate geothermal electricity exists in Germany. It is important to specify an appropriate threshold in the size of geothermal plants for which it is possible to get guaranteed feed-in tariffs (e.g. 10 MW_{el} like in Germany). This "standard" should be extended in all EU countries, to equalize the geothermal market. Again on the German example, additional bonuses should be envisaged; for example the challenging but promising EGS technology (Enhanced Geothermal Systems) should be provided with incentives.

Also the decoupling of heat from electricity should be propelled (as it is in the German EEG) in terms of economy, because of penalization of electricity production. The best geothermal regulations are described below in the part concerning deep geothermal.

Finally, an important communication plan is crucially needed to promote all the technologies:

- Conventional geothermal electricity (dry steam and flash steam: water dominated reservoirs and temperatures above 180°C).
- Electricity ORC and kalina Cycle (Binary / Low temperature: range from 180°C to 75°C)
- Enhanced Geothermal Systems – EGS (Hot Dry Rock)

- Supercritical fluids: still at R&D stage

Geothermal heating and cooling

- deep geothermal:

National legislation must define geothermal energy clearly. Based on this definition appropriate regulation must then be adapted through the natural resources, hydrocarbons, mining, groundwater or planning laws or as a separate act.
The main areas for consideration in any geothermal regulation are:

- Primary Legislation needs to clearly define the ownership of the resource at a national level as well as nominating an authority with power to issue licenses for exploration and development of the resource.
- The state owns the geothermal resource or governs the right to use of the resource and grants a license to a company to explore for and produce geothermal energy
- A system of licensing for exploration and exploitation for geothermal resources should be in place as a primary requirement to develop and regulate the national geothermal sector.
- A single administrative authority must be in charge of delivering the authorization, providing data, promoting the technology…
- There is a need for each country to adopt a national strategy that establishes the geothermal potential, identifies targets and increases the public awareness of geothermal energy.

There should be no license fee or royalty payment for geothermal systems (shallow or deep) because the heat is not permanently removed from the rock. The heat resource is renewable and therefore not "mined" in the conventional sense.

- shallow geothermal heat pump systems:

For shallow geothermal exploration and development where licensing is required the local authority could be the licensing authority.

Shallow geothermal energy usage should be regulated only when necessary through local planning laws where large sized commercial systems are installed: A flow rate cut-off for pumping groundwater as a heat source should be applied to define which projects require a license in order to comply with national groundwater abstraction legislation.

Small sized closed loop domestic systems should be the subject of a simple information submission form to a nominated government agency to ensure suitable monitoring at national level of resource usage and protection especially in vulnerable areas. These should require no exploration license; however, the reporting of new heat pump installations to the competent authority is required for registration reasons.

In the accreditation of installers there should be a differentiation between shallow geothermal system installers and heat pump installers.

Shallow geothermal standards need to deal with, among other items:

- Drilling procedures for safety, efficiency and environmental protection (groundwater protection)
- Quality of borehole heat exchangers, manifolds, etc.

- Sizing and design guidelines securing systems for sustainable and efficient operation
- Specific components

It is necessary to increase the awareness. A Large national or local communication campaign will help to develop geothermal heat pump systems.

PART II
GTRH Geothermal Regulation Framework