

## COMPARISON OF RENEWABLE ENERGY SUPPORT IN SLOVAKIA AND IN MACEDONIA

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### ABSTRACT

*Paper compares different approach to the renewable energy in Slovakia and in Macedonia, with reference to geological and climate conditions. Paper deals with national support and different background for increasing renewable energy sources in the energy sector in both countries.*

### 1. INTRODUCTION

Slovakia and also Macedonia are located in Europe, and are continental countries. Slovakia is nearly one time larger than Macedonia and also number of inhabitants is one time higher. Both countries want to via their national politics support renewable energy sources. The main difference is that Slovakia belong to European Union and therefore in Slovak energy law are included directives and other documents of European committee and Slovakia has to reach national targets given in the renewable field. Republic of Macedonia is a European Union candidate country, but in the law and sub laws for energy, renewable energy sources have a key role.

## 1. SUPPORT OF RENEWABLE ENERGY IN SLOVAKIA AND IN MACEDONIA

Nowadays political and economical authorities are searching for new, stable and environmentally friendly energy sources which could be able to cover all energy demands and moreover assign the energy safety and the sustainable development of the energy industry.

### Situation in Slovakia

Slovakia is located in the east Europe, between latitudes 47° and 50° N, and longitudes 16° and 23° E. It has a population of over five million and an area of 49 035 km<sup>2</sup>. The Slovak climate lies between the temperate and continental climate zones with relatively warm summers and cold, cloudy and humid winters. The Slovak landscape is primarily mountainous nature, extending across most of the northern half of the country. The average temperature is 8.7 °C, the warmest average max. temperature is 26 °C in July and the coolest average min. temperature is -7 °C in January. Slovakia receives on average 605 mm of precipitation annually or 50 mm each month [8]. There is an average range of hours of sunshine in Slovakia of between 1.5 hours per day in December and 9.1 hours per day in July. On balance there are 2072 sunshine hours annually and approximately 5.7 sunlight hours for each day [8].

Table 1 Development of the energy dependence (% of net imports in gross inland consumption) in Slovakia and in Macedonia from 2000 till 2010 [9]

geo(time)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
<b>EU (27 countries)</b>	46.69	47.39	47.56	48.97	50.24	52.46	53.67	52.98	54.64	53.73	52.68
<b>Slovakia</b>	64.97	62.25	64.15	64.65	67.85	65.42	63.86	68.37	64.57	66.43	63.13
<b>Former Yugoslav Republic of Macedonia</b>	40.52	38.63	46.09	38.75	41.95	43.34	44.95	47.97	46.24	44.82	43.74

Slovakia is highly dependent on energy commodities import, mainly from Russian federation. Energy dependence of Slovak republic (63.13%) is higher than EU average (52.68%) and in comparison with Macedonia is almost 20% higher. Slovak energy sector structure is diversified in terms of the fuels used, with natural gas, nuclear power, solid fuels and to a lesser extent oil constituting a majority of primary energy supplies.

Considering the electricity production, Slovakia was exporter till the end of 2006 when the unit 1 of nuclear power plant Jaslovske Bohunice was shut down (table 1). Second unit (unit 2) was shut down in 2008. The reason of shutting down was the condition of Slovakia's accession to the European Union.

Nowadays, Slovakia is electricity importer, electricity balance is low, in 2011 it was 2.5%. In 2011, total installed capacity in Slovakia reached 8 152 MW, with total electricity consumption at 28 862 GWh and total electricity production at 28 135 GWh (table 1). The share of RES at the electricity production is increasing, but on excluding large hydroelectric plants, the share of RES drops to less than 2%. In last decade the highest new installed capacity was from the photovoltaic power plants, in May 2011 overall installed capacity in the photovoltaic was 512.8 MW. By now geothermal energy has not been used in Slovakia for electricity production purposes (geothermal energy rather finds use for heat production) and share of wind energy is very low.

Table 1 Share of energy sources covering electricity production and consumption in Slovakia, 2006 – 2011 [2]

	GWh					
	2006	2007	2008	2009	2010	2011
Nuclear Power Plants	18013	15335	16704	14081	14574	15411
Thermal Power Plants	5935	5421	5647	4768	5023	5726
Hydro Power Plants	4447	4485	4284	4662	5493	4006
Others	2832	2666	2674	2563	2630	2992
Balance (Import)	-1603	1725	521	1312	1041	727
<b>Consumption</b>	<b>29624</b>	<b>29632</b>	<b>29830</b>	<b>27386</b>	<b>28761</b>	<b>28862</b>
<b>Production</b>	<b>31227</b>	<b>27907</b>	<b>29309</b>	<b>26074</b>	<b>27720</b>	<b>28135</b>

\*Others: industrial PP and RES

All European Union member states are obliged to incorporate the EU energy legislation into their national legislation and implement the provisions while accounting for country specific characteristics and national interests of the country concerned providing the characteristics and interests do not conflict with fundamental EU principles. Slovak Republic became a regular EU member on May, 1<sup>st</sup>, 2004 which entails apart from rights also some duties including the implementation of the EU energy legislation in Slovak law. The key documents relating to power engineering in Slovakia are [5]:

- **Energy Policy** (2006): Defines the fundamental goals and framework criteria for the development of power engineering in the long-term horizon.
- **URSO price edicts**: Price regulation in power engineering, means of enforcement, justified costs, verification of reasonable profit.
- **Act No. 656/2004 on power engineering** and on amendments to several acts of law:
  - Regulations for business operations in power engineering, access to the power engineering market;
  - Rights and obligations of energy market players;
  - Permits for construction of power engineering facilities;
  - Guidelines for execution of the functions of national authorities in power engineering and supervision by national authorities over business operations in power engineering.
- **Act No. 309/2009 Coll. on the Promotion of Renewable Energy Sources and High-efficiency Cogeneration**: regulates the support system for RES and high-efficient combined heat and power generation and sets out the rights and obligation of renewable energy production.

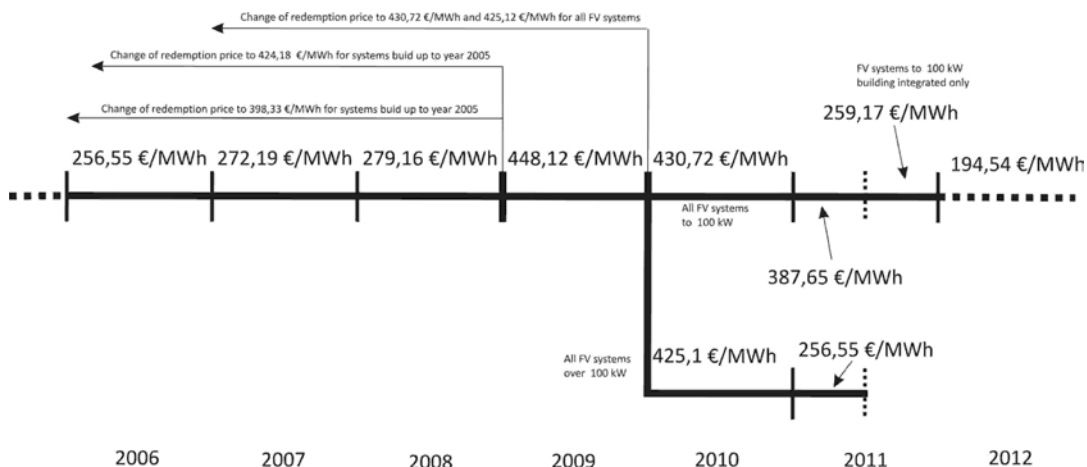


Figure 2 Process in the feed-in tariffs of the photovoltaic in Slovakia from 2009 till 2012 [6, 7]

The support to RES in Slovakia was given mainly via feed-in tariffs and Act No. 309/2009. Due to this act, solar energy was rapidly improved, from 0 MW of installed capacity of the photovoltaic, it comes to 480 MW (816 installed FV power plants). Feed-in tariffs for electricity from the photovoltaic were set up to at about 430 euro/MWh. The photovoltaic big boom dampens after decreasing of this price, and nowadays the feed-in tariff for FV is little bit more than 250 euro/MWh and only for photovoltaic at the roof or envelope of the buildings. Process in the feed-in tariffs of the photovoltaic in Slovakia from 2009 till 2012 is shown in fig. 2.

Concerning the renewable sources utilization in Slovakia, the source with highest utilisation potential is biomass - almost 50% of Slovakia is covered by farmland and 41% by forest, which represents the huge potential to produce biomass from the wood, side products of agriculture and animal waste. The next highest potential has solar energy, geothermal energy, large and small hydroelectric plants and wind energy. Existing potential of RES, except of hydro power, is unused.

### Situation in Macedonia

Republic of Macedonia is, like Republic of Slovakia, highly dependent on energy commodities import. Apart the whole consumption of natural gas and oil, 30% from the total annual consumption of electrical energy is from import.

In 2011, total electrical energy consumption was 8985.3 GWh, total electricity production was 6324.6 GWh (70.4% from electrical energy consumption) and import of electrical energy was 2660.7 GWh (29.6% from electrical energy consumption). Renewable energy sources in the total electrical energy production are with 23.22% or 1468.8 GWh and in the total electrical energy consumption are with 16,35%. In the electrical energy production from renewable energy sources 1272.8 GWh are from big hydro power plants (more than 10 MW installed power) and the rest 196 GWh (3% from the total electrical energy production or 2.2% from the total electrical energy consumption) are from small hydro power plants (less than 10 MW installed power) and sun power plants (photovoltaic power stations).

In order to increase electrical energy production from RES Government of the Republic of Macedonia, together with Energy Regulatory Commission and Energy Agency brought new Energy Law and new regulations for renewable energy sources. For the different type of renewable energy source is determinate a tariff (preferential price of electrical energy) and the guaranteed period for using the status privileged producer of electrical energy from RES (Table 2).

The total electrical energy produced from the “Privileged Producer” (from RES), according to the Energy law must be purchased by the MEPSO - Market Operator with the preferential price of electrical energy determinate by the Energy Regulatory Commission.

In order the impact of the new RES to the end price of electrical energy not to be more that 4%, the Government of the Republic of Macedonia make a decision to limit the installed capacity from different types of RES for the status “Privileged Producer” of electrical energy with preferential price. In the next table are presented the limits of installed capacity form different types of RES in Macedonia (Table 3).

Table 2 Feed in Tariffs in Republic of Macedonia

Small Hydro power plants			
Block	Monthly quantities of delivered electricity (kWh)	Feed-in tariffs (€cents/kWh)	Guaranteed period (years)
I	1 – 1.020.000	12	20
II	1.020.001 – 2.040.000	8	
III	2.040.001 – 4.200.000	6	
IV	4.200.001 – 8.400.000	5	
V	Above 8.400.001	4,5	
Wind Power Plants		8,9	20
Electricity generation from BIOGAS power plants			
Block	Installed capacity(kW)	Feed-in tariffs (€cents/kWh)	Guaranteed period (years)
I	≤ 500 kW	15	20
II	501 – 2000 kW	13	
PHOTOVOLTAIC			
Block	Installed capacity(kW)	Feed-in tariffs (€cents/kWh)	Guaranteed period (years)
I	≤ 50 kW	30	15
II	51 kW – 1000 kW	26	
Electricity generated from Biomass			
Block	Installed capacity(kW)	Feed-in tariffs (€cents/kWh)	Guaranteed period (years)
I	≤ 1000 kW	11	20
II	1001– 2000 kW	9	

## 5. CONCLUSION

Republic of Macedonia like a European Union candidate country is prompted to implement EU directives and legislation for renewable energy sources. Feed in tariffs and guaranteed period for using this feed in tariffs are indicatives that in future there will be a lot of investments in RES. But frequent changes of the feed in tariffs are a very big negative impact for making investment decision for the investors. In the past 5 years feed in tariff for electrical energy from photovoltaic power stations was changed two times. With the first decision Energy regulatory Commission decide the feed in tariff to be 46 / 41 €cents/ kWh. The second changes was for decreasing the feed in tariff on 38 / 34 €cents/ kWh, and the last change was for decreasing on 30 / 26 €cents/ kWh. This decreasing of more than 35 % is a big negative impact for investors how has attend to invest in RES in Republic of Macedonia. Also the big negative impact is a Government decision to limit the installed capacity from RES how will be Privileged Producers of electrical energy in Macedonia with feed in tariff for produced electrical energy.

Table 3 Government decision for maximum installed capacity from RES in Macedonia

Type of RES	Installed capacity per plant	Total installed capacity in Macedonia
Small Hydro power plant	Up to 10 MW	unlimited
Wind parks	Up to 50 MW	150 MW
Photovoltaics	Up to 50 kW = 2 MW Above 50 kW = 8 MW	10 MW
CHPP	Up to 3 MW	10 MW
Power plant on biogas/biomass	Up to 500 kW = 2 MW Above 500 kW = 8 MW	10 MW

## 6. ACKNOWLEDGEMENT

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