14 Reports on Evaluation of Market Barriers for Geothermal District Heating in Europe

State of play, implementation of the RES Directive, and Recommendations

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About the GeoDH Project

The potential of deep geothermal for district heating is significant. The objectives of GeoDH are therefore to

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

In Europe, there are over 5,000 district heating systems, including some 250 geoDH systems in operation in 2014. The market share of district heating technology is about 10% of the heating market. The crucial challenge is to promote geothermal district heating (geoDH) in Europe and to facilitate its penetration to the market.

There are several Eastern and Central European countries, such as Hungary, Poland, Slovakia, Slovenia, Czech Republic, and Romania with geothermal DH systems installed. However, the potential is much larger. 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 but also to establish the market conditions for a development of the geoDH market.

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 financing required.

A third group of EU countries includes those Member States currently developing their first geothermal DH systems, such as the Netherlands, UK, Ireland and Denmark. There is no tradition of geoDH so there is a need to establish the market conditions for its development.

The GeoDH consortium has been working on these 3 different groups of countries, thus with juvenile, in transition and mature markets, in 14 countries in total, in order to achieve results replicable across the EU28.

Visit www.geodh.eu for more information.

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List of main abbreviations and acronyms used

AIRU	Italian Association for Urban Heating
CHP	Combined Heat and Power
DH	District heating
EGEC	European Geothermal Energy Council
EHP	Euroheat & Power
EIA	Environmental Impact Assessment
geoDH	Geothermal district heating
GWh	Gigawatt hour
GWth	Gigawatt thermal
Ktoe	Thousand tonnes oil equivalent
NREAP	National Renewable Energy Action Plan
RES-H	Renewable energy sources for heat
RES Directive	Directive 2009/28/EC on the promotion of the use of energy from renewable sources
SEAP	Sustainable energy action plan

Executive Summary

The assessment carried out during the GeoDH project shows how regulatory and market conditions widely vary across the 14 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 the case, for instance, where:

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

Contrariwise, a persisting number of barriers are perceived to be detrimental to any further market development of geothermal / district heating:

- Market sometimes closed to new entrants (e.g. in Slovenia);
- Poor regional and local planning
- Long and burdensome administrative procedures (e.g. in Italy, Slovenia, and Hungary),
- Serious regulatory gaps such as a lack of dedicated licencing system for deep geothermal and unregulated right to use the geothermal resources (e.g. in Ireland , UK, and Czech Republic),
- Lack of support (e.g. in Ireland, Poland and Slovakia), and
- Lack of a level-playing field (e.g. in Bulgaria, Czech Republic, Slovenia, Poland, Hungary and the Netherlands where gas prices are regulated and connection to the gas grid is sometimes mandatory).

In this context, it is worth highlighting that in some countries the presence of some good practises may be largely offset by the persistence of barriers. It is therefore crucial to have a consistent enabling framework from start to finish.

Other three interesting aspects have emerged during the project:

- Assessing the implementation of key articles of the EU RES Directive (e.g. articles 13 and 14) is not an easy task and should be properly carried out by the European Commission. In the target countries, it is generally observed that the EU 20-20-20 framework has indeed attracted some new interest in the 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 mining and oil & gas sectors. This issue should be addressed in the review of the relevant EU legislation.

- Particularly in emerging markets there is shortage of qualified specialists and the industry, mainly composed of local SMEs, is not organised in a structured national association. The result is weak advocacy power and inability to remove persisting market failures against conventional competitors. In this case, it is advised to policy-makers to create the initial conditions to attract investments and specialists from close fields such the mining and gas sectors;

Not only lack of information is detrimental. In certain cases misinformation over deep geothermal between policy-makers and citizens may bring about confusion and social opposition. While it is important to deal with communication at the very beginning of project development, it is still equally critical to launch large awareness and educational campaigns to improve the general knowledge about geothermal energy.

Introduction

The use of geothermal as a source for district heating (DH) is all but new. As a matter of fact, it dates back to Roman ages as seen in the ruins of city homes and baths heated via natural hot water catchments and piping. An outstanding example is found at Chaudes Aigues, in Central France, a city DH system pioneered in the year 1330, fed by the Par hot spring at 82°C, and still in operation today. As reported in the city annals, heated homes were charged a tax by the local landlord in exchange of maintenance duties.

With modern technology, geothermal resources with temperatures above 50-60°C have been more widely used for district heating, with peaks following the oil crises in the 1970s. After twenty years of slower development, the geothermal district heating market is now enjoying a renewed momentum, notably as a consequence of higher oil and gas prices, technological developments, as well as renewed concerns over energy dependency and sustainability.

In 2012 there were more than 160 geoDH in operation in the European Union (total capacity: around 1.1 GWth, producing 4256 GWh or some 366 ktoe), while some 190 projects are under development or under evaluation (including the upgrade of existing systems). However, as shown by the GeoDH Project (see report "Potential for Geothermal District Heating in Europe") as much as 25% of total EU population lives in areas suitable to geothermal district heating. Much of this potential, however, is still untapped.

Figure 1: The 14 countries covered by the project

A greater development of geoDH technology will improve the sustainability, security and competitiveness of Europe's heat (and more and more cold) supply.

Developing geothermal district heating requires an enabling framework beginning with clear and consistent national / regional strategies from the public authorities. From the project developer's point of view, realising a geothermal project requires several authorisations and the compliance with a number of national and local regulations.

The main requirements / permits that may be required for a geothermal district heating project development are the following:

- Water, mineral, and mining rights,
- Exploration permits,
- Well construction permit,
- Development rights,
- Payment of royalties,
- Environmental impact assessment (EIA),
- 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. To this end, this report presents best practice and the regulatory and financial hurdles for these technologies in each of the 14 countries covered by the project: Italy, France, Germany, Ireland, United Kingdom, Ireland, Netherlands, Denmark, Poland, Slovakia, Czech Republic, Slovenia, Romania, and Bulgaria. A summary of this analysis is presented in the next session.

The information on the market and regulatory frameworks of these EU Member States were collected from existing studies, during national workshops held in each of the project countries between October 2012 and February 2014, as well as through a survey mapping both quantitative and qualitative factors.

Where solid information was available, the country outlook includes an assessment of the implementation of Directive 2009/28/EC (RES Directive), in particular regarding simplification of administrative procedures (Article 13.1), local and regional planning (Article 13.3), and information (Article 14.1). The best practice identified will serve to provide, at the end of this report, a set of recommendations for removing regulatory and market barriers, improving national and local regulatory frameworks and thereby increasing the market penetration of geothermal energy in Europe.

Overview in the 14 project countries

Country	Good practice	Barriers	Implementation and impact of RES Directive
MATURE MARKETS			
France	▪ Geological information available ▪ Clear definition of procedures and licensing authorities ▪ National insurance fund available ▪ Structured representation of interests ▪ Appropriate national / regional support schemes	▪ Long administrative procedures ▪ Still insufficient number of qualified specialists	▪ Implementation on-going ▪ No substantial impact, though contribution to new interest in the technology
Germany	▪ Geological information available ▪ Clear definition of procedures and licensing authorities, exclusive rights concerning the resource ▪ Structured representation of interests and expertise ▪ National support scheme exists (not fully satisfactory, however)	▪ Long and complex administrative procedures ▪ Insurance not always available ▪ High investment cost, support scheme does not fully offset lacks in economy	▪ Implementation complete ▪ Impact relatively low, as most measure have been in place already in 2009

MARKETS IN TRANSITION			
Denmark	▪ Clear definition of competences between licencing authorities ▪ Information easily accessible ▪ Clear classification of geothermal resources and clarity over resource ownership rights ▪ Increasing interest from policy-makers	▪ Lengthy administrative procedures ▪ Lack of reliable geological information ▪ Limited national / regional support ▪ Insufficient number of qualified specialists ▪ No deep geothermal targets in the NREAP and regional plans	-
Hungary	▪ Geological information available ▪ Definition of resource ownership ▪ Financial support available ▪ qualified specialists	▪ Regulated tariffs ▪ Long and complex administrative procedures ▪ Underdeveloped representation of interests ▪ Lack of insurance scheme and green-heat support	▪ Implementation on-going, RES targets are under revision, total RES share will not change, only proportions among different types. Geothermal electricity target might be reduced, direct heat will stay
Italy	▪ Information available ▪ Incentives available ▪ Specific legal framework for geothermal	▪ Lack of an appropriate regulatory framework for DH ▪ Complex and long administrative procedures ▪ Lack of adequate strategy on geothermal/DH in some regions ▪ Lack of geothermal expertise in public offices outside Tuscany ▪ High costs for drilling, construction and management ▪ Insufficient number of qualified specialists ▪ Underdeveloped representation of interests	▪ Good, but lack of key implementing measures, poor coordination with the regional level and provisions and information mainly valid for electricity.
The Netherlands	▪ Geological information made public after 5 years ▪ Insurance scheme available ▪ National planning on geothermal energy ▪ Adequate national/regional support schemes	▪ Lack of appropriate legislation for DH infrastructure ▪ Complex administrative procedures ▪ Licensing authorities not clearly defined ▪ Regulated prices and mandatory connection to the gas network ▪ Poor regional strategy on district heating	▪ Little impact on simplification of administrative procedures; ▪ Major impact of the support scheme for projects development

EMERGING MARKETS			
Bulgaria	▪ Geological information available ▪ National / regional strategy on geothermal / district heating	▪ Regulated prices ▪ Insufficient national / regional support schemes ▪ Complex administrative procedures ▪ Insufficient number of qualified specialists ▪ Inefficient infrastructure and heating systems	-
Czech Republic	▪ Geological information available ▪ Certain degree of simplification of administrative procedures	▪ Exclusive right to use the geothermal resource not regulated ▪ Regulated prices ▪ Poor national/ regional strategy on geothermal / DH ▪ Regulatory gaps and one-size fits all approach to RES ▪ Insufficient financial support ▪ Insufficient number of qualified specialists ▪ Fiscal disadvantages compared residential gas boilers	▪ Certain degree of simplification, e.g. centralisation of approval process and establishment of specific measures to reduce and precise deadlines for licencing; ▪ "One size-fits all approach to RES; implementation mainly focused on electricity.
Ireland	None	▪ Lack of understanding and reliable information ▪ Lack of regulatory framework ▪ Poor national strategy ▪ Lack of financial support ▪ Educational and awareness gaps	▪ Any assessment of the implementation of the RES Directive is negatively influenced by the fact that nor the heat market or geothermal are addressed

Poland	▪ Geological information available ▪ Certain degree of simplification of administrative procedures ▪ Clear definition of competences between different authorities ▪ Definition of resource ownership	▪ Lack of awareness, interest and reliable information ▪ Regulated prices ▪ Limited financial support ▪ Lack of insurance scheme ▪ Inadequate R&D funds ▪ Public budget constraints ▪ High cost of distribution networks ▪ Technical standards and system design ▪ Poor national / regional strategy on geothermal / district heating	▪ New Mining law has simplified the licencing process ▪ New provisions on renewable energy only recently approved; ▪ Focus on renewable electricity and small-scale installations, therefore no or very little impact on geothermal energy.
Romania	▪ Adequate legislation for DH	▪ Lack of information ▪ Long and complex administrative procedures ▪ Lack of national strategy and predictability ▪ Regulated prices ▪ Insufficient financial support ▪ Lack of structured interest representation for deep geothermal ▪ Poor national strategy on geothermal / district heating	▪ Legislation transposing the RES Directive is limited to electricity production from RES, no provision on thermal energy;
Slovenia	None	▪ Complex administrative procedures and unclear definition of licensing authorities ▪ Regulated prices ▪ Lack of reliable information ▪ Inadequate support schemes ▪ Lack of qualified specialists ▪ Lack of dedicated office ▪ Market closed to new entrants ▪ Poor national strategy on geothermal / district heating	-

Slovakia	▪ Geological information available ▪ National strategy on geothermal / district heating	▪ Complex administrative procedures ▪ Regulated prices ▪ Lack of support schemes ▪ Lack of qualified specialists ▪ Lack of dedicated office	-
United Kingdom	▪ Geological data available ▪ Certain degree of simplification of administrative procedures ▪ Increasing regional strategy on geothermal / district heating ▪ Appropriate national and regional support schemes ▪ Guidance for DH available	▪ Exclusive right to use the geothermal resources not regulated ▪ Lack of dedicated licencing system for deep geothermal energy resources ▪ Lack of role of definition of local authorities in the development of DH schemes ▪ Lack of qualified specialists	Some positive impact: support schemes in place and on-going debate to simplify administrative procedures and fill some regulatory gaps

SECTION I:

MATURE MARKETS

France

Background

According to Euroheat & Power (EHP, 2013) in France there were 548 district heating systems in 2011 corresponding to a market share of approximately 7%. The development of fuel used for district heating has been moving over the last 10 years towards using more renewable and waste energy. However, the most used primary energy source is still natural gas (43%), followed by waste (24%), while 3.1% is the share of heat supplied by geothermal resources.

The first geoDH systems were installed in France in the 1960s in the Paris basin, pioneering the doublet well concept of heat farming. An interesting element in the French geoDH market is the technological progression aiming at bringing the longevity of the initial DH doublet up to 50 years; The concept is the following: after 25 years, the two wells of the doublet are lined and rebuilt as reinjection wells in combination with a newly drilled production well.

Today there are already more than 40 geothermal district heating plants supplying the local DH network such as in Chevilly Larue/L'Hayles-Roses-Ile de France (19.2 MWth) and in Meaux Beauval-Ile de France (13.7 MWth). Many projects are currently being developed including in Paray-Vieille-Poste with expected capacity installed of 32.75 MWth, in Rittershoffen (24 MWth) and some smaller projects with expected installed capacity between 8 and 12 MWth.

Good practice

Information available

BRGM (the French Geological Survey) has developed numerous maps covering the main areas of development. Drilling data are available immediately, while a dedicated online database (Infoterre) owned by the Ministry of Ecology and driven by BRGM allows to obtain all the information registered, including tests, loggings, technical and geological cross section of the well.

Clear definition of procedures and licencing authorities

The licencing authorities are clearly defined. The administrative body in charge of issuing drilling permits is DRIRE for Ile-de-France and DREAL for the other 21French regions. The permit is signed by the Prefecture of the region. Rules are based on a very clear Mining code.

National insurance fund available

The French National Risk Mitigation Fund proved its efficiency for 30 years. It compensates the lack of private insurance and allows the development of geothermal heat through a one-off guarantee

based on risk pooling. It covers the short-term risk (drilling) and the long-term risk (development and possible natural depletion of the resource).[1]

Structured representation of interests

A dedicated industry organisation exists, while the Ministry set up a national committee for geothermal energy in September 2010. This committee brings together representatives from the industry, public authorities, and civil society, including environmental non-governmental organisations.

Appropriate national/regional strategy on geothermal/district heating

On the national level, geothermal is included in the NREAP with clear targets for 2020. On the regional level, each region (22) has realised or is realising its plan which includes, when assuming reasonable and affordable resources, the use of geothermal energy.

Adequate national/regional support schemes

The national support using the "Heat fund" of ADEME was operational since 2009 and ended in 2013. The support was calculated for each project to ensure the cost for geothermal KWh was 5% below the cost of gas. In addition, the VAT is fixed at 5,5% instead of 19,6% if geothermal energy supplies a minimum of 50% of the total DH network.

On the regional level some financial support schemes are available. To promote renewable energies, the Aquitaine Region (in the South-West of France) set up an innovative financial tool based on “subsidies loans”. This project was contracted between the European Investment Bank and three regional French banks (Banque Populaire, Caisse d’Epargne et le Crédit Agricole).

Regulatory and market barriers

Long administrative procedures

The main problem remains the lengthy procedure for obtaining the drilling permit, which, depending on the region ranges between 6 and 18 months.

Insufficient number of qualified specialists

The expertise is in the hands of 5 to 6 engineering companies and 4 to 5 utilities which are used to running geoDH plants for more than 30 years.

Overall transposition and implementation of the RES Directive

The current implementation of the directive is ongoing. It is triggering new interests, but it did not cause substantial changes to legislation.

[1] For more information see GeoDH report on support schemes.

Germany

Background

In Germany, there are 3 390 district heating plants, making the country the biggest market for DH in the EU together with Poland. In Germany CHP is the biggest source for District Heating with a share of over 80%. More in detail, district heating has a market share of 13.2% of all occupied residential buildings with a significant difference between the market share in Western and Eastern Germany (EHP, 2013).

According to Euroheat & Power (EHP, 2013), the main fuel used is natural gas (44%) followed by coal (42%). Geothermal still represents a niche market but is on the rise. Around 26 geoDH plants are already in operation, while more than 60 GoeDH plants are being development, including cogeneration plants and the upgrading of existing systems.

Good practice

Geological information available in an internet-based system

The Leibniz Institute for Applied Geophysics (LIAG) in Hannover, has developed a geothermal information system (GeotIS) providing information and data compilations on deep aquifers relevant for geothermal development. GeotIS includes data of the South German Molasse Basin, the Upper Rhine Graben, and the North German Basin.

It is a public internet based information system funded by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. It satisfies the demand for a comprehensive, largely scale-independent form of a geothermal atlas which can be continuously updated. GeotIS helps users to identify geothermal potentials by visualising temperature, hydraulic properties and depth levels of relevant stratigraphic units.

There are also some regional databases/models on the state (Bundesland) level, e.g. for the Ruhr area (largely abandoned coal mining region) and in Bavaria.

R&D funds for deep geothermal available

In summer 2014, more than 80 individual R&D-projects on deep geothermal funded by the Federal government were ongoing, a number of which were part of several cluster projects. The total annual value of these grants amounts to about 20.5 million Euro, of which 74.5 % went into projects that could benefit geothermal district heating (2.4 % are targeted at electricity exclusively, and 23.1 % are concerning EGS). This can be seen as a tremendous increase as compared to the past.

National financial support for deep geothermal available

The government offers several modules for supporting deep geothermal heat, i.e. deeper than 400 m, temperature >20 °C, and minimum plant size 300 kW_{th}.

- Support for the plant as such, amounting to 200 € per kWth installed capacity, up to a maximum of 2 M€
- Support for drilling costs of wells over 400 m depth, amounting to 375 €/m for depth 400-1000 m, 500 €/m for depth 1000-2500 m, and 750 € from 2500 m on, up to a maximum of

2.5 M€ per borehole and 5 M€ per plant (independent of number of boreholes). Both wells and deep borehole heat exchangers are eligible.

- Support for additional expenses, if these can be justified, amounting to 50% of these expenses, to a maximum of 1.25 M€ per borehole.

The modules can be cumulated, and support is given as a low-interest loan with repayment bonus, i.e. the amounts given above have not to be repaid.

There is also a support for the district heating grid, provided at least 50% of the heat comes from renewable sources, and the grid is supplying heat to existing buildings (for new buildings, use of some share of renewable heat is obligatory as to the EEWärmeG, and that obligation could be fulfilled by RES heat in a grid – so if a grid is planned mainly for new buildings, it will not be supported). The support is given as a low-interest loan, of which a part has not to be repaid. The amounts in 2014 are set at 60 €/m of pipeline, to a total of 1.5 M€ if geothermal heat is contributing, and up to 1800 € per connection per existing building.

Additionally, a public / private risk mitigation scheme is also available, though not successful.[2] A public risk coverage fund has been requested since long by the industry, but was only established in the state of Bavaria for some period, and helped to realise several projects.

Structured representation of interests and expertise

Germany has a strong geothermal community which is also very well organised. However, this comprises mainly industry and research/academic, and a real national geothermal platform, including government, administration, civil society etc., could improve the case for geothermal energy use very much.

In addition, there is academic education, with new or enlarged programmes as in Aachen, Bochum, Clausthal-Zellerfeld, Karlsruhe, Mainz etc., and the Drilling School in Celle is expanding. However, there is still a lack of qualified specialists in all other fields.

Regulatory and market barriers

Long and complex administrative procedures

The administrative procedures are basically well suited to regulate the use of deep geothermal energy, to protect the interests of investors, to achieve work safety, to protect the environment, etc. The proceedings are governed by the mining authorities, in cooperation with all other stakeholders concerned.

However, these administrative procedures have a long history in mining, and are not set up for use with geothermal energy. This makes them a bit awkward in terminology, specific formal requirements, etc. A positive aspect is that geothermal energy is considered a “bergfrei” resource (one of the ancient mining words, that cannot be translated; it is somewhat similar to “crown” in England). The meaning is that the resource is not owned by the land owner, but by the state, and can be given by concession to interested users. The procedure is in two steps, one for the exploration phase, and one for exploitation.

[2] See GeoDH report on support schemes for more details. Available at www.geodh.eu/library.

The fact, that mining authorities had to find the right ways how to handle geothermal energy in this framework, intended for ore, coal, hydrocarbons, etc., and the federal structure of the country, result in different approaches and grades of complexity among the states. While most of the process is governed by the Federal Mining Act (BBergG), the actual regulation and licensing is done on the state (Bundesland) level.

A common, countrywide, streamlined approach of mining procedures for geothermal energy would be desirable. The fact that geothermal energy is regulated by mining law creates numerous problems in the shallow geothermal sector, in spite of the fact that most of the smaller geothermal heat pump plants fall under an exemption in the BBergG.

Also this exemption was not intended for geothermal energy regulation in the beginning, and thus the wording is not well suited, and the practice is quite different in the various states. To solve these problems It might make sense to consider taking shallow geothermal (definition is currently the realm from 0-400 m) out of the definition of “bergfrei” resource. Alternatively, the distinction could be made at a certain temperature level (e.g. <25 °C), or for plants where a heat pump must be used. This would not change the definition of geothermal energy as such, just distinguishing between the part of the resource considered “bergfrei” (i.e. subject to mining law), and the rest free to use, and regulated by water law, civil law etc.

III. Overall transposition and implementation of the RES Directive

The RES Directive is well implemented in German legislation. The two basic acts are the following:

- EEG – the Renewable Energy Act, providing feed in tariffs for renewable power

- EEWärmeG – the Renewable Energy Heat Act, setting obligations for use of renewable energies for heating. Geothermal district heating is considered, in the form that it is eligible for fulfilling the obligations when supplied to a grid. In general, the EEWärmeG did not have to positive effects, as it puts the obligation on new construction, and in the same moment has abolished the support for RES in new buildings.

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Support for existing buildings, not covered by the EEWärmeG, is given through the Market Incentive Program (MAP), the deep geothermal part of which is explained above.

It is worth mentioning that the articles on regulation, training and information (art. 14-13) are not yet explicitly transposed.

SECTION II:

MARKETS IN TRANSITION

Denmark

Background

District heating in Denmark is a dominant heating solution for households, accounting for 62.5% of the market. Around 400 district heating systems were operational in 2011, three of which supplied by geothermal heat plants in Copenhagen Margetheholm, Thisted and Sønderborg.

Geothermal and other renewable sources have the potential to replace coal and natural gas, the latter covering around 32% of the district heating supply. More than 10 new geoDH are planned to be built including an installation in Greater Copenhagen with expected capacity of 210 MWth.

Good practice

Clear definition of competences between licencing authorities

The licensing authorities in charge of geothermal are clearly defined.

Information easily accessible

The Danish Energy Agency (DEA) provides information on permitting process, while consultants provide the assessment of projects.

Clear classification of geothermal resources and clarity over resource ownership rights

Geothermal resources are classified based on temperature, while geothermal resources belong to the state and the right of exploration and development can be granted to third parties.

Increasing interest from policy-makers

During the years 2011 and 2012, 10 projects involved geothermal resources were launched. Furthermore the area has political focus, as the use of the geothermal resources allows for higher level of integration with the electrical system and a lesser dependence on biomass and gas.

Regulatory and market barriers

Lengthy administrative procedures

Lengthy administrative procedures are a major issue in Denmark. There are many stages of approval connected to geothermal projects as follows:

1) Approval of seismic survey,

2) Approval of drilling equipment and drilling programme and

3) Approval of plan for utilization of geothermal heat.

Furthermore geothermal plants using electrical heat pumps must be approved as a production facility. This is a major problem as there is a legal demand that production facilities must deliver heat as well as electricity.

Besides, an applicant wishing to exploit geothermal resources must collect a consortium consisting of people with major experience within the geothermal field in order to be considered. In addition, the applicant must have a solid financial foundation and must have a major focus on the process and a willingness to explore the actual geothermal potential.

The environmental screenings, despite useful in communication with the municipality and the local community, need more than a year to be carried out. They cover the following aspects:

- Removal of wastewater from drilling
- Noise during establishment
- Mud and waste from drilling
- Risk of polluting underground fresh water supply.

Lack of reliable geological information

In Denmark there is no reliable data regarding the underground and the quality of geothermal resources. However, more detailed maps and web tools are being developed.

Figure 1: Geothermal well in Copenhagen. Copyright: EGEC.

Limited national/regional support

It is a long process to establish geothermal facility in Denmark. The establishment of geothermal facilities takes around 5-6 years. Moreover, lack of knowledge of the actual potential of the underground is visible and the cost of using electrical heat pumps is often so high, that it makes it unfeasible to extract heat from the geothermal sources. This means that the geothermal heating plant is not always in use, making the investment less feasible than predicted.

Limited resources (some EUR 1.5 million) have been set aside for different analyses etc. in the period 2012-2015 on national level, while support schemes on regional level are unavailable. This lack of financial support, like the one granted in the 1990s for the development of the DH network, may be a barrier even if Danish utilities are able to obtain cheap loans.

However, a national guarantee fund for geothermal energy should be put in place as of 2015, thereby overcoming a major barrier for geothermal district heating in Denmark.

Insufficient number of qualified specialists

GeoDH is still under development with just 3 plants commissioned in a period of nearly 30 years, so there is a natural lack of qualified specialists.

No deep geothermal targets in the NREAP and regional plans

No contribution from deep geothermal has been reported in the Danish NREAP. However, Denmark has 3 operating geothermal plants, but all are operating in a system with heat pumps in order to increase the temperature level. Renewable Energy action plans of targeted regions are not available. Energy planning is based on projects and the municipalities and strategic energy planning involving several municipalities is developing. This process could lead to formulation of targets for geothermal energy.

Hungary

Background

Hungary lies on a characteristic positive geothermal anomaly and has a very significant geothermal potential. 20 geothermal heat plants are already in operation. Among them, three are new in Makó, Szolnok and Miskolc, with the latter having the highest installed geothermal capacity of 55 MWth. In addition, more than a dozen of projects are under planning or development and are expected to be realised in the next 3-4 years.

Regarding district heating, this technology supplies 648 000 households in 95 settlements (15.2% of all total households). The majority of installations were built in the 1960's and 1970's in the large housing estates of the socialist era and, to a significant extent, serve inefficient network systems.
Natural gas is by far the main fuel used for district heating in Hungary; in 2009 it accounted for 92, 3%, while geothermal covers 1.6% (EHP, 2013).

Good practice

Geological information available

Geological data is in general available. The Geological and Geophysical Institute of Hungary provides a wide range of web-map services, web-based borehole database catalogues and other geology-geophysics related information (www.mfgi.hu). The Hungarian Office for Mining and Geology (www.mbfh.hu) continuously publishes the preparatory technical reports for tendering geothermal concessions (www.mbfh.hu).

Definition of resource ownership

The Mining Act clearly defines that geothermal resources are owned by the state. Exploitation of deep geothermal energy (below -2500 m) happens in the frame of concessions with clear provisions.

Financial support

Grants for geoDH projects exist mostly in the frame of the "Environment, Energy and Energy-efficiency" Operative programmes from the Structural Funds, which is expected to be renewed for the new programming period 2014-2020. Between 2007 and 2011 altogether 15 deep geothermal projects were supported with grants of EUR 19.48 million. A new support scheme targeting geothermal district heating has been launched from 2013 (EEA grants). The VAT rate of 5% maintains the potential of existing DH systems in Hungary. It makes the market competitive by comparison with natural gas and its VAT rate of 27%.

Qualified specialists

Many qualified specialists are needed, especially considering the significant number of geothermal units in operation for decades and the new projects under development. Geothermal special engineering university education has been started in order to increase the number of geothermal experts.

Regulatory and market barriers

Regulated tariffs

In Hungary the regulated price for heat seems to be an important barrier. It makes modernisation goals unreachable and an expansion impossible (EHP, 2013). Price of district heating (between heat supplier and end-user) in Hungary is determined by the Ministry of National Development, while in 2013 the Government decreased the tariff of DH by 10%.

In addition, gas price is regulated, making it artificially low for residential consumers. Overall, regulated tariffs unfavourable affect the competitiveness of geoDH.

Long administrative procedures and legal contradictions

The legal framework for geothermal energy use is rather complicated and needs to be simplified; the mining, energy, environmental protection and water management authorities share competences regarding regulations and licensing procedures. Legal contradictions and time-consuming licensing procedures are still in place.

Underdeveloped representation of interest

The Hungarian geothermal community is fragmented with three independent associations. The advocacy force towards policy and decision makers is rather limited.

Overall transposition and implementation of the RES Directive

So far the measures transposing and implementing the RES Directive have not contributed to streamlining the administrative procedures: Indeed, regulatory barriers still persist.

Italy

Background

Italy is not a traditional district heating country, notably due to its extensive gas network developed across the country, as well as to the general mild climate conditions of the central and southern regions. In 2011 DH served 109 urban centres, representing 4% of the total demand (AIRU, 2013). According to EHP (2013) the main fuel used for DH systems is natural gas, which accounts for 76% of the total supply. Around 13% of the heat supplied was produced by waste, while according to the Italian Association for Urban Heating - AIRU (2013), around 1% is produced from geothermal.

There are around 20 geothermal heat plants supplying the local DH network such as in Pomarance (Tuscany) with the highest installed capacity (21.5 MWth), Santa Fiora (17.2 MWth, Tuscany) and in Ferrara (14 MWth). Additionally, more than 10 new systems are under development, including the extension of the one in Milan with a total expected capacity of 70 MWth (including from other sources).

Good practice

Information available

Temperature measurements are publicly available in databases of the websites of the Ministry of Economic Development and of the National Research Council's Institute of Geosciences and Earth Resources.

Incentives available

The following economic incentives are available, mainly for end users: National guarantee fund for investments in DH networks (yet to be implemented), 10% VAT on network building works, White Certificates (non-cumulative with other government incentives), other regional incentives and funds.

Fiscal and commercial rebates applied to final users are also available: up to 0.02194 €/kWh[3] tax credit, 10% VAT on energy consumption and connection works, (only for residential), 20.6 €/kWth contribution for grid connection, 65%[4] refund of grid connection costs as income tax credit (refund in 10 years).

[3] In March 2014, it has been reduced by 15%, retroactively from January 2014
[4] Tax rebate valid until 31st December 2014, after which it will decrease to 50%, unless new provisions are adopted.

Specific legal framework for geothermal

A specific legal framework for geothermal has been introduced into the Italian legislation with the Legislative decree No 22 dated 11th of February 2010.

This decree clearly classifies the geothermal resources as follows:

- National related geothermal resources: High enthalpy (>150°C) geothermal fluids and/or geothermal projects > 20 MWt;
- Local related geothermal resources: Medium (90°-150°C) and Low (<90°C) enthalpy geothermal fluids and/or projects < 20 MWth;
- Small local utilizations: wells < 400m and geothermal projects < 2 MWth.

Furthermore, the decree gives the regions the competence to authorise and regulate geothermal explorations and exploitations, simplifies administrative procedures (mainly for small local utilisations) and should guarantee a competitive system for the use of geothermal resources.

Regulatory and market barriers

Lack of an appropriate regulatory framework for DH

In Italy, the lack of an appropriate regulatory framework that regulates DH and defines the kind of service (public or private) generates confusion and negative effects on the economic competitiveness of this technology.

Lack of a specific legislation on DH network requires the need to simplify the existing fragmented legislative framework as too many laws, decrees, resolutions, circulars and procedures often overlapping cause confusion in the DH sector.

Some new provisions were adopted on 4th July 2014 in the decree No 102 transposing Directive 2012/27 on energy efficiency and designating the authority for the electricity, gas and water services to regulate the DH sector:

- Definition of continuity, security and quality standards of the service provided by DHC (including measurement systems)
- Criteria to establish connection and disconnection fees
- Processes by which DHC network operators make publicly available commercial conditions
- Conditions for access to the DCH network, to promote the integration of new heat production units in DHC systems and the recovery of locally available heat on a cost-benefit basis
- Establish tariffs for heat supply, only for new DHC, when the connection to the network is imposed by regions or municipalities

A recent survey of the Competition Authority states that a full substitution of current DH market mechanisms is not necessary, while it suggests to improve the effectiveness of current market regulations through a sectorial framework law. This should both give homogeneity to current local

regulations and improve the market competition, as well as ensuring the requirements of universality, continuity, security, affordability and transparency of the service provided by the DH.

In terms of funding, the Legislative Decree 28/2011 mentions a guarantee fund for DH systems, which has never been created. The Decree 102/2014 on energy efficiency replaces this fund with a Fund for Energy Efficiency which will cover not only the DH sector but also other energy efficiency measures.

However, the Decree ensures favourable conditions for DHC, such as access to the fund for works (for new networks or extensions) started between the entrance into force of Decree 28/2011 and that of Decree 104/2014, as well as a portion to support DHs which seems to give main priority to DHs connected to biomass distributed generation systems.

Complex and long administrative procedures

Despite a dedicated national legal framework on geothermal energy, the administrative procedures are complex and vary from region to region. Too many offices and authorities involved make this phase complex and long lasting. The permitting phase may last more than 3 years. Moreover administrative procedures involve a significant burden also from a financial point of view.

Lack of geothermal expertise in public offices outside Tuscany

Regions have been left with all the responsibilities to achieve the 2020 targets, but without tools, guidelines and often with no technical expertise required to assess and manage instances. National guidelines for the exploration and production of geothermal resources are required.

Limited regional strategies on geothermal/district heating

The NREAP sets the following objective by 2020:

- Geothermal heat consumption excluding low temperatures for Heat Pumps: 300 ktoe;
- DH from RES: 900 ktoe.

The National Energy Strategy and other relevant national acts include support measures for district heating and RES-H. The national energy strategy adopted 2013 increases to 20% (~11 Mtoe/year) the 2020 targets for renewables in heating and cooling, but does not propose concrete measures and does not support DH networks.

On the regional level not all Italian regions have a plan.

Tuscany: a regional energy-environmental plan is under approval; Geothermal DH is important to develop heat supply chains and will be supported with legislation, financial incentives and research. The Tuscan geothermal DHs objective in 2020 amounts to 43.9 ktoe.

Latium: a new Energy plan is being drafted; the old regional energy plan does not take into account deep geothermal for heat purposes and only considers solar and biomass as renewable sources for DH; RES-H are generally not enough considered.

Lombardy: is finalising the drafting of the regional energy plan; the old plan takes into account the use of geothermal supply chains also for DHs and through financial supports.

Emilia Romagna: DHs are considered strategic and shall be included in local spatial and urban planning and municipalities shall take into account discounts for the building of DHs; moreover the region aims at creating a framework for the planning and regulation of DH location and authorisations, issuing financial contributions for DHs and promoting the use of RES-H (including from low enthalpy geothermal energy) and waste heat. The 2020 target for geothermal heat (shallow and deep) is 32.3 ktoe.

Overall, regions in Northern Italy consider the use of DH as strategic and propose incentives, but do not appropriately take into account the use of deep geothermal energy. Indeed, except for Tuscany, shallow geothermal energy is rather developed (mainly in Lombardy), while deep geothermal is still at an early stage, both for regional/local planning and regulations.

High costs for drilling, construction and management

The totality of Tuscan geothermal DHs are currently connected to high enthalpy plants, characterized by small villages, low number of consumers (therefore lower cost-sharing) located on a wide territory and city centres with architectural constraints. Such a situation leads to operational issues, which involve higher costs in designing and construction first and then in management.

Higher costs for construction and management raise the payback period to 30 years and lead to increased tariffs, lowering the economic competitiveness of this service. Additionally, technical issues and management costs increase the farther you move from the substation. However, the management of a geothermal DH system installed 40 years ago in the Tuscan geothermal area has been improved introducing more efficient exchange groups, remote control and automatic regulating flow rate valves, which allow modular supply according to heat demand and the reduction in electricity and heat demands.

Additionally, high drilling costs are experienced in the whole country. As a matter of fact only two other geoDH use deep geothermal heat: Ferrara and Vicenza (the latter using an old well for oil exploration), while the remaining Italian geoDH use low temperature shallow resources.

Insufficient number of qualified specialists

There is insufficient number of qualified specialists mainly due to a greater deficiency of interest in the DH sector, compared to other technologies. This implies the use of applications developed for other sectors. However, the few existing DH specialists have high expertise.

Underdeveloped interest representation

AIRU is the most important Italian association in DH sector. However there is still a need to networking among different actors involved in this field, and consequently in that of geoDH.

Overall transposition and implementation of the RES Directive

Legislative decree 28/2011 transposes the RES directive. However, most of information provided following the RES national decree generally concerns the use of RES for power production and not for heat production. In this regard, DH operators still complain the lack of specific geoDH implementing decrees.

- **Article 13.1.**
  The Italian regulator (Gestore Servizi Energetici) issued two reports about the regulatory framework concerning authorisations and licensing procedures for RES plants, both at national and regional level. The information provided by these reports, however, mainly focused on power generation. Moreover the website of GSE has a section with info about legislation, authorisations and licensing procedures for RES plants, both at regional and local level.
- **Article 13.3.**
  DH and geothermal DH are considered strategic: DH networks are considered primary infrastructure works and municipalities assess the availability of third parties to build DH during design and planning infrastructures.

  Municipalities with population above 50000 inhabitants have to draft DH development plans. As of 2017 RES consumption for domestic hot water and space heating in new buildings should achieve 50%. Regrettably, this provision does not apply to dwellings connected to DH.
- **Article 14.1.**
  The website of GSE has a section with information and instructions about national support measures for RES plants.

The Netherlands

Background

The supply of heat from District Heating schemes in the Netherlands accounts for a small proportion of the total heat consumption as only 4.4% of all dwellings have a District Heating connection (EHP, 2013). However, this share has been slowly increasing over the last years and there is a potential for further increase.

The Dutch DH systems is nearly entirely supplied with natural gas (92%). However, there are already 8 geothermal heat plants supplying in particular greenhouses. New projects are planned to be located in Agriport A7, in Heemskerk, in Venio/Grubbenvorst and in Brielle, with an expected capacity of 17.4 MWth.

Good practice

Information available

Though mainly developed for oil and gas the Mining Act also covers geothermal energy at depths of more than 500 meters. An important factor is that all data collected during drilling and production becomes public information after a five year period. As several thousand deep boreholes have been drilled for oil and gas over the years the geothermal community has access to an incredible wealth of free and accessible data on which to base project development.

Risk mitigation insurance scheme available

The risk mitigation scheme in the Netherlands was launched in 2009 through the regulation SEI Risico's dekken voor Aardwarmte. The scheme has been developed jointly by the Ministries of Economic Affairs and Agriculture together with NL Agency and TNO.

After two tenders, the scheme is deemed to have helped projects get started by ensuring financing through a quick and non-profitable insurance process. The scheme is considered as a transparent and objective benchmark for the market and officials expect that more private insurances will enter the geothermal market and will take over from the scheme.

State budget: €43.35 million. Premium of 7% of the maximum guaranteed amount is charged.

Coverage ratio: Up to 85% of eligible costs.

National planning on geothermal energy

A 'National Action Plan for Geothermal Energy' was developed in 2011. The document was a solid analysis, including on the potential (11 – 14 PJ per year) that could be realised by 2020.

Adequate national/regional support schemes

A national support mechanism for geothermal heat was introduced in 2012 by the inclusion of geothermal energy in the existing general programme for the production of renewable energy

(SDE+). SDE+ for geothermal heat bridges the difference between cost price and (fossil fuels) market price of heat (5-7 euro per GJ) and is comparable to Feed in premium mechanisms. SDE+ supports the geothermal well and does not take into account whether the heat is used in district heating systems or by one horticultural or industrial user.

On the regional level there are 12 different regimes in all Dutch provinces. In Limburg, for instance, there is the Limburg Economic Fund, through which projects can be financed when they have a viable business case.

Regulatory and market barriers

Lack of appropriate legislation for heat distribution networks

There is a lack of an Act in infrastructure for heating and cooling. This is due to the very strong competition with natural gas.

The Heat Act is already 10 years old, but was never really implemented since there is an Order in Council required. In the beginning of 2013 the Senate approved a proposal and the expectation is that it will come into force in 2014. This Act however only regulates rates of GJ heat and not for cooling. For cooling, though, a report is required, but it is not covered legally.

It is observed a legal constraint in the combination of different laws that cover geothermal energy. Permits, under these different laws can influence each other in a negative way like the Mining Act and the General Environment Conditions Act.

Licencing authorities not clearly defined

The licencing authorities are not clearly defined. In general municipalities are in charge for the legal procedure of permitting. However, Central government/ coal authority is, under the Mining Act, responsible for the permit in case of wells below 500 meters. Wells below 100 and until 500 meters obtain their permit under the Water Act, of the local Province. Wells above 100 meters need to be noted in a system which is organised by municipalities, which can be seen as a spatial planning map of the subsurface. No permits are requested for the DH itself.

Regulated price and mandatory connection to the gas network

The reference for the heat tariff is the price of natural gas. This means that the heat price cannot be higher than that the price of heat from natural gas. For heat/cooling exploitation a control by the regulator is built into the law, in which the profit on the investment is allowed with a maximum of 5-7.1%, after tax.

Additionally the **Building Act** in the Netherlands prescribes that, to receive a building permit it is mandatory to have a natural gas connection. This is an obligation to connect but no obligation to purchase and use natural gas. However in most cases, installation companies are used to a way of working and advice households to use natural gas. Since there is much natural gas available in the

Netherlands, the industry of conversion technology is strongly embedded. Both the gas and conversion industry have an interest in the sale of natural gas and boilers.

The split incentive is another major issue. Under **the Landlords and Tenants Act** housing associations may not increase the rent in the event less than 70% of the inhabitants of a block allow this increase. In most cases investment space must be created to realize district heating and cooling infrastructure. This obligation is a constraint for district heating and cooling projects in existing neighbourhoods.

Poor national/regional strategy on district heating

There is no plan for the transition to district heating and cooling due to the interests of the fossil fuel industry. On the regional level there is only a small network under the leadership of projects or local governments.

Overall transposition and implementation of the RES Directive

Implementation of Article 13.1 has no effect on DH. The legal instruments are mainly focussed on large projects, such as those for wind energy and biomass.

Art. 13.3 has a link with DH in the sense that since January 2011 a new calculation tool is introduced called EMG. This tool facilitates the calculation of a value for DH with heating in the energy performance indicator for buildings. However, the calculation of heat and natural gas for the building permit still gives a preference for natural gas.

Implementation of art 14.1 is mainly worked out as dissemination of information regarding renewable energy.

SECTION III:

EMERGING MARKETS

Bulgaria

Background

In Bulgaria the district heating market is not very dynamic. There are only 14 systems installed, none of which with geothermal. The market has mainly developed in the capital, where there has been a growth of 1-2 % per year in the number of households connected. Around 70% of heat supplied via DH was produced by natural gas. In addition, it is worth noting that there has been a significant reduction in the proportion of thermal energy used in the energy consumption of households: -19% in 2006 and 15.6 % in 2011.

Good practice

Geological information available

Each local Basin directorate has data of geothermal potential. Moreover, there is a register of geothermal resources in the Ministry of Environment.

National/regional strategy on geothermal/district heating

Geothermal DH is included in the National Renewable Energy Action Plan for Bulgaria. There are special goals for RES and in particular, for heat pumps, and local DH.

Some municipalities in the Black Sea region are signatories of the "Covenant of mayors". Each of them has to prepare a Sustainable energy action plan including a chapter dedicated to the potential and possibilities of the geothermal to be used for cooling and heating purposes. The following parameters should be reported: max and min temperature, debit, location and ownership, current use.

Up to now, a SEAP has been adopted in Varna, Burgas, Malko Tyrnovo, Dalgopol, Aksakovo, Beloslav and Nesebar. Furthermore, more SEAPs are being prepared in the following municipalities: Avren, Kavarna, Sozopol Valchi Dol).

II. Regulatory and market barriers:

Regulated price

The price in Bulgaria is regulated. The situation makes this sector unstable and inefficient. Moreover, most of the District Heating and Cooling are dependet on the public gas supplier (EHP, 2013).

Insufficient national/regional support schemes

Bulgarian municipalities cannot ensure financial support for Geothermal DH plants. The reason for that is a permanent lack of financing. However, there are three supportive programmes:

-Structural Funds – available for Bulgarian cities with more than 80 000 inhabitants, the grant is between 70-100% and the subsidy can be use from municipality

- Rural programme for development: Available for small cities with fewer than 80,000 inhabitants, the grant covers between 70-100% of the costs;

-Norway grants available for all Bulgarian municipalities, the grant amounts up to 90% of the investment, in particular for fuel switch. There are special grant scheme rules by several Bulgarian banks and the available grant is 30% for geothermal plants.

Overall, this does not seem sufficient to encourage investments.

Complex administrative procedures

There are many licensing authorities responsible for development of the geothermal resources in Bulgaria. The responsible bodies are – the Basin directorate for water management in Black Sea Region and local authorities. Moreover, it is required to have a permit from municipality issued by a city architect, in coordination with a utility company. The permit for drilling takes around one year.

In addition, there are national rules for each step of geothermal DH that include:

1. Application form with:

- Report estimation in accordance with NATURA 2000;

- Technical details of the project;

- Description of necessary water capacity;

2. Introducing the full documentation for agreement of parameters of water withdrawn.

3. Public procedure for issuing permit;

4. The permit is granted

Insufficient number of qualified specialists

There are very few deep drilling specialists in Bulgaria. However, there are professional associations of Design engineers, DH companies, and geothermal engineering companies, which can help in sharing information on permitting process and independent assessment of some projects.

Inefficient infrastructure and heating systems

Infrastructure and internal heating systems are outdated and inefficient. Besides, internal heating systems with vertical distribution make individual meters of consumed energy from each apartment impossible to calculate.

III. Overall transposition/ implementation of the RES Directive

The Energy Efficiency Law and the Law for RES in Bulgaria define and regulate rights and obligations in the energy management, including governmental rights and responsibilities. These laws include major chapters related to the energy policy of Bulgaria and use of its renewable and secondary sources.

SEDA (Sustainable Energy Development Agency) is established within the Structure of the respective Ministry aiming to support the implementation of the goals of the National Energy Strategy.

The transposition of the RES directive formally establishes a simplified framework, namely:

- **Article 13.1.**

12 energy agencies are distributed within Bulgaria. They have expertise and possibility to give consultancy regarding the necessary administrative procedures.

The fees depend on expenses, the issue time is fixed. There are simplifications for small RES systems, while the Energy Regulation Office of the Bulgaria provides on its website detailed information for applicants.

Analysis of the Bulgarian legislation was carried out and established critical points prolonging approval processes in the scope of regional and construction management. This analysis resulted in several measures in order to facilitate the authorisation, certification and licensing procedures:

• Approval process to be dedicated to regional or local authorities

• Integration of approval processes (concerning primarily regional and construction management)

• Standard consultancy process during negotiation with concerned national authorities

• Establishment of specific measures to reduce and precise deadlines within the approval process

- **Article 13.3.**

Energy Efficiency Law and the Law for RES in Bulgaria require an assessment of the energy demand in buildings and the possibility to use RES for each new building or buildings undertaking major renovation.

- **Article 14.1.**

The Ministry of Energy and Economy provides a free internet portal (http://www.eufunds.bg/) with all relevant information concerning the possibility of grants and subsidies for facilities generating energy from renewable sources.

Czech Republic

Background

There is a strong district heating tradition in the Czech Republic. According to Euroheat & Power (EHP, 2013) some 37% of all households are connected to DH. DH systems are operated in all cities with a population of over 50, 000 inhabitants. In these urban areas DH accounted for 73% of the market share.

The primary energy sources used are nearly entirely fossil fuels, with the very limited exception for biomass. As a matter of fact about 67% of the heat supplied was produced by burning coal, while natural gas accounted for 26% of the heat supply in 2011. (EHP, 2013).

There is already a geothermal heat plant in the country supplying the local DH network, i.e. the Thermo Děčín project in Northern Bohemia. Few sites are discussed to be considered for development of cogeneration projects. Against this background geothermal energy has the potential to be integrated in existing networks thereby contributing to the decarbonisation of the heat sector in the country.

Good practice

Information available

Thermal data from borehole well logging and geothermal potential maps are available. In terms of support schemes, the Ministry of Industry and Trade provides a free internet portal (www.mpo-efekt.cz) with all relevant information concerning the possibility of grants and subsidies. However, little support is given to geothermal or district heating.

Certain degree of simplification of administrative procedures:

Licence and Environmental impact assessment are not required for the exploration phase, but only a statement from the County Council (for single well deeper than 30m or total depth of drilling over 100 m, and notification to Mining Authority is obligatory). The exploration, however, must be carried out by the authorised entity. In case of industrial exploitation of geothermal energy the exploration area has to be set and an EIA process for intent of exploitation is required.

The approval process for new construction of private land for pipes is very long and difficult to access. The licencing authorities are clearly identified for the development of the geothermal resources (Ministry of Environment, the Building Authority for smaller projects and for DH infrastructure, the Water Bureau if groundwater is withdrawn).

Regulatory and market barriers

Exclusive right to use the GT resource not regulated

In the Czech Republic there is no relevant legal regulation and guidance focusing on the delineation of protection zones related to geothermal resources. So far, protection zones are determined on the

basis of analogy with reserved mineral deposit protection zones. However, problems still persist, e.g. the issue of the spatial extent of this protection zone.

Regulated price

Heat prices are regulated by the Czech Republic energy regulatory authority. Thus, the State supervises heat prices which include relevant costs and profits of the heat dealers and taxes. Heat dealers are subject of periodical controls focused on costs which are related with heat production and DH operating.

Poor national/regional strategy on geothermal/district heating

A National Energy Strategy was agreed in March 2004 and defines the national priorities until 2030 (geoDH not specified, only renewable resources).

The NREAP of the Czech Republic assumes in 2020 achieving a 14% share of energy from renewable sources in gross final energy consumption. However, no target for geothermal energy is specified. Similarly, no dedicated regional strategies or plans exist.

Regulatory gaps and one-size fits all approach to renewable energies

For deep geothermal regulations are more complex with legal gaps. There is currently no single legal or technical regulation which would deal with geothermal energy resources and their use in a comprehensive manner. It is necessary to ensure the synthesis of definitions and terms of geothermal resource and streamline legal and administrative procedures at the national level (from the exploration to exploitation of the resource). Another problem is that legislation tends to be general and loose and not dedicated to the specificity of the technology. Indeed geothermal energy is treated in a similar manner as other renewables, such as photovoltaic or wind. This approach does not provide for appropriate conditions for the development of geothermal DH.

Insufficient financial support

In an emerging market such as the Czech Republic, geothermal projects need some financial support from the public sector and cooperation of public and private bodies. There is some support for district heating & cooling from RES, but they are either unstable (EU structural funds) or limited to grants.

In the Czech Republic, the heat from renewable energy sources is mainly supported through some subsidies. Furthermore, renewable heating plants are exempt from real estate tax (§ 1 par. 2 letter J Regulation No. 12/1993).

Green bonuses concerned the heat produced from geothermal energy facilities with heat rate exceeding 200 kW. One of the main goals of the National Energy Policy is indeed to support the heat pumps implementation as a regulatory element for central systems and for regional purposes as well.

Insufficient number of qualified specialists

There is insufficient level of expertise in geothermal development in general and in geoDH (very few geothermal specialists, particularly for deep drilling).

Overall transposition/ implementation of the RES Directive

The transposition of the RES directive formally establishes a simplified framework, namely:

- **Article 13.1.**

Fifty energy consultant centres are distributed within the Czech Republic. Consulting is free of charge.

Energy Regulation Office of the Czech Republic provides on its website detailed information for applicants for licences including all necessary application forms.

Analysis of the Czech legislation was carried out and established critical points prolonging approval processes in the scope of regional and construction management. This analysis resulted in several measures in order to facilitate the authorization, certification and licensing procedures:

• Centralization of approval process

• Integration of approval processes (concerning primarily regional and construction management)

• Standard consultancy process during negotiation with concerned national authorities

• Establishment of specific measures to reduce and precise deadlines within the approval process

- **Article 13.3.**

Act 406/200 Coll. on Energy Management and Regulation 148/2007 Coll. on Energy demand of buildings require an assessment for the RES use for each new building or building significantly reconstructed/renovated.

- **Article 14.1.**

The Ministry of Industry and Trade provides a free internet portal (www.mpo-efekt.cz) with all relevant information concerning the possibility of grants and subsidies for facilities generating energy from renewable sources.

Ireland

Background

Ireland has neither district heating (DH) nor deep geothermal tradition. Indeed, there are no geothermal installations and no plan to build any so far, while there are only two district heating systems in whole country in Dublin and Cork. However, since the completion of geothermal exploration wells in 2009 by GT Energy in Newcastle, South County Dublin, the potential for harnessing deep geothermal resources from the margin of the Dublin Basin has been further explored.

Good practice

No good practice could be observed.

Regulatory and market barriers

Lack of understanding and of reliable information

The very poor knowledge of the underground resources appears as a main barrier.

Moreover, there is a lack of wide and detailed information on geothermal energy resources and potential contributions and of experience with DH technology. The national geological survey is attempting to fill this gap.

Lack of legislation and regulatory framework

Despite a public consultation run between 2008 and 2009, heavily influenced by the work and results of the GTRH project, a regulatory framework for geothermal energy in Ireland is still absent.

The lack of clarity on permitting requirements (shallow or deep) is therefore a clear barrier for geothermal. Where an abstraction license is required (generally the case for larger schemes) applications are to the local authorities. A centralised licensing and regulatory body should be responsible for geothermal energy and district heating (but this is against the current policies of decentralisation that are being implemented).

Poor national strategy

There is a lack of clear policy objectives at national and local level for DH & Geothermal in the main strategic documents. For instance, currently geothermal is not considered as part of the NREAP, while the Irish *Strategy for Renewable Energy: 2012 – 2020*, and *A Strategic Framework for Northern Ireland* fail to address the heat market.

District heating and geothermal resource development are considered only by Dublin as part of the Dublin SEAP. Other local initiatives make reference to geoDH in counties Cork, Waterford, Meath & Ballymena (N. Ireland), Antrim (N. Ireland).

Lack of financial support

There is no support for DH in Ireland and N. Ireland. Government policy in Northern Ireland supports fossil fuel and gas infrastructure. However, support tariff for Deep Geothermal in N. Ireland is under review.

Educational and awareness gaps

These mainly relate to public perception and understanding of both geothermal a District heating technology and the potential contribution of geothermal resources to local and national heating demands.

Overall transposition and implementation of the RES Directive

Any assessment of the implementation of the RES Directive is negatively influenced by the fact that nor the heat market or geothermal are addressed.

That said, the articles of the RES Directive somehow relevant to geoDH are implemented as follows:

- Article 13.1. Local authorities, the Sustainable Energy Authority of Ireland (SEAI), the EPA, DCENR and GSI provide information - when relevant- on environmental permits required or on registers of approved equipment.

- Article 13.3 - Approved equipment and installer lists through the Sustainable Energy Authority of Ireland (Triple E register) - http://www.seai.ie/Your_Business/Triple_E_Product_Register/

- Article 14.1 - support measures for renewable technologies are centrally managed by the SEAI through an application process. information on available grant and eligible technologies in included in (http://www.seai.ie/Grants/Better_energy_homes/) - Most of these measures do not directly support geoDH.

Poland

Background

With some 500 systems installed in 2011, DH infrastructure is well developed in Poland (EHP, 2013). Currently there are 6 geoDH plants, the largest of which are found in the Podhale Region (40.7 MWth) and Pyrzyce (35.2 MWth).In Poland the heat sector is based on coal (around 76% of the heat supplied), while both natural gas and oil and petroleum products accounted for some 6%. Renewable energy appears to be negligible.

Good practice:

Information available

National and regional geological data are available in databases of the Polish Geological Institute and some other bodies. Information is also accessible from a set of regional atlases on geothermal resources for ca. 80% of the Polish territory. Moreover, more detailed information exists for several smaller areas, counties and localities.

Certain degree of simplification of administrative procedures

The new Geological and Mining Law, which entered into force in 2012, facilitates and simplifies some legal and administrative procedures by, among others, introducing a single system of licensing for exploration and drilling works and transfer them to the competences of regional administrations.

Other provisions facilitating geothermal activities include:

- Exemption from royalties for geothermal water development;
- Exemption from fees for the geological information used the project exploration phase;
- Reduction of fees for the use of geological information in order to develop geothermal water (up to 1% of its value until 31/12/2020, then 5%);
- No need for licenses for exploration of geothermal resources but only for drilling works and exploration to be approved by the regional administration;
- Shortening the development license procedures by a significant reduction of the duties of cooperation with other bodies while issuing the decision on concession. In some cases, however, there are still long procedures (3-4 months) to agree the EIA report with local/regional entities (including Regional Environment Inspection Agendas) before issuing the environmental decision.

Clear definition of competences

Since 2012 the licensing authorities are clearly identified for the development of the geothermal resources (The Regional Marshal). The exploration phase requires approval by Mining authority and the design of district heating and district heating plants are certified by an authorised industry.

Definition of resource ownership

Geothermal resources – both deep and shallow located below 3 below the surface level, belong to the state treasury and are regulated by the Geological & Mining Law.

Regulatory and market barriers:

Lack of awareness, interest and reliable information

Many decision-makers and the public believe that geothermal investments are very expensive at all stages and therefore would not be economically viable. The problem is that there is no comparative data on the effectiveness of public support and capital investment compared with the amount of energy generated from various RES. In fact, according to available data, geothermal energy is not the most expensive.

Besides, there is a poor level of knowledge and awareness among many decision-makers and politicians at various levels, local/regional administrations, DH designers and companies.

Lack of interest and no activities by the above-mentioned entities to promote, consider and initiate GEODH systems is visible. In addition, with only some exceptions, there is a lack of consistent contacts and cooperation between some public institutions and the geothermal sector which greatly hinders the development of a medium and long-term strategy.

Regulated prices

Tariff for heat and electricity must to be agreed with Energy Regulatory Office (no space for creating high incomes / profit for energy / heat producers) Recently there has been seen an increase in the heat price due to implementation of the requirements of the European Directive on new standards of emissions such as modernisation and construction of the new installations for flue gas (EHP 2013).

Lack of insurance scheme

There is a lack of risk mitigation system, which has been recommended for many years by professionals following the examples of some other countries.

Limited financial support

Since 2013 there are no dedicated national support schemes for geothermal resources' exploration drilling and for the subsurface parts of geoDH in Poland. However, some support for the above-surface parts of geoDH systems (network infrastructure, etc) is available, in particular for thermal retrofitting, modernization, energy efficiency) – via some state and EU programmes managed by the state. In order to re-launch some support, interested parties are awaiting for the next round of structural funds 2014-2020. In addition, there is some support from international initiatives such as the Norway Grants and the EEA grants.

In terms of regional support schemes some very limited funding is available, in particular loans to public entities for e.g. heat pumps used for DH.

Inadequate Research and Development funds

There is only limited interest and R&D support for new geothermal technologies like low-temperature geothermal binary systems and their introduction into the Polish market. Available

research programmes require a significant financial contribution of the commercial partner (about 40%), which in particular for new and risky ventures, is too high.

Public budget constraints

High upfront investment costs are connected especially with drilling stage. This fact hampers GEODH development in particular as heat supply is competence of local governments – when no sufficient public support is available they have no own resources to initiate and to be involved in such projects.

High cost of distribution networks

Significant financial problem with GEODH systems may arise from the costs of construction of transmission networks if the owners of the land will enforce the law. This problem has been indicated by a number of investors and operators of heating systems. Moreover, these costs would increase energy costs for clients.

Technical standards and system design

Geothermal installations operating in Poland often supply heat to the already existing district heating systems. Yet, the integration of geothermal into existing networks is very complicated considering the Polish geothermal resources (temperature of geothermal water up to ~85°C) and the fact that these systems were designed for high-temperature heat, for instance:
-Large district heating systems are often designed for the typical inlet water temperature of 130 or 110°C with a return temperature of 90°C (sometimes 70°C).
-Heating systems in older buildings are designed for parameters 90/70° C.
-New buildings are increasingly designed to operate heating installations designed for performance 75/60°C.

Poor national/ regional strategy on geothermal/district heating

The national target for deep geothermal heat is 178 ktoe for all uses by 2020.

There is a clear lack of adequate national strategy concerning GEODH expressed by, among other things, by a lack of a comprehensive and enabling regulatory framework on renewable energy in general.

III. Overall transposition/implementation of the RES Directive

The RES Law has only recently been introduced. Yet it does not create better conditions for RES-H deployment and does not include financial incentives for RES H (including geothermal heat). This Law is focused on RES electricity (biomass, wind) and biofuels. Some support measures will refer to micro-installations (less than ca. 70- 100 kWth; what is not applicable for geothermal taking into account the capacities of heating installations).

- No support scheme for generation / sales of RES heat is envisaged also by the NREAP by 2020 (despite many demands by the professional organizations and experts).
- No mention in the NREAP about the possibility of geothermal electricity co-generation (or generation) by 2020 (despite such provisions postulated by professionals).

- Except provisions of Geological and Mining Law, main legal and financial acts and statements referring to GEODH (and to other RES) regulate this sector at national level, while still there is no regional or local implementing/acts.

Figure 2: Geothermal drilling in Pohdale. Copyright: Beata Kepinska

The European Commission referred Poland to the Court of Justice of the European Union for failing to fully transpose the Renewable Energy Directive. The Polish parliament in June 2013 approved amendments to its Energy Act which will allow it to implement the provisions of the EU's Third Energy Package and possibly avoid financial penalties for its failure to transpose elements of the package to date.

At the time of writing[5], Poland has yet to fully transpose the climate and energy package and the European Commission has started infringement procedures against.

[5] In the summer 2014.

Romania

Background

In the last two years the district heating market has shrunk by approximately 10% due to population's reduced purchasing power, an increase in the price of fuels, unreliable support from local administration, high network losses, and lack of investments. However, improvement can be observed in some cities, proper insulation has been installed in 3% of the buildings already (EHP, 2013).

The main fuel used for District Heating is natural gas (71%), while coal and coal products accounted for 26% and renewables only for 1.2% of the heat supplied in 2011 (EHP, 2013). There are 84 DH systems operating in the country, with more than 10 GeoDH plants.

Good practice:

Appropriate legislation for DH

District heating is well defined in the legislation.

Regulatory and market barriers:

Lack of information

The values presented in NREAP regarding the geothermal potential (167 Mtoe) stem from different documents published in the last 20 years. The reality is that the authorities didn't initiate a sound research in order to clarify these inputs. This is a barrier for new and large investments.

Long and complex administrative procedures

For deep geothermal the regulations are perceived to be complex; permits are only given to certified companies qualified to obtain exploration / exploitation license by the National Authority for Mineral Resources - ANRM. Exploration licenses are given for 5 years (with a possibility of extension for 3 years). Development licenses must be approved by the Government and last 20 years with the possibility of a 5 year-extention. Fees are regulated by article 44 and 45 of Mining law and updated on an annual basis.

Lack of national strategy and predictability

The lack of transparency and predictability in the Government strategy (both in the medium and long term) represents the major barrier for the development of geothermal in Romania.

The public-private ownership is not very extended in general and in DH in particular because of the lack of predictability of the legislation.

Regulated prices

The price of thermal energy produced in DH systems (using natural gas) is partially covered by local authorities – in Bucharest 50%. In this case, even if the price for population is high, it is yet affordable. The future does not seem to be a serious preoccupation for local and national authorities.

Insufficient financial support

There are no dedicated and predictable economic tools to support GeoDHs. For instance there is a lack of funds for pre-feasibility studies that could in turn help to obtain more knowledge about the geothermal potential and increase awareness. The total budget allocated for geothermal is very poor (only one project before 2010). Support schemes are not reliable (see for instance the Green Certificates scheme on which many investors based their plans and in 2013 the scheme was postponed by 4-5 years).

Two potential financial support measures presented in NREAP remain Structural funds and Environment funds.

Lack of structured interest representation for deep geothermal

There is not a dedicated industry representation for deep geothermal in Romania (only the Romanian Geoexchange Society for GSHP applications). and some universities (e.g. in Oradea) can offer information and advice.

Poor national strategy on geothermal/district heating

The Romanian NREAP includes very little information and no objectives for geothermal energy. Some achievements are set out in geothermal DH (Nadlac, Oradea, Beius, Sanmartin, Lovrin, Calimanesti) without detailed and quantified information. No objectives regarding GeoDH, GSHP and electricity production in particular. In 2006 the total geothermal heat supplied for buildings was 131.000 Gcal/year and "it is supposed" to double until 2020. No plans regarding specific measures, actions, responsibilities and intermediary / final deadlines for geothermal energy (GeoDH, GSHP and electricity).

III. Overall transposition/implementation of the RES Directive

Law 220/2008 transposes the RES Directive into the national legislation. However, it is limited to electricity production from RES (there are no provisions on thermal energy).

- Art 13.1 of RES Directive: there are not national rules concerning the availability of information on the authorization, certification and licensing procedures applied to plants and associated infrastructure for the RES heat and cold distribution and the clarity in coordinating and defining respective responsibilities of national, regional and local administrative bodies for authorisation, certification and licensing procedures including spatial planning. The Law 220 was updated yearly and does not contain provisions on RES DH and Ground source heat pumps.

- Article 14.1: Availability of information on support measures to all relevant actors, such as consumers, builders, installers, architects, and suppliers of heating and cooling equipment and systems.

Slovenia

Background

In Slovenia the number of households using district heating increased by 1.8% in 2011 in comparison with 2009. In terms of primary energy sources, coal accounted for 71% of the heat supplied through district heating networks, whilst some 13% was produced by natural gas and 11% by combustible renewables (EHP, 2013).

In 2011 there were 54 district heating systems. Three Geothermal heat plants supply the local DH networks in Benedict, Lendava and in Murska Sobota, while two new projects are being planned in Turnisce and Ormoz.

Good practice

Given the size of the market, no good practice could be observed.

II. Regulatory and market barriers

Complex administrative procedures and unclear definition of licensing authorities

Regulations for deep geothermal are more complex compared to those for shallow geothermal with heat pumps. Licensing authorities are not clearly defined for development of the geothermal resources. Permits and authorities responsible for issuing authorization for DH network building are Ministry of infrastructure and spatial planning, Energy Agency of the Republic of Slovenia. A concession is needed for systems above 1 MW. Permits and authorities responsible for issuing drilling authorisations is the Mining Inspectorate. Water permit and a concession are issued by Agency for environment. If the heat is not extracted by water (ground heat pumps) a permit in line with the Mining act is needed.

There are two legislative acts regulating the exploitation fees (water act and mining act) and there are also several regulations regulating the environmental tax. The terms for the thermal water concessions according the water act are still in preparation. One of the discussed possibilities is that concession should be proportional to the extracted water quantity and to heat that could be originated from thermal water.

Regulated prices

Prices of installations above 1 MW are regulated. They have to be based on actual costs.

Lack of reliable information

Data available is scarce and mostly unverified.

Inadequate support schemes

National support measures do not differentiate between different renewable sources. However, it is obligatory to supply 25 % of energy to buildings from renewable energy sources. Additionally, there are not regional support measures. There is a lack of financial resources - state, municipal and private and of financial supports (such as grants, subsidies, drilling risks insurances etc.). However, some grants and low-interest loans can be acquired.

Lack of qualified specialists

There is a lack of administrative and practical expertise in geothermal development.

Lack of dedicated office

There is a lack of dedicated office for provision of clear and expert information on permitting process and independent assessment of the project for the benefit of the local granting authorities and to define government policy for Geothermal and GeoDH

Closed markets

Competition in the market is scarce and there is a lack of possibilities for new companies to enter into the market.

Poor national/regional strategy on geothermal/district heating

On the national level there is only some schemes for co-financing the construction of district heating systems using wood biomass and geothermal energy - A public tender for co-financing district heating using geothermal energy is being drafted at the time of writing (May 2014).

More importantly, however, there is no special emphasis on geothermal DH in the NREAP or on the regional level. Geothermal it is rather considered together with other renewables.

III. Overall transposition/implementation of the RES Directive

The new Energy Law[6] lays down the conditions and conditions that must be met for the provision of public services. It also allows the municipality to impose a connection to the heat distribution system (in the case of public utilities) and prioritidation of heating in the municipal area. For both the necessary basis should be prepared in the local energy plan. Heat distribution can be performed as optional local public service or regulated economic activity subject to public interest. Law also determines the rate of heat produced from renewable sources to be achieved by each of the district heating system. Information on authorization and certification are available at Public Energy which is authorized for issuing licenses. Law also provides that the Ministry responsible for Energy and Eco Fund are allocating subsidies for projects and energy efficiency measures, district heating and for the production of heat from renewable sources. Eco Fund executes it in the name and on behalf of the ministry. Information on support measures is available at Eco Fund.

[6] In the process of being adopted at the time of writing (May 2014).

Slovakia

Background

There are 2,361 district heating systems in Slovakia, five of which supplied with geothermal. According to Euroheat and Power (2013), however, there is an increasing disconnection rate, which would be caused by regulation of gas prices as well as from energy efficiency measures in buildings. Moreover, the emergence of a hidden heat market is visible, around 10-20% of the sales of heat is realised by enterprises operated under a permit issued by Regulatory Office for Network Industries.

The main trend has been towards switching fuel used in DH from coal or natural gas to biomass. However, the main primary energy source is still natural gas, accounting for 61%, while 28% was produced by burning coal and 7% by biomass.

I. Good practice:

1. Information available

Data are available mainly in the National Atlas of Geothermal Energy.

2.National strategy on geothermal/district heating

Geothermal DH is included in the National Renewable Energy Action Plan.

II. Regulatory and market barriers

Complex administrative procedures

The procedures are rather complex with significant obstacles.

Regulated prices

Price of heat is regulated by Act No 276/2006, as amended, on the basis of RONI decrees which, every year since 2003, have set the scope and method of regulation, the scale and structure of eligible costs, the method used to determine reasonable profit.

Lack of national/regional support schemes

There is a lack of financial support for geothermal in Slovakia as support schemes on the regional and local level do not exist.

Lack of qualified specialists and dedicated office

There is a lack of qualified specialist and of a dedicated office for provision of clear and expert information on permitting process and independent assessment of the project for the benefit of the local granting authorities and to define government policy in the field.

III. Overall transposition/implementation of the RES Directive

The act on the Support of Renewable Energy Sources (RES Act No. 309/2009 Coll) is periodically amended and as mentioned by Tomas Malatinsky, Minister of Economy responsible for energy legislation, on 14/10/2013: "I think the current amendment the Act, as well as any subsequent, will be based on getting bigger and bigger experience that in this area we have. We will monitor our aims to bring RES into irreplaceable position in the Slovak energy mix without much impact on raising prices for consumers and therefore we will amend this law almost permanently".

United Kingdom

District heating in United Kingdom is underdeveloped but is currently gaining momentum and its potential is under evaluation. Currently only 4% of the building stock is connected to heat networks, covering around 1-2% of UK's demand. The most important fuel source used in CHP installations is natural gas, which accounts for 71%.

In the UK there is only one small geothermal plant in Southampton with an installed capacity of 2.8 MWth, while A few projects are currently being developed.

Good practice

Information availability

There are extensive datasets available through the British Geological Survey with regard to subsurface information, however not always specific to geothermal resources.

Certain degree of simplification of administrative procedures

The Environment Agency (EA) water abstraction legislation and permitting system is not particularly complex, however license is granted on a tiered application process with the first stage being a conceptual model completed in advance of exploration. This model required to be updated to Tier after drilling completion and testing of the first well. The final tier and license is completed when both wells are completed and tested.

Appropriate regional strategy on geothermal/district heating

Several individual Renewable Energy Strategies in the UK make reference to the potential use of geothermal energy resources where these have been previously identified through historical geothermal studies and more recent research. Similar policies highlight the benefits of district heating. However, Geothermal DH in the National Renewable Energy Action Plan is not currently considered as part of the NREAP.

Appropriate national and regional support schemes

At national level there is the DECC - Renewable Heat Incentive, dedicated deep geothermal tariff of £0.05 per kWh to be implemented in 2014. At regional level there is the Regional Growth Funds for District Heating schemes – policy-related supports include individual city and council initiatives to develop district energy (e.g. Manchester, Liverpool, Stoke on Trent, Southampton).

Guidance for DH available

Guidance document 377 on DH is published as requiring revision and modernization with a detailed procurement/feasibility and completion guidelines.

Regulatory and market barriers

Exclusive right to use the GT resource not regulated

Legislation defined the public ownership of the resources and developers pay royalties for using them. However, project developers are not protected against external interference. The Hungarian new mining law for establishing a protection zone to geothermal developers could be used.

Lack of dedicated licensing system for deep geothermal energy resources

Scattered pieces of legislation seemed to be enough for the moment as few projects are currently developed. However, a licensing scheme is needed to facilitate investment and decrease project development risk and facilitate the administrative process – This is currently not a priority at government level. The licencing authorities are not clearly defined. They are many such as: Environment Agency - Water Abstraction licensing System and -Groundwater Investigation Consent, Environment Agency, (UK & N. Ireland), Coal Authority (UK) - DETINI GSNI for Northern Ireland) and local Councils.

In order to speed up developments and reduce costs, UK Government has launched a consultation on simplification of procedures for drilling access. [7]

The current proposals include:

- Underground right of access for shale gas and deep geothermal operations only below 300m (nearly 1000ft);
- A voluntary community payment of £20,000 per lateral well; and
- A clear notification system to alert local people.

Lack of role of definition of local authorities in the development of DH schemes

It is difficult to deal with DH in the United Kingdom. Therefore the German model could be applied (DH is dealt by local authority and geothermal developments through central government).

Besides, local authorities have to define the environmental strategy submitted to public examination. (Local planning needs evidence on geothermal). After examination, a control of application procedures is required.

Lack of qualified specialists

There is still a problem with qualified specialists in the UK.

III. Overall transposition/implementation of the RES Directive

The transposition of the directive formally is as follows:

- Article 13.1 - this is done nationally through the Micro generation Certification Scheme (MCS) in the UK & Northern Ireland - http://www.microgenerationcertification.org/

[7] At the time of writing (May 2014). The consultation is open until 15th August 2014.

- Article 13.3 - Refer to the point above.

- Article 14.1 -This is outlined in the UK through the Renewable Heat Incentive Scheme (refer to https://www.gov.uk/government/policies/increasing-the-use-of-low-carbon-technologies/supporting-pages/renewable-heat-incentive-rhi)

In Northern Ireland this is done through a similar (but separate scheme with different tariffs) the Northern Ireland Renewable Heat Incentive (http://www.detini.gov.uk/deti-energy-index/deti-energy-template-menu-5.htm).

SECTION IV: CONCLUSIONS AND RECOMMENDATIONS

Conclusions and key recommendations for policy-makers

As observed in this report, licencing procedures, regulatory and market frameworks as well as access to information widely vary in the 14 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 technology.

- This is the case where, for instance, geological data are freely available to project developers (e.g. after a five year period in the Netherlands);
- A public risk insurance scheme is in place (i.e. in France and the Netherlands);
- There is a clear definition of procedures and licensing authorities (e.g. France, Poland and Denmark)
- Adequate national and regional strategies (Bulgaria) integrated with some form of financial support (e.g. Hungary, Italy, and, Netherlands, and the UK).

Contrariwise, a persisting number of barriers are perceived to be detrimental to any further market development of geothermal / district heating:

- Poor regional and local planning, which can improved with the implementation of the Energy Efficiency Directive[8];
- 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 licencing system for deep geothermal and unregulated right to use the geothermal resources (e.g. in Ireland , UK, and Czech Republic),
- Lack of support (e.g. in Ireland, Poland and Slovakia), and
- Lack of a level-playing field (e.g. in Bulgaria, Czech Republic, Slovenia, Poland, Hungary and the Netherlands where gas prices are regulated and connection to the gas grid is sometimes mandatory).

In order to remove the **regulatory barriers and promote the best practices** identified in the project countries and presented in this report**,** the GeoDH consortium has developed a set of recommendations collected in an ideal 'Regulatory Framework'.[9]

This regulatory 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.

These proposals should lead to regional and local regulations favourable to geothermal DH development in Europe. The key recommendations are provided below:

- **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 ;**

[8] Article 14 provides that, by the end of 2015, Member States should carry out a comprehensive assessment as well as a cost-benefit analysis of the potential for high-efficiency cogeneration and district heating and cooling.
[9] The full regulatory framework is available on the GeoDH website www.geodh.eu.

- **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 (DH) 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;**

- **GeoDH 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.**

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