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**Conference Paper**

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**Provided in Cooperation with:**

The Research Institute for Agriculture Economy and Rural Development (ICEADR), Bucharest

*Suggested Citation:* Turek-Rahoveanu, Petruta (2020) : Potential of renewable resources in Romania and the EU, In: Agrarian Economy and Rural Development - Realities and Perspectives for Romania. International Symposium. 11th Edition, The Research Institute for Agricultural Economy and Rural Development (ICEADR), Bucharest, pp. 142-146

This Version is available at:

<https://hdl.handle.net/10419/234382>

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# POTENTIAL OF RENEWABLE RESOURCES IN ROMANIA AND THE EU

TUREK-RAHOVEANU PETRUTA<sup>1</sup>

**Summary:** *In most European countries in the energy sector, a reconsideration of renewable energy priorities is taking place, increasing consumer safety and protecting the environment through the use of renewable energy sources that provide an affordable and guaranteed solution in the medium and long term. In Romania renewable energy constitutes 30% of the total percentage of energy used, although we have a high potential of renewable energy sources such as biomass, hydro or wind energy. In order for renewable energy sources to become an important factor in mitigating climate change and improving the overall energy security of the European Union, it is necessary to change the way renewable energies are promoted within EU Member States.*

**Keywords:** *biomass, green energy, wind energy*

**JEL classification:** *Q4, Q40, Q42, Q43, Q47, Q49*

## INTRODUCTION

Renewable energy is produced using the earth's natural resources, such as sunlight, wind, water resources (rivers, tides and waves), heat from the earth's surface or biomass. The process by which these renewable resources are converted into energy does not emit greenhouse gases, so renewable energy is also referred to as 'clean energy'.

It can be used for biogas in the production of heat or electricity, as well as for biofuels in the transport sector.

Renewable energy plays a fundamental role in achieving the EU's energy and climate targets. Not only is it available in abundance within the EU, but it is also cost-effective with fossil fuels. As such, it can help to make our energy systems more efficient and reduce the EU's dependence on imported fossil fuels.

It also has the potential to provide a range of new jobs, create new industrial opportunities and contribute to economic growth.

In 1991, Denmark installed the world's first offshore wind farm "Sellby", which included 11 wind turbines. Germany introduced the first 'power tariff' for renewable energy sources in the same year; a policy mechanism to accelerate investment in renewable energy technologies.

Europe has also become the largest market for solar photovoltaics by covering more than 70% of the market by 2008. In the same year, Spain's Olmedilla photovoltaic park – a 60 megawatt power plant, making it the largest in the world – generated enough solar energy to power 40,000 homes a year.

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As the rest of the world increasingly uses and produces renewable energy sources, Europe has continued to be a leader. In July 2019, Portugal achieved the lowest cost of a global solar photovoltaic park – a record that still stands today.

## MATERIAL AND METHOD

The analysis in this paper is based on statistical data from the publications provided by Eurostat and INS on the share of renewable energy in the EU in the period 2012-2018.

Indicators highlighting the evolution of the data studied are used in the paper, by analysing the average of the period and the increases over each year.

The calculation formulas to calculate the indicators are as follows<sup>2</sup>:

Fixed-base indices:  $ISC = (SC_n/SC_0) \cdot 100$

- the arithmetic mean, in which:

$\bar{X}$  = arithmetic mean;

$X_i$  = average values over a number of years ( $i$ );

$n$  = number of years taken into account.

For standard deviation  $\hat{\sigma} = \sqrt{\frac{\sum (\bar{x} - x_i)^2}{n-1}}$ ; in which:

$\hat{\sigma}$  = standard deviation;  $x_i$  = average production values over a number of years;  $n$  = number of years taken into account.

For the mean square deviation  $\hat{\sigma}_x = \sqrt{\frac{\sum (\bar{x} - x_i)^2}{n(n-1)}}$ ; in which:

$\hat{\sigma}_x$  = mean square deviation;

For the coefficient of variation = , in which:

$C$  = coefficient of variation (expressed as a percentage).

where:  $C$ -coefficient of variation- expressed as a percentage and which may be small (0-10.0%, average(10.1-20%) (greater than 20.1%).

## RESULTS AND DISCUSSIONS

Most European countries in the energy sector are reconsidering priorities for increasing safety in consumer food supply and environmental protection, and in this process, renewable energy sources provide an affordable and guaranteed solution in the medium and long term.

Advances in renewable energy show that the share of this type of energy in total consumption in the EU shows that it had reached only 14.6% in 2014. This is explained by the fact that more than half of the energy consumed in the EU came from net imports (gas and crude oil). In 2018 the share is increasing to 18% with a coefficient of variation of 7%, the difference having a small significance.

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<sup>2</sup> Ceapoiu, N., 1968, Applied statistical methods in agricultural experiments and statistical Ed. Agro-Silva, Bucharest

Table 1. Share of renewable energy in 2012-2018  
(% of gross final energy consumption)

Specificare	2012	2013	2014	2015	2016	2017	2018	Media	STDEV	Coefficient of variation %
<b>European Union - 27 countries (from 2020)</b>	16.063	16.711	17.482	17.849	18.048	18.471	18.884	17.64	0.99	5.58
<b>European Union - 28 countries (2013-2020)</b>	14.69	15.378	16.219	16.732	16.995	17.474	17.98	16.50	1.16	7.02
<b>Belgium</b>	7.181	7.515	8.032	8.003	8.712	9.064	9.424	8.28	0.82	9.92
<b>Denmark</b>	25.466	27.174	29.31	30.835	31.837	34.72	35.708	30.72	3.75	12.20
<b>Germany</b>	13.555	13.766	14.386	14.901	14.885	15.472	16.481	14.78	1.01	6.81
<b>Estonia</b>	25.524	25.324	26.145	28.228	28.684	29.127	29.996	27.58	1.88	6.82
<b>Ireland</b>	7.054	7.618	8.598	9.108	9.258	10.588	11.061	9.04	1.45	16.09
<b>Greece</b>	13.741	15.326	15.683	15.69	15.39	16.951	18.002	15.83	1.34	8.49
<b>Spain</b>	14.287	15.319	16.125	16.228	17.427	17.563	17.453	16.34	1.24	7.59
<b>France</b>	13.437	14.043	14.581	15.012	15.68	16.012	16.593	15.05	1.12	7.45
<b>Croatia</b>	26.757	28.04	27.817	28.97	28.267	27.28	28.024	27.88	0.71	2.54
<b>Italy</b>	15.441	16.741	17.082	17.526	17.415	18.267	17.775	17.18	0.91	5.28
<b>Cyprus</b>	7.137	8.456	9.173	9.929	9.859	10.491	13.882	9.85	2.10	21.32
<b>Latvia</b>	35.709	37.037	38.629	37.538	37.138	39.019	40.292	37.91	1.51	4.00
<b>Lithuania</b>	21.437	22.689	23.593	25.751	25.615	26.039	24.448	24.22	1.74	7.18
<b>Luxembourg</b>	3.14	3.531	4.512	5.05	5.44	6.286	9.059	5.29	1.98	37.50
<b>Hungary</b>	15.53	16.205	14.618	14.495	14.315	13.517	12.489	14.45	1.23	8.48
<b>Malta</b>	2.862	3.76	4.744	5.119	6.208	7.27	7.978	5.42	1.85	34.05
<b>Netherlands</b>	4.659	4.691	5.415	5.657	5.827	6.461	7.385	5.73	0.97	16.89
<b>Austria</b>	32.678	32.77	33.653	33.542	33.365	33.144	33.426	33.23	0.38	1.14
<b>Poland</b>	10.897	11.368	11.495	11.743	11.267	10.964	11.284	11.29	0.29	2.59
<b>Portugal</b>	24.579	25.7	29.508	30.514	30.865	30.611	30.322	28.87	2.60	9.02
<b>Romania</b>	22.825	23.886	24.845	24.785	25.032	24.454	23.875	24.24	0.77	3.19
<b>Slovenia</b>	20.818	22.407	21.539	21.894	21.293	21.056	21.149	21.45	0.55	2.55
<b>Slovakia</b>	10.453	10.133	11.713	12.883	12.029	11.465	11.896	11.51	0.95	8.21
<b>Finland</b>	34.434	36.73	38.78	39.32	39.011	40.917	41.162	38.62	2.36	6.12
<b>Sweden</b>	50.23	50.8	51.874	53.009	53.371	54.201	54.645	52.59	1.68	3.19
<b>Iceland</b>	72.394	71.66	70.484	70.261	70.175	70.691	72.182	71.12	0.94	1.32
<b>Norway</b>	65.55	66.746	69.19	69.193	70.163	71.647	72.752	69.32	2.54	3.67
<b>Montenegro</b>	41.531	43.735	44.111	43.089	41.558	39.708	38.807	41.79	2.01	4.81
<b>North Macedonia</b>	18.128	18.509	19.559	19.527	18.044	19.636	18.118	18.79	0.75	3.99
<b>Albania</b>	35.152	33.167	31.476	34.387	35.487	34.465	34.865	34.14	1.39	4.07
<b>Serbia</b>	20.79	21.095	22.864	21.989	21.147	20.287	20.32	21.21	0.93	4.38
<b>Turkey</b>	13.208	13.91	13.596	13.603	13.741	12.767	13.659	13.50	0.39	2.86

Source: data processed by Eurostat

In 2018, Sweden recorded the highest share of renewable energy, from gross final energy consumption (54.6 %) and a coefficient of variation of 3,19 %.

Sweden is followed by Finland with 41.2%, Latvia with 40.3%, Denmark 36.1% and Austria 33.4%.

On the other hand, the lowest shares of renewable energy were recorded in the Netherlands 7,4 %, Malta 8,0 %, Luxembourg 9,1 % and Belgium 9,4 % (Table 1).

The EU is trying to reach 20% of its final gross consumption of renewable energy by 2020. Thus, in order to achieve this objective in the development of renewable energies, France and the Netherlands must increase their share of renewable energy in final energy consumption by at least 6,4 % and 6,6 % respectively.

For 2020, twelve Member States have already exceeded their target, including Croatia, Sweden, Denmark and Estonia in the range of 5% to 8%.

In Romania, the share of renewable energy in gross final energy consumption was from 25% in 2016 to 24.5% in 2017, so that in 2018 it reached 23.9%.

Thus, in 2018, Romania was only 0.1 percentage points from the target set under the Europe 2020 strategy, according to which the share of renewable energy in gross final energy consumption must reach 24%. The average period 2012-2018 is 24.2%, with a coefficient of variation of 3.19% and a small meaning.

Romania has a diversified but quantitatively reduced range of primary energy resources: crude oil, natural gas, coal, uranium ore, as well as a potentially recoverable renewable resources.

## CONCLUSIONS

In view of the responsibility the whole world has towards future generations and the environment, the European Union has set clear targets for renewable energy production.

The European Union's energy policies are focused on ensuring safe, sustainable and affordable access to energy. In order to achieve these objectives, the European Union has set out to adopt a long-term energy strategy with clear directions on energy security and efficiency, reducing carbon emissions, including through the growing use of renewable energy.

Most Member States will meet or exceed their 2020 targets. However, the forecasts also anticipate that Ireland, Luxembourg, the Netherlands and the United Kingdom will not meet their national targets.

In order for renewable energy sources to become an important factor in mitigating climate change and improving the overall energy security of the European Union, it is necessary to change the way renewable energies are promoted within EU Member States<sup>3</sup>

The priority objective of Romania's energy policy has also been to promote the exploitation of renewable energy resources (RES). Thus: by HG 443/2003 (repealed by OUG 88/2011), the provisions of Directive 2001/77/EC on the promotion of electricity production from renewable energy sources were transposed. The following objectives have been set: the legal framework necessary to promote E-SRE, the indicative targets for the share of SRE in Romania's gross energy consumption, and the share of E-SRE in the country's gross electricity consumption<sup>4</sup>.

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<sup>3</sup> Thomas D. Foust, Doug Arent, Isaias de Carvalho Macedo, José Goldemberg, Chanakya Hoysalad, Rubens Maciel Filhob, Francisco E. B. Nigroc, Tom L. Richarde, Jack Saddlerf, Jon Samsethg, Chris R.

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