The importance of energy sources based on RES in the context of the current economic and social life in the light of the tourism sector in Slovakia

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Abstract
The paper discusses the consequences of the high living standards of people, heavy energy consumers. Geopolitical space along with geo-strategic axes indicate the future development of the world and paint a picture of countries that fundamentally affect the direction of the company. Slovakia belongs also to this area, not just in terms of the position of the country, but Slovakia also has become interconnected and thus more dependent on ambient geopolitical and geo-economic space. In order to reduce our dependence on raw material from other countries, it is necessary to address the deficit of primary energy sources through alternative sources, either through renewable energy or through specific energy carrier - hydrogen. Those figures show what may be potential contribution to the implementation of RES in the mix with the context of economic recovery showing tourism potential.

Keywords: renewable energy, hydrogen, globalization, tourism, RES

INTRODUCTION

Currently here on Earth lives 7 billion inhabitants. The enormous growth in population is due to rising living standards. The level of our consumption accelerates, it‘s driven and supported by the growth of living standards in specific countries and culture of consumerism, which largely shapes consumer behavior (Beck, 2004). According to current projections, global energy consumption over the past twenty years has increased by more than 50% and will double by the year 2050 (World Population Prospects, 2009). If the earth will run out of her resources, the current form of human civilization may collapse. If humanity want to survive, then it should create the environment (natural and social) that met the criteria of energy sufficiency, and in which humanity fully benefit of current educated society, which is the period of expansion of services such as using tourism in form of a sustainable tourism development, which would contribute to ensuring the protection and enhancement of cultural and natural heritage. The potential of tourism can be a key element and therefore the aim of the european policy should be its full advantage.

SLOVAKIA'S ENERGY FUTURE

In view of the expected direction of geopolitical actors and their energy policies, the European Commission called on Member States to make a commitment to build a low-carbon economy by 2050. The European Commission's analysis shows that by 2050, nuclear power may offer partial

substitution of fossil fuels for transport and heating andcontribute to almost complete elimination of CO_2 (reducing greenhouse gas emissions by 80-95% by 2050 compared to 1990). In the meaning of efficiency in achieving these goals, it's the least costly scenario with a substantial portion of nuclear energy. Ensuring the construction of new nuclear power plant in Bohunice site (Janočková et al., 2012) is one of the priorities of the security strategie of electricity supply in the period 2013-2030, as defined in the Energy Security Safety SR. In the long term it's about defining key parameters in the energy mix of SR. The share of resources making the energy mix SR, involved in the production and consumption of electricity is shown in the following chart (Chart 1).

In Slovakia in 2012, a total volume of 28 786GWh of electricity was produced with an index of 100.64% over 2011. Increased annual production compared to 2011 was due to water (108.1%) and especially photovoltaic systems (180.5%). After the drought of 2011, production of hydroelectric power in 2012 again exceeded 4,000 GWh and reached the level of production from 2004 to 2009. Historically, the largest volume of electricity production from water was achieved in 2010, with the value 5493 GWh. In 2012, hydroelectric power plants contributed to overall electricity production of Slovakia with share of 15.3%. Photovoltaic power after rapid gain in connecting toelectric system of Slovakia in the first half of 2011 reached in the 2012 production volume of 561 GWh (an increase of 251 GWh compared to 2011). The share of manufacturing photovoltaic power plants reached March-September 2012 level of 2-3% of total production in Slovakia. Significantly lower production was observed in the case of conventional thermal power plants (index 90.9%) burning fossil fuels (brown and black coal, petroleum products and natural gas). Production of nuclear power plants was the same as in 2011 (index 100.3%). Nuclear power plants were same in 2012, as in previous years, with the largest share of total electricity generation in Slovakia (54.6%).

Total gross electricity consumption in

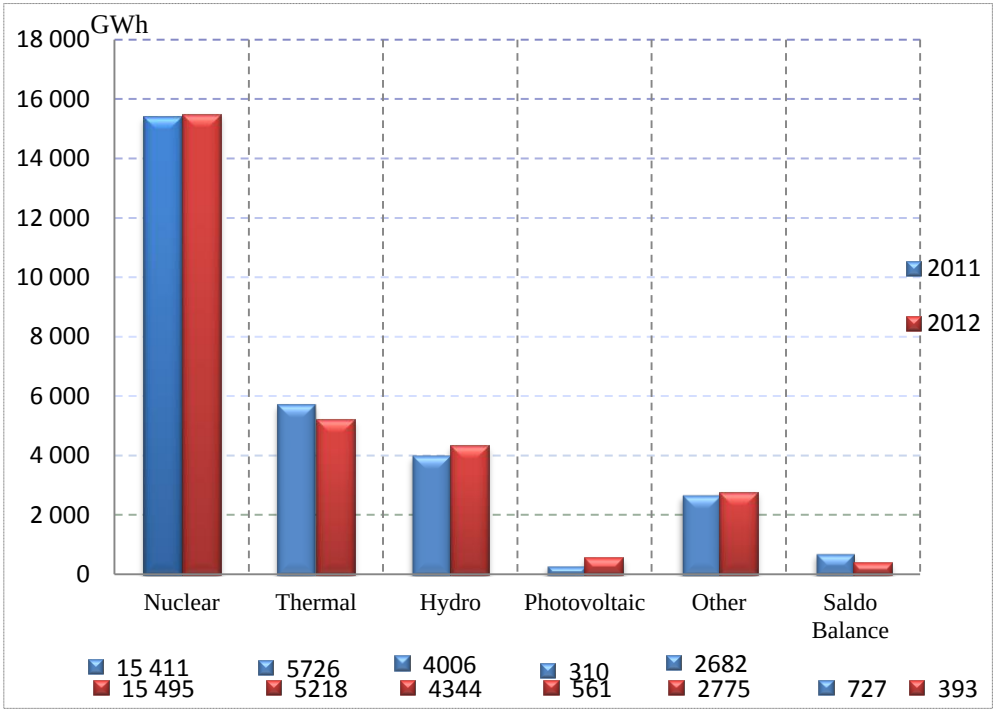

Chart 1 Share of sources in electricity production in Slovakia between 2011 and 2012

Slovakia in 2012 reached 28,786 GWh (Table 1) and compared to 2011 recorded only a slight decrease (index 99.46%). The electricity consumption for pumping at pumped storage water power plants reached 345 GWh. Electricity consumption compared to 2011 had an upward trend only in the third quarter of 2012, in recent months the monthly consumption is lower or the same level as in 2011. Electricity system of Slovakia in terms of providing consumptioncoverage was six years in a row as an importing system. The import shares in consumption in 2012 was 1.37%, the lowest value since 2007.

Table 1 Consumption of electricity in Slovakia between 2011 and 2012

Year (GWh)	2011	2012
Production	28 135	28 393
Balance (+Imp)	727	393
Consumption	28 862	28 786

For the production and consumption of electricity, primary sources of energy was used in such an amount as shown in the diagram (Fig. 1), which shows time since 1993 up to the next consumption indication until year 2030.
Volumes of production of electricity from renewable energy and heat production from renewable energy sources are in the following figure (Fig. 2).

TOURISM AS A TOOL OF ECONOMIC POLICY IN EUROPE AND IN SLOVAKIA

Unprecedented population growth, which began in 1950, creates unsustainable pressure on existing ecosystems (WWF, 2006). In addition, there are other significant ongoing economic, sociological and demographic changes. The end of 20th century was marked by tremendous development of new information and communication technologies. Ability to

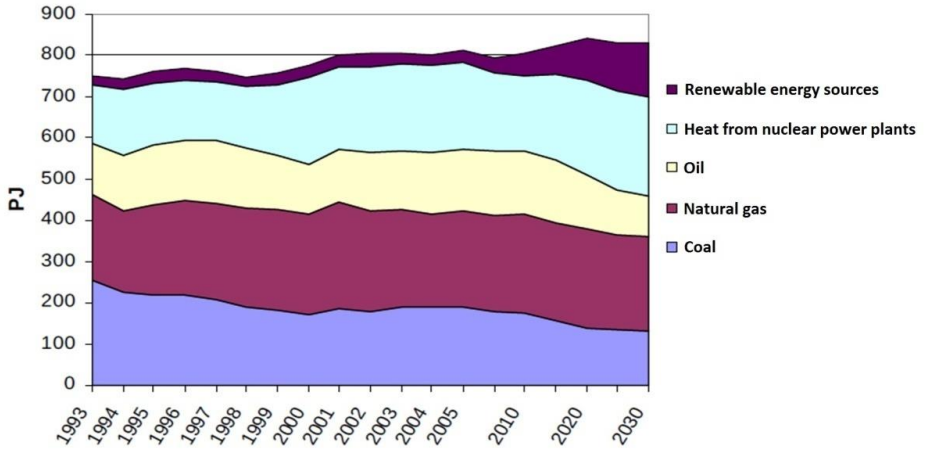

Fig. 1 Development of consumption of primary energy sources. Source: Ministry of Economy

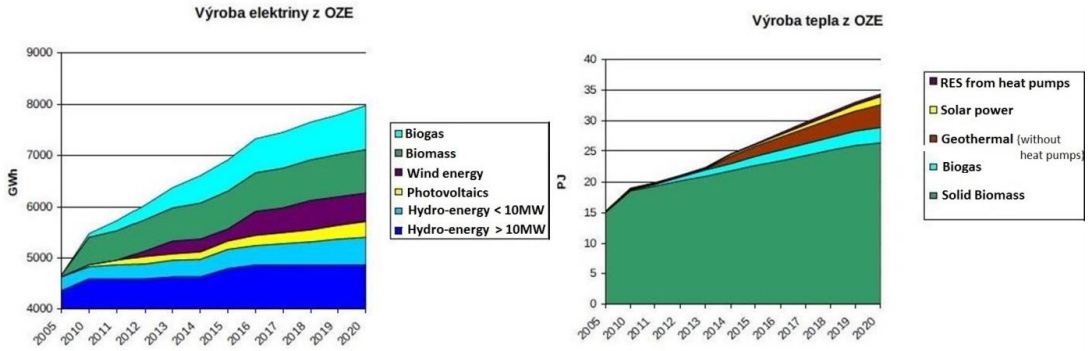

Fig. 2 Projections of electricity and heat from renewable sources by NAP. Source: Ministry of Economy

deformate information into knowledge has become essential for the educated society, increasing the importance and need for services. The strength of Europe is in her culture, arts and liberal education. Here is potential to build on the strong historical roots, which can bring significant competitive advantage and in the future predestine it to be the world leader in this field. Tourism can be helpful for this strategy, specifically in the form of sustainable tourism development, which would contribute to ensuring the protection and enhancement of cultural and natural heritage. The potential of tourism can be a key element, therefore the aim of the policy should be its full advantage. (Rybár & Horodníková, 2011a; Rybár & Horodníková, 2011b; Rybár & Hvizdák, 2010; Rybár et al., 2010).

Tourism is one of the fastest growing sectors, which is involved not only in the production economy (Table 2), but also contributes to the positive image of Slovakia. Tourism is very variable economic sector. Therefore, it is necessary to see the importance of knowledge needs, desires and demand of tourists, visitors, or residents.

The cause of fluctuation in tourism demand may already be mentioned geopolitical and political situation, exchange rate, trendiness, weather, as well as culture of consumerism. Clients are becoming more confident, more experienced, require high quality at relatively low cost. They care more about their health and good physical condition. Young people also love the exotic, prefer unique experience before comfort. The growth of senior clientele is obvious and has specific needs and desires, it all produces instability of demand. Instability of demand depends on the purchasing power. Fundamental shift in purchasing power can be monitored in two ways: purchasing power is transferred from the richest countries to middle income countries. This process comes along with the transition of most populous states to middle income categories. This transfer is quite intense in these countries (Brazil, Russia, India, China, (WWF, 2006) but also other countries such as Bangladesh, Egypt, Indonesia, Iran, Mexico, Nigeria, Pakistan, Philippines, South Korea, Turkey and Vietnam) have become essential indicators, determining the next trends in consumption, but also the need to travel. The second shift in purchasing power is transfer to the individuals belonging to the middle income category, a phenomenon known as the explosion of the global middle class. Already a decade strengthening trend, shall

Table 2 Real GDP per capita (in €) for the reporting period 1995-2012

Country	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Slovakia	4800	5600	7100	7700	8500	9000	8600	8900	9200	9400
geo: eu28	18200	20800	22400	23100	23700	23700	22600	22900	23300	23100
EÚ (27 countries)	18300	20900	22500	23200	23800	23800	22700	23100	23400	23300

Table 3 Number of trips (visits) nights and overall spending on tourism in Slovakia from 2005 to 2012.

Number of trips (visits), overnights and total expenditure on tourism								
	2005	2006	2007	2008	2009	2010	2011	2012
	LONG AND SHORT TRAVELS							
Number of trips	3 848 099	3 934 480	4 086 140	3 895 448	3 425 775	3 592 967	4 129 847	3 215 340
Number of nights	20 045 125	20 595 879	21 106 753	20 543 129	18 170 987	14 788 969	16 771 835	15 615 916
Average length of stay	5,2	5,2	5,2	5,3	5,3	4,1	4,1	4,9
Total expenditure (in thous. €)	525 568	540 819	604 721	640 739	621 839	507 521	594 044	696 550
Average expend. per trip (in€)	137	137	148	164	182	141	144	217

continue in intensity and its peak could be achieved in the next decade. The proportion of people in the global middle class should grow by 2030 from the current 29 to 50%. To see how this trend reflected in the total expenditure of tourists in Slovakia in the period 2005-2012, we show it in the following table (Table 3). (Štatistický úrad SR, 2012)

The standard of living based on the fossil economy in usual conditions is not sustainable and therefore the countries in the near future will have to focus their activities on other energy sources, another system of economy, geopolitical space (eg, aerospace, marine, sites with high biomass yield, etc.). Other management system and energy sources (e. g. solar, hydro, photovoltaic, renewable etc.) will then be the basis for other activities and focus of geopolitical actors in 21 century. It invokes changes in the interestshierarchystructure and political systems, economic systems, national and global geopolitical system.

We can look for the solution at countries that understand the importance of moral sustainability of the country and began to use alternative sources for themselves. Spain is one of the EU countries, where 11% share of RES (Rybár, 2013; Rybár et al., 2007) is for primary energy sources, while the electricity production is coveredwith 32.6% by renewable, as shown on (Fig. 3) and where it reaches the high level of tourism (Fig. 4).

Hydrogen has a certain specific position among alternative fuels. We cannot say that alternative fuel - hydrogen is renewable source or not, without defining the process of its production. If we look at ways of manufacturing hydrogen, it is clear that the primary production is not in any way connected with renewable energy sources (Fig. 5).

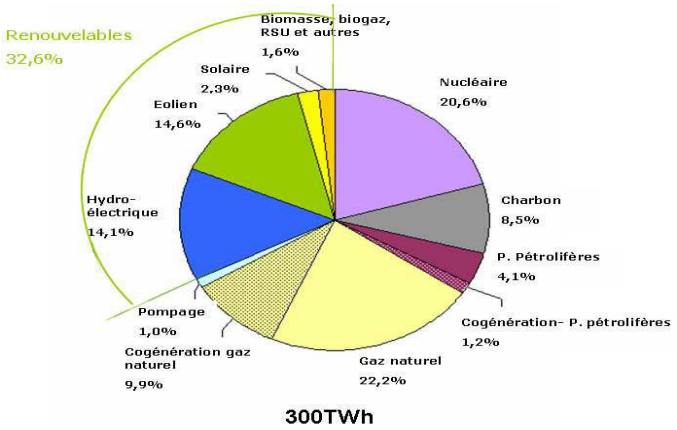

Fig. 3 Structure of the electricity in Spain in 2009.

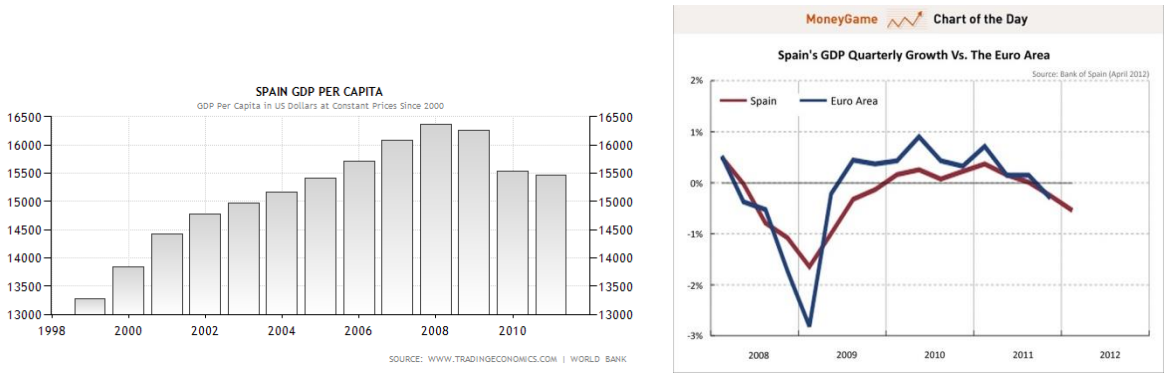

Fig. 4 GDP per capita of Spain in the years 1998 to 2011, Spain's GDP comparison with the euro area GDP

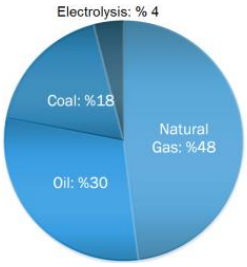

Fig. 5 The percentage amount of resources consumed to produce energy

Basic methods to produce the molecular hydrogen on an industrial scale are as follows:

1. Thermal decomposition of methane at very high temperature (1200 °C) $CH_4 \rightarrow C + 2H_2$
2. Water-gas reaction with water vapor in the presence of catalysts at a temperature of 300 °C we can obtain a very pure hydrogen, which is used for hardening: $CO + H_2 + H_2O\ (g) \rightarrow CO_2 + 2H_2$
3. Reaction of water vapor with the hot coke at a temperature of 1 000 °C (from a water gas): $C(s) + H_2O(g) \rightarrow CO(g) + H_2(g)$
4. Formation of hydrogen as a by-product in the production of sodium hydroxide (NaOH) - electrolysis of an aqueous solution of NaCl: $NaHgx\ 2 + 2H_2O \rightarrow 2\ NaOH + H_2 + 2x\ Hg$.
5. DC electrolysis of water.
1. By using electricity generated from renewable energy sources, we can talk about fuel - hydrogen as an alternative energy source. (Rybár et al., 2008; Rybár et al., 2012)

Another important aspect of the eventual use of hydrogen as an alternative fuel for transport and energy as well as local decentralized energy sources with close links to the development of the tourism industry, is in the way of efficient and safe hydrogen storage. This is the purpose of the project VUKONZE, in which concept was created prototype device,to storage produced gas, created, transformed or consumed in the manufacture process or energetics and being safely stored. It can finds main application wherever long-term safe storage of energy gasesand their regulated and safe dosing for further use is required. Device consists of a thermally insulated chamber, which is filled with material with a high surface area, while the outer shell is a thermally insulated chamber in direct contact with the cold reservoir. The outer and inner shell is connected with heating key. Output from a thermally insulated chamber is connected to the appliance. At the same time the output energy from a source gas goes into the chamber. Thermally insulated chamber equipped with heating, which is turned on by the regulator while wrenching heat key whenthere is requirement for the energy supply of gas appliance and vice versa, the controller switches off the heater and turn on the heat key while filling the device with gas going through the heat exchanger, which is in contact with a cold reservoir. (Molokáč & Rybár, 2012)

CONCLUSION

The presented data shows, that at present way of live, given by geopolitical, economic and living standards of human society,it is not a real to maintain this trend for long time. Negative events related to covering energy demand, will probably continue to accumulate and possibly exacerbated, because the population in 2050 will reach 9 billion, (World Population Prospects, 2009) while the majority of population growth will be in the developing countries. Primary energy sources are already insufficient to cover all needs, therefore the attention is directed to the use of renewable energy, like the energy of hydrogen and hydrogen production, as an alternative fuel. Natural process of releasing energy from hydrogen makes it suitable for applications, that may be a useful complement to the strategies for the development of peripheral and with human activity unaffected regions, with high potential for development of the geotourism. The basic prerequisite for an

application of hydrogen in this context is safe and economically viable technology for its storage. The presented system VAZEP is an example of such a technical solution.

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