Interactive information point about geothermal applications in Central-Eastern Europe

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ABSTRACT

In Poland complex and reliable information about places with geothermal applications in Europe is either fragmented or published in expert's magazines. For consumers some information about geothermal swimming pools is mostly given on commercial web sites, or in some articles and reports. There are few reliable sources of information about geothermal heating plants for non-specialists in this field. More reliable information is given about spa resorts where geothermal water is used for treatment. In Poland, the information are mostly connected with the national health-care system.

The project presented below was created to join three geothermal water applications: heating, recreation and treatment in a wider area. At the beginning, the area will be narrowed down the Poland, the Czech Republic, Slovakia and Hungary. In the future there are plans to develop the project and include other countries from Europe to the project.

An information point will be created. It will be an interactive tool to show the most essential geothermal information. On the map, the exact position of the geothermal institutions, will be marked, the users will be able to obtain more precise information by clicking or touching the screen. Each geothermal heating plant will be profiled by geothermal water temperature, depth of the aquifer, water TDS and flow rate, capacity and heat energy use. The information about geothermal swimming pools and aqua parks will include the temperature of geothermal water, TDS, the composition and type of water used in swimming pools and their infrastructure. If the water is used for treatment, the indications and contraindications for bathing in the water will be also highlighted.

The information point will enable searching and classifying the information by given criteria, such as the type of geothermal water, the level of mineralization and the temperature of the water, the specific area of the country, the infrastructure of the swimming pools or aqua parks, etc. It will allow to compare some water applications in different locations. It's friendly software will make research quick and easy. The information point will be a great opportunity to propagate geothermal applications, first from Central-East Europe, and then entire Europe in the future. The information will be updated each year.

1. INTRODUCTION

Currently growing interest in renewable energy sources sector, in the global economic market, is observed. Unsurprisingly, both the business sector and the individual investor increasingly turn to alternative energy sources such as: sun, wind, water, biomass and also geothermal energy. Some of the countries belonging to the European Union, for many years, the sector of renewable energy sources are treated as a priority. Undoubtedly, this fact is associated with an increase in environmental pollution, as well as with a number of directives aimed at the protection imposed by the EU on Member States.

Unfortunately, the degree of geothermal energy use in Poland, compared to other non-conventional sources of energy, is still relatively low. Evidence of this situation can be observed in report of the Renewable Energy Sources (RES) usage in Poland for the year 2011, which was conducted by the Central Statistics Office. The report shows that the share of geothermal energy in the total energy generation from renewable sources constitutes reach only 0.16%. Which in comparison with biomass is a marginal part of all considered renewable sector. Shares of particular renewable energy sources is presented on scheme in Fig 1. Therefore, social education in this field is so important, as well as the promotion of geothermal energy, which could be use in greater extent than is done today.

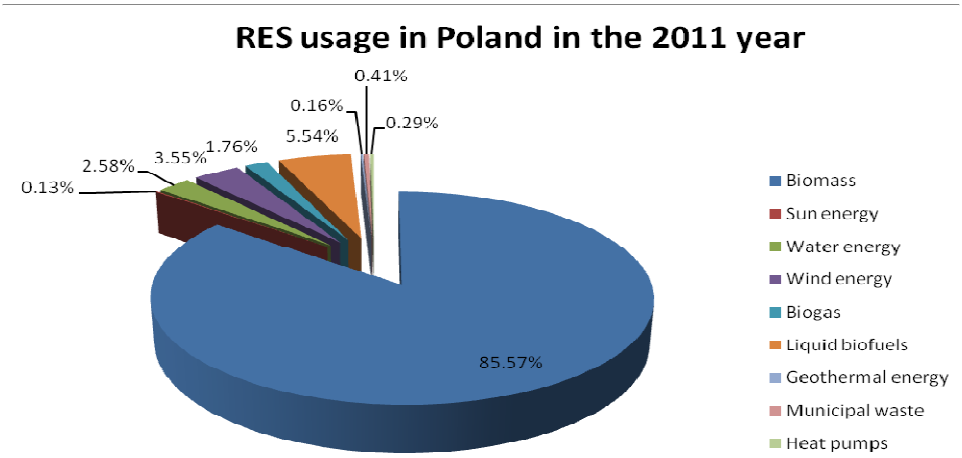

Figure 1: RES usage in Poland for the 2011 year (CSO 2011).

The complex and reliable information about the geothermal resources, as well as the potential for the utilization of groundwater in Poland can be found mainly in scientific publications, reports or published in expert's magazines. Sometimes the geothermal information are incomplete, fragmented or difficult to access. For all those, who are not implemented in this field of knowledge, searching and collecting the most important information relevant to them, often causes a lot of problems and takes a lot of their time. There are few reliable sources of information about geothermal heating plants for non-specialists in this field. Usually more reliable information is given about spa resorts where geothermal water is used for treatment. In Poland, the information are mostly connected with the national health-care system.

The process of obtaining information from a variety of commonly available tool like the Internet, which today is the most common instrument for searching data, is also problematic. Furthermore, it should be pointed that many of data and information published on the Internet very often are unreliable - in spite of the many advantages of using the internet, also this tool can be unreliable.

Taking into account the increase interest in the sector of renewable energy sources including geothermal energy, the access to the comprehensive and complex data about the renewable energy sector should be simple and fast, both for people who are interested in this subject for years and also for all those for who this topic is something new, or for potential investors.

2. THE MAIN SOURCE OF INFORMATION ABOUT GEOTHERMAL POWER

Until now, there is a number of publication where the most important information in the field of geothermal energy in Poland can be found. An excellent example are the geothermal Atlas published from the 90's by a Professor Gorecki team from University of Science and Technology from Krakow, in collaboration with a number of experts representing different fields of science, such as earth sciences, geophysics, computer science, economics and many other. Atlases are the most current compendium of knowledge about geothermal power and designate most prospective area for geothermal energy utilization in Polish territory.

The information focused on geothermal energy also can be found on the websites of organizations such as the International Geothermal Association (IGA), which created several years ago interactive map of Europe, in which the general information of the degree of geothermal energy utilization in various European countries, including Polish, are published. Another examples are interactive maps of spas or groundwater types in Poland available on the official website of the Polish Geological Institute. On these sites the information about the groundwater temperature, type, or location in various Polish regions, can be found. Data on the chemical composition, and size of mineralization, as well as the properties of water in the specific spas and their therapeutic application is also available on the official website of the particular centres. Also the data about specific geothermal plants can be found on their representatives website. However, the information sometimes can be rudimentary, averaged, and in the various sources the units of particular parameters are often different - making it difficult for the readers to compare the potential of water from different places of our country. More detailed information are not available in general. Another difficulty is aspect connected with updating all the information about geothermal conditions in Poland, because not all of the information are updating each year.

3. COMPLETED PROJECTS RELATED TO GEOTHERMAL ENERGY

Until now in the world, there are a number of projects aimed at disseminating information about the conditions of geothermal energy. Excellent example can be projects created by such entities as the Department of Geology and Mineral Industries in Oregon, which constructed an interactive map which

by using a simple search engine, enable users for quick and easy searching the location of the geothermal wells, or geothermal sources in Oregon. Similar maps have also been created for the area of Ontario (created by the Ontario Geothermal Association) or Nevada (created by the University of Nevada).

Following the example of projects completed so far, in cooperation with the Polish Association and the University of Science and Technology, a project aimed at creating an interactive tool focused on territory of Poland was created. The main aim of this project was to create free of charge and public interactive tool which will promote geothermal energy in Poland and which will contain selected geothermal data. Considering many forms of using the geothermal energy depending on its temperature, the opportunity to compare the location of the most promising areas for potential investors, becomes an important task.

4. THE STRUCTURE OF THE PORTAL: GEOTHERMAL-INFORMATION-POINT

The project presented below was created to join three geothermal water applications: heating, recreation and treatment in a wider area. GeoInfoPoint is an interactive tool, which friendly software will make research quick and easy. Available options are presented by five thematic modules (Fig. 2) named similarly the information which they contain:

1. **Geothermal plants** - module show locations of all operating geothermal plants located in Poland. The model also includes the basic parameters of geothermal plants such as name, year of establishment, wells used for the operation in the system, power produced by the plant, etc.

An examples of application window of module "Geothermal Plant" is shown in Fig. 3.

2. **New projects** - the location of new projects (all projects related to geothermal energy, both for heating, recreation and balneoterapeutic purposes will be consider). It applies, either projects in progress and projects planned in the future.

3. **Health resort** - spa all centers which use underground thermal water for treatment

4. **Recreational centres** - the location of recreational facilities including balneoterapeutic use of thermal waters

5. **Cooperation** - module mainly directed to representatives of geothermal plants, spas, recreational centres or balneoterapeutic resorts as well as people who are in the process or are planning investments in Polish geothermal and wanted to put the information and update the website or already contained in the information.

This interactive tool show the most essential geothermal information. On the map, the exact position of the geothermal institutions, is marked, the users are able to obtain more precise information by clicking or touching the screen. Each geothermal heating plant are profiled by geothermal water temperature, depth of the aquifer, water TDS and flow rate, capacity and heat energy use. An example of information about selected power plant in Poland is showed below in Table 1. The information about geothermal swimming pools and aqua parks will include the temperature of geothermal water, TDS, the composition and type of water used in swimming pools and their infrastructure. If the water is used for treatment, the indications and contraindications for bathing in the water will be also highlighted.

Figure 2: The five thematic modules available on website.

Figure 3: Map available in the "Geothermal Plant" module.

Thanks to the possibility of choosing the specific module, each user will be able to easily find interesting information by selecting one of the above options. Those interested in recreational facilities without hardships find the most important information about leisure centres that use geothermal water such as water temperature or their type. However, those looking for spas or balneotherapeutic resorts find detailed information not only about temperature, mineralization, and water chemical type, but also about their main applications in medicine, so that they can independently choose which of the centres is favourable for them, and which of them they should avoided.

Major aspect is also the credibility and updating the data published in the portal. Currently, the information published in the portal is based on data provided in the aforementioned Geothermal Atlases - which constitute the most current information about geothermal energy in Poland. In the future, direct cooperation with the centres which use geothermal water for heating, recreational or medicinal purposes is planned. Also the update of all the data published in the portal will be carried out each year. All published information will come directly from the representatives of selected centres, so their claim will not be questionable. Another convenience is the fact that the published data for various centres will be served in the same unit - making it easier for users to compare the selected centres between them.

5. FUTURE PLANS

In the future develop of the portal for the next European States is planned. Due to further expansion of the portal the possibility to obtain information on the use of geothermal energy not only in Poland but also in other countries will be available. Furthermore a simple search engine will be also created. Thanks to that the information point will enable searching and classifying the information by given criteria, such as the type of geothermal water, the level of TDS (mineralization) and the temperature of the water, the specific area of the country, the infrastructure of the swimming pools or aqua parks, etc. It will allow to compare some water applications in different locations. Search process of finding specific information will make it easier. It will also provide a basis for estimating the utilization and the rate of development of both the heating sector and the recreational or medicinal sector in selected countries of Central Europe.

Table 1: Example of information published on the website (based on Gorecki 2011).

Name of the installation	Pyrzyce
Type of use	**Heating**
Maximum capacity of geothermal water	**340.0 [m^3/h]**
Capacity installed (estimated) Total/from geothermal power	**48.00/ 14.80 [MW_t]**
Heat Use (Sale) Total/ geothermal power	**100.0/ 60.0 [TJ/year]**
Type of water	**Cl^-,Br^-,I^- Fe^{2+},Mn^{2+},HBO_2**
PH value	**8,12**
Water aquifer	**Sandstone (Lower Jurassic - Lias)**
Depth of the aquifer	**1489-1636 [m bsl]**
Maximum flow rate	**340 [m^3/h]**
Water temperature (min/max)	**61/63 [^oC]**
TDS (water mineralization)	**120 [g/dm^3]**
Number of boreholes	**2**
Installed capacity of heat exchangers	**14.8 [MW_t]**
Installed capacity absorption heat pumps	**20.4 [MW_t]**

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