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THE IMPORTANCE OF USING RENEWABLE ENERGY IN THE FORM OF BIOMASS

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Abstract: Currently, many countries in the world face the serious consequences of global warming, such as: floods, landslides, excessive heat during summer, drought and many others. The material consequences of climate changes on the economy, on human life and on the environment are very serious. Human activity overloads the atmosphere with carbon dioxide and other emissions that cause global warming, capture heat, slowly increase the planet's temperature and have a significant and harmful impact on our heath, on the environment and on the climate. The increase of providing renewable energy would allow replacing energy sources that have high carbon emissions and would lead to the reduction of global warming. The paper presents aspects regarding the importance of using renewable energy, as alternatives to using conventional energy sources (coal, petrol, wood, etc.).
Keywords: renewable energy, global warming, greenhouse gas, biomass

INTRODUCTION

Nowadays, more and more countries worldwide are confronting the consequences of global warming, such as floods, storms, landslides, excessive heat during summer, drought and others. The material consequences of climate changes on the economy, on people's lives and on the environment are very serious. Global warming by 1.8 - 4.0° C by 2100 could lead in this century to a rise in the sea level of 18-59 cm. According to the Stern Review, climate changes, caused by greenhouse gas emissions from the energetic sector, are considered as being "the greatest and the widest-ranging market failure ever seen" and a major threat to the global economy [1, 8].

Greenhouse gas emission is a serious threat in terms of producing climate changes, with potentially disastrous effects on humankind. The use of renewable energy sources (RES), together with improving energy efficiency (EE) can contribute to reducing fuel consumption, reducing greenhouse gas emissions and, therefore, to preventing dangerous climate changes [3].

These two severe problems – energetic crisis and the impact on the environment – represent global humankind problems whose solution lies on the shoulders of engineers. Because the world is so dependent on energy, because the majority of the world population uses fossil fuels to satisfy their energetic needs, a fact causing a high degree of pollution for the environment, arises the strict need to search for new sustainable and environment friendly sources of energy. All traditional energy sources used pollute the environment, whereas renewable energy is basically devoid of this negative effect of polluting the environment.

The potential of renewable energy sources is huge, because these sources can surpass many times the global demand for energy. Renewable energy sources such as biomass, wind energy, solar energy, water energy and geothermal energy can supply sustainable energy services, based on the regular use of available native resources. The transition towards renewable energy systems seems more and more possible as their costs decreases while the price of oil and natural gas continues to fluctuate [9].

Human activity is overloading the atmosphere with carbon dioxide and other emission that cause global warming, capture heat, slowly increase the planet's temperature and have a significant and harmful effect on our health, on the environment and on the climate. The increase of supplying renewable energy could allow replacing the energy sources

that have high carbon emissions and could lead to the reduction of global warming.

MATERIAL AND METHOD

The use of renewable energy is one of the most effective ways to ensure a more clean character to the supply of energy. Numerous citizens desire to be better informed about what renewable energy sources mean and how they can use them optimally. Romania has the capacity to produce energy from a multitude of sources, but the most important are biomass and water energy, as shown in table 1.

Table 1 [10]. Renewable energy production in Romania by type

Energy type	2010	2011	2012	2013
	-equivalent for 1 ton of oil-			
Water energy	1709.6	1266.4	1037.5	1286.1
Wind energy	26.3	119.3	227.0	388.7
Solar energy	0.1	0.0	0.1	0.2
Photovoltaic energy	0.0	0.1	0.7	36.1
Solid bio-fuels (excluding coal)	3900.0	3475.9	3795.1	3656.7
Biogas	3.1	13.1	27.3	19.6
Urban waste (reusable)	0.0	0.0	0.0	0.2
Bio-gasoline	35.4	34.8	42.5	26.5
Biodiesel	10.8	94.1	88.7	120.8
Geothermal energy	23.0	23.8	23.3	26.0
TOTAL renewable energy	5708.3	5027.5	5242.2	5560.9

Different sources of renewable energy are situated in different stages of technological and commercial development. In favorable conditions, wind energy, water energy, biomass and solar-thermal energy are viable alternatives from the economic point of view. Other types, such as photovoltaic energy (the production of electricity from sunlight using silicon panels) require an increase in demand in order to improve their economies of scale [7].

EU has committed, to reduce, by the year 2050, greenhouse gas emissions by 80-95% compared to the levels registered in 1990, in the context of the necessity to reduce emissions by developed countries. In the 2050 energy perspective, the Commission examines the challenges linked to fulfilling the EU objective in terms of decarbonisation ensuring, in the same time, the safety of energy supply and the competitiveness.

Table 2 [5, 6]. The share ofrenewable energy ingross final energyconsumption

Country	RE share in 2005 -%-	RE share in 2012 -%-	Objective on RE share for 2020 -%-
Romania	17.8	22.9	24
Total EU-28	8.7	14.1	20

In the view of the year 2050, the European Commission announces very ambitious targets for reducing greenhouse gas emissions with 80-95% and relies especially on reducing them by increasing the share of energy from renewable sources.

Romania has a diversified, but reduced quantitatively range of fossil and mineral resources for primary energy: petrol, natural gas, coal, uranium, as well as an important potential of renewable resources that can be valorized.

Romania remains an economy with a big consumption of energy, despite the tendency to decrease registered in recent years (a decrease of energy consumption of 36.4% between 1999 and 2010, and as an effect of reducing industrial activity due to the economic crisis).

Table 3 [5, 6]. Final energy consumption in Romanian Households %

Product	2007	2008	2009	2010	2011	2012	2013
Total petrol products	8.0	3.7	4.0	2.9	3.0	2.5	2.6
Gas	27.5	27.1	26.8	27.2	29.7	31.6	31.7
Solid fuels	0.1	0.6	0.2	0.1	0.2	0.3	0.3
Electric energy	11.9	11.1	11.8	12.0	12.7	12.8	13.2
Renewable energy	35.8	42.5	42.5	43.7	40.2	40.9	40.4
Derived heat	16.7	14.9	14.7	14.0	14.3	11.9	11.7

According to the Romanian Energetic Strategy for the period of 2007-2020, the national potential for renewable energy sources is estimated at 14,718 ktoe and is larger than Romania's import of primary energy in 2010 (11,239 ktoe) and is as follows:

- Solar thermal energy - 1433 ktoe;
- Solar photovoltaic energy - 103 ktoe;
- Wind energy - 1978 ktoe;
- Water energy - 3440 ktoe;
- Biomass and biogas - 7597 ktoe;
- Geothermal energy – 167 ktoe.

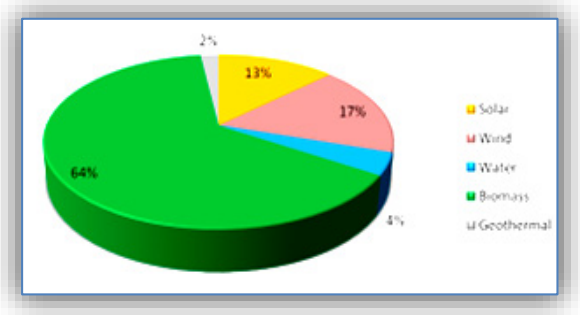

Figure 1 –Romania's renewable energy potential [12]

For Romania, harnessing the potential of renewable energy sources aims at increasing the safety of energy supply by diversifying sources and decreasing the share of imports of classic energetic

resources, aiming at a sustainable development for the energetic sector and the protection of the environment. Reducing the dependency for imports of energy resources is a goal all the more important as strategic documents in the field (among which The Romanian Energetic Strategy for 2010-2035) brings forward the perspective of an increase of the dependency for energy imports from about 35-40% presently to 60-70% on medium term, if the current structure and dynamics of consumption are maintained.

Biomass is the biodegradable part of products, waste and residues from agriculture, including plant and animal substances, forestry and related industries, as well as biodegradable part of industrial and urban waste (Definition given in HG 1844 from 2005 on promoting the use of bio-fuels and other renewable carburant for transport).

Biomass comprises all forms of plant and animal material grown on the surface of the earth, in the waters or on waters, as well as substances produced by biological development.

Biomass is the most abundant renewable resource on the planet and includes absolutely all the organic matter produced by the metabolic processes of live organisms.

Energy stored in biomass is released through various methods, which however, represent the chemical process of burning (chemical transformation in the presence of molecular oxygen, which is an exergonic process).

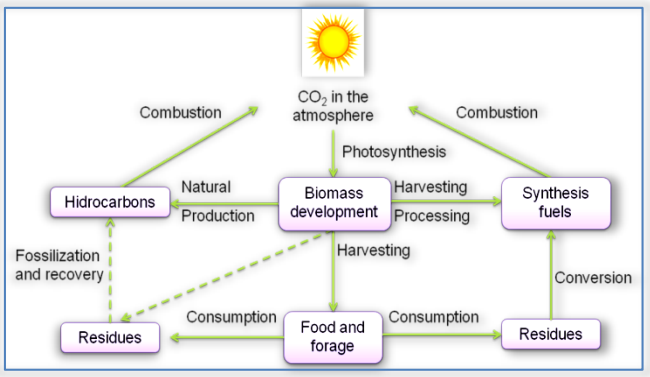

Figure 2 – The circuit of biomass energy [2]

There is a large variety of sources of biomass, among which are counted the fast growing trees (poplar, willow, eucalyptus), sugar cane, rape, fast growing herbaceous plants and various types of residues, such as wood from trimming trees and from constructions, straws and stems of cereals, residues resulting from wood processing, paper waste and used vegetable oils. The main biomass resource is however represented by wood.

RESULTS

The use of biomass has several advantages: offers an efficient solution for eliminating solid household residues and reduces emissions of carbon dioxide and nitrogen acids by replacing coal in thermal plants, thus contributing to decreasing environment pollution. Also, is presents an economic benefit. According to a study conducted by the Institute of Political Economy of Energy and Environment, conducted by specialist from the Bocconi University in Milano, electricity produced using biomass has the lowest cost of generating compared to any other source of renewable energy.

Fresh biomass is used for the production of energy, for nutrition and as raw material for the industry, but these applications imply a powerful interaction with the biosphere and its damage. Heat production from biomass is carried out through combustion processes, whose efficient production requires prior drying, the energy necessary for this process being significant in ratio to the energy value of the product, being recommended to use solar energy for drying biomass.

Table 4 [10]. Forecasted production of electric energy from renewable sources for 2015 compared to 2010

Renewable energy sources	2010 (GWh)	2015 (GWh) -estimates-
Solar energy	1860	1160
Wind energy	314	1001
Water energy – total, out of which: Low power hydro-energy (max. 10 MW)	18200 1100	18700 1600
Biomass	1134	3654
Geothermal energy	-	-
Total	22608	26115
Share of ERES in the consumption of electric energy	30.00%	30.40%

Wet biomass represents biomass with a relatively high content of water and a low content of lignin. Wet biomass is adequate for the production of biogas by anaerobic conversion due to these composition properties.

Dry biomass is represented by biomass with a high content of lignin and a low content of water. This type of biomass is not adequate for anaerobic treatment in the purpose of producing biogas, because the content of lignin cannot be converted anaerobically and so it does not contribute to the conversion into useful energy. Due to the low content of water, these residues are ideal for thermal use. For this purpose, the following types of residues are used: residues from forestry, community waste or trees and bushes cut from private properties, old wood, wood waste and fire wood.

Regional distribution of dry biomass (wood) in Romania varies: approximately 90% of the fuel wood and 55% of wood residues are found in the area of the Carpathians and Sub-Carpathians. Over

54% of agricultural waste is found in the South part of Romania and in Moldavia [11].

In Romania, large quantities wood residues in the form of small pieces are found, but it lacks the organization of collecting and transporting them. Studies conducted show that these waste represent highly valuable resources.

Biomass is currently used in Romania for the production of heat, especially in furnaces (0.8 – 4 kW) for cooking and heating water. 95% of biomass is used like this at the moment, the rest of 5% being used industrially to generate hot water and steam, for example in wood processing factories. The average installed power for industrially used biomass is from 3.3 MW to 4.7 MW.

Renewable energy can be used for all energy requirements: producing electricity, transport and household heating. Different types of renewable energy can be used in different ways, not all being adequate for every application. Water energy and wind energy are used exclusively for generating electricity, while other sources, such as biomass (organic matter), geothermal energy and solar energy can be used both for electricity and for heating.

CONLUSIONS

Romania has wide research experience in the agricultural field, including in cultivating biomass. There is a strong scientific base that can be used for improving the existing energy plants and introducing new plants in plantations.

The optimal valorization of biomass can contribute to increasing revenues from agricultural exploitations.

Forestry exploitations can supply an important quantity of biomass from forestry waste (branches etc.) to which are added those resulted from wood processing (wood chips, sawdust).

In Romania there is a high quantity of agricultural waste (ex. straws) available for producing bio-fuels.

The high costs of energy require finding a solutions for reducing them, by valorizing local resources (much cheaper).

Currently, the problem of replacing fossil fuels is heavily posed, both from the point of view of reducing CO_2 emissions, but also as an alternative to the inherent decrease of fossil fuel reserves. The demand for natural resources has grown rapidly, surpassing long-term capabilities ensured by the planet.

The main difference between the two forms of energy is the following one: fossil fuels can only be transformed into usable energy after thousands of years, while the energy from biomass is renewable, being possible to use it year by year. The simplest method of producing heat from biomass is that of burning it. This method is known as direct combustion. Other technologies used to convert biomass into usable energy include: gasification, combined combustion and modular systems.

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