AN OVERVIEW OF THE REGULATORY FRAMEWORK FOR THE GEOTHERMAL ENERGY IN EUROPE AND SERBIA

by

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In this paper the relevant legislation for the geothermal energy in the European countries and Serbia is reviewed. There is a variety of the incentives for the geothermal production which are well known throughout the European Union. The governmental policies for the support of the geothermal development have so far focused on the power generation only. It is necessary to make serious efforts in order to harmonize the legislation and to simplify the procedures of establishing and implementing the policies for boosting the direct use of the geothermal energy.

The Law on Energy of the Republic of Serbia which was adopted by the Parliament and the Energy Development Strategy of the Republic of Serbia until 2015 have defined the privileged power producers, but only by passing the Regulation on the incentive measures for the production of electricity using the renewable energy sources combined with the production of electricity and the thermal energy, which came into force on January 1st 2010.

Key words: *geothermal energy, geothermal legislation, support mechanisms*

Introduction

The use of the alternative sources of energy nowadays is a very important factor for the sustainable economic development. With the increasing world population today the world`s electricity consumption has reached 17,000 TWh (2008) and increases each year by over 1.5%, so it is very difficult to meet the growing energy needs by relying only on the traditional energy sources (oil, coal, natural gas) [1]. In the European Union countries an act on the renewable energy resources was passed in 2004 (The Directive 2001/77/ES [2]), which stimulates the building of the facilities for the production of electricity from the renewable energy sources with the aim to increase the share of that kind of energy by 20% by 2020.

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Also, the new Directive 2009/28/EC about renewable energy set binding national targets which members of the European Union need to achieve by promoting renewable energy in the sectors of electricity, heating and cooling and in the transport sector. All that should be done in order to ensure that by 2020 the renewable energy makes at least 20% of total energy consumption in the European Union. Directive also predicts that by 2020 the use of renewable energy in transport (biofuels, electricity and hydrogen produced from renewable sources) will be at least 10% of total fuel consumption in the European Union [3].

In Europe currently the geothermal energy production takes up a very small share of the total amount of energy derived from the renewable energy sources. Although the electricity production is cost-effective and competitive if we compare it with the conventional power plants, the risks associated with the investment into the geothermal sites still continue to be a limiting factor, and thus the installed power amounts about 1,124 MW_e (for 2007). The use of the heating energy from the geothermal deposits has been showing a slight increase and is mainly used for heating and balneology. It amounts to 13.6 GW_{th} [4]. During the last decade the use of the shallow geothermal resources by using heat pumps has shown an exponential growth of over 670,000 installed units in the EU and 7.6 GW_{th} (2007) [5]. The plan is that by the end of 2010 the heating energy derived from the geothermal sources (excluding the heat pumps) reaches 5 GW_{th}, and together with the installed capacity for the production of the electricity about 1 GW_e [6 – 10].

The legislation in Europe

The renewable energy sources (RES) in the European Union produced 437 TW_eh of the electricity in 2001 which is 15.5% approximately of the total amount of needs. The share of the electrical energy derived from the cogeneration in the total electricity production for the EU-15 amounted to 10% but there are big differences among the individual countries.

The costs of the implementation of the renewable energy sources are generally higher than the costs in the case of the use of the traditional fossil fuels. The reason for that lies in the fact that market price for the electricity derived from the fossil fuels does not include its full economic production price. In the European Union today a growing number of incentives and support mechanisms for the use of the renewable energy sources are being introduced, primarily in order to obtain electricity.

When the stimulating measures of RES in the EU are concerned, the primary focus is obtaining the support for obtaining electricity. In that respect within the framework of the stimulating measures the following systems exist:

– The fixed price scheme - in accordance with which the obligation by the electrical company to buy the electricity on the basis of RES and pay by the rate depending on the type of the applied technology.
– The tendering system - by which the periodical call auctions are envisaged for the production of the prescribed amount of electricity RES based together with the negotiation of the on the lowest offered price basis (this method was in force in Great Britain, Scotland and the Northern Ireland and is still in force in France (and for the projects of over 12 MW in the Republic of Ireland as well).

– The Green Certificate - marks a certificate which the manufacturer gets for the each RES-based produced unit, by which the electrical power company is obliged to deliver the electricity to the consumers, out of which at least one part is ERS based.

Table 1. An Overview of the political measures and the legislation in the EU countries that have a well-established framework in the field of using geothermal energy [2, 3, 10-14]

Country	Policy name	Policy type
The European Union	– The Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the Promotion of electricity produced from renewable energy sources in the internal electricity market – 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 RES	– Obligations
Austria	– The Renewable Energy Targets – Ecological plant and act on "green" energy	– Guaranteed prices / Feed-in tariff (0.07 € per kWh) – Obligations
France	– The Mining Act (Code Minier) – The Decree 77 – 620 (16 June 1977) "Low temperature geothermal deposits" – The Decree 74 – 498 (24 March 1978) "Geothermal prospecting and exploitation licenses" – The Credit system (FOGIME)	– 3rd party finance – Guaranteed prices / Feed-in tariff (0.0762 € per kWh) – Green certificates
Germany	– The Federal Mining Law – The Renewable Energy Sources Act (2004) (Erneuerbare – Energien – Gesetz EEG) – The Renewable Energy Sources Act (2009) (Erneuerbare – Energien – Gesetz EEG) – The Market Stimulation Programme (Marktanreizprogramm)	– Guaranteed prices / Feed-in tariff (plants with capacity of 5 MW or below – 0.15 € per kWh, 5 MW to 10MW – 0.14 € per kWh, 10 MW to 20 MW – 0.0895 € per kWh, and above 20 MW, price is 0.0716 € per kWh) (for 2004), – up to 10 MW – 0.1584 € per kWh, from 10 MW – 0.1010 € per kWh (for 2009) – Obligations – 3rd party finances – Capital grants – Consumer grants/rebates
Greece	– New Law on the Exploitation of Geothermal Potential (Law 3175/2003) – The Founding decree of the Centre for Renewable Energy Sources – CRES – The Exploitation of Geothermal Potential (Law 1475/84)	– Guaranteed prices / investment subsidies – The combination of other measures defined by regulatory and administrative rules

Table 1. continuation

Hungary	– The Mining Law (no. XLVIII,1993) – The Water Management Law (no. LVII,1995) – The Concession Law (no. XI, 1991) – The Environmental Impact Assessments (EIOP) – The Energy conservation and Energy Efficiency Improvement Action Programme (Resolution 1107/1999)	– Regulatory and administrative rules – Mandatory quota – Guaranteed prices / Feed-in tariff (0.06 – 0.068 € per kWh)
Italy	– The Tax Credit for Geothermal Energy and Biomass EEC Directive 85/337 (Environmental Impact Assessment) – Electricity from geothermal energy (utility programme – ENEL)	– Guaranteed prices / Feed-in tariff (0.17 € per kWh) – Mandatory quota (2% per year should be increased) – Tax credits
Romania	– The Mining Law (1998) – Energy Law 13/2007 – GD no 443/2004 with modification of GD no 958/2005 – Law no 220/27 October 2008	– Energy quota obligation – Green certificate system (but only for electricity production from RES)
Poland	– The Geological and Mining Law (Official Journal No. 27, item 96 with amendments) – The Development Strategy of Renewable Energy Sector	– General Energy Policy

As the other types of the renewable energy sources, the geothermal energy involves the high investment costs and relatively low labor costs. There is almost no country in the world which does not directly or otherwise subsidize the use of the geothermal energy with the desire and effort to expand it. For example, in France, Sweden and Switzerland the most appropriate modalities of the state subsidies have been applied and the appropriate energy policies and the strategies for the implementation, the production and the rational use of the energy sources have been introduced.

For example, in Bulgaria, based on the Energy Law passed in 2003 it is now possible for the first time to determine the instruments for the stimulation of the RES based energy production. The stimulating measures include the obligatory networking and the formation of prices determined by the regulatory body which are based on the long-term costs and investment benefits. The law also provides a system for establishing the amount for the energy production, bearing in mind the environment protection and the energy trade in accordance with the Certificate of the Environmental Protection.

In many countries the geothermal energy sources are the subject of the Mining Law whereas the production of the geothermal fluids from the subsurface is regulated by the Water Protection legislation. This implies that the responsibilities are assigned to the different ministries, often with a limited interaction and cooperation between them (tab. 1) [10].

Most of the countries do not have strictly made regulations or laws about the geothermal potentials or the use of the geothermal energy. These are mostly a part of the laws or regulations about the use of the RES as well as the Mining Laws and the Water Laws. Apart from that there is a shortage of the regulations concerning the particular technologies (SNR, the heat pumps). Only a few EU directives mention the geothermal waters and only in a few sentences.

The Groundwater directive 80/68/EEC of 17th November 1979 on the protection of the groundwater against the pollution caused by certain dangerous substances) In the Act 4. of this directive it is stated that countries, the EU members can allow the re-injection before the first research is undertaken into the same underwater which is used for the geothermal purposes, as well as for the waste water from the mining pits and quarries and for the waste waters from the factories.

The Bathing Water Directive 76/160/EEC. This directive includes the interpretation about the bathing water quality, except for the water used for the therapeutic purposes and the swimming pool water.

The Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment.

The Directive 2000/60/EEC on Water Policy of the European Parliament and the of the Council establishing a framework for the Community action in the field of water policy – the Water Framework Directive – in the Act 11 of this directive the prohibition measures against the entities which release the direct pollutions of the groundwater aquifer. The EU members can also allow the re-injection before the first research is undertaken into the same groundwater aquifer which is used for the geothermal purposes.

Croatia started the National Energy program for the use of the geothermal energy – GEOEN in 1998 which includes all the technical, technological, legal and other measures for the increase of the geothermal energy, and which was later included in the Strategy of the Energy Development of the Republic of Croatia.

Table 2. The Summary of the legislation characteristics relevant to geothermal energy utilization [10]

Country	Mining Law coverage	Special Provision for GSHP's*	Geothermal tax applicable
Germany	yes	yes	no
France	yes	no	no
Hungary	yes	no	yes
Romania	yes	no	yes
Switzerland	no	yes	no

*GSHP's-ground source heat pumps

In the European Union there are measures of encouragement for the use of heat pumps, and subventions are the primary type encouragement (tab. 2). The investment of the country/state is necessary, in order to make the payment period acceptable, because, at the moment, it isn't cost-effective to invest in the geothermal energy. By conducting certain projects, a country, in cooperation with the local municipalities, organizations of customers and manufacturers and environmental organizations, subsidizes 30 or 40% of expenses of the installation of the heat pumps.

The European Heat Pump Association was published the development plan till the year 2020. It has been emphasized that heating and cooling utilize at least 40% of total number of energy consumers within the EU and that substitution of oil and gas boilers, as well as the heating by electric energy by heat pumps can contribute significantly to the strategy development for renewable energy sources within the EU. It has been concluded that wide

spread heat pump installation should reach nearly 70 million installed heat pumps in the year 2020. They will be able to realize 20.5% of GHG reduction plan in EU till the year 2012 and 21.5% of this plan till the year 2020. It has been concluded that in future heat pumps will make about 30% of the aim for renewable energy in the EU in the year 2020 [5].

The countries with the leading geothermal heat pumps market in Europe are Sweden, Switzerland, Germany and Austria. In Austria, as well as in Germany, measures of encouragement for the heat pumps installation vary in different regions of the country. The only direct support measure for geothermal heat pumps on the federal level in Germany was part of the Market Stimulation Programme. For example, in Bavaria, since 2003, there following measures of encouragement were implemented:

– € 150 for every installed kW for heating in already existing buildings, if, at the same time, the heating system was adapted and
– € 100 for every installed kW for heating in all other cases.

Maximum subvention is 25%, keeping in mind the investments' expenses, which cannot be bigger than € 12.500 for the heat pump system.

For example, in Switzerland, there was a promotion of the heat pumps installation and the subvention was € 200 per installed kW [10].

In table 3, the preview of cost of the electricity derived from the geothermal sources is given, and it is based on the encouragement rate in some countries.

Table 3. The Guaranteed price of electricity derived from the geothermal sources in some European countries [10 - 14]

Country	Price [€cent per kWh]
Czech	9.6
France	7.62
Germany	7.16 - 8.95
Austria	7.0
Greece	6.43 - 7.78
Hungary	6 - 6.8
Slovenia	6.11

The legislation in Serbia

The availability of the geothermal energy in Serbia is very small. The preference of the geothermal energy in relation to other renewable energy sources is that it is concentrated on separate locations and it's very simple to use it for heating. The research in Serbia began in 1974, after the first world oil crisis. And there are more than 100 hydro-geothermal low-temperature systems in Serbia. The total flow rate of all the natural geothermal sources amounts to 4,000 ls^{-1} approximately. The total installed capacity amounts to 86 MW, and the annual energy use is 2,415 $TJyear^{-1}$.

The locations in Serbia where the geothermal energy sources exist are mainly concentrated, and the temperatures are most often between 15 and 90 °C. It is estimated that use of technology for exploitation of Serbian geothermal sources for production of heat is possible in:

- Agriculture – for ecologic food growth (agro and aquaculture),
- Public services area for the central heating,
- Health industry and body care – balneal-therapy, and
- Touristic purposes [15].

At the same time, the disposition of the used water is a big problem, and it requires ecologically legitimate recipients close to customers. The cheapest way would be the return of that water into the well, but that requires additional funds. It is also considered that there is no need for the new hydrothermal wells, because there is small percent of use of already existing wells and groundwater aquifers, especially for obtaining energy.

There is no law regulation on the exploitation of groundwater. There is a law considering geological researches, but there is no defined law on the exploitation of groundwater [16, 17]. Thermal energy is used in very small amount in SPA's and for green houses heating and apart usual taxes and refund there is no other benefit for the country.

In the regulation on the amount of fees for the use of the mineral resources it is said that the price for the groundwater and geothermal water should be 1.5% of price of mineral resource on the market. This refers to the use of resource and not to exploitation, *i. e.* concession, for which there's separated fee. Although there is the Concession Law [18], *i. e.* The Law on the Use of the Natural Resources for certain period of time, there is no regulation for its enforcement. This Law is applicable to the public tender procedure for the construction of energy facilities, but the concession-granting procedure is rather complex.

In the adopted Energy Law of the Republic of Serbia [19] (article 84-88) and The Republic of Serbia Strategy for the development of Energy by the year 2015, producers of electricity with benefits are defined, but only by passing the Regulation on the incentive measures for the production of electricity using renewable energy and combined production of electricity and thermal energy, which came into force on 1st January 2010. This Regulation shall be prescribed by the incentive measures for the production of electricity using renewable energy sources and for the purchase of that energy – Feed-in tariff balancing, and reading, are defined by the energy facilities that produce electricity from renewable sources, regulate the contents of the contract on the purchase of electricity by the incentive measures, and the compensation costs of energy produced by the buyer. Under this regulation, Article 4, the price of electricity from geothermal sources is defined and that is the one of 0.075 € per kWh [19]. This system has proved very effective in some countries of the European Union and there is a very quick increase in the amount of energy produced from RES.

Ministry of Mining and Energy of the Republic of Serbia is working on the amendments of the Energy Law in terms of precisely defining obligations of energy entities (caring out one or more energy activities) and energy consumers to report on their energy production/consumption/ transmission, *etc.*

In 2006, the Republic of Serbia ratified the Treaty establishing the Energy Community. In article 20 of this Treaty states that every signatory is obligated to adopt an implementation plan of the Directive 2001/77/EC for the promotion of renewable energy sources derived electric energy production and the 2003/30/EC Directive on the promotion of the use of biofuels or other renewable fuels for transport.

Generally speaking, exploiting the RES energy is insufficient, and therefore existing potentials are absolutely unused [20, 21]. In order to improve the overall situation, Serbian authorities have taken a whole set of measures and activities with the goal to increase the

production of energy from RES, based on domestic and foreign investments. Serbia has all the basic potentials for producing energy from RES, but estimations point out the fact that Serbia has the most favorable conditions for usage of geothermal sources, wind, and biomass [22].

In the Republic of Serbia there is a lack in the number of the standard equipment and procedures for the exploitation of RES which are in the area already established in the EU. There is also the lack of rules and regulations for the design, construction, control, and assembly / installation of devices that use the RES, and a lack of accredited laboratories certificate power plants using RES [23].

Conclusions and the regulatory tasks for the future

The costs of using renewable energy sources are generally above the cost of applying traditional fossil fuels and that makes the renewable energy technology uncompetitive in the market for the production and sale of electricity.

The Serbian government has recognized and supported the need for the institutional support of use of RES and is providing incentives for the production of electricity. Using geothermal energy as a form of renewable energy is very profitable in Serbia due to the fact that there are a number of existing wells, about 80, whose potential is not sufficiently used or not used [24]. What's more, the incentives for the use of heat pumps and the price of water in the direct use of geothermal heat sources in use are still not defined. There are no specific regulations for HVAC systems with geothermal heat pumps, including geothermal heat exchanger.

Also, it is necessary at the local and regional level, depending on locally available resources, to introduce different incentives and tax incentives for the potential investors.

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