

RENEWABLE ENERGY MARKET IN V4 COUNTRIES

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Abstract

Renewable sources of energy are an important alternative when we talk about shifting from fossil based economy toward low-carbon economy. In accordance with one of the most important goals of European Union (EU) to reach 20 percent share of renewable energy in the total energy mix by 2020, countries are oriented to change structure of energy market. However, it seems that this goal is little too ambitious from viewpoint of some member states. It is quite obvious that countries of Visegrad area will not achieve 20% share of renewables. The main aim of article is to examine the structure of energy market in Visegrad countries (V4) with special focus on production and consumption of renewable energy sources. Consequently, we analyze energy balance of Slovakia, Czech Republic, Hungary and Poland from the side of consumption. We also study the consumption of energy in relation to individual sectors of national economy.

Results of analysis suggest that Slovakia has highest dependence on import of energy from all Visegrad countries. Even though, agriculture and forestry are sectors which are less important in terms of GDP, they are one of the major consumers of energy in Slovakia. We stress the controversy of this fact, because these are the sectors with huge potential for production of biomass as the feedstock of renewable source of energy.

Keywords: energy balance, renewable energy sources, consumption, V4 countries

JEL classification: Q02, Q42, Q57

1 Introduction

The EU faces globally perceived climate issues resulting into dependence on energy imports and scarce energy resources. The need to mitigate climate change is seen

as the way to fight economic challenges (Directive 2012/27/EU). Therefore, the EU seeks to shift from carbon based industries toward green solutions in development of national economies. One of the most important goals of EU is to reach 20 per cent share of renewable energy in the total energy mix by 2020, so the countries are oriented to change structure of energy market (Svetlanská et al., 2015). Suitable climatic, soil and rainfall conditions for growing energy crops in European fields mean that EU has been a key player for biodiesel production, especially Germany (Kapusta & Lajdová, 2016). On the other hand, the issue of biomass production for replacement of fossil fuels is questionable as, especially the first generation biofuels produced from agricultural feedstock, may result in significant problems related to indirect land use change, emissions and food security threat (Frank, 2015).

The goal of energy efficiency improves the security of supply by reducing primary energy consumption and decreasing energy imports. The purpose of investing into renewable energy sources helps to reduce greenhouse gas emissions in an effective way (Directive 2012/27/EU). The renewable energy contribution is expected to increase up to 55%–75% of gross final energy consumption in 2050. It is obvious that the EU has made significant progress since 2005 and is on track to reach its 2020 renewable energy targets (Scarlat et al., 2015)

The cooperation of the Visegrad Group in the energy sector is an extremely important part of their economic policy and a natural component of foreign activities. Regional cooperation in the energy sector is a priority in the context of recent developments that affect the energy security in Central Europe (Visegrad group Annual report, 2016/2017).

The aim of article is to examine the structure of energy market in V4 countries with special emphasis on production and consumption of renewable energy sources. We develop the analytical modelling tool evaluating selected aspects of energy balance of V4 countries with special attention put on renewable energy sources.

Renewable sources of energy in V4 countries

Primary energy consumption includes heating, cooling, and transportation. Increasing renewable energy sources in transportation is more costly than in case of electricity generation, and thus the share of renewable energy sources in electricity generation is likely to be significantly high, even higher than 20% in 2020 (Ruska & Kiviluoma, 2011).

In case of V4 countries, a balanced approach was shaped under the presidency of the Slovak Republic in 2015, in order to achieve EU energy policy objectives. The focus was put on topics like safety, competitiveness and sustainability, preserving the sovereignty of the countries in the choice of energy mix in accordance with national conditions and in the choice of technologies for low carbon energy

system, the need to develop an analysis of the impact on energy prices and costs for industry and households, as well as measures to protect vulnerable customers. In this context, it has been emphasized that in line with the principle of subsidiarity and technological neutrality, nuclear energy is essential from the perspective of emission reduction (Dynamic Visegrad 2014/2015).

The Czech Republic

The Czech Republic has experienced strong growth in the sector of renewable energy, with the share of renewable energy sources (RES) in total primary energy supply increasing from 6.7% in 2010 to 9.4% in 2014 despite claims that the potential of RES is limited by natural conditions and environmental protection requirements. The State Energy Policy projects up to 25% renewable energy in total energy consumption by 2040. Reaching the envisaged share of RES will require greater focus on developing the sector and examining the potential of all RES (IEA, 2016).

Hungary

Hungary has ambitions to fulfill EU Commission requirements by ensuring 14.65 % ratio of renewables within its gross final energy consumption by 2020, over the obligatory 13 % prescribed for Hungary as national overall target in the Renewable Energy Directive (Gullai, 2016). The ratio of the RES out of the gross final energy consumption was 9.6 % in 2014.

Poland

Production of primary energy in Poland is based mainly on fossil fuels. First place belongs, to hard coal and lignite, which cover 56% of the demand. Crude oil also has a significant share amounting to 25% (PAIH, 2013). The power of all installation producing energy from the renewable energy sources was sixfold from above 1 GW in 2004 to over 6 GW in 2015. This growth is seen as the result of increase in power of wind farms. In 2015, wind farms dominated the renewable energy production sector by 64 % of the total power from renewable energy sources (Igliński et al., 2016).

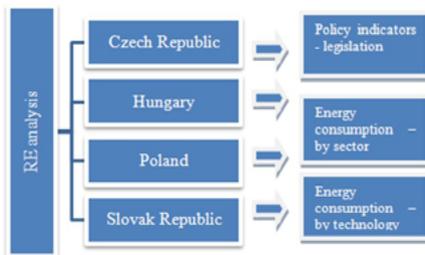
The Slovak Republic

Due to its extraordinary technical potential, the current use of RES under the conditions of the Slovak Republic is inadequate. Less than 12% of technical potential for biomass is currently used as well as the potential solar energy (0.2%). As the result of the construction of large hydropower plants, the hydro power potential is used for 50%. The Slovak Republic is rich in geothermal resources compared to other V4 countries. It currently uses approximately 36 localities in Slovakia for production of geothermal energy. The lowest technical potential for use in the Slovak Republic has the wind energy (IRENA, 2017).

2 Data and methodology

For analysis of renewable energy market in V4 countries we developed analytical model to examine selected progress indicators of RES (Renewable Energy Sources).

Figure 1 Analytical model



Source: elaborated by authors

Notes: RE – renewable energy

For the policy indicators we examine the common legislation of EU in terms of fulfilling national targets set by Renewable Energy Directive.

Data on energy consumption are based on the Energy balances of V4 countries and are obtained from statistical offices, International Renewable Energy Agency (IRENA) and EUROSTAT.

3 Results

The table below (Table 1) shows data from the Statistical Office of the Slovak Republic. These data represent the percentage of consumption of energy from renewable energy sources in total energy consumption in the Visegrad Group countries and national targets set by Renewable Energy Directive for the period 2010 – 2015.

Table 1 The development of the share of energy consumption from renewable energy sources in total energy consumption in the Visegrad Group countries and national targets set by Renewable Energy Directive for the period 2010 – 2015

	Slovak Republic	Czech Republic	Hungary	Poland
2010	09.1	10.5	12.8	09.3
2011	10.3	11.0	14.0	10.3
2012	10.4	12.8	15.5	10.9
2013	10.1	13.8	16.2	11.4

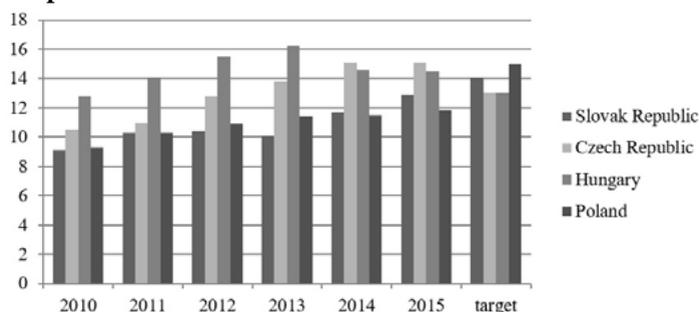
	Slovak Republic	Czech Republic	Hungary	Poland
2014	11.7	15.1	14.6	11.5
2015	12.9	15.1	14.5	11.8
target 2020	14.0	13.0	13.0	15.0

Source: Statistical Office of the Slovak Republic, own processing.

The member states of the European Union have adopted targets for the use of energy from renewable energy sources – 20 percentage share of renewable energy consumption by 2020 and 27 percentage share by 2030. Each of the European Union member states, besides the targets above, also sets its own target. Visegrad Group countries aren't exceptions. Their targets are listed in the table (Table 1). The total share of energy consumption from renewable energy sources rises in the each country of the Visegrad Group from year to year, which is a positive signal for implement the energy policy priorities and the ideas of green growth. In 2015 (which will be the subject of a more detailed analysis) the Czech Republic and Hungary didn't only to achieve, but also exceeded the certain target. The Slovak Republic - target of 14 percent and Poland - target of 15 percent of the use of renewable energy, have failed to reach the target until the last analysed year. The highest percentage share of energy from renewable energy sources (15.1 percent) was achieved in the Czech Republic in 2015. Based on available data we can state, that the Slovak Republic missed only 1 percent of the national renewable energy target in 2017.

The situation regarding the share of energy from renewable energy sources for the period 2010 - 2015 is illustrated by a bar chart.

Figure 2 **The development of the share of energy consumption from renewable energy sources in total energy consumption in the Visegrad Group countries and national targets set by Renewable Energy Directive for the period 2010 – 2015**



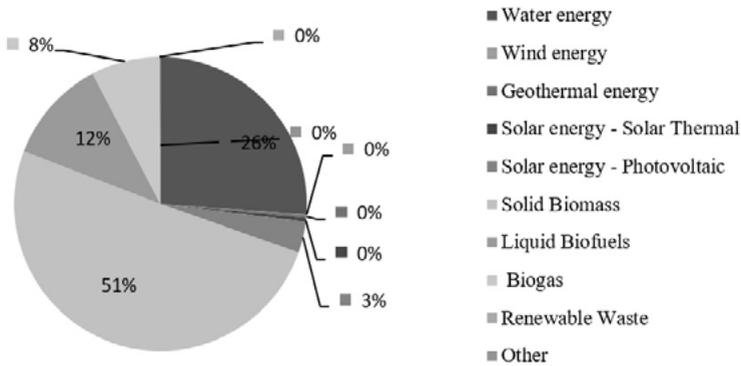
Source: Statistical Office of the Slovak Republic, own processing.

The percentage of renewable energy consumption in total energy consumption in individual countries of the Visegrad Group in 2015 will be the subject of a more detailed analysis.

Slovak Republic

In the Slovak Republic, the consumption of energy from renewable energy sources in total energy consumption in 2015 is 52 396 TJ (12.9 percent). The largest share of renewable energy consumption in the Slovak Republic represents energy produced from solid biomass (blockwoods, wood chips, briquettes, pallets, sawdust, straw and hay). Causes of 50.5 percent of solid biomass share of all available technologies are general availability, huge resources and low energy costs. On the other hand, the lowest share of renewable energy consumption represents wind energy due to a political decision about institutional blockade of the construction of wind power plants since 2010.

Figure 3 Percentage of energy consumption from renewable energy sources in the Slovak Republic in 2015 - technologies



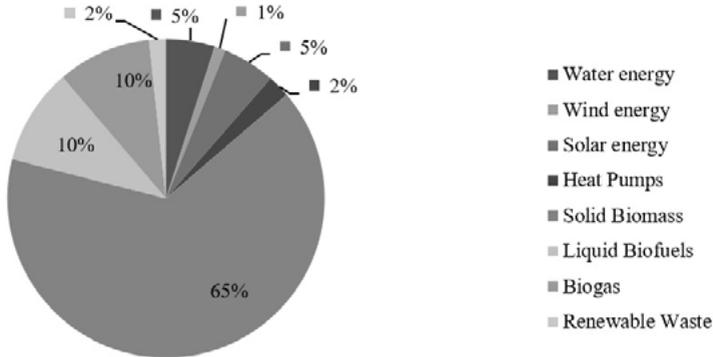
Source: International Renewable Energy Agency, own processing.

Czech Republic

In the Czech Republic, the consumption of energy from renewable sources represents 15.1 percentage share (165 938 TJ) in 2015. Compared to the Slovak Republic, the consumption of renewable energy in the Czech Republic is more than three times higher. The largest share of renewable energy consumption in the Czech Republic has energy consumption, that is produced from solid biomass. The wide use of biomass in this country is the cheapest way to increase the share of renewable energy sources in energy production. On the other hand, wind energy has the lowest share of renewable energy consumption. Wind energy belongs

to the technology from which the Czech Republic produces less energy, because the construction of wind power plants is limited due to technical and environmental constraints.

Figure 4 **Percentage of energy consumption from renewable energy sources in the Czech Republic in 2015 - technologies**

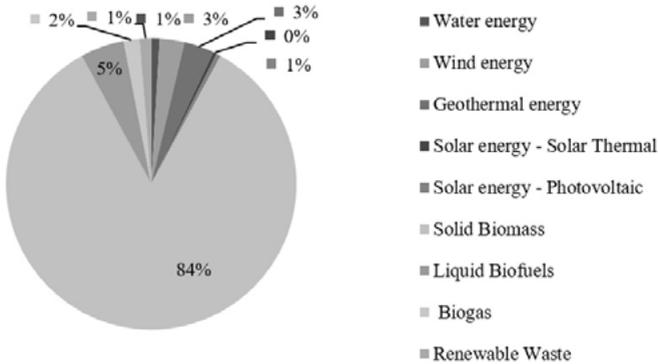


Source: International Renewable Energy Agency, own processing.

Hungary

In the Hungary, the consumption of energy from renewable energy sources represents 108 031 TJ (14.5 percent). Analogous to the Slovak and Czech Republic, there is the most energy from renewable energy sources made of solid biomass. Consumption of solid biomass represents 84.1 percentage of the total energy consumption of renewable energy sources. Boilers, which is designed for burn biomass should replace coal-based system in the Hungary. The lowest share of renewable energy consumption represents solar energy. We can say, that in 2015 the contribution of the Sun to energy production is minimal. Solar energy (which is dedicated to the production of electricity – photovoltaic cells and heat - solar collectors) represents less than 1 percent of the consumption of energy from renewable energy sources.

Figure 5 Percentage of energy consumption from renewable energy sources in the Hungary in 2015 - technologies

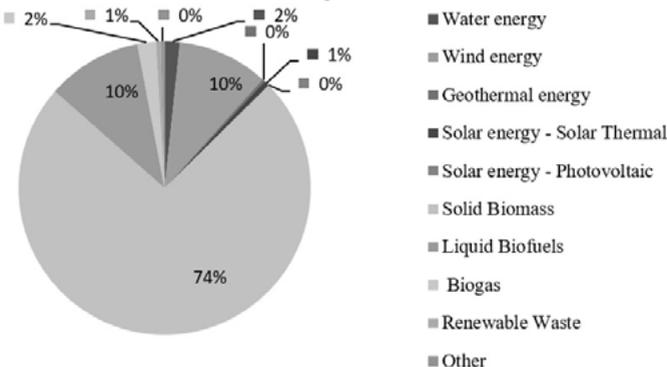


Source: International Renewable Energy Agency, own processing.

Poland

In the Poland, the consumption of energy from renewable energy sources represents 302 500 TJ (11.8 percent). Consumption of bioenergy produced from solid biomass (223 225 TJ) represents 73.8 percent of total renewable energy consumption. Based on the above, we can say, that four analysed countries of the Visegrad Group consume the most energy, which is produced from the solid biomass. Liquid biofuels and wind energy are also significant. On the other hand, the lowest share in the consumption of renewable energy sources represents geothermal energy.

Figure 6 Percentage of energy consumption from renewable energy sources in the Poland in 2015 - technologies



Source: International Renewable Energy Agency, own processing.

The following table (Table 2) shows the data on the share of energy from renewable energy sources in three selected sectors.

Table 2 Percentage of energy from renewable energy sources in three selected sectors in 2010 - 2015 in the Slovak republic

	renewable energy sources			
	electricity	transport	heating and cooling	total share
2010	17,8	5,3	7,9	9,1
2011	19,3	5,5	9,3	10,3
2012	20,1	5,4	8,8	10,4
2013	20,8	6,0	7,9	10,1
2014	22,9	7,6	8,9	11,7
2015	22,7	8,5	10,8	12,9

Source: Statistical Office of the Slovak Republic, own processing

Based on the data from the table we can say, that the share of renewable energy represents three sectors in which the countries of the Visegrad Group (in our case the Slovak Republic) were obliged to set their targets. The largest share of energy from renewable sources in the conditions of the Slovak Republic concerns the production of electricity and the smallest transport sector during the whole analysed period. The Czech Republic, Poland and Hungary reach the highest values in the heat and cold sector.

4 Conclusion

The Visegrad Group represents an informal cooperation of four Central European countries (Slovak Republic, Czech Republic, Hungary and Poland). Visegrad Group is a lively and informal regional structure of four European Union and NATO member states which share the same values and have a common history, culture and geography. The member states of the Visegrad Group have adopted targets for the use of energy from renewable energy sources – 20 percentage share of renewable energy consumption by 2020 and 27 percentage share by 2030. The Czech Republic and Hungary didn't only achieve, but also exceeded the predetermined target. The Slovak Republic - target of 14 percent and Poland - target of 15 percent of the use of renewable energy, have failed to reach the target until the last analysed year. The largest share of renewable energy consumption in the Slovak Republic, the Czech Republic, Hungary and Poland represents energy produced from solid biomass. On the other hand, the lowest share of renewable energy

consumption in the Slovak Republic and the Czech Republic represents wind energy, in Hungary solar energy and in Poland geothermal energy. The largest share of energy from renewable sources in the conditions of the Slovak Republic concerned the production of electricity and the smallest transport sector during the whole analysed period. The Czech Republic, Poland and Hungary reach the highest values in the heat and cold sector.

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