

Development aspects and targets of RES

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Abstract

The European targets in the field of energy, which should be reached by the year 2020 include reduction of the net final energy consumption by 20%, provision of energy from renewable energy sources (RES) to 20% from the final energy consumption and reduction of the greenhouse gases emission by 20%. As for the Republic of Macedonia, although there are no quantified targets, as a candidate status country for membership in the EU it should commit and work on meeting these targets.

These three European targets are strongly interconnected, complement and influence each other. Therefore, the elaborated topic is quite specific, important and contemporary because it observes renewable energy sources (RES), and in this context, the analysis covers the development aspects and RES targets in the frames of the European Union and the Republic of Macedonia. In this respect, the research is based on carefully selected and processed data regarding the development aspects and fulfilling of given RES targets at the level of EU-28 in general and in each of the countries, by the year 2020.

Furthermore, in this paper, particular emphasis is placed on the final energy consumption in the frames of EU-28, as well as the percentage distribution of this energy by sectors in 2015, including the projected need of total final energy in the Republic of Macedonia by fuel and sectors in 2020.

Keywords: final energy consumption, RES, development aspects, targets.

Introduction

Reduction of the needs for traditional organic fuel and reduction of greenhouse gases emission, thus decreasing the negative impact of the energy sector on the environment or protection and preservation of the environment, determines the ecological efficiency in terms of utilization of renewable energy sources (RES) potential. This inevitably imposes the need of increased share of energy from renewable sources in the final energy consumption.

Therefore, the subject of analysis in this paper is the energy from renewable sources, and the aim is to emphasize the importance and actuality of the crucial element in the policy of each country in order to achieve an optimal percentage in the share of renewable sources in the final energy consumption.

In that context, the paper comprises of four parts, covering the global commitments within the European Union and the Republic of Macedonia. The first part will analyze the final energy

consumption in EU-28 and outside of EU-28. The second part will include the share of energy from renewable sources in the gross final energy consumption in EU-28 and outside of EU-28 countries. The third part will study the final energy consumption in the Republic of Macedonia and the share of renewable sources energy in this consumption. The fourth part will point out the total final energy demand in the Republic of Macedonia by fuel and sectors in the year 2020, and in the end the paper gives conclusions.

Final energy consumption in EU-28 and in the countries outside of EU-28

The final energy consumption in EU-28 for the period 2012-2015 is shown in Table 1. After an insignificant decrease of 4.1% in 2014 the final energy consumption in EU-28 was 1,061.7 (Million toe) and it remained almost unchanged in 2015 with an amount of 1,084.0 (Million toe), that is, increased by only 2.1% compared to the previous year. The final energy consumption in the observed period reached its maximum in 2012, when it was 1,108.0 (Million toe).

Table 1. Final energy consumption in EU-28 for the period 2012-2015 (Million toe)

	2012	2013	2014	2015	14/13	15/14	Share in EU-28, 2014[%]	Share in EU-28, 2015[%]
EU(28countries)	1108.0	1107.6	1061.7	1084.0	-4.1%	2.1%	100%	100%
Belgium	35.1	36.4	34.2	35.8	-6.0%	4.6%	3.22%	3.30%
Bulgaria	9.2	8.8	9.0	9.5	2.2%	5.5%	0.84%	0.87%
Czech Republic	24.5	24.3	23.6	24.2	-2.8%	2.5%	2.22%	2.23%
Denmark	14.2	14.1	13.5	13.9	-4.2%	2.9%	1.27%	1.28%
Germany	212.1	217.7	208.9	212.1	-4.0%	1.5%	19.67%	19.56%
Estonia	2.9	2.9	2.8	2.8	-3.4%	0%	0.26%	0.25%
Ireland	10.6	10.7	10.8	11.2	0.9%	3.7%	1.01%	1.03%
Greece	17.0	15.3	15.5	16.5	1.3%	6.4%	1.45%	1.52%
Spain	83.2	80.8	79.2	80.5	-1.9%	1.6%	7.45%	7.42%
France	148.5	151.2	140.3	144.1	-7.2%	2.7%	13.21%	13.29%
Croatia	6.7	6.6	6.2	6.6	-6.0%	6.4%	0.58%	0.60%
Italy	121.8	118.5	113.3	116.4	-4.3%	2.7%	10.67%	10.73%
Cyprus	1.8	1.6	1.6	1.7	0%	6.2%	0.15%	0.15%
Latvia	4.0	3.9	3.9	3.8	0%	-2.5%	0.36%	0.35%
Lithuania	4.9	4.8	4.9	4.9	2.0%	0%	0.46%	0.45%
Luxembourg	4.2	4.1	4.0	4.0	-2.4%	0%	0.37%	0.36%
Hungary	16.5	16.6	16.2	17.3	-2.4%	6.7%	1.52%	1.59%
Malta	0.5	0.5	0.5	0.6	0%	20%	0.04%	0.05%
Netherlands	51.5	51.6	47.3	48.5	-8.3%	2.5%	4.45%	4.47%
Austria	27.1	28.0	26.7	27.4	-4.6%	2.6%	2.51%	2.52%
Poland	64.4	63.3	61.6	62.3	-2.6%	1.1%	5.80%	5.74%
Portugal	16.0	15.9	15.8	16.0	-0.6%	1.2%	1.48%	1.47%
Romania	22.8	21.8	21.7	21.9	-0.4%	0.9%	2.04%	2.02%
Slovenia	4.9	4.8	4.6	4.7	-4.1%	2.1%	0.43%	0.43%
Slovakia	10.3	10.6	10.0	10.1	-5.6%	1%	0.94%	0.93%

Finland	25.2	24.7	24.5	24.2	-0.8%	-1.2%	2.30%	2.23%
Sweden	32.4	31.6	31.2	31.8	-1.2%	1.9%	2.93%	2.93%
United Kingdom	135.9	136.7	129.6	131.4	-5.1%	1.3%	12.20%	12.12%
Iceland	2.7	2.9	2.9	3.1	0%	6.8%	/	/
Norway	18.8	19.0	18.5	18.7	-2.6%	1.0%	/	/
Montenegro	0.7	0.7	0.6	0.7	-14.2%	16.6%	/	/
FYROM	1.9	1.8	1.8	1.9	0%	5.5%	/	/
Albania	1.9	2.0	2.1	2.0	5%	-4.7%	/	/
Serbia	8.5	8.3	7.8	8.2	-6.0%	5.1%	/	/
Turkey	84.2	82.0	85.9	93.2	4.7%	8.4%	/	/
Bosnia and Herzegovina	2.0	1.9	4.5		136.8%	%	/	/
Kosovo	1.2	1.2	1.2	1.3	0%	8.3%	/	/

Source:

[http://ec.europa.eu/eurostat/statisticsexplained/index.php/File:Final_energy_consumption,_1990-2015_\(million_tonnes_of_oil_equivalent\)_YB17.png](http://ec.europa.eu/eurostat/statisticsexplained/index.php/File:Final_energy_consumption,_1990-2015_(million_tonnes_of_oil_equivalent)_YB17.png), and own calculations based on the given data, 19 April 2018

Germany had the highest level of final energy consumption in 2015 compared to all member-states, having a share of 19.56% of the total final energy consumption in EU-28, France had a share of 13.29%, United Kingdom 12.12% and Italy also had a double-digit share of 10.73%. There is an insignificant increase of the final energy consumption in the same countries compared to 2014, while Italy has a slight decrease. The increase and decrease in all EU-28 countries in 2015 compared to 2014 is insignificant, except for Malta where the increase reaches 20%. At the same time there is an increase in 2015 compared to 2014 in most countries, that is, in 23 countries, a decrease occurs in 8 countries, and there are no changes in 3 countries.

Regarding the countries outside of EU-28, given in Table 1, the increase and decrease in 2015 compared to 2014 is insignificant, except for Montenegro where the increase reached 16.6%.

There is an increase of the final energy consumption in 2015 compared to 2014 in all of these countries, except in Albania, which experienced a decrease of 4.7%.

Based on all of the above, almost all of the EU-28 countries and the countries outside of the EU have an increase of the final energy consumption in 2015.

Share of energy from renewable sources in gross final consumption of energy in EU-28 countries and countries outside of EU-28

The share of RES in the final energy consumption is defined¹ as a ratio of energy obtained from RES and total consumption of final energy. The targets, which apply for the member-states of the EU, are calculated based on the share of RES in the total consumption of final energy in the observed country in 2005, plus 5.5% for each member state plus a certain percentage proportionally to the gross domestic product per capita.²

¹Directive 2009/28/EC (OJ L 140, 5.6.2009) of the European Parliament and of the Council, on the promotion of the use of energy from renewable sources

² MASA, Strategy for use of renewable sources of energy in the Republic of Macedonia until 2020, Skopje, (2010), p.91

The share of energy from renewable sources into the gross final energy consumption in EU-28 for the period 2012-2015 increases year after year and amounts to 16.7% in 2015 (Table 2). In 2015 this share among the member states was highest in Sweden (53.8%), Finland (39.2%), Latvia (37.6%), Austria (32.8%), Denmark (31.0%), Croatia (28.9%), Estonia (28.6%) etc. Almost all countries of EU-28 have an insignificant decrease of the share of RES in 2015 compared to 2014, whereas the biggest increase occurred in Estonia (2.3%), United Kingdom (1.5%), Denmark (1.4%), Sweden (1.3%), Slovakia (1.2%) etc. An insignificant decrease occurred in four countries including: Latvia (1.1%), Austria and Hungary (0.2%), and Belgium (0.1%), while there are no changes in Czech Republic and Romania.

It is important to mention that all countries of EU-28, except for Hungary, had an increase of the share in 2015 compared to 2012, whereas the biggest increase occurred in Denmark (5.3%), Finland (4.8%), Lithuania (4.4%) etc.

In order to achieve a quantified share of energy from renewable energy sources in the final energy consumption in the EU-28 countries until 2020, compared to the observed period (2005), 14 countries need to increase the share by over 10%, 1 country should increase the share by 10%, while the others by less than 10%.

In order to achieve a quantified share of energy from renewable energy sources in the final energy consumption in the EU-28 countries until 2020 compared to 2015, it is necessary to increase the share for additional 3.3%. For the purposes of achieving the same target, 6 countries need to increase the share by less than 3.3%, compared to 2015, including Slovakia 1.1%, Austria 1.2%, Latvia 2.4%, Greece 2.6% etc. The following 10 countries need to increase the share by more than 3.3%: The Netherlands 8.2%, France 7.9%, Ireland 6.8%, United Kingdom 6.5%, Luxembourg 6.0% etc. Only Poland needs an increase of additional 3.3%. The quantified target by 2020 was achieved by 11 countries in 2015, of which: Croatia with over 8.9%, Sweden 4.8%, Estonia 3.6% etc.

Regarding the countries outside of EU-28, given in Table 2, the highest share of energy from renewable sources in the gross final energy consumption in 2015 is recorded in Island 70.2%, Norway 68.4%, Montenegro 43.1%, Albania 34.4%, and Macedonia 19.5%.

All of these countries show an insignificant decrease of the share in 2015 compared to 2014, except for Albania, which has an increase of 2.9%.

Some of these countries show a decrease and some an increase of the share in 2015, compared to 2012: increase is observed in Norway 4.4%, Montenegro 1.6% and Macedonia 1.4%, while decrease is noticed in Island 2.2% and Albania 0.8%.

Table 2: Share of energy from renewable sources in gross final consumption of energy per country in EU-28 for the period 2012-2015 (%)

	2012	2013	2014	2015	13-12	14-13	15-14	15-12	2020 Target	S ₂₀₀₅
EU-28	14.4	15.2	16.1	16.7	0.8	0.9	0.6	2.3	20	
Belgium	7.2	7.5	8.0	7.9	0.3	0.5	-0.1	0.7	13	2.2
Bulgaria	16.0	19.0	18.0	18.2	3	-1	0.2	2.2	16	9.4
Czech Republic	12.8	13.8	15.0	15.0	1	1.2	0	2.2	13	6.1
Denmark	25.7	27.4	29.6	31.0	1.7	2.2	1.4	5.3	30	17.0
Germany	12.1	12.4	13.8	14.6	0.3	1.4	0.8	2.5	18	5.8
Estonia	25.8	25.6	26.3	28.6	-0.2	0.7	2.3	2.8	25	18.0
Ireland	7.1	7.7	8.7	9.2	0.6	1	0.5	2.1	16	3.1
Greece	13.5	15.0	15.3	15.4	1.5	0.3	0.1	1.9	18	6.9
Spain	14.3	15.3	16.1	16.2	1	0.8	0.1	1.9	20	8.7
France	13.4	14.1	14.7	15.1	0.7	0.6	0.4	1.7	23	10.3
Croatia	26.7	28.0	27.8	28.9	1.3	-0.2	1.1	2.2	20	12.6
Italy	15.4	16.7	17.1	17.5	1.3	0.4	0.4	2.1	17	5.2
Cyprus	6.8	8.1	8.9	9.4	1.3	0.8	0.5	2.6	13	2.9
Latvia	35.7	37.1	38.7	37.6	1.4	1.6	-1.1	1.9	40	32.6
Lithuania	21.4	22.7	23.6	25.8	1.3	0.9	2.2	4.4	23	15.0
Luxembourg	3.1	3.5	4.5	5.0	0.4	1	0.5	1.9	11	0.9
Hungary	15.5	16.2	14.6	14.4	0.7	-1.6	-0.2	-1.1	13	4.3
Malta	2.8	3.7	4.7	5.0	0.9	1	0.3	2.2	10	0.0
Netherlands	4.7	4.8	5.5	5.8	0.1	0.7	0.3	1.1	14	2.4
Austria	31.5	32.4	33.0	32.8	0.9	0.6	-0.2	1.3	34	23.3
Poland	10.9	11.4	11.5	11.7	0.5	0.1	0.2	0.8	15	7.2
Portugal	24.6	25.7	27.0	28.0	1.1	1.3	1	3.4	31	20.5
Romania	22.8	23.9	24.8	24.8	1.1	0.9	0	2	24	17.8
Slovenia	20.8	22.4	21.5	21.9	1.6	-0.9	0.4	1.1	25	16.0
Slovakia	10.4	10.1	11.7	12.9	-0.3	1.6	1.2	2.5	14	6.7
Finland	34.4	36.7	38.7	39.2	2.3	2	0.5	4.8	38	28.5
Sweden	51.1	52.0	52.5	53.8	0.9	0.5	1.3	2.7	49	39.8
United Kingdom	4.6	5.7	7.0	8.5	1.1	1.3	1.5	3.9	15	1.3
Norway	64.0	65.9	68.6	68.4	1.9	2.7	-0.2	4.4	67.5	58.2
Iceland	72.4	71.6	70.4	70.2	-0.8	-1.2	-0.2	-2.2	/	/
Albania	35.2	33.2	31.5	34.4	-2	-1.7	2.9	-0.8	/	/
Montenegro	41.5	43.7	44.1	43.1	2.2	0.4	-1	1.6	/	/
FYROM	18.1	18.5	19.6	19.5	0.4	1.1	-0.1	1.4	/	/

Source: http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Table_2-Share_of_energy_from_renewable_sources_in_gross_final_consumption_of_energy_2004-2016.png, and own calculations based on the given data, 19 April 2018

Final energy consumption in the Republic of Macedonia and share of energy from renewable energy sources in this consumption

In October 2005, the Republic of Macedonia signed the Energy Community Treaty³ and according to the Treaty, the cosignatory countries have to harmonize their legislation with the existing regulations of the European Union (*acquis communautaire*) on energy, environment, competition and renewable energy sources. Based on this, the Republic of Macedonia directly adopted the corpus of rights and obligations, and some of them were implemented into the national legislation with the adoption of the Law on Energy in 2006, as well as with the most recent Law on energy, adopted in 2011.

The final energy consumption in the Republic of Macedonia for the period from 2012 to 2015 is shown in Table 1. From the presented data it could be concluded that after the decrease in 2013 and 2014, compared to 2012, the final energy consumption in 2015 increased again to 1.9 Mtoe, which is a increase of 5.55% compared to 2013, i.e. compared to 2014.

The final energy consumption in the observed period has reached its maximum in 2012, i.e. 2015 when it amounted to 1.9 Mtoe.

After the increase in 2013 and 2014 compared to 2012, the share of energy from renewable sources in the final energy consumption in the Republic of Macedonia in 2015 decreased to 19.5% and is lower than the share in 2014 by 0.1%, while the share in 2013 exceeds 1.0%. In the observed period it has reached its maximum in 2014, amounting to 19.6%. (Table 2).

It is important to mention that the share of 19.5% in 2015 is the biggest share in the observed period 2012-2015 since the share of 19.6% in 2014.

The percentage share of RES in the total consumption of final energy in Macedonia, according to the actual average values, shall increase from 13.8% in 2005 to 21% in 2020. In accordance with the adopted method for calculation of the target share of RES in the total final energy consumption in 2020 by the EU member-states, the target percentage for Macedonia shall be 21%. In fact, in 2020 the percentage share of 21% would be the energy from RES 6,699 GWh compared to the final energy consumption of 31,850 GWh.⁴ Therefore, Macedonia needs to increase the share by 7.2%.

Although the Republic of Macedonia does not have a quantified obligation, in order to produce 21% of the energy from renewable sources in the structure of the final energy consumption by the year 2020, it needs to increase the share of another 1.5% compared to 2015, which is less than the required increase of 3.3% for EU-28. In this manner, another target of the Internal Market of the EU shall be met by the year 2020.

In order to meet this target and at the same time develop the RES in the period until 2020, the total investments have been estimated at EUR 1.5 billion⁵. This would be accomplished with investments made by the company for production of electricity JSC ELEM (EUR 260 million), public-private partnership (EUR 670 million), concessioners (EUR 480 million) and private investors (EUR 30 million). In order to achieve this, special preferential tariffs should be used,

³The Republic of Macedonia ratified the Energy Community Treaty in 2006 by Law, Official Gazette of RM No.59/2006. Other cosignatory countries of the Treaty are Albania, Bosnia and Herzegovina, Montenegro, Romania, Serbia, Kosovo and the European Community

⁴MASA, Strategy for energy development until 2030, Skopje, (2010), p.11

⁵MASA, Strategy for use of renewable sources of energy in the Republic of Macedonia until 2020, Skopje, (2010), pp.115

thus stimulating the production of electricity from RES, where all consumers shall compensate the increased costs, that is, the price difference.

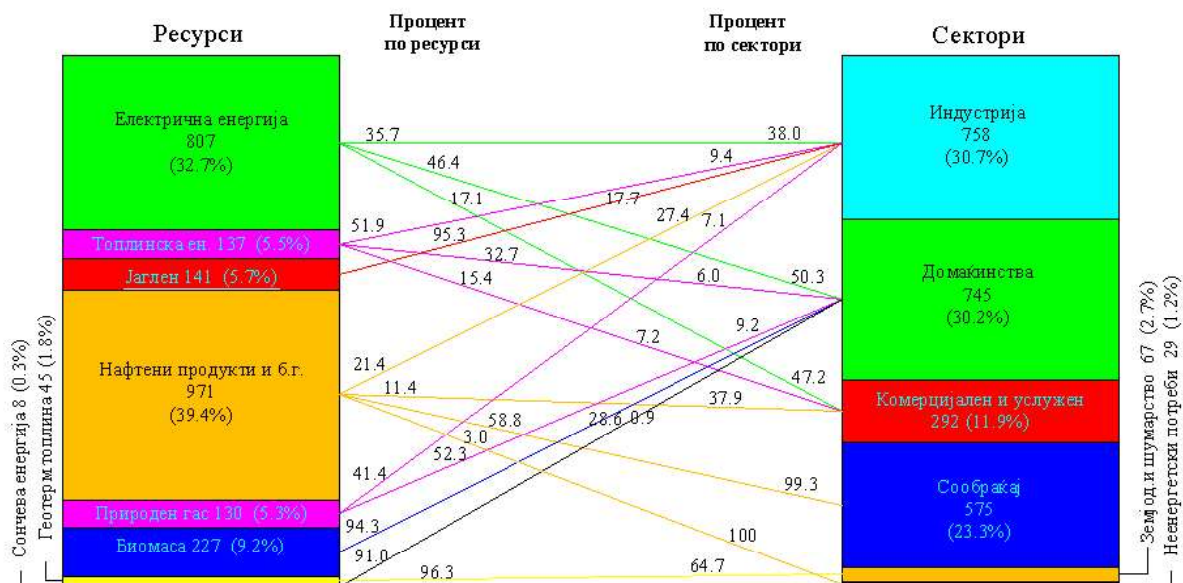
Total final energy demand in the Republic of Macedonia by fuel and sectors in 2020

The final energy demand by fuel is directly connected to the analyzed energy requirements by sectors. According to the intensified energy efficiency measures scenario in 2020 (Figure 2) this demand reaches 2466 ktoe.

By analyzing the percentage shares of the final energy demand in 2020 by sectors, given in Figure 2, it could be observed that according to this scenario as well, the largest share can be attributed to the industry and households with 30.7% and 30.2%, respectively. The traffic sector covers 23.3%, while the commercial and service sector uses 11.9%. The smallest share goes to agriculture and forestry with 2.7% and non-energy needs with 1.2%.

Figure 2 shows the percentage shares of different fuels used for meeting the final energy demand in 2020. The largest share goes to oil products 39.4%, electricity 32.7%, biomass 9.2%, coal 5.7%, heat 5.5%, natural gas 5.3%, geothermal energy 1.8% and solar energy 0.3%.

Figure 2. Total final energy demands by fuel and sectors in 2020 according to the intensified energy efficiency measures scenario (ktoe)



Source: Own calculations based on data from the Strategy for energy development of the Republic of Macedonia until 2030, MASA, Skopje 2010, p. 81, 82, 87, 91, 93, 101-107 and 110

Conclusion

The detailed and practical elaboration of the selected data regarding RES, i.e. energy consumption, share of RES in this consumption, development aspects and fulfillment of the specific target of RES within the European Union and the Republic of Macedonia, as well as the analysis of the data show their importance and influence on the electric energy system, the competition, the economic development of the countries as well as the European ecological standards on protection and preservation of the environment.

Taking into consideration all of the above mentioned, in terms of the importance of RES in the EU and the Republic of Macedonia, especially now when the Republic of Macedonia is in the process of integrating into the European family, the use of RES and investing in their development would enable us to become a modern and technologically advanced country. To summarize we would like to point out the following:

- ◆ Activities should be undertaken for efficient exploitation of RES, thus improving the results in the energy production sector, and at the same time decreasing the dependence of the country from importing electricity.
- ◆ Foreign and domestic investors should be attracted through creation of a favorable investment climate in the country, which would invest in the development of RES, and apart from reducing the import dependency of the country, it would also decrease the trading deficit and directly contribute to the development of the domestic economy and the macroeconomic stability of the country in general.
- ◆ The 19.5% share of RES in the final energy consumption in 2015 shows that the Republic of Macedonia is close and has committed to meet the determined target of the EU.
- ◆ Although the Republic of Macedonia has no quantified obligations, by increasing the share of RES in the final energy consumption, it will contribute to the global commitment for reduction of the greenhouse gas emissions, and as a country candidate for membership in the EU. it would be included in these efforts and targets of the EU.
- ◆ The Republic of Macedonia should continue meeting the obligations deriving from the Energy Community Treaty, referring to RES, competition, environment, energy efficiency, liberalization of the electricity market and introduction of actual competition in July 2020, in terms of opening an electricity market (power exchange) in the Republic of Macedonia.
- ◆ The existing capacities, that is, companies, which in the frames of the organizational structure will start using the existing resources more sensible and start recognizing and using the benefits of renewable resources, new technologies and European funds etc. based on analysis of the factors of their surroundings, will have bigger chances for innovative and sustainable development of their companies, since those analysis would provide them with preliminary information and findings, and in this sense enable them to undertake well-timed activities.
- ◆ The Republic of Macedonia should impartially use all available resources for investing in the development of RES: equity investments, loans, state grants, recapitalization, concessions, public – private partnership and other innovative approaches. The selection of a particular form of financing shall depend on the characteristics of the project itself and the conducted analysis of the project's strengths and weaknesses.

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