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# MAIN DIRECTIONS FOR ENERGY USE OF BIOMASS IN ROMANIA

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**Summary:** *Energy is an area of strategic and vital importance for Romania's economic development. At national level there is a wide activity of using biomass for the production of electricity and heat, determined by the requirements of the European Union's energy policy to reduce CO<sub>2</sub> emissions. The availability of biomass resources has made it an attractive source of renewable energy, with the potential to provide economical and cost-effective energy. The paper presents a review of directions and policies on bioenergy and energy production through the use of biomass.*

**Keywords:** *biomass resources, renewable energy, energy policies*

**JEL classification:** *Q16, Q42, Q48*

## INTRODUCTION

The European Union's energy policies are focused on ensuring safe, sustainable and affordable access to energy. To achieve these goals, the European Union aims to adopt a long-term energy strategy with clear directions on energy security and efficiency, reducing carbon emissions, including through the increasing use of renewable energy.

Ensuring energy security at national level, especially with regard to bioenergy as part of an energy portfolio, allows for synergies between systems and policy objectives related to energy access, economic development, growth and stability of environmental objectives. In the general context of environmental security, the role of bioenergy is very important in mitigating climate change. Currently, in Romania, renewable energy constitutes 30% of the total percentage of energy used. Biomass is the main type of renewable energy source in our country. It is represented by organic components formed by photosynthesis, which use solar energy, as well as by fixing nitrogen from the air and CO<sub>2</sub>. Depending on the type of waste used or the destination of the final consumption, the amount of heat resulting from the energy recovery of biomass has different weights in the balance of primary resources. Thus, the use of biomass is done by thermal conversion or by conversion of solid, liquid or gaseous energy sources.

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 energy is promoted in EU member states.

## MATERIALS AND WORKING METHODS

The materials used in this paper refer directly to specialized scientific studies in the field and the processing of related data as a result of the research conducted. The paper presents a review of directions and policies regarding bioenergy and energy production through the use of biomass.

## RESULTS AND DISCUSSIONS

"Green energy", clean and renewable, is one of the major concerns of the European Union, but also of many Member States, for the development of clean energy that can reduce the impact on the environment associated with conventional energy generation and increase energy independence.

"Green energy" is a term that refers to renewable and non-polluting energy sources. From the energies generated by wind and solar panels to the energies obtained from biomass, ecological concerns and efforts aimed at obtaining green energy and replacing traditional energy sources have become increasingly intense recently, not only in Romania but also at sea. part of the world. Globally,

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it is estimated that green energy, renewable, constitutes about 20% of the total energy produced, the variations remaining quite large, depending on the climate and the means invested.

"Renewable energy" is a term that refers to forms of energy produced by energy transfer of energy resulting from renewable natural processes. Thus, the energy of sunlight, winds, running water, biological processes and geothermal heat can be captured by humans using various processes. [35]

"Renewable energy" is also called alternative energy, usable energy derived from sources that are able to recover, such as the sun (solar energy), wind (wind energy), rivers (hydroelectric energy), hot springs (energy geothermal), tides (tidal energy) and biomass (biofuels). [2]

The major advantage of using energy from renewable sources is that these sources are non-polluting, reduce dependence on imported fossil fuels and significantly reduce the greenhouse effect, have low operating costs and are important in the rational dosing of depletable resources. It also increases security in local and national power supply.

The priority objective of Romania's energy policy has been and is to promote the capitalization of renewable energy resources (RES). [9] So:

- 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-RES, the indicative targets on the share of RES in Romania's gross energy consumption, as well as the share of E-RES in the country's gross electricity consumption. A target has also been set. 12% of gross national consumption, which was to come from renewable energy, and the electricity component of this target was set at 22.1% of total Community electricity consumption by 2010, a share which was to be produced from renewable energy.

- By HG 1535/2003, Romania adopted the "Strategy for capitalizing on renewable energy resources" which presents the advantages and potential of renewable energy sources in the European Union and Romania. It included an indicative program for capitalizing on RES in Romania. The necessary actions, financial resources (internal and external), responsibilities and estimated deadlines were also mentioned.

- By HG 1892/2004 (repealed by HG 1479/2009) established the system for promoting electricity produced from renewable energy sources (E-RES), thus stimulating the production of E-RES in Romania by applying mandatory quota systems combined with the trading system of green certificates.

- By HG 958/2005 (repealed by HG 1479/2009), for the amendment of HG 443/2003 on the promotion of the production of electricity from renewable energy sources and for the amendment and completion of the Government Decision no. 1.892/2004 for the establishment of the production promotion system electricity from renewable energy sources, the system of mandatory quotas was established, combined with the trading system of green certificates. The share of electricity produced from renewable energy sources in the gross national electricity consumption was changed from 30% to 33%. The green certificates market initially operated based on the ANRE Order 22/2006 on the Regulation on the organization of the green certificates market.

- HG 1069/2007 approved the "Romania's Energy Strategy for the period 2007-2020", in which the level of national indicative targets on the share of electricity from renewable energy sources in gross domestic electricity consumption in the perspective of 2010, 2015 and 2020 is 33%, 35% and 38% respectively.

- HG 750/2008 approved the "Regional state aid scheme for the capitalization of renewable energy resources" which regulates the financing granted to economic operators for making initial investments in order to capitalize on renewable energy resources for electricity and heat production.

- HG 1661/2008 approved the "National Program for increasing energy efficiency and the use of renewable energy sources in the public sector, for the years 2009-2010. This program co-

finances investment projects on increasing energy efficiency and the use of renewable energy sources, with local government authorities as direct beneficiaries.

- In order to reach the national target for 2020, Law no. 220/2008 regarding the establishment of the system for promoting the production of energy from renewable sources. Thus, a system was established to promote the production of electricity from renewable sources based on the imposition of mandatory electricity quotas, combined with the trading of green certificates. The promotion system is applied for electricity produced in units qualified by the National Energy Regulatory Authority - ANRE and delivered in the National Energy System, respectively: hydro energy produced in power plants with an installed capacity of up to 10 MW, put into operation or modernized since 2004, wind energy, solar energy, geothermal energy, biomass, biogas, waste fermentation gas, also called landfill gas, sludge fermentation gas from wastewater treatment plants. This law was amended and supplemented with the provisions: OG 29/2010, Law 139/2010, OUG 88/2011 approved by Law 134/2012, OUG 57/2013 approved by Law 23/2014, OUG 79/2013, HG 994 / 2013.

- HG 1479/2009 (repealed by OUG 88/2011) established the system for promoting the production of electricity from renewable energy sources, which provides that the system of mandatory quotas combined with the trading of green certificates is applied to promote electricity produced from renewable sources. Thus, E-RES producers can have revenues both from the sale of electricity on the electricity market and from the sale of green certificates on the green certificate market. Renewable electricity producers have also been exempted from paying for the imbalances caused.

- HG 835/2010 amended the "National Program for increasing energy efficiency and the use of renewable energy sources in the public sector, for the years 2009-2010", approved by HG no. 1661/2008. Thus, it was decided to reduce the funding of the National Program 2009-2010 and to change the deadline for the submission by the beneficiaries of the investment projects of the documents for establishing the eligibility.

- In accordance with the provisions of Decision COM C (2011) 4938 final of July 2011, in order to reduce overcompensation and so that the scheme does not lead to some undue competitive advantages, Romania has assumed the obligation to monitor the costs and revenues of the producers benefiting from the support scheme.

- By Decision COM C (2015) 2886 of May 2015, Romania notified a set of measures that led to changes in the system for promoting energy production in RES

In 2009, Directive 2001/77 / EC was replaced by Directive 2009/29 / EC which decided that Member States should contribute to the 20% target for energy produced from renewable sources in gross final energy consumption. To this end, each Member State negotiated the target it wanted to assume with the European Union, adopting a National Renewable Energy Action Plan (PNAER) by the end of June 2010. Thus, the directive 2009/28 / EC, in PANER, Romania has assumed a target of 24% energy produced from renewable sources in final energy consumption.

In 2017, The Council of the European Union has reached a general agreement between Member States and set a target of 27% renewable energy in 2030 at EU level. The European Parliament has proposed that in 2030 at EU level the target be 35% energy from renewable sources.[7]

The "Energy - Climate Change 2020" legislative package, adopted by the European Council, sets targets for the EU for 2020, also known as the "20-20-20 targets", namely[34]:

- reducing GHG emissions at EU level by at least 20% compared to 1990;
- a 20% increase in the share of renewable energy sources (RES) in total EU energy consumption, as well as a 10% target for biofuels in energy consumption for transport;
- a 20% reduction in primary energy consumption, to be achieved by improving energy efficiency, compared to the level of consumption in the absence of these measures.

Romania, by modifying the National Integrated Plan for Energy, Climate Change, has assumed the modification of the target of energy produced from renewable sources to over 30% of the internal energy consumption provided by renewable resources by 2030. Implementing this

objective is essential to attract investment and non-reimbursable funds, as well as the creation of new jobs.

*Biomass resources for energy production*

In Romania, more than 60,000,000 tons of biomass/year can be produced, from which, by using conversion technologies, over 280,000,000 MWh of electricity and heat can result. The Energy Strategy of Romania (SER) for the period 2017-2020 (updated for the period 2011-2020) has established as a key objective for 2020 the increase of the renewable share in the final gross energy consumption to 24%.

Our country has favorable environmental conditions for a wide variety of renewable sources with great energy potential. Renewable energy sources in Romania are presented in the table below:

Table 1: The national potential of renewable sources in Romania

Renewable energy source	Energy potential	Energy equivalent energy (thousand toe)	Application
Solar energy			
-terme	60x106GJ	1433.0	Thermal energy
-fotovoltaic	1200 GWh	103.2	Electricity
Wind power	23000 GWh	1978.0	Electricity
Hydroelectric power of which:	40000 GWh	3440.0	Electricity
-under 10 MW	6000 GWh	516.0	Electricity
Biomass and biogas	318x106G	7597.0	Thermal energy
Geothermal energy	7x106GJ	167.0	Thermal energy

Source: National Action Plan in the Field of Renewable Energy (PNAER) - 2010

On the Romanian territory, the distribution of renewable energy resources depends on the physical-geographical characteristics. Thus, the plains and low hills of the south and southeast of the country have resources of solar energy, wind and biomass, the west of the country has most of the geothermal resources and mountainous areas concentrate significant resources of biomass and microhydro.

Depending on the costs of use, the volume of resources, the technologies used, the most convenient renewable resources for electricity production are hydroelectric power plants including micro hydropower plants, wind turbines and cogeneration plants that use biomass, and for heat production are biomass and solar energy.

Biomass is a reliable and renewable local energy source, with which fossil fuels can be replaced. Being the main fuel used in rural areas, biomass is used for space and water heating, as well as for cooking. It covers about 7% of primary energy demand and about 50% of Romania's renewable resources potential. Given that fossil fuels come from biomass, it follows that biomass can easily be transformed into solid, liquid or carbon-based fuels.

Energy produced from biomass includes any solid, liquid or gaseous fuel or any electricity or product derived from organic matter, either directly from plants or indirectly from industrial waste derived from plants, commercial and urban waste or agricultural and forestry residues.

Biomass sources that can be used for energy production are:

- Wood (forest timber, wood residues, etc.)
- Agricultural residues (straw, rice husks, fibrous matter remaining after sugar cane or sorghum stalks, olive waste, etc.)
- Energy crops (mischantus, panicum virgatum, etc.)
- Solid municipal waste, waste fuels, liquid waste and organic waste.

The energy incorporated in biomass is released by various methods. The technologies for energy use of biomass are:

- Direct combustion in boilers with heat generation.
- Advanced thermal conversion of biomass into a secondary fuel, by thermal gasification or pyrolysis, followed by the use of fuel in an engine or turbine.

- Biological conversion to methane by aerobic bacterial digestion.
- Chemical and biochemical conversion of organic matter into hydrogen, methanol, ethanol or diesel fuel.

The use of biomass as an energy resource has economic, social and ecological benefits, among which we mention:

- continuous energy, renewable annually, inexhaustible
- safety and economic sustainability
- ensures total energy independence
- has the lowest generation cost comparable to any other renewable energy source
- creating new jobs
- ensures quality thermal comfort at a low price
- non-polluting energy, because by drying it is processed into pellets, briquettes or chopped, becomes storable and can be stored for a longer period of time
- helps to dispose of waste
- ensures effective ecological protection for the population and the environment
- by using advanced technologies, it can be transformed into energy efficient, economical and environmentally friendly

The disadvantage is that carbon monoxide is released by combustion

## CONCLUSIONS

In Romania, obtaining renewable energy from biomass occupies an increasingly important place in national energy strategies. The energy obtained from biomass is in different stages of technological and commercial development.

Biomass is the most widespread and most abundant renewable energy resource in Romania. This represents the biodegradable part of the products agricultural waste and residues, including plant and animal substances, forestry and related industries, as well as the biodegradable part of industrial and urban waste. [6]

Biomass can be used for several purposes and its energy use has many advantages, including:

- the use of biomass for energy promotes a change in society towards improving the efficiency of the use of sustainable biomass resources and energy autonomy;
- maximizing the reduction of greenhouse gases by replacing fossil fuels (coal, oil, gas) with biomass;
- is an ecological solution for the energy needs of local communities (electricity, heat or urban cooling)
- is an effective solution for the disposal of solid agricultural, industrial and household waste, thus reducing emissions of carbon dioxide and nitric acid;
- electricity from biomass has the lowest cost of generation compared to other renewable energy sources;

The future of the European Union's energy policy - climate change aims to:

- ensuring the functioning of energy markets in conditions of competitiveness;
- ensuring the energy security of the European Union;
- promoting energy efficiency and energy saving;
- development and promotion of renewable energy sources;
- minimizing greenhouse gas emissions;
- developing and promoting the interconnection of energy networks

## BIBLIOGRAPHY

1. National Energy Regulatory Authority - ANRE - Order no. 22/2006 on the approval of the Regulation on the organization and functioning of the green certificates market
2. <https://www.britannica.com/science/renewable-energy>
3. European Commission - Decision COM C (2011) 4938/July 2011
4. European Commission - Decision COM C (2015) 2886/May 2015
5. Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market
6. Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community
7. [https://www.economica.net/lovitura-de-la-guvern-pentru-verzii-care-spera-la-noi-subventii-romania-nu-si-a-asumat-o-noua-crestere-a-target-of-regenerabile\\_152402.html](https://www.economica.net/lovitura-de-la-guvern-pentru-verzii-care-spera-la-noi-subventii-romania-nu-si-a-asumat-o-noua-crestere-a-target-of-regenerabile_152402.html)
8. HG no. 1844/2005 on the promotion of the use of biofuels and other renewable fuels for transport
9. Ministry of Economy, Energy and Business Environment - European and National Legislation <http://energie.gov.ro/home/informatii-de-interes-public/surse-regenerabile-de-energie-in-romania/legislatie-primara/>
10. Official Monitor of Romania no. 288/24 April 2003 - HG 443/2003 on the promotion of the production of electricity from renewable energy sources (10 April 2003)
11. Official Monitor of Romania no. 736/19 October 2011 - Emergency Ordinance no. 88/2011 on amending and supplementing Law no. 220/2008 for establishing the system for promoting the production of energy from renewable energy sources
12. Official Monitor of Romania no. January 8/7, 2004 -HG no. 1535/2003 regarding the approval of the Strategy for capitalization of renewable energy sources (December 18, 2003)
13. Official Monitor of Romania no. 1056/ November 15, 2004 -HG no. 1892/2004 for establishing the system for promoting the production of electricity from renewable energy sources (November 4, 2004)
14. Official Monitor of Romania no. 843/7 December 2009 - DECISION no. 1,479 of November 25, 2009 for establishing the system for promoting the production of electricity from renewable energy sources
15. Official Monitor of Romania no. 843/15 September 2004 -HG no. 1429/2004 Regulation for the certification of the origin of electricity produced from renewable energy sources (September 2, 2004)
16. Official Monitor of Romania no. 4/4 January 2012 - Decision no. 1232/2011 for the approval of the Regulation on the issuance and pursuit of guarantees of origin for electricity produced from renewable energy sources
17. Official Monitor of Romania no. 809/6 September 2005 -HG no. 958/2005 amending Government Decision no. 433/2003 on the promotion of the production of electricity from renewable energy sources and amending and supplementing Government Decision no. 1892/2004 establishing the system for promoting the production of electricity from renewable energy sources (18 August 2005 )
18. Official Monitor of Romania no. 843/7 December 2009 - Decision no. 1479/2009 for establishing the system for promoting the production of electricity from renewable energy sources
19. Official Monitor of Romania no. 628/29 August 2008 -OG no. 22/2008 Ordinance on energy efficiency and promoting the use of renewable energy sources by final consumers (August 20, 2008)
20. Official Monitor of Romania no. 574/1 August 2014 - Law no. 121/2014 on energy efficiency
21. Official Monitor of Romania no. 781/19 November 2007 -DECISION no. 1,069 of September 5, 2007 on the approval of the Romanian Energy Strategy for the period 2007-2020
22. Official Monitor of Romania no. 543/18 July 2008 -HG no. 750/2008 Regional state aid scheme for the capitalization of renewable energy resources
23. Official Monitor of Romania no. 858/19 December 2008 -HG no. 1661/2008 Decision on the approval of the National Program for increasing energy efficiency and the use of renewable energy sources in the public sector, for the years 2009-2010
24. Official Monitor of Romania no. 577/13 August 2010 -Law no. 220/2008 for establishing the system for promoting the production of energy from renewable energy sources
25. Official Monitor of Romania no. 616/31 August 2010 -OG no. 29/2010 on amending and supplementing Law no. 220/2008 on establishing the system for promoting the production of energy from renewable energy sources (August 30, 2010)
26. Official Monitor of Romania no. 474/9 July 2010 -Law no. 139/2010 on amending and supplementing Law no. 220/2008 on establishing the system for promoting the production of energy from renewable energy sources
27. Official Monitor of Romania no. 736/19 October 2011 -OUG no. 88/2011 on amending and supplementing Law no. 220/2008 for establishing the system for promoting the production of energy from renewable energy sources. (October 12, 2011)
28. Official Monitor of Romania no. 505/23 July 2012 -Law no. 134/2012 for approval OUG no. 88/2011 on amending and supplementing Law no. 220/2008 for establishing the system for promoting the production of energy from renewable energy sources

29. Official Monitor of Romania no. 335/7 June 2013 -OUG no. 57/2013 on amending and supplementing Law no. 220/2008 for establishing the system for promoting the production of energy from renewable energy sources
30. Official Monitor of Romania no. 390/29 June 2013 -OUG no. 79/2013 on amending and supplementing the Law on Land Improvements no. 138/2004, for the completion of OUG no. 82/2011 on some measures for organizing the land improvement activity, as well as for the amendment of letter e) of paragraph (6) of Article 3 of Law no. 220/2008 for establishing the system for promoting the production of energy from renewable energy sources
31. Official Monitor of Romania no. 788/16 December 2013 -HG no. 994/2013 regarding the approval of the measures to reduce the number of green certificates in the situations provided in art. 6 para. (2) lit. a), c) and f) of Law no. 220/2008 for establishing the system for promoting the production of energy from renewable energy sources
32. Official Monitor of Romania no. 574/12 August 2010 - DECISION no. 835 of 11 August 2010 on amending the National Program for increasing energy efficiency and the use of renewable energy sources in the public sector, for the years 2009-2010, approved by Government Decision no. 1661/2008
33. National Renewable Energy Action Plan (PNAER) - National Renewable Energy Action Plan 2020
34. Romania's Energy Strategy for the period 2007-2020 updated for the period 2011-2020 [http://mmediu.ro/new/wp-content/uploads/2014/01/2012-07-31\\_evaluare\\_impact\\_planuri\\_proiectstrategiaenergeticaromania.pdf](http://mmediu.ro/new/wp-content/uploads/2014/01/2012-07-31_evaluare_impact_planuri_proiectstrategiaenergeticaromania.pdf)
35. [https://ro.wikipedia.org/wiki/Energie\\_regenerabil%C4%83](https://ro.wikipedia.org/wiki/Energie_regenerabil%C4%83)