Advantages of Renewable Energy Sources?

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Research on RES

In the year 2011, University of Economics in Bratislava, Faculty of Business Management started a research project VEGA, supported by the Slovak Ministry of Education on

Perspectives of SMEs participation in diversification of the energetic infrastructure

Research project No 1/07/87/11, VEGA 319

Legislative background

Directive of the European Parliament and Council 2009/28/EC dated 23rd April, 2009 about support of utilization of Renewable Energy Sources (RES) is a strategic document, which aims at the period till the year 2020. It creates a basis for ongoing sustainable development of utilization of RES even further on. The EU member states had become obliged to develop their own legal acts complying the above mentioned regulation and consequent directives.

Road Map

The Road map for meeting European directive 2009/28/EC contains following agenda:

- Europe 2020 Strategy
- Integration of RES into internal market
- Reduction of cost of technologies to be competitive
- Support of cooperation and trade
- Current state and perspectives towards 2020+

Renewable Energy Sources

- **Water** (<1MW; 1-10MW; >10MW)
- **Biomass** (Wood; Agricultural; Biogas; Biofuels)
- **Solar**
- **Wind**
- **Geothermal**

Water energy

Slovenské elektrárne a.s. – list of 10 hydropower stations >10MW with the highest installed capacity

(Source: Licences of the Regulatory Office for Network Industries for the year 2010)

Name of the hydro power station	Installed capacity [MW]	Production per year [GWh]
VE Cierny Váh	735,16	79,00
VE Gabcíkovo	720,00	1 938,00
VE Liptovská Mara	198,00	81,00
VE Mikšová	93,60	166,40
VE Nosice	67,50	147,30
VE Ružín 1	60,00	57,40
VE Považ. Bystrica	55,20	98,20

Water energy

Water power stations <10MW

A large enterprise Slovenský vodohospodársky podnik, š.p. is exclusively operating 33 Small WPSs. Their total installed capacity is 8.2 MW and production per year 28 GWh of electric energy.

Office for regulation of network industries issued next licences for many organizations public and private onces.

Case: VODOHOSPODÁRSKA VÝSTAVBA, š.p.

VE – Water works Žilina (72MW; 173GWh/year)

Biomass

- Wood – very perspective because of extensive forest area at Slovakia (wooden pellets, waste..)
- Agricultural – not so developed till now
- Biogas – not so developed
- Biofuel – partially developed, but oil containing plants are on the place where should be plants for food, which is many times imported in a deteriorate quality

Solar energy

Solar energy is a pure energy coming from the sun, which is unlimited source.

In 2009, just after national legal acts following the Dir. 2009/28/EC we could see a boom of construction of photovoltaic panels. Many SMEs and also large companies took use of the chance to make money.

Situation: Producers sold electric energy on solid price and made their profit. Distributing companies have been obliged to buy. Instability of electricity systems has created losses which are finally paid by all of us.

Wind energy

World-wide

Calculation of the tower hight…Example of 100-MW onshore wind farm:

25 towers @ 4 MW
25 towers @ $500k/tower = $12.5 million in structure + foundation
10 miles roads @ $1.5 million/mile = $15 million
Total infrastructure cost = $27.5 million or $275,000/MW
100 towers @ 1 MW
100 towers @ $350k/tower = $35 million in structure + foundation
50 miles of roads @ $1.5 million/mile = $75 million of road
Total infrastructure cost = $110 million = $1,100,000/MW

Wind energy (cont. world-wide)

- By increasing the tower size and turbine capacity, we can reduce the infrastructure cost tremendously. There are numerous additional advantages to having fewer towers per project:
- Less environmental impact overall; fewer roads, which means a smaller area of the site is impacted with construction traffic
- Less earthwork and grading impact
- Taller towers with larger turbines results in low frequency rotation of the rotor (<15 rpm), which means less bird impact issues (birds can detect the lower rotation blades and divert their flight path)
- Fewer turbines means overall lower maintenance cost because there are less machines to monitor; it's easier to monitor 25 towers versus 100.

Wind energy

Slovakia

The potential of wind energy =

cca 600GWh/year (comparing with water and biomass very low. Only 4 localities:

Kysuce, Orava, Spiš, Malé Karpaty)

Wind energy – pros and cons

For electricity generation min. 5m/sec., optimally 12m/sec.

Advantages:

- No emissions
- Decentralization and demonopolization of energy production
- Wide range of scale from several 100W for home utilization up to several MW - electric energy production for transmission network
- At low capacity easy assembly and operations

Disadvantages:

- Irregularity and low speed of wind flowing
- Instability in terms of transmission network regulation
- Low return of investment
- Ecological and landscape problems

Geothermal energy world-wide

Tab. Installed capacity of electric and thermal energy production world-wide in 2000 and 2010

	Electric enery production		Heat energy production	
	2000/2010		2000/2010	
	MW(e)	%	MW(t)	%
Africa	54/174	0,7/1,6	121/130	0,7/0,3
America	3390/4561	42,5/42,6	5954/14293	34,7/28,3
Asia	3095/3661	38,8/34,2	5151/11555	30,0/22,8
Europe	998/1635	12,5/15,2	5630/24178	32,8/47,8
Oceania	437/685	5,5/6,4	318/427	1,8/0,8
Total	**7974/10716**	**100/100**	**17174/50583**	**100/100**

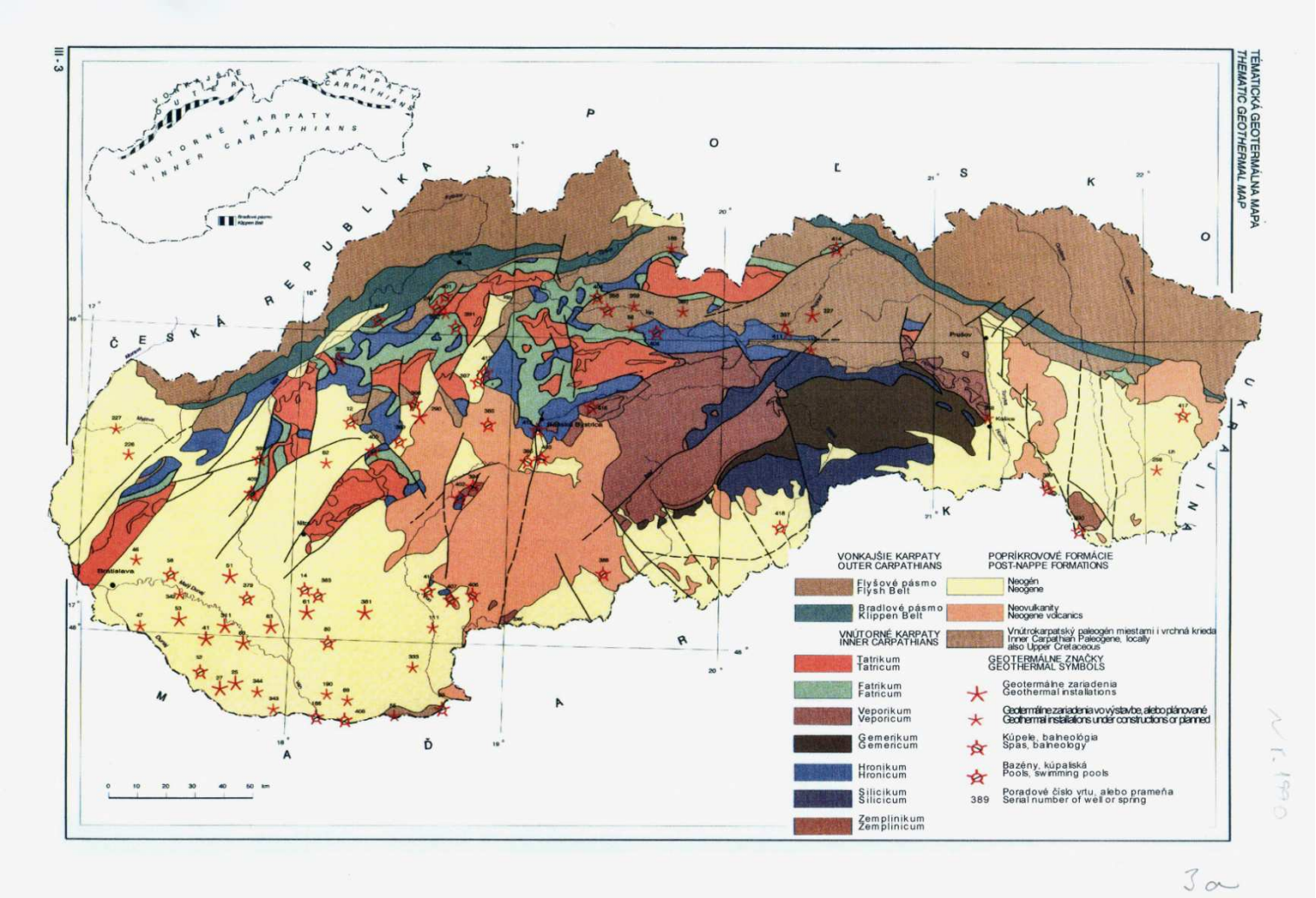
Sources: Huttrer, 2000; Bertani, 2010; Lund, Freeston, 2000; Lund et al., 2010

Geothermal energy – Slovakia

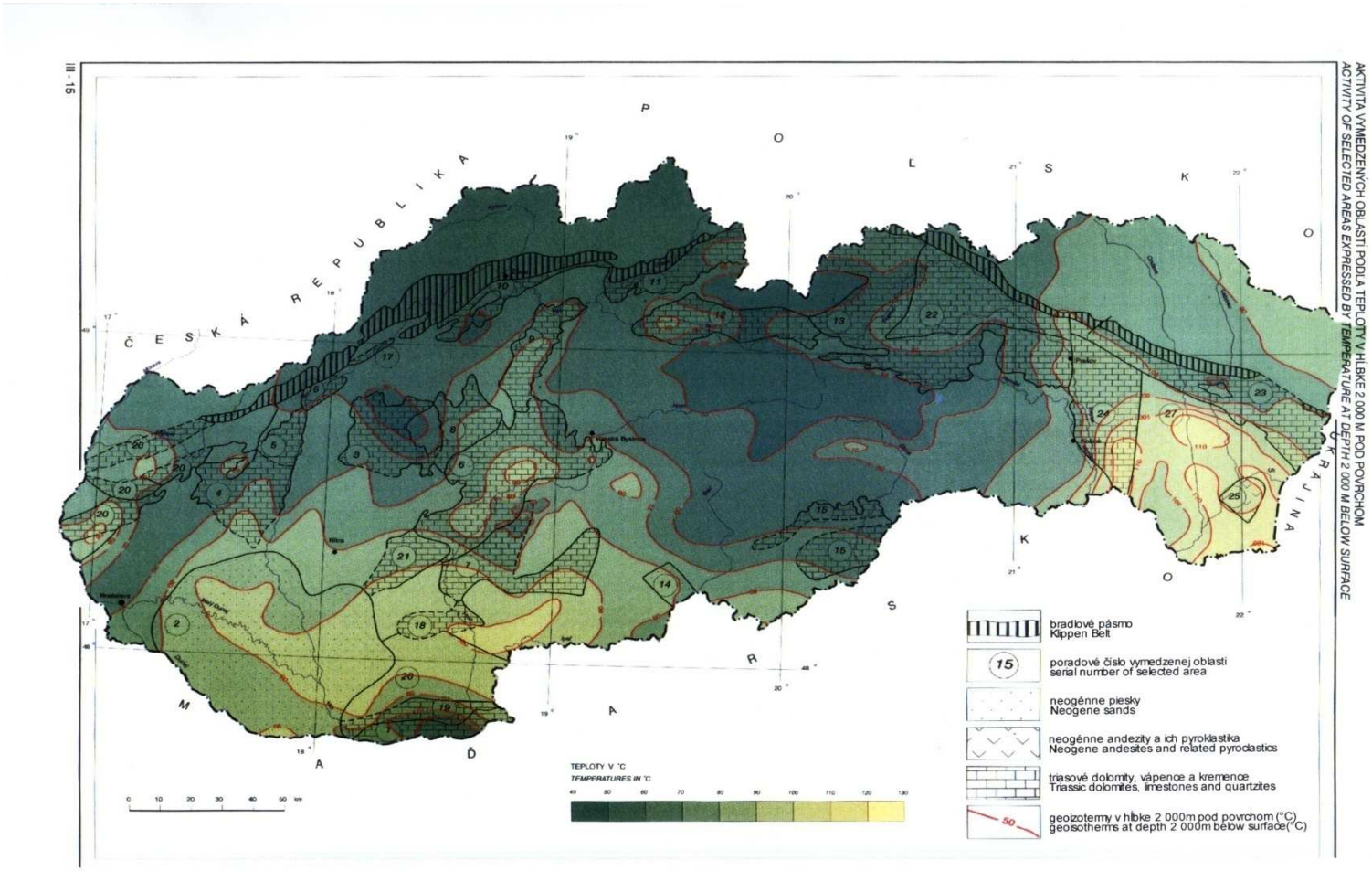
Slovakia, thanks to natural conditions, has a significant potential of geothermal energy. According to uptodate surveys the heat capacity is 5538 MW_t . The geothermal sources are represented above all by geothermal waters in depth of 200-5000m.

Today, the geothermal energy in Slovakia is utilized in 38 localities with the usable heat capacity of 143 MW_t . In one case (Košice) it is possible to use it also for electric energy production (temperature of 130^{0}C) .

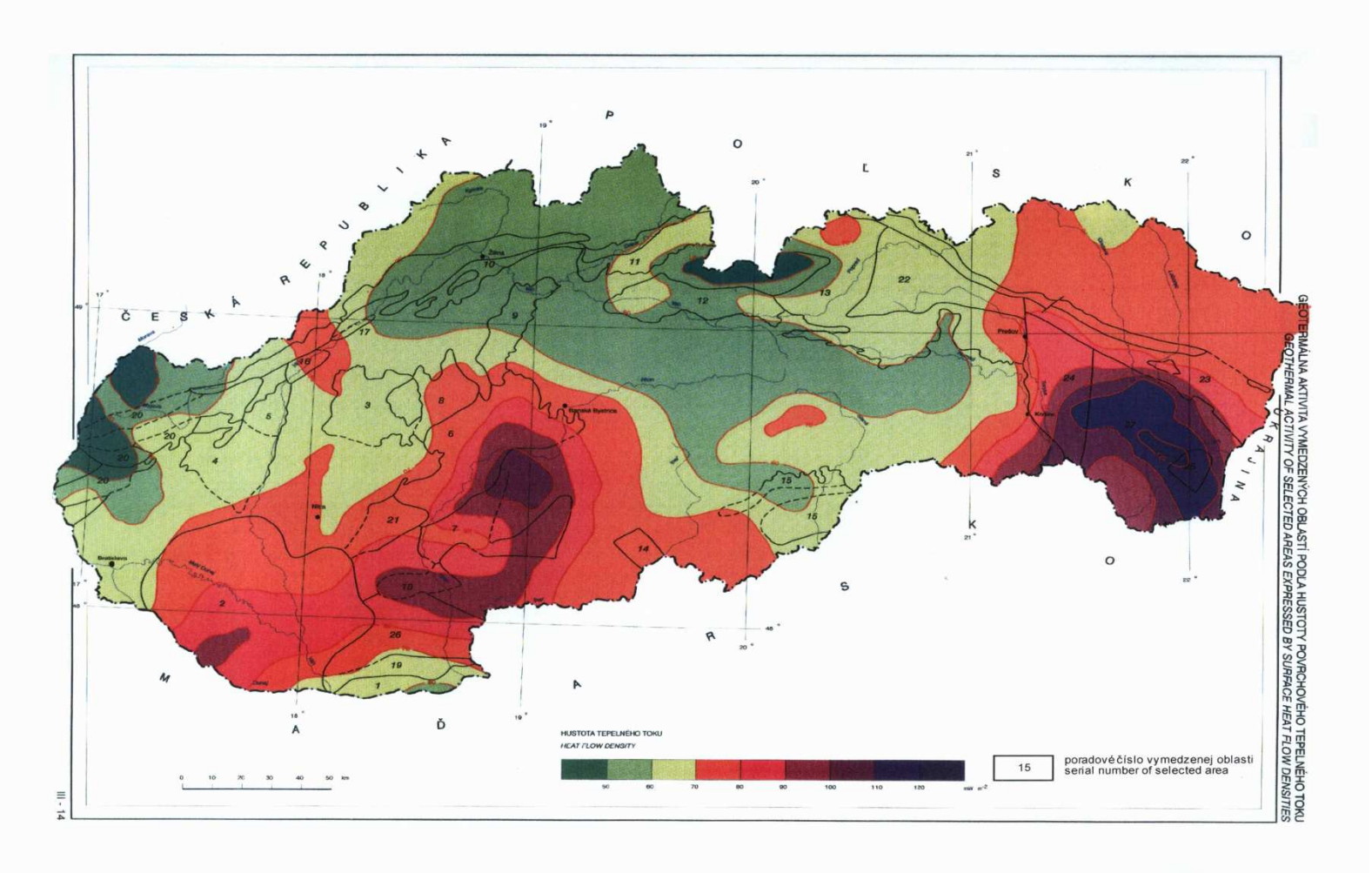
Geothermal energy – Slovakia



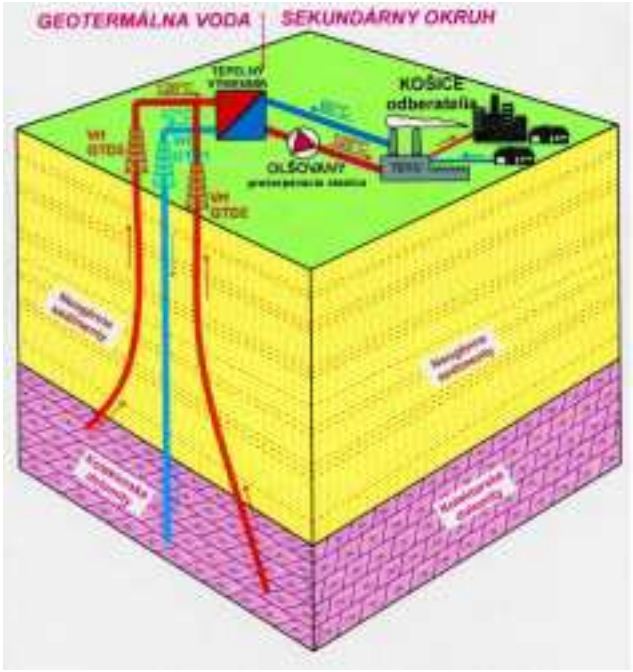
Geothermal energy – Slovakia



Geothermal energy – Slovakia



Geothermal energy – Slovakia, Košice



Geothermal energy, locality Košice

Today, Košice city with 260000 residents is to be supplied with heat through the network from thermal power plant with the capacity production and distribution of 4400 TJ. It is assumed that the geothermal energy will cover 2100 TJ, which is 48% of the total production.

Benefits:

- Reduction of emissions
- Ecological source – after removing thermal energy from the overheated steam it is re-injected back to the earth (i.e. no waste). It is perspective of the lower price of heat for people in the city and to employ people.

Recommendations (answer to the headline question)

YES, but it is necessary to pay attention to:

- Dissemination of verified information with stress on ethics
- Education on Green energy
- Investment to living environment and survival of our children
- Development of meaningful research on RES

Thank you for your attention