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Geoenergy in Poland

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ABSTRACT

This paper presents the current state of geothermal energy production in Poland and its future development prospects. At present, there are four geothermal heating plants in Poland. In addition, warm water is used in seven spa towns in balneology as well as in seven thermal swimming pools for recreational purposes. There has recently been an increase in the number of installed heat pumps in Poland – reaching 10,000 in 2010. In the near future the development of geothermics in Poland is forecast to continue. The first power and heat geothermal plant is being built in Uniejów whilst in more than ten other towns special swimming pool complexes using geothermal warm water are being built or designed. In the coming years heat pumps will be installed in living and office buildings as well as in public use buildings (mostly in newly built ones). Moreover, in Poland it is planned to use heat pumps in order to recover waste heat from factories and power plants.

Contents

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1. Introduction

According to Directive 2001/77/EC [1] and Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 [2], Poland is obliged to increase its use of energy from renewable sources. The target for renewable energy production in Poland is set to rise from S_{2005} = 7.2% in 2005 to S_{2020} = 15% in 2020.

Since 2000 a gradual increase in the amount of renewable energy has been observed (Fig. 1) [3,4]. In 2009, 253,153 TJ was obtained from renewable energy sources, which is 9.0% of primary energy in total [4].

The highest contribution to renewable energy production in 2009 was from solid biomass energy, which was 85.7% of the total renewable energy production. The next highest contribution to renewable energy production were:

- liquid biofuels – 7.1%,
- hydropower – 3.4%,
- biogas – 1.6%,
- wind – 1.5%,
- heat pumps – 0.4%,
- geothermal energy – 0.3% [4].

In Poland in 2010 about 10,000 heat pumps were installed and the amount of heat produced using these installations exceeded 1 PJ/year [5]. The data presented in Fig. 2 illustrate a constant increase in energy obtained from the Earth's interior, especially in energy obtained using heat pumps [3–5].

This paper presents the results of sociometric research describing the current state of the renewable energy sector in Poland and its future development prospects in relation to geothermal energy. For the purpose of the research, the following surveys were carried out: "Heat Pumps in Poland – Producers" [6], "Heat Pumps in Poland – Customers" [7], the data obtained directly from geoenergy producers were also used.

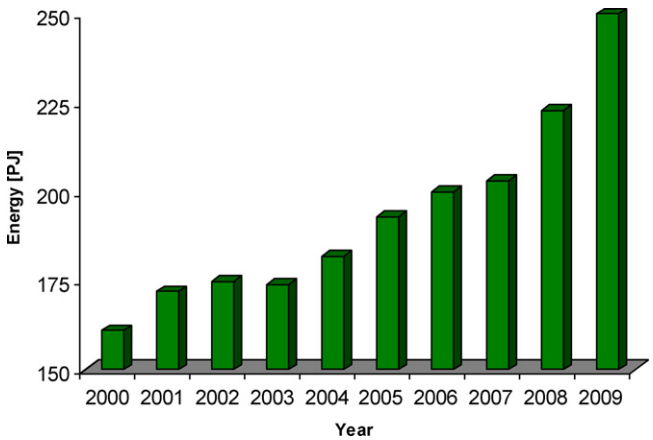

Fig. 1. Renewable energy production in Poland in 2000–2009 (own data based on Refs. [3,4]).

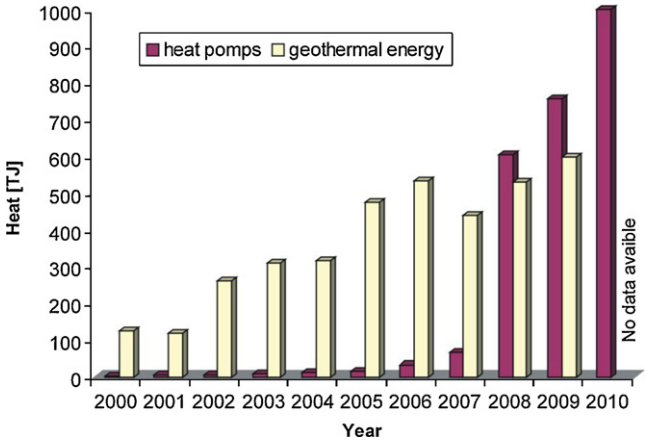

Fig. 2. Heat production using heat pumps and geothermal energy in Poland in years 2000–2009 (own data based on Refs. [3–5]).

This research is a continuation of an earlier work conducted in 2008, when surveys were sent out to renewable energy producers in Kujawsko-Pomorskie Voivodeship [8] and the work conducted in 2009, when the surveys were sent out to bioenergy producers in Poland [9].

2. Geothermal resources in Poland

In Poland, geothermal waters occurring in reservoirs located up to a depth of 3000 m, generally have a temperature not exceeding 100 °C [10–14]. The geothermal gradient is highly differentiated in Poland, depending on geological composition and, in particular, on halokinetic structures, which are characterised by high heat conductivity. Within the depth range of 200–2500 m, it varies from 20 to 110 m/1 °C. In the north-east part of the country the value of the thermal gradient increases to about 100 m/1 °C, which is related to a crystalline base occurring relatively shallow. The lowest values, of 20 m/1 °C, are present in the Sudety (Cieplice Śląskie-Zdrój, Lądek-Zdrój) [12–16].

About 2/3 of Poland's area is thought to show good prospects in terms of exploiting geothermal potential using current technological capabilities (Fig. 3) [12–16].

3. The geothermal heat plants in Poland

In the middle of the 1980s research and development work was commenced to use geothermal energy in the heating sector: space heating and, on a semi-industrial scale, in agriculture and fish breeding. As a result, geothermal heat plants were opened in Bańska Niżna, Pyrzyce, Uniejów, Mszczonów (Fig. 4) and Stargard Szczeciński. Currently (May 2011), the plant in Stargard Szczeciński is not working due to economic problems [17].

3.1. Bańska Niżna

A warm source in the vicinity of Zakopane was already known in the 19th century, with water of temperature 20 °C being used in