D.5.5.2. Summary report on EU legislation and policies, best practices regarding the direct use of deep geothermal energy

March 2018

Interreg
Danube Transnational Programme
DARLINGe

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DARLINGe project is co-funded by the European Regional Development Fund (1612249,99 €) and by the Instrument for Pre-Accession Assistance II (534646,6 €) under Grant Agreement no DTP1-099-3.2

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1. Introduction

Against the background of climate change, the European Union faces a major dependence on energy imports, for which the existence of an integrated energy policy is vital for a competitive, sustainable economy and, last but not least, an economy based on low consumption.

The first forms of regulation and the development of an efficient and sustainable policy in the area of a common European market were reflected in the founding treaties of the European community, such as:

- The Treaty of the European Coal and Steel Community of 1952

-The Euratom Treaty of 1957.

which envisaged a unitary management and consumption approach for the energy sector.

Under the umbrella of these regulations, the policy of producing and controlling energy has laid the foundations for the establishment of the European Union, and the current need for an energy policy is given by the real energy challenges that currently exist to increase security supplying energy to consumers.

Regarding the security of energy supply, it is worth noting that Europe is increasingly dependent on imports of oil and gas, which makes the Member States highly vulnerable. According to the forecasts following the present course of activities, the EU's dependence on energy imports will go from 50% of its total energy consumption to 65 % by 2030. A dependence on gas imports is also expected to grow from 57% to 84% by 2030 and from 82% to 93% for oil imports. These increases pose significant political and economic risks, as the world's energy resources are under extreme pressure at present and in the future.

The major oil and gas producers will have to take measures and make important investments to meet rising demands and their ability and willingness to do so is uncertain, therefore the risk of interruption of energy supply becomes a growing risk close to reality.

Another aspect to be considered is that in the European Union, the energy sector accounts for about 80% of greenhouse gas emissions, being the main cause of climate change and, to a large extent, of air pollution, so policies and strategies must initiate programs with concrete and sustainable plans and measures to reduce greenhouse gas emissions for the energy sector.

In the light of these needs, Europe has shown its intention to lead the global fight against climate change, an intention which has been confirmed by the European Union's position in the United Nations climate change debates, the debate on the prolongation and the applicability of the Kyoto Protocol in Doha in December 2012 and in Paris in 2015. Following these debates, the Kyoto Protocol, one of the world's most important documents on the fight against climate change, was prolonged by another 8 years, at least 20% by 2020, with strong commitments to this sense.

The European energy-climate policy framework consists of a vast number of directives, regulations, as well as policy papers, strategies, action plans, road-maps setting visions and targets for 2020, 2030 and 2050. This report aims to provide a brief summary on the key documents especially those ones that are relevant for direct use (heating) of deep geothermal energy resources.

2. European Union legislation and strategic energy policy objectives

The European Energy Policy highlights the fact that the energy policy must be part of the overall objectives of European economic policy, to safeguard collective interests, sustainable development and consumer protection. The EU's energy strategies also have an impact on policies in other areas, so it is very important to have a correlation and coherence between them. Also, with regard to cooperation with third countries, the European Union must strive to create a single energy policy to protect Member States from imbalances in the economic market due to lack of energy or the supply of energy at high costs.

In order to create an efficient economy, the main strategic policy objectives that emerged at EU level are: sustainability, competitiveness and security of supply.

It is envisaged that the promotion of environmental sustainability will be achieved by strengthening the EU leadership position by adopting an energy efficiency action plan, by further developing the development of renewable energies by initiating programs with R & D support.

Strengthening security of energy supply will be done by developing a common foreign policy by maintaining a permanent dialogue with the Member States to cover the energy consumption of communities in order to limit the European Union's vulnerabilities to hydrocarbon imports and the need to promote the exploitation of the geothermal potential.

Ensuring competitiveness aims to promote employment at EU level through efficient and sustainable economic growth, enabling optimal supply of safe energy at affordable prices to European consumers.

In order to help European consumers, European decision-makers have endorsed, through the provisions of the Treaty of Lisbon, the need for energy to be given a central role in European activities, giving them a new legal basis not covered by the previous treaties, namely Article 194 of the Treaty on the functioning of the European Union. Article 194 (1) of the Treaty on the Functioning of the European Union (TFEU) sets out its objectives as follows: “in the context of the establishment and functioning of the internal market and with regard for the need to preserve and improve the environment, Union policy on energy shall aim, in a spirit of solidarity between Member States, to:

- ensure the functioning of the energy market;

- ensure security of energy supply in the Union;

- promote energy efficiency and energy saving and the development of new and renewable forms of energy”.

Besides this, Article 194 TFEU further frames the EU actions on energy issues with reference to the establishment and functioning of the internal market, while the requirement “to preserve and improve the environment” makes clear that the existing obligation to integrate environmental considerations (in Article 11 TFEU) explicitly applies to energy legislation and policy. EU decision-makers are entitled to legislate on a number of issues which can have a relevant impact on the geothermal energy sector, regardless of the differences between shallow and deep, heating and cooling, electricity or combined heat and power (CHP). For instance, legislation aiming to increase the share of renewable energy incentivises the use of geothermal energy technologies. On the other hand, measures aiming to preserve the quality of the environment ensure may limit the location, affect the procedures required and ultimately the costs of the realisation of a geothermal system.

Against this background, it should be noted that the EU legislation goes beyond EU member states as it applies to the European Economic Area (EU countries plus Iceland, Norway and Lichtenstein) when deemed "of EEA relevance" and can be also adopted by other third countries under the Energy Community Treaty or bilateral agreements.

Furthermore, it is relevant to highlight that EU legislation is often flexible, broad in scope, and aims to lay down the general objectives in a policy sphere. Hence, in many cases the actual impact will ultimately depend on the way the EU legal framework is eventually transposed and implemented at national level.

The regulatory field of the energy sector at European level includes various legislative instruments (directives, regulations, decisions, recommendations). While the EU can make use of a variety of formal and quasi-formal legislative instruments, those relevant for geothermal energy are often "directives", which by definition "shall be binding, as to the result to be achieved, upon each Member State to which is addressed, but shall leave to the national authorities the choice of form and methods" (Article 288 TFEU). Because of this interdependence between the legislation at supranational and national level, and in most cases between the national and the regional level, any analysis of the EU legal framework for geothermal cannot be exhaustive and self-standing. Yet, it could provide valuable background information for a better understanding of the legal framework at national and local level.

The main EU environmental regulations affecting the geothermal energy sector are: the regulations on water, on energy and environmental assessment.

2.1. Energy-related regulations

The **Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources (RES)** is amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. According to the provisions of Directive 2001/77/EC on the production of energy from renewable sources, it was foreseen that, by 2010, the European Union would provide about 12% of the energy needed by the use of renewable sources.

This Directive establishes a common framework for the promotion of energy from renewable sources. It sets mandatory national targets for the overall share of energy from renewable sources in gross final consumption of energy and for the share of energy from renewable sources in transport.

It also lays down rules relating to statistical transfers between Member States, joint projects between Member States and with third countries, guarantees of origin, administrative procedures, information and training, and access to the electricity grid for energy from renewable sources. It establishes sustainability criteria for biofuels and bioliquids. In this directive the methodology for the accounting of renewable part of the energy from heat pumps is also given (ANNEX VII).

The Directive prescribes the adoption of the national renewable energy action plan (NREAP) for each Member State. These plans are prepared in accordance with the template published by the Commission; provide detailed roadmaps of how each Member State expects to reach its legally binding 2020 target for the share of renewable energy in their final energy consumption.

The Directive promotes cooperation amongst EU countries (and with countries outside the EU) to help them meet their renewable energy targets. This cooperation can take the form of:

-statistical transfers of renewable energy

-joint renewable energy projects

-joint renewable energy support schemes.

The Directive requires Member States to recommend to all actors, in particular local and regional government bodies, to ensure that equipment and systems installed for heating and cooling using renewable sources are used in the planning, design, construction and renovation of residential (or industrial) areas energy. The directive states that governments should encourage local and regional government bodies, in particular to include, where appropriate, heating and cooling systems from renewable sources of energy.

Legally binding targets and measures to dismantle the barriers of renewables entering the energy market are identified as:

- Long and discriminatory administrative procedures

- Rigid local plans

- Lack of information

- Shortage of skilled workers

- Unfair access to the grid

The relevant key provisions of the RES are the following:

Art. 2 (c) – Definition of geothermal energy: „energy stored in the form of heat below the surface of solid earth" No differentiation between deep and shallow.

Art. 3 – Manadatory national targets: defines legally binding targets for each Member State by 2020. Art 3 of the RES Directive allows Member States to use national financial mechanisms to be able to achive national RES targets, such as:

- Investment aid (capital grant, loan, risk insurance)

- Operating aid (feed-in-tariff / premium, green certificates, tax exemptions, etc.)

These are compatible with EU law ONLY if:

- Promote the execution of an important project of common European interest

- Does not adversely affect trading conditions of common interest

In 2014 EC adapted Environmental and Energy Aid Guidelines (EEAG), which caused a change in operating aids (phasing out feed-in tariffs) for renewable electricity. From 2017 there is a mandatory and technology neutral bidding process, which fails to recognise the specificities of each different renewable technology and assumes a well-functioning EU internal energy market (which is not the case: different grid costs, capital costs, administrative costs, regulated electricity prices, fossil fuels and nuclear still receiving subsidies, etc). This is unfavorable for geothermal electricity as pre-mature technology (compared to solar or wind)

Art. 4 – National Renewable Energy Action Plans (NREAP-s): detailed roadmap showing how each country expects to reach the targets (sectoral targets, technology mix, etc.)

Art. 5 – Calculation of renewable energy from heat pumps

Art. 13 – Administrative procedures, local and regional planning, use minimum levels of renewable energy in buidings. Art. 13 (1): Requires Member States to streamline and rationalize administrative procedures, to define and coordinate the respective responsibilities of central, regional and local authorities responsible for licensing and certification. Art. 13 (3): recommend all actors to consider the installation of equipments and systems for the use of electricity /heating-cooling (district heating) from renewable energy sources when planning local infrastructures („smart cities"). Art. 13 (4-6): to introduce, where appropriate to use minimum levels of renewable energy in buildings (geothermal heat pumps and geothermal district heating)

Art. 14 – Information and training. To ensure that information is available to all relevant actors about support measures, net benefits and costs + guidance and training programs. Certification schemes for installers of shallow geothermal energy systems have to be available by 2012, certification awarded in an EU country shall be recognized by any other Member State

Art. 16 (2) – Access to electricity grid.

The **EU Directive 2010/31/EU on energy performance of buildings** applies to new and existing buildings undergoing major renovation: high-efficiency alternative systems (e.g. geothermal heat-pumps, geothermal district/block heating-cooling) need to be considered before construction. No concrete levels are prescribed, but has to be cost-optimal. All new buildings owned or occupied by public authorities must become "nearly zero-energy" by the end of 2018, and all new private buildings by 2020.

According to the **EU Directive 2012/27/EU on energy efficiency** of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC, Member States have to set up energy efficiency obligation schemes to achieve new savings each year of 1.5% of the annual energy sales to final customers. In order to improve energy efficiency in energy generation Member States must assess the potential for the application of high-efficiency cogeneration and efficient district heating and cooling (geothermal technologies). Cost-benefit analysis should be done in order to identify the most resource- and cost-efficient solutions to heating-cooling.

2.2. Water-related regulations

Concerning the legal protection of water resources at European level, both the European Union and the Member States are parties to a series of international agreements on the protection and sustainable use of water resources.

The protection of water resources at European level includes a complex and wide range of cooperation and cooperation activities, in the form of various treaties, conventions or documents belonging to international bodies. At the meetings of international conferences on the legal protection of continental waters, a series of documents, statements and principles have been drawn up and adopted which regulate the need for efficient, rational and efficient water management in Europe.

Although conventional international practice in the field of international water use and in general cooperation between states has developed rather slowly, the growing interest of states

to prevent and mitigate its pollution and its harmful effects is manifested strongly in international, governmental and nongovernmental organizations.

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 (Water Framework Directive - WFD) requires member states to implement the necessary measures to prevent deterioration of the status of all bodies of surface water and to prevent or limit the input of pollutants in groundwater. It is complemented in 2006 by a specific directive on groundwater based on article 17 of the WFD.

The application of water legislation to geothermal energy differs between open or closed-loop systems.

The ultimate goal of the WFD is to achieve/maintain the good quality and quantity status of (groundwater) bodies by 2015 („environmental objectives").

The good quantity status (amount of groundwater) means that the level of groundwater in the groundwater body is such that the available groundwater resource is not exceeded by the long-term annual average rate of abstraction (no overexploitation). Alterations to flow direction resulting from level changes may occur temporarily, or continuously in a spatially limited area, but such reversals do not cause saltwater or other intrusion.

The good quality status means that there are no effects of saline or other intrusions, and water chemistry values do not exceed the Community quality standards.

However the WFD does not deal with those local processes and contaminations whose temporal and spatial formation does not influence status of the whole groundwater body, and does not threaten the fulfilment of its environmental targets.

Art. 11of the WFD gives Member States the option to authorize the reinjection into the same aquifer of used geothermal water as long as it does not compromise the environmental objectives. National governments have the competency to decide as to whether reinjection of the geothermal fluids is required.

Article 8 of WFD gives provisions on the establishment of monitoring programmes of groundwaters. Monitoring of groundwaters related to the WDF concerns the entire groundwater body, but it also supports the integrated management of the catchment area and reaching its environmental targets.

The **Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration (Groundwater Directive)** establishes specific measures as provided for in Article 17(1) and (2) of Directive 2000/60/EC in order to prevent and control groundwater pollution. These measures include in particular: criteria for the assessment of good groundwater chemical status and criteria for the identification and reversal of significant and sustained upward trends and or the definition of starting points for trend reversals.

This Directive also complements the provisions preventing or limiting inputs of pollutants into groundwater already contained in Directive 2000/60/EC, and aims to prevent the deterioration of the status of all bodies of groundwater.

The purpose of the **Directive Council 80/68/EEC of Council, from 17 December 1979 on the protection of groundwater against pollution** caused by certain dangerous substances is to prevent the pollution of groundwater by substances belonging to the families and groups of substances in lists I or II in the Annex, and as far as possible to check or eliminate the

consequences of pollution which has already occurred. This is mostly relevant in connection with re-injection of thermal groundwater after energetic utilization.

In this directive the re-injection of water in the aquifer is also mentioned (Articles 4, 6, 10,17). Member States may, after prior investigation, authorize discharges due to re-injection into the same aquifer of water used for geothermal purposes. Artificial recharges for the purpose of groundwater management shall be subject to a special authorization issued by the Member States on a case-by-case basis. Such authorization shall be granted only if there is no risk of polluting the groundwater. With regard to discharges into transfrontier groundwater, the competent authority of the Member State which intends to grant authorization for such discharges shall inform the other Member States concerned before an authorization is issued. At the request of one of the Member States concerned and before an authorization is issued, consultations shall be held in which the Commission may participate.

2.3. Environment-related regulations

An environmental assessment ensure that the environmental implications of a project are evaluated and taken into account. Environmental assessments can be undertaken for individual projects on the basis of **Directive 2011/92/EU on Environmental Impact Assessment (EIA)** or for public plans or programmes on the basis of **Directive 2001/42/EC (SEA Directive)**. Both Directives ensure that plans, programmes and projects likely to have significant effects on the environment are subjected to an environmental assessment prior to their approval or authorisation.

According to the EIA Directive the national authority determines whether and which geothermal projects should be subject to an environmental impact assessment.
A geothermal project also has to comply with **Directive 92/43 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive)**. In accordance with Article 6 (3) of the directive, if a proposal is considered to have a significant effect on the conservation objectives of a Community Site an appropriate assessment will be required.

The purpose of the **Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on environmental liability** with regard to the prevention and remedying of environmental damage is to establish a framework of environmental liability based on the 'polluter-pays' principle, to prevent and remedy environmental damages.

2.4. The European climate-energy framework and future visions

Targets on greenhouse gas emissions, energy efficiency and renewable energy constitute the cornerstone of the European Union's climate and energy framework. This framework serves as a basis to promote RES such as geothermal.

The **Climate Change Energy Package** has set for the European Union a set of 2020 targets, known as "20-20-20 objectives", consisting of:

- reducing EU greenhouse gas emissions by at least 20% compared to the EU of the 1990 level;

- a 20% increase in the share of renewable energy sources, the total energy consumption of the EU as well as a target of 10% biofuels in energy consumption for transport;

- a 20% reduction in primary energy consumption to be achieved by improving energy efficiency compared to the level at which consumption would be achieved without these measures.

This legislative package also contains other complementary normative acts:

- Decision 2009/406 / EC on the reduction of greenhouse gas emissions;

- Directive 2009/29 / EC on the improvement and extension of the European greenhouse gas emission allowance trading scheme;

- Directive 2009/31 / EC on the geological storage of carbon dioxide (CO_2).

The **EU climate and energy framework beyong 2020** (**A 2030 framework for climate and energy policies)** lays out three EU wide targets adopted on December 2014:

- at 40% greenhouse gas emission reduction target compared to 1990 levels by 2030;

- at least 27% renewables in final energy demand by 2030;

- an indicative target of 27% improvement in energy efficiency compared to a baseline in 2030 (keeping in mind a figure of 30% for a 2020 review).

Beyond the targets, the European Commission introduced a set of directives and regulations to support the ambition of its climate and energy policies. The **Clean Energy Package** comes to update this regulatory framework, with a goal of preparing the transformation the European energy system and streamlining EU climate and energy policies. The main pieces relating to the Climate and Energy framework are:

• The Proposal for a recast Renewable Energy Directive (replacing Directive 2009/28/EC);
• The Proposal amending the Energy Efficiency Directive (amending Directive 2012/27/EU);
• The Proposal for a Governance Regulation (which replaces the whole existing planning and reporting framework)

• The Proposal amending the Energy Performance of Buildings Directive (amending Directive 2010/31/EU);
• Proposal for a regulation and a directive on the internal market for electricity (notably replacing DIRECTIVE 2009/72/EC).

The proposal for a **Governance Regulation** aims at streamlining planning and reporting requirements for EU Member States in order to comply to the Paris Agreement framework at to reduce the administrative burden of Climate and Energy policy. It replaces several legislative texts to define National Energy and Climate Plans for Member States for the period between 2020 and 2030, and to set up the reporting obligations for the period. The Governance Regulation defines how Member States will plan and develop a vision on their energy systems for the long-term. Currently being discussed, there are many uncertainties regarding the outcome of the text. It has however some potential to contribute to the development of geothermal energy by favouring an integrated planning of the Energy system across the 5 dimensions of the Energy Union.

These different pieces of legislation are being discussed between Member States and the European Parliament.

In the **Energy Roadmap 2050** several decarbonisation scenarios by 2050 have been analysed. The share of renewable energy rises substantially in all scenarios, achieving at least 55% in gross final energy consumption in 2050. The energy roadmap is not focused on geothermal

energy particularly; the geothermal energy is mentioned only as a part of renewable heating and cooling. Geothermal electricity technologies are deeply underestimated in the report and that the Roadmap does not even mention EGS among those technologies needing further investments and development to bring down costs. Tthe potential of utilisation of geothermal heat for heating and cooling sector is underestimated too.

3. Conclusions

Competitiveness, sustainability and security of supply of the population are the major objectives the European Union needs to address through a firm, unitary and lasting energy policy in all Member States in order to maintain a decent living for present and future generations.

Given that many of the Member States of the European Union are dependent on energy imports, energy efficiency measures and those related to the exploitation of renewable energy sources are very important for ensuring and maintaining security of energy supply.

The efficient and responsible use of resources, the maintenance of affordable consumer market prices and the development of innovative solutions packages for this sector are a very important pillar for increasing the quality of life in Europe, contributing to the long-term development of sustainable development of the society we live in.

Renewable energy sources such as geothermal energy is an important alternative to fossil fuels and the use of these sources not only contributes to the reduction of greenhouse gas emissions from energy production and consumption but also to a significant reduction in the Union's dependency.