

# **PRODUCTION OF ELECTRICITY FROM RENEWABLE ENERGY SOURCES AND OBSTACLES TO FURTHER DEVELOPMENT IN THE REPUBLIC OF MACEDONIA**

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## **INTRODUCTION**

Although renewable energy sources (RES) usage for electricity production is not at all new, until recently (apart from large hydro power plants), its contribution to Macedonia's electricity production was negligible. Country's commitment for becoming an EU member state brought many reforms. The energy sector, previously with no strategic vision of its development and no sustainability, has begun to transform to comply with the market economy model. Macedonia made efforts to fulfill the commitments coming from the EU candidate status including reforming the energy sector and prioritizing RES policy and its implementation.

Renewable energy sources can be divided into two main categories: traditional renewable energy sources such as biomass and large hydro power plants (HPPs) and the so called "new renewable energy sources" such as the solar energy, wind energy, geothermal energy, etc.

Analysis presented in this article refers to growth in electricity production from renewable energy sources in the last decade while taking into account possibilities as well as barriers for its further growth.

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The main goal of this paper is to analyze growth in electricity production from RES in the Republic of Macedonia. Main barriers for even wider implementation of projects related to RES usage for electricity production are also presented.

## ELECTRICITY GENERATION IN THE REPUBLIC OF MACEDONIA

According to the European Directive 2001/77/EC, [1], the share of renewable energy in the total energy consumption by 2020 should be 20%, and by 2040 as much as 40%. The share of renewable energy in primary energy consumption in the EU in 2012 was more than 14.1%, [2]. In the same direction is the EU Directive on full replacement of old string lights with new, energy-saving compact fluorescent ones by 2012, [3], which should achieve great savings on electricity and consequently, reduced CO<sub>2</sub> emissions in the atmosphere.

Total energy consumption in the Republic of Macedonia in 2010 topped 20810 GWh, ie. it was 6,6% higher than previous year, [4].

Compared to similar countries from the European Union (EU), Macedonia is significantly lower energy consumer, [5], which is, in bigger part, a consequence of large industrial capacities failure due to transition and privatization, economic crisis after 2008 etc. in comparison, total energy consumption in Macedonia for 2010 has not yet surpassed total energy consumption in 1988.

If we take into account electricity production in large hydro power plants, share of renewable energy sources in country's electricity production for the period 2013-2016 varied from 25,77 to 38,55%, Table 1.

TABLE 1 – NET ELECTRICITY PRODUCTION IN THE REPUBLIC OF MACEDONIA, 2013-2016

	MWh				%			
	2013	2014	2015	2016	2013	2014	2015	2016
<b>Total net electricity production</b>	<b>5.672.272</b>	<b>4.975.719</b>	<b>5.277.773</b>	<b>5.287.093</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>
Thermal power plants	3.742.599	3.506.444	3.092.720	2.699.116	66,0%	70,5%	58,6%	51,1%
CHP plants and industrial power plants	348.239	189.061	175.406	549.659	6,1%	3,8%	3,3%	10,4%
Hydro power plants	1.572.384	1.195.444	1.846.060	1.869.104	27,7%	24,0%	35,0%	35,4%
Solar power plants	9.051	14.383	22.599	23.699	0,2%	0,3%	0,4%	0,4%
Wind power plants	0	70.387	120.768	109.483	0,0%	1,4%	2,3%	2,1%
Biogas plants	0	0	20.219	36.033	0,0%	0,0%	0,4%	0,7%

But, if we take out electricity production from large hydro power plants, the outlook is completely different. In this case, one can notice that share of RES in net electricity production for the same period is between 0,16 and 3,20%, which is significantly lower than other EU countries. It is expected that the share of RES in total energy consumption until 2030 reaches 30,3% [6, 7].

After lignite, from the domestic energy sources, biomass has second spot according to significance in the country's energy balance. Solar energy has insignificant share in electricity production (well below 1%), while wind energy electricity production accounts for approximately 2% of the total net electricity production.

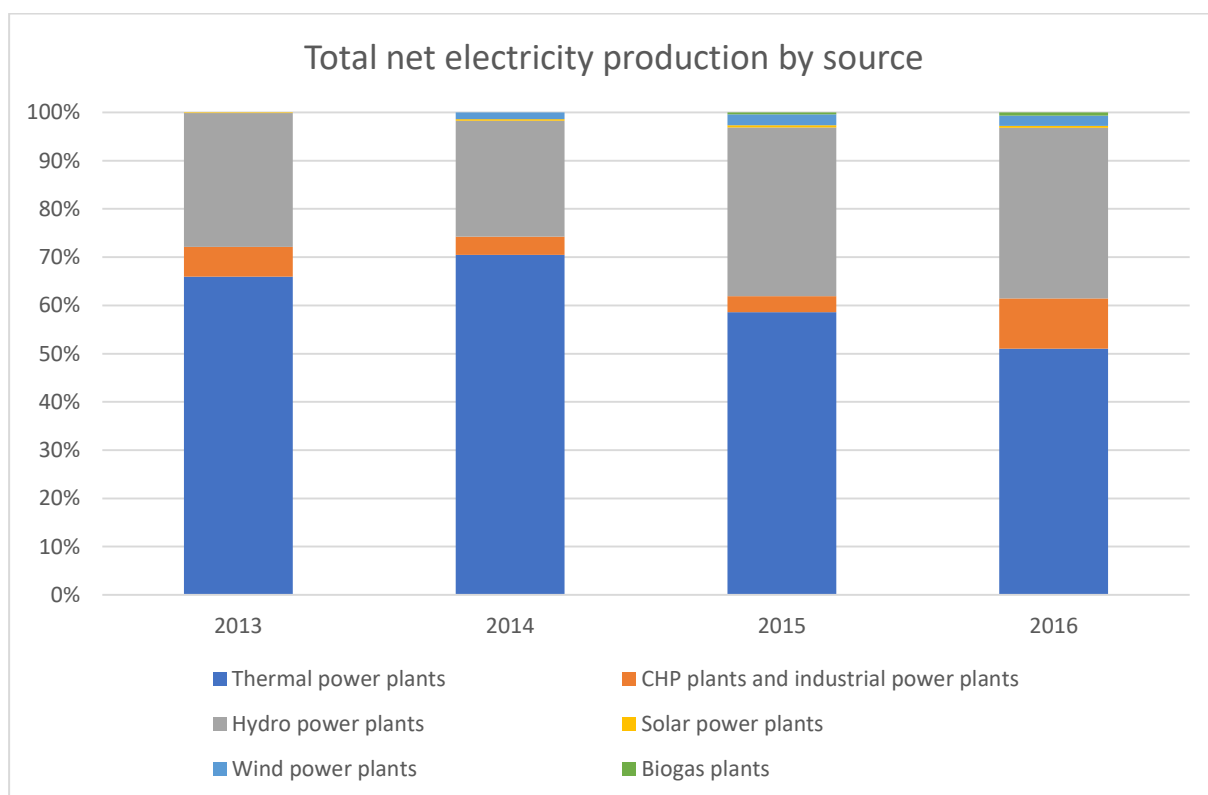


FIGURE 1 – TOTAL NET ELECTRICITY PRODUCTION BY ENERGY SOURCE, 2013-2016, IN PERCENTAGE

## LEGAL FRAMEWORK AND MAIN OBSTACLES FOR DEVELOPMENT OF RES PROJECTS

According to the Decree for feed-in tariffs, [8], issued by the Government of the Republic of Macedonia, hydro power plant can acquire status of preferential producer if the installed capacity of the plant is less or equal to 10 MW. The feed-in tariffs for produced and delivered electricity from HPP during one calendar month are:

TABLE 2 – FEED-IN TARIFFS FOR ELECTRICITY PRODUCED AND DELIVERED FROM HPP, DEPENDING ON THE QUANTITY OF DELIVERED ELECTRICITY.

Block	Quantity of delivered electricity by block (kWh)	Feed-in tariff (€/kWh)
I	$\leq 85.000$	12,00
II	$> 85.000$ и $\leq 170.000$	8,00
III	$> 170.000$ и $\leq 350.000$	6,00
IV	$> 350.000$ и $\leq 700.000$	5,00
V	$> 700.000$	4,50

Preferential producer has right to use feed-in tariffs for produced electricity in a period of 20 years.

The same decree, [8], contains conditions under which photovoltaic (PV) power plants can acquire preferential status. PV power plant must have installed electric capacity smaller than 1 MW. Feed-in tariffs for electricity produced and delivered from PV power plants, depending on installed electric capacity are given in TABLE 3.

TABLE 3 – FEED-IN TARIFFS FOR ELECTRICITY PRODUCED AND DELIVERED FROM PV POWER PLANTS, DEPENDING ON THEIR INSTALLED CAPACITY

Installed capacity of PV plant	Feed-in tariff (€/kWh)
≤ 50 kW	16
> 50 kW	12

Preferential producer has right to use feed-in tariffs for produced electricity in a period of 15 years.

The total installed electric power of preferential electricity producers from PV power plants is limited according to the Decision issued by the Government of RM, [9], as follows:

- Total installed electric capacity for application of feed-in tariffs for electricity produced from PV power plants with installed capacity smaller or equal to 50 kW should be 4 MW,
- Total installed electric capacity for application of feed-in tariffs for electricity produced from PV power plants with installed capacity bigger than 50 kW but smaller or equal to 1 MW, should be 14 MW.

During the preparation of this article, upper limits of this Decision were already met, [10], and therefore further installations of this type of electricity producer are not expected in near future.

Preferential producer of electricity from wind can obtain this status if installed capacity of the wind farm is smaller or equal to 50 MW. Feed-in tariff for electricity produced and delivered from wind energy generators (wind farms) is 8,9 €/kWh.

Preferential producer has right to use feed-in tariffs for produced electricity from wind in a period of 20 years.

The total installed electric capacity of wind power plants for which feed-in tariffs are applied, by 31.12.2025 should be 150 MW, according to the following timetable:

- Total installed electric capacity of wind power plants using feed-in tariffs for electricity up to 31.12.2016 should be 65 MW;
- Total installed electric capacity of wind power plants using feed-in tariffs for electricity up to 31.12.2020 should be 100 MW and
- Total installed electric capacity of wind power plants using feed-in tariffs for electricity up to 31.12.2025 should be 150 MW.

Having in mind that the first wind farm in Macedonia, WF “Bogdanci” is already operational in its first phase with total installed capacity of 36,8 MW, and after its final realization its installed capacity should be 50,6 MW, meaning that in the period until the end of 2020, there will be approximately additional 50 MW available for application of feed-in tariff.

Recent studies, [11, 12], have shown potential barriers for utilizing RES in the Republic of Macedonia. They are classified into suitable groups in compliance with the matching specificity.

### **Low feed-in tariffs set by the state**

The electricity producers by utilizing RES expect a safe return of their investment in the necessary equipment, infrastructure and human resources as well as shorter period of return on investment through contracts for preferential tariff for purchase of electricity generated by ELEM (JSC “Macedonian Powerplants”) and transmitted by MEPSO (Electricity Transmission System Operator of Macedonia) and EVN Macedonia (company for power distribution and supply on the territory of the Republic of Macedonia). In practice, for some RES, that period is longer than 25 years and is not attracting much interest from potential investors.

At the time of completion of this article, the total installed capacity of the photovoltaic power plants, [10], had already been filled in the whole country, hence their construction was halted. Considering that the whole region is rich in potential energy coming from solar power, it is obvious that the biggest opportunity of the region in terms of amended legislation is to attract domestic and foreign investors to invest in Photo-voltaic power plants (PVPP). Attractive feed-in tariffs will allow a shorter period of return on investment and solid profits in a reasonable period of time. In order to trigger investment boom in this area, it is necessary to amend the existing legislation by shifting the limitations in capacities.

### **Slow and inefficient administration at state and local level**

Investors are interested to invest in the region and in well prepared projects, with precisely specified indicators for infrastructure, the potential of the region and country as a whole, with fast administrative procedures for obtaining the necessary documents and permits imposed by legislation and regulations. These preconditions can be fulfilled only by a fully qualified, effective and fast administration which responds effectively and timely to the demands of potential investors. Unfortunately, many subjective difficulties exist in practice when providing the necessary documentation for an investment start up caused by the slow and inefficient administration. Complicated and long administrative procedures for preparing detailed plans (at least 6 months), and long administrative procedures for obtaining building permits for facilities of RES (12 months) and the lack of complete plan documentation deter potential investors. Additional problem for investors is the disagreement with the company EVN in terms of connecting to the power grid.

However, this evaluation is partial and not generalized, focusing on part of the local government administration. Still, receiving a delayed (or no) response to the submitted applications, the transfer of responsibilities and competencies vertically and horizontally, declaring oneself unauthorized, causes anxiety among potential investors and they soon withdraw.

### **The political uncertainty and corruption**

In every state, the potential investors require and expect guarantees in case of changing the political party in power, there would be no change in terms of policy support to foreign investors in the implementation of business plans. They also require certain level of security that the fiscal policy will not dramatically change, nor the amount of taxes and other fiscal burdens. The same expectations stand in relation to the possible corruption of the administrative apparatus which significantly hampers the implementation of business plans and sets barriers to quick and effective resolution of administrative duties.

Currently, the regulations, measures, norms and standards in Republic of Macedonia create a good business climate for foreign investors. The consistency of this policy is uncertain when the government changes at a political level, as well as its implementation at the local level, i.e. municipal authorities should show goodwill to attract foreign investors through quick and efficient resolution of administrative responsibilities, control and sanctioning of the administrative staff in terms of potential corruption.

### **Lack of data and research**

Investors require information on existing potentials defined in recognized and confirmed feasibility studies, expert assessments and forecasts for the development of RES. Generally, this type of documentation is hard to find for the reason that no relevant researches were made

for creating relevant data that will help certainly in receiving an estimation of the cost-effectiveness of investing in RES.

### **Ad-hoc investment instead of strategic and predictable financing**

The development of the energy sector of a country must be planned, with a clearly defined strategy, goals and objectives, defined timetable for the realization of these goals. The implementation of this strategy can only be achieved with active and effective participation of potential investors in financing clear, precisely defined and sustainable projects that will contribute to local economic development, and at the same time will be fully supported by the state through a clear administrative procedure, short deadlines for overcoming administrative barriers, and of course, strong motivation through higher feed-in tariffs for purchase of generated electricity.

Since, there is a strategy for energy development in the Republic of Macedonia to 2030, as well as strategy for utilizing RES to 2020, it is necessary to strengthen national mechanisms for stronger intervention of the local government, especially to encourage mayors and employees in local administration to involve themselves more actively in the implementation of these strategic documents.

### **Insufficient knowledge of technical features, capabilities and performance of equipment and systems for RES**

Because of the enormous expansion of installing equipment and devices for RES in Europe and the world, the number of manufacturers of the necessary technical equipment and systems constantly grows and develops fast. Competition grows, the cost of equipment reduces, and the technical performance of equipment, devices and systems constantly improves and the level of usage is on the rise. For potential investors, it is important to have professional help from educated people who constantly follow market trends, thus being able to give professional, timely and responsible advice and suggestions for the selection of equipment, its quantity, and the way of transportation, installation, commissioning and the connection to the grid of the Republic of Macedonia. It should conform to the regulations and existing legislation with the capabilities of the local government, i.e. with the level of its development.

## **CONCLUSION**

After introduction of secondary legislative that defines utilization of renewable energy source by the means of feed-in tariffs for electricity production of RES, investor's interest for this sector is noticeable. Even though the energy from RES, apart from large hydro power plants, has very small share in the total net electricity production, there is significant growth in production capacities.

Despite initial growth of this 'new' energy sector, the progress has significantly slowed down in the last two years. There are a lot of objective and subjective reasons for this. Some of the legal and institutional barriers for further growth are presented in the article.

Overcoming of the above-mentioned obstacles and barriers would result in a greater penetration of RES utilization opening possibility for the country to reach EU's 20-20-20 targets (a 20% reduction in EU greenhouse gas (GHG) emissions from 1990 levels; raising the share of EU energy consumption produced from renewable resources to 20% and a 20% improvement in the EU's energy efficiency by the year 2020).

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