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Recommendations for the regulatory framework facilitating the geothermal district heating development in Europe

ABSTRACT: The article presents the recommendations of regulatory framework, the introduction of which would significantly facilitate the wider geothermal energy uses in district heating systems in European countries (including Poland). This is all the more urgent that the geothermal resources suitable for such applications on a much larger scale than now have many countries in our continent. Removing legal barriers and simplification of procedures to a large extent should encourage operators, investors, policy makers and other stakeholders interested in this field of ecological energy. The recommendations have been developed within the framework of the EU project „Promote geothermal district heating in Europe" GeoDH) conducted in 2012–2014 (http://www.geodh.eu). The project concerned fourteen countries and gathered the teams from ten countries, including Poland (Division of Renewable Energy Sources MEERI PAS). The proposed legal solutions were consulted and endorsed by many representatives of local authorities and other stakeholders from several countries.

KEYWORDS: geothermal energy, district heating systems, legal regulations, Europe

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Introduction – background and objectives of " The Regulatory framework for geothermal district heating in Europe"

Many European countries possess geothermal energy resources suitable for different applications on much wider scale than now. In particular, this statement refers to the space heating sector. Indeed, this type of geothermal uses shall have the priority because of several reasons. However, in 2012/2013 for a total number of about 5 000 district heating systems in Europe (DH; covering some 10% of the heating market) only 247 were the geothermal district heating systems (geoDH). The comparison of these two figures shows that significant geothermal energy potential in many countries has been poorly developed so far. To the large extent this is mainly due to the lack of adequate national and regional policies and legislation concerning district heating and geothermal district heating systems (the latter as part of RES heat sector) which would create a proper long-term environment for geoDH projects' development. Only a solid legal framework, continuity and predictability of legal, administrative and incentive provisions will provide a stable background allowing strategic decisions in both the RES' and geothermal heat sectors to be taken.

These issues were in focus on the IEE project "Promote the geothermal district heating systems in Europe" GeoDH in frame of the Intelligent Energy Europe Program (IEE/11/813/SI2.616373). Its main purpose was to suggest effective tools and guidance for stakeholders and to stimulate the use of clean geothermal energy for district heating thereby contributing to the implementation of Directive 2009/28/EC on the promotion of the use of energy from renewable sources. The project was coordinated by the European Geothermal Energy Council and embraced 14 countries: Bulgaria, Czech Republic, Denmark, France, Germany, Hungary, Ireland, Italy, the Netherlands, Poland, Romania, Slovakia, Slovenia, United Kingdom. Among the partners was the team from the Division of Renewable Energy Sources of the Mineral and Energy Economy Research Institute of PAS (Kasztelewicz & Kępińska 2012; Kępińska & Kasztelewicz 2013). Figure 1 shows that majority of district heating systems in EU27 is located in the listed countries, so it also results in fact that they have significant potential for introducing geothermal energy into these systems.

In some of the-above-listed countries situated in Eastern and Central Europe (e.g. Bulgaria, Czech Republic, Slovenia) there is both the need to convince decision makers and to adopt the right regulatory framework but also to establish the market conditions for the geoDH development. Several countries in western part of Europe 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 financing required. A third group of the countries includes those currently developing their first geothermal district heating systems (e.g. the Netherlands, United Kingdom, Ireland). They have no tradition of geoDH so there is a need to establish the market conditions (regulatory, financial etc.) for its development. The GeoDH consortium was working on the fourteen countries covered in total, in order for the activities to be replicated after the project in all Europe.

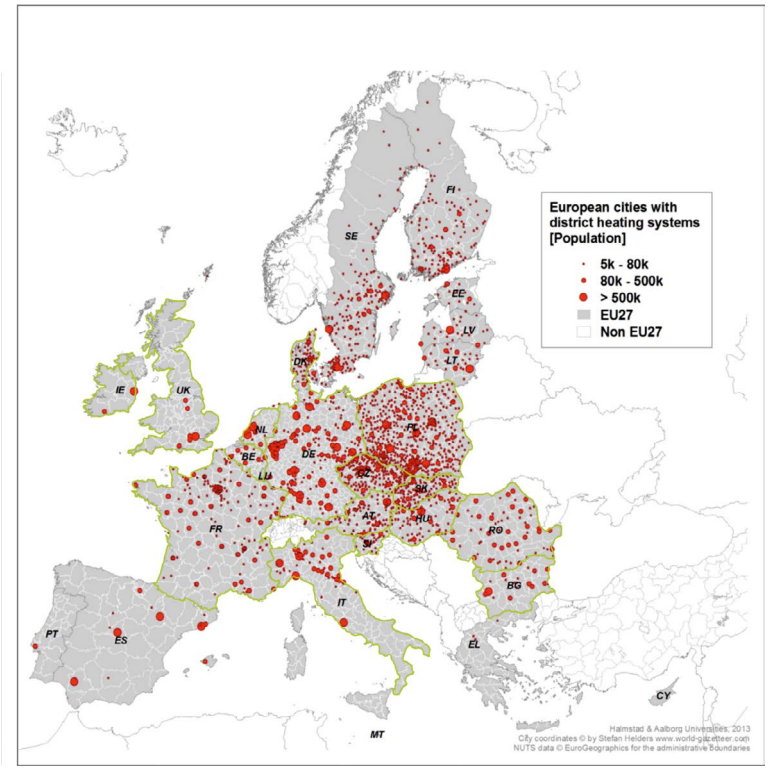

Fig. 1. Map of the EU27 cities (above 5000 inhabitants) with district heating systems.
Green lines – the contours of 14countries included into the GeoDH project (source of map: Werner & Persson 2013)

Rys. 1. Mapa miast w UE 27(powyżej 5000 mieszkańców) posiadających systemy centralnego ogrzewania. Zielone linie – kontury 14 krajów ujętych w projekcie GeoDH (źródło mapy: Werner i Persson 2013)

The specific objectives of GeoDH project were the following:

- Propose the removal of regulatory barriers in order to promote the best circumstances and to simplify the procedures for operators and public authorities.
- Develop innovative financial models for geoDH in order to overcome the current financial crisis which is hampering the financing of geothermal projects which are capital intensive.
- Train technicians and decision-makers of regional and local authorities in order to provide the technical background necessary to approve and support projects.

These essential objectives were complementary aimed to contribute to increase in the use of geothermal energy in district heating systems in Europe on a scale appropriate to the resource base, the requirements of Directive 2009/28/EC, a sustainable low-carbon energy policy, as well as market and social demand. It was expected that the GeoDH project would result in increased awareness of the potential applications and benefits of district heating with geothermal share, with a set of recommendations for removing barriers and improving regulatory frameworks, a better understanding of related technologies, costs and financing, as well as with a transfer of best practices to national and local authorities.

Among the main outcomes of the project are the recommendations of the "Regulatory framework for geothermal district heating systems in Europe" ("The Framework"). Their main purpose is to propose the removal of regulatory barriers, to optimise and simplify the regulations and to provide the measures and guidance facilitating the introduction of complementary and cohesive legal and regulatory provisions essential to creating a long-term stable system and stimulate the stakeholders for the use of geothermal energy for district heating. It has been pointed out that adequate national codes and legislation are required for these purposes, as well as regional regulatory frameworks and local planning systems favourable to geoDH deployment.

It should be added that the GeoDH project and its outcomes (like "The Framework") has met largely the efforts of many international and national geothermal experts and communities which repeatedly called for a higher share of geothermal in the national strategies and renewable energy action plans for 2020 and for better regulatory and administrative conditions facilitating geothermal energy development (e.g. GTR–H Final Regulatory Framework 2008; Kępińska, & Tomaszewska 2010).

1. Geothermal energy potential for district heating in Europe – some facts

In the case of fourteen countries embraced by the GeoDH project, the current knowledge on geological and geothermal conditions, data from operational district heating systems, heat demand, etc. were the basis to draw general conclusions and highlight the areas where potential for geothermal district heating exists. These can be summarized as follows (Dumas & Angelino 2015):

- Geothermal district heating can be developed in all countries.
- The potential for geoDH development by 2020 is much higher than the forecasts of Member States in their National Renewable Energy Action Plans.
- The Paris and Munich basins are the two main regions today in terms of number of geoDH systems in operation.
- The Panonian basin, the Inner Carpathians basins are of particular interest when looking at potential development in Central and Eastern European countries.
- The extensive European Lowlands (covering significant areas in several countries: Denmark, Germany, Poland) also offer good conditions to develop geoDH systems in many localities.
- Geothermal fluid temperature is not the only selection criteria; other key factors are sufficient water flow rate on the supply side, and the heat users (urban density) on the demand side.

Among the outcomes of the GeoDH project is an interactive web-map viewer which highlights the areas in 14 European countries where potential for geothermal district heating exists (http://www.geodh.eu). It is generally presented down to the depths of 2 km below ground level

(in some countries main resources are located also at greater depths (2–4 km., e.g. Poland), in such cases relevant specific information is available by contacting GeoDH partners in the respective countries).

According to Eurostat, about one third of the EU's total crude oil (34.5%) and natural gas (31.5%) imports in 2010 originated from Russia. Of this, 75% of the gas was used for heating (2/3 in households and 1/3 in the industry). With this in mind, the more significant is the fact that geothermal district heating technology has the potential to replace a significant part of that fuels and to increase security of energy supply by using local energy sources (Dumas & Angelino 2015). All the more that that over 25% of the EU population lives in areas suitable for geoDH. In other words – geothermal has the potential to alleviate Europe's energy security crisis (http://www.egec.org).

2. The objectives and basis for elaboration of "The Regulatory framework for geothermal district heating in Europe"

As pointed out above, only a solid regulatory framework, continuity and predictability of legal, administrative and incentive provisions will create a proper background for wider geothermal district heating systems development in Europe. The recommendations of such a framework elaborated as part of the GeoDH project make suggestions for decision makers on ways to optimise and simplify the local and regional regulations (the details are included in the report on "Regulatory Framework for Geothermal District Heating Systems in Europe" (http://geodh.eu/wp-content/uploads).

Developing geoDH requires an enabling framework beginning with clear and consistent national and regional strategies from the public authorities. From the project developer's point of view, realisation of geothermal project requires several authorisations and the compliance with a number of national and local regulations. The main requirements and permits that may be needed for a geothermal district heating project development are the following (Dumas & Angelino 2015): water, mineral, and mining rights; exploration permits; well construction permit; development rights; payment of royalties; environmental impact assessment; environmental permit; building permit for the plant/distribution network; dismantling permit. Regulatory barriers and long administrative procedures can result in additional costs. It is therefore crucial that a fair, transparent and not too burdensome regulatory framework for geothermal and district heating is in place.

Building on the feedback received in several national workshops organised within the project, the GeoDH consortium has gone beyond the mere analysis of legislation. An accurate assessment was carried out to understand the practical implementation of regulations and the overall conditions influencing the development of the technology (Dumas & Angelino 2015). The main

good practises and barriers were detailed, country by country, in a report "14 Reports on evaluation of market barriers for geothermal district heating in Europe" (http://geodh.eu/wp-content/uploads). That report indicated how regulatory and market conditions widely vary across the GeoDH countries. However, it is still possible to observe that some practice is perceived as being pre–requisite or very favourable to the development of geothermal district heating technology. This is e.g. the case where (Dumas & Angelino 2015):

- Geological data are freely available to project developers (e.g. in the Netherlands).
- A public risk insurance scheme is in place (i.e. in France, the Netherlands).
- There is a clear definition of procedures and licensing authorities (e.g. France, Poland, Denmark).
- Adequate national and regional strategies (Bulgaria) integrated with some form of financial support exist (e.g. Hungary, Italy, and, Netherlands, and the United Kingdom).

From the other hand, a persisting number of barriers are detrimental to any further market development of geothermal district heating:

- Market sometimes closed to new entrants (e.g. in Slovenia).
- Long and burdensome administrative procedures (e.g. in Italy, Slovenia, and Hungary).
- Serious regulatory gaps such as a lack of dedicated licensing system for deep geothermal and unregulated right to use geothermal resources (e.g. in Ireland, the United Kingdom, Czech Republic).
- Lack of sufficient or any support (e.g. in Ireland, Poland, Slovakia).
- Lack of a level–playing field (e.g. in Bulgaria, Czech Republic, Slovenia, Poland, Hungary, the Netherlands) where fuel prices are sometimes regulated and/or connection to the gas grid is sometimes mandatory.

The set of proposals included in the "Regulatory framework for geothermal district heating in Europe" was elaborated on the following basis:

- Experience and observations regarding the regulatory and administrative circumstances of, shortcomings in, and obstacles to implementing geothermal heating projects.
- The outcomes of fourteen national workshops, feedbacks and questionnaire surveys done in 2012–2014. During the realisation of those tasks information on the current regulatory framework was collected, analysed and summarised in order to identify the barriers hampering geothermal district heating deployment in each from the fourteen countries.
- The outcomes of the IEE Project "Geothermal Regulatory Framework – Heat", GTR–H (EISAS/EIE/06/007/2006), in particular selected recommendations included in the "GTR–H Final Regulatory Framework" (2008).
- Screening of selected publications.
- Some findings of the IEE Project "Promoting Geothermal Electricity in Europe", GEOELEC (IEE/10/321 /SI2.591109), 2011–2013 (http://www.geoelec.eu).

One of the interesting statements that arose during the project realisation was that the assessing the implementation of key articles of the EU RES Directive was not an easy task and should be properly carried out by the European Commission. In the GeoDH countries it is generally observed that the EU "3x20" set of directives did attracted some new interest in the geothermal

sector. However, dedicated legislation and simplification of administrative procedures, when observed, were not stemming from the RES Directive but rather linked to reforms for the geological, mining and oil & gas sectors (eg. Poland). This issue should be addressed in the review of the relevant EU legislation (Dumas & Angelino 2015).

3. Main recommendations of the "Regulatory framework for geothermal district heating in Europe"

The recommendations of the "Regulatory Framework for Geothermal District Heating in Europe" are presented in several main chapters related to various specific issues:

- Definition of geothermal energy resources and related terms.
- Geothermal resources ownership and regulations.
- Licensing systems for geothermal exploration and development concerning geoDH systems (including simplification of the procedures).
- Licensing for district heating.
- Geothermal energy and the licensing authority.
- Access to information on geothermal resources suitable for geothermal district heating systems.
- Geothermal district heating systems in national, regional and local energy planning and management.
- Role of public and private stakeholders (energy service companies, district heating system operators, etc.).

"The Framework" is primarily addressed to regional public authorities in charge of regulations and local development, since they are deeply involved in licensing and other procedures related to geothermal energy exploration, development, and management. The proposals should lead to regional and local regulations favourable to geothermal district heating development in Europe. The key recommendations are listed below (full version of "The Framework" is available at http://geodh.eu/wp-content/uploads):

- National and local rules must include a definition of geothermal energy resources and related terms, in line with Directive 2009/28/EC.
- Ownership rights should be guaranteed.
- In line with Article 13 of Directive 2009/28/EC, administrative procedures for geothermal licensing have to be fit to purpose – they should be streamlined wherever possible and the burden on the applicant should reflect the complexity, cost and potential impacts of the proposed geothermal energy development.
- The rules concerning the authorisation and licensing procedures must be proportionate and simplified, and transferred to regional (or local if appropriate) administration level.

- The administrative process must be reduced.
- Rules for district heating should be as decentralised as possible in order to be adaptable to the local context, and stipulate a mandatory minimum level of energy from renewable sources, in line with Article 13 §3 of Directive 2009/28/EC.
- A unique geothermal licensing authority should be set up.
- Information on geothermal resources suitable for geoDH systems should be available and easily accessible.
- Geothermal district heating systems should be included in national, regional and local energy planning and strategies.
- Policy–makers and civil servants should be well informed about geothermal.
- Technicians and Energy Service Companies should be trained in geothermal technologies.
- The public should be informed and consulted about Geothermal DH project development in order to support public acceptance.
- Legislation should aim to protect the environment and set priorities for the use of underground: geothermal energy should be given priority over other uses such as for unconventional fossil fuels, CCS, and nuclear waste deposits.

"The Framework" was consulted by key stakeholders and endorsed by relevant authorities in fourteen European countries covered by the GeoDH project.

Closing remarks

"The Regulatory framework for geothermal district heating in Europe" – elaborated as one of the outcomes of the GeoDH project – belongs to the crucial initiatives and proposals presented in recent years in order to support and facilitate the increase of geothermal energy uses in Europe (also in Poland). It contains recommendations on the introduction of relevant legislation and administrative provisions indispensable for geothermal district heating – the most perspective and needed type of geothermal deployment in many countries on our continent. Its importance is reinforced by the fact that it was developed in cooperation with geoDH and DH operators, energy servicing companies, specialists, practitioners and representatives of local authorities. These recommendations should lead to regional and local regulations favourable to geothermal DH. Their implementation will facilitate the introduction of complementary and cohesive legal provisions essential to create a long-term system for geothermal district heating development in European countries.

"The Framework" was endorsed by the representatives of many local authorities and other stakeholders from 14 countries. It was delivered (along with other major outcomes of the GeoDH project) to some EU institutions dealing with the renewable energy sources, as well as to the representatives of governments and their agencies in particular countries covered by the project.

It is hoped that they will be taken into account by decision–makers and will be helpful for the introduction of appropriate conditions for geothermal heating sector, also in Poland.

The paper presents some results of works conducted in frame of the IEE Project "Promote geothermal district heating systems in Europe", GeoDH (EE/11/813/ SI2.616373) performed in 2012–2014.

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Rekomendacje ramowych przepisów prawnych sprzyjających rozwojowi geotermalnego ciepłownictwa sieciowego w Europie

Streszczenie

Artykuł przedstawia rekomendacje ramowych przepisów prawnych, których wprowadzenie w znacznym stopniu ułatwiłoby szerszy rozwój wykorzystania energii geotermalnej w sieciach c.o. w krajach europejskich (także w Polsce). Jest to pilna kwestia tym bardziej, że zasoby geotermalne nadające się do takiego zagospodarowania na znacznie większą niż dotychczas skalę posiada wiele państw naszego kontynentu. Usuwanie barier prawnych i uproszczenie procedur w znacznym stopniu powinno sprzyjać operatorom, inwestorom, decydentom i innym zainteresowanym tą dziedziną ekologicznej energetyki. Rekomendacje zostały opracowane w ramach Projektu unijnego „Promowanie geotermalnego ciepłownictwa sieciowego w Europie" (GeoDH) zrealizowanego w latach 2012–2014 (http://www.geodh.eu). Projekt dotyczył czternastu krajów, uczestniczyły w nich zespoły z dziesięciu państw, w tym z Polski (z Pracowni Odnawialnych Źródeł Energii IGSMiE PAN). Proponowane rozwiązania prawne były przedmiotem konsultacji i uzyskały poparcie wielu przedstawicieli władz lokalnych i innych podmiotów z kilkunastu krajów.

SŁOWA KLUCZOWE: energia geotermalna, systemy ciepłownicze, przepisy prawne, Europa