GEODH Project: Promote Geothermal District Heating Systems in Europe

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on behalf of the GeoDH consortium

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ABSTRACT

The objective of the IEE funded GEO-DH project (www.geodh.eu) is to accelerate the uptake of geothermal district heating (GEODH) to contribute, among other things, to increased security of supply in the EU and to the achievement of the targets set in the Renewable Energy Directive (EU, 2009). This project aims to remove administrative and financial barriers and to work alongside decision makers to facilitate the adoption of the right regulatory framework. It focuses on developing geothermal district heating systems in Central and Eastern Europe and in other EU countries with ambitious 2020 target or with geothermal DH projects under development.

Visible results of the project will include the production of geothermal and heat demand maps, workshops and capacity building activities with regional and local authorities (LAs) in the target countries. In addition, administrative, legal, financial and managerial recommendations will be put forward to address the identified barriers and to contribute to the acceleration of the market penetration of this technology. The undertaking of the activities for and with the public authorities in the target regions and local authorities as well as the interaction with the stakeholders is expected to lead to significant project impacts.

Figure 1: GEODH logo

1. INTRODUCTION

The IEE - Intelligent Energy Europe - funded GEO-DH project runs from April 2012 to September 2014. The Brussels-based European Geothermal Energy Council (EGEC) has initiated and now coordinates the project with the ultimate aim of accelerating the uptake of geothermal district heating (GEODH) in Europe by removing non-technical barriers.

The project consortium comprises a range of government bodies, national district heating and geothermal associations, and local authorities, each representing a country with the exception of the coordinator EGEC (partner names and logos are included in Table 1 overleaf).

This project covers 14 countries and has a special focus on Central and Eastern Europe (Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovenia) and other EU countries with ambitious 2020 target (The Netherlands, Germany, Italy, France) or with geothermal DH projects under development (Denmark, United Kingdom, Ireland).

GEODH builds on previous EU projects such as GTR-H, aiming to identify and review the regulatory barriers and deficiencies in unregulated EU countries (Goodman et al., 2010), and is complementary to the on-going GEOELEC project (www.geoelec.eu), which is covering certain aspects of the deep geothermal sector (e.g. drilling market, environmental protection and social acceptance) which are relevant also to the development of geothermal district heating systems.

2. BACKGROUND

District heating is a system distributing heat from a centralised generation plant to end (residential, tertiary, commercial, recreational facilities etc.) users, connected via a heating grid and substations. DH has replaced, in many instances, traditional central heating systems where each building is heated by an individual boiler.

DH may easily achieve higher energy, economic and environmental performance. Heat supply is best adjusted to users demand. Individual building boilers are replaced by a heat exchanger three way valve piping outfit, fuel supplies and operation/maintenance are optimised, all factors resulting in significant cost savings. Last but not least, this technology reduces greenhouse gas emissions and excess heat losses, thus securing upgraded environmental control. In Europe, there were over 5,000 district heating systems installed in 2012 and altogether the market share of district heat is about 10% of the heating market.

The use of geothermal as a source for DH is all but new. As a matter of fact, it dates back to Roman ages seen in the ruins of city homes and baths heated via natural hot water catchments and piping. At Chaudes Aigues, in Central France, a city DH system, pioneered in year 1330, fed by the

Par hot spring at 82°C, is still operating to date. Heated homes were charged, in those times, a tax by the local landlord in exchange of maintenance duties, as reported in the city annals.

Currently, there are 216 GeoDH systems in operation in Europe, with a total installed capacity of 4,900 MWth (Figure 3). The 157 GeoDH systems installed in the EU-27 display a total installed capacity of 1622 MWth (Dumas et al., 2012).

These systems are widely recognised to be competitive, sustainable and reliable. The further development of the use of geothermal in DH systems can, among other things, provide a significant contribution to achieving the 20-20-20 targets of the Europe 2020 strategy, namely:

- Reduction of at least 20% in greenhouse gas (GHG) emissions compared to 1990 levels;
- 20% of the final energy consumption to come from renewable sources;
- An improvement of energy efficiency by 20%.

Table 1: GeoDH Partners

Name	Profile	Logo
Intelligent Energy Europe	EU Programme	
European Geothermal Energy Council **Coordinator**	European Geothermal Association	
Magyar Állami Földtani Intézet	Hungarian Geological Survey	
Agency for geothermal power engineering	Slovakian Geothermal association	
Union of Bulgarian black sea local authorities	Bulgarian Assoc. of Municipalities	
Slovensko društvo za daljinsko energetiko	Slovenian DH association	
Consorzio per lo Sviluppo delle Aree Geotermiche	Italian public company owned by municipalities	
Association Française des professionnels de la géothermie	French Geothermal Association	
Polish Academy of Sciences - Mineral and Energy Econ. Res. Institute	Polish Geological Survey	
Fjernvarmens Udviklingscenter	Danish association for promoting DH	
Gemeente Heerlen	Dutch municipality	

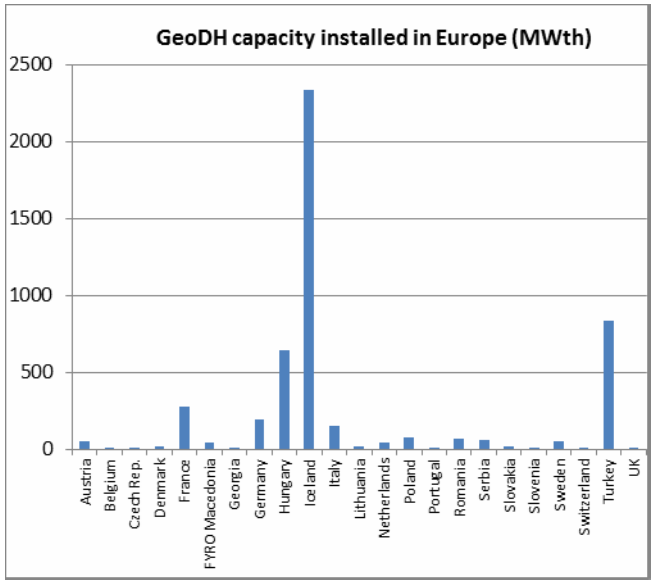

Figure 3: GeoDH capacity installed in Europe (Source: EGEC Geothermal Market Report 2012)

There are already several Central and Eastern European countries (such as Hungary, Poland, Slovakia, Slovenia, Czech Republic, Bulgaria and Romania) with geothermal DH systems installed. However, as suggested in the National Renewable Energy Action Plans (NREAPs) of Hungary, Poland, Slovakia, the potential is much larger. The challenge now is to remove administrative and financial barriers in order to facilitate the penetration of geothermal DH. In the other Eastern and Central Europe countries (Bulgaria, Czech Republic, Slovenia) there is both the need to convince decision makers and to adopt the right regulatory framework as well as to establish the market conditions for a development of the GeoDH market.

In addition, several Western European countries have 2020 targets for geothermal DH of which Germany, France and Italy are the most ambitious. In order to reach these targets, simplification of procedures is needed and more effective financing required.

Lastly, a third group of EU countries includes those Member States currently developing their first geothermal DH systems, such as the Netherlands, the UK, Ireland and Denmark. For this third group of countries, there is not a long tradition of GEODH so there is a need to establish the market conditions (regulatory, financial, etc.) for its development.

The GEODH consortium is working on these 3 different groups of countries (with juvenile, in transition and mature markets) with 14 countries covered in total, (see Figure 2) in order after the project to replicate activities in all EU-27 member states.

All in all, there is still a significant untapped potential in Europe, compared to which the technology results to be still poorly deployed. To reverse this situation it is necessary to identify and address the current barriers affecting the development of geothermal district heating.

Figure 4: The 14 countries covered by the project consortium

3. EXPECTED RESULTS AND BROADER IMPACTS

The specific objectives of GEODH are to:

A. Propose the removal of regulatory barriers in order to promote the best circumstances and to simplify the procedures for operators and policy makers;

B. Develop innovative financial models for GEODH in order to overcome the current financial crisis hampering the financing of geothermal projects, which are capital intensive;

C. Train technicians and decision-makers of regional and local authorities in order to provide the technical background necessary to approve and support projects;

The market and regulatory framework of the 14 European Countries covered will be analysed in order to identify barriers and the specifics of national situations. This will be achieved by exchange of information on costs and the market penetration, by evaluating national and local regulatory framework and transferring experiences from the collective wisdom of European geothermal industry to the 14 European Countries. Legal, financial, managerial as well as technical recommendations will be drafted in order to accelerate market penetration of this technology. The sharing of best practices and technologies amongst European Countries will be achieved through targeted seminars (1 in each country) and activities in 14 regions / local authorities within 14 target countries focusing on a specific audience: municipalities, energy service companies and regional authorities, in order to familiarise them with and improve their competence in the design, installation, operation and maintenance of geothermal DH facilities.

Some of the visible results of the project are summarised below.

3.1 Increasing awareness on the potential for GEODH at regional level

An important barrier for the development of deep geothermal is that decision-makers at national, regional and local levels do not have a clear picture about the geothermal potential and its advantages and therefore do not always feel the need to establish regulations and support schemes. In order to overcome this barrier, a compilation of geological data will be prepared for each region and followed by an estimation of the heat demand. Special attention will be paid on the future evolution of the heat demand in cities with more efficient buildings, and on the role DH can have in this new situation.

Consolidation of above and underground data will result in assessing the geothermal DH potential in best locations in each country. This will be quantified in terms of GWh/annum and resulting equivalent CO_2 emissions saved. Maps on regional geothermal potential and promising projects will be created for the 14 countries. One overall European map will be produced and published online.

The objective is to provide a general overview for the local authorities and the developers whether there is a potential at a regional and local scale. In addition, the project will aim to demonstrate to national governments where in their regions geothermal can be developed, in order to contribute to achieving the national RES targets.

3.2. Proposing recommendations for better regulation

Awareness on the current situation in terms of regulations and barriers prevailing in the European Countries is key to removing regulatory market barriers, improving national and local regulatory frameworks and increasing national market penetration of geothermal energy.

The objective here is to propose local decision makers solutions for simplifying the regulations by translating the best rules into regional and local regulatory solutions and to engage the relevant authorities involved in decision making for endorsing our regulatory proposals for geothermal. Following the identification of the barriers for geothermal DH, the project will focus on the regulatory aspects at local level.

Geothermal regulations have been reviewed in GTRH and a EU legal framework on geothermal regulations has been presented. Main task will now be to implement this framework with endorsement of GEODH recommendations at local level. Indeed, it appears that a national legal frame exists in some countries. Nevertheless, many regional and local authorities did not implement it yet.

3.3. Proposing innovative financing solutions

Geothermal district heating systems are capital intensive. The main costs are initial investment costs, for production and injection wells, down-hole and transmission pumps, pipelines and distribution networks, monitoring and control equipment, peaking stations and storage tanks. Operating expenses, however, are much lower than in conventional systems and consist of pumping power, system maintenance, operation and control.

To a certain extent the generally higher upfront-costs of RES-applications can be compensated by lower or less fluctuating fuel prices or lower running costs. Innovative solutions for financing projects have to be found to overcome this obstacle. Such solutions will be studied in detail and presented in each country to convince operators the geothermal DH makes economic sense.

Special attention will be paid on cooling in order to explore decentralised cold production from geothermal district heating using absorption chillers as an example. These kinds of applications can be seen as an “alternative application” or “secondary application” for cascade applications to try to get maximised benefit from geothermal installations.

3.4. Spreading best practises and training key stakeholders

Training activities will then transfer the best practices and best technologies in geothermal direct heating to the 14 target countries.

Good practices are already in use but they are not very well known. For this reason best practice examples of existing geothermal district heating schemes throughout Europe or schemes that are in the final stages before market implementation will be summarised, classified, and analysed, with the objective of creating examples of good practises in EU countries, covering centralised, large and small-scale systems, different transfer media, as well as different resources.

Moreover, specific training activities will be conducted for further development of geothermal DH by means of 14 targeted courses firstly for local authorities, and other important stakeholders such as DH operators.

4. TARGET GROUPS

The project the consortium has established a genuine contact with stakeholders who are crucial for a successful implementation of the projects, namely:

A. Policy and decision makers of national authorities to adopt the right legislative framework;

B. Decision makers from municipal and local authorities and energy authorities to have a better regulatory framework and simplify the procedures at local level;

C. Banks, potential investors and other market players to stimulate investment in the sector;

These stakeholders will be associated with the project in order find solutions together for removing the barriers mentioned in the foregoing sections.

Furthermore, a second group of stakeholders will be involved as they will benefit from better market conditions and are interested in tools provided by the project:

A. National and local suppliers, designers and installers of district heating and cooling systems (namely engineers, geologists, technicians and utilities) and small and medium-sized enterprises (SMEs);

B. District heating operators and DH associations;

C. Owners and tenants of large buildings;

D. Educational and training institutions (universities, training centers)

They will be active in an Advisory committee and during the dissemination phase in order to reach as many stakeholders as possible across the EU.

CONCLUSIONS

In order to achieve the expected results and accelerate the uptake of geothermal district heating, the consortium is undertaking a number of activities. Studies and reports will be prepared (a set of regulatory recommendations, a report on financial issues and a study on the geothermal potential); seminars (in order to train civil servants in each country) will be organised, workshops (which will communicate the potential applications and benefits of geothermal energy to key stakeholders on each occasion) will be held and local and national authorities will be targeted through a promotional campaign.

These tools resulting from the work undertaken in the project, will address the gap between the potential of deep geothermal to supply heating and cooling, and the potential of new and existing district heating systems to absorb the heat, and thereby allowing economic heat production through renewable energy. The possibilities which are offered by district heating systems will, subsequently, support the stabilisation of existing district heating systems as they will be addressed as valuable supportive instruments to fulfil the respective national and EU-wide goals for renewables (NREAPs with 2020 targets).

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