BIOMASS AS A RENEWABLE ENERGY RESOURCE IN ROMANIA

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Rezumat. Romania prezintă un potenţial ridicat de biomasă pentru producerea de energie electrică şi termică, în principal din fondul forestier şi agricultură. Această lucrare prezintă principalele surse de biomasă, utilizarea actuală, dezvoltarea şi o prognoză pentru producerea de energie electrică şi termică până în 2020.

1. ACTUAL BIOMASS UTILIZATION

Romania has a great biomass energy potential, evaluated at about 7600 thousand toe/year resulting from forestry and fire wood wastes, wood-sawdust wastes and other wood waste, agricultural waste resulting from cereals, corn stems, vine wastes, biogas and urban domestic waste.

Biomass is currently used for heating purposes. The potential market for biomass applications is very large but specific stimulants will be needed in order for this potential to be realized.

Direct burning in the kilns, stoves for space heating, cooking and hot water preparation is about 95 % of the biomass use. These furnaces have a nominal capacity between 0.8 kW to 4 kW and are hand stocked and have low energy efficiency and generate high noxious emissions (CO, CO_2, NO_x).

Burning in thermal plants to generate industrial steam and hot water in sawmills and in other industries equals about 5 percent of biomass usage.

The biomass sector in Romania is characterized by a twofold regional distribution; about 90 % of fuel wood and 55 % of wood waste is found in the Carpathians and Sub Carpathians. About 54 % of agricultural wastes are found in the South Plain and Moldavia. About 52 % of biogas is found in the South Plain and the Western Plains.

Large amounts of small-sized wood is obtained in wood industry, but utilization of this wood for energy purposes is insufficient due to difficulties related to gathering, processing and transportation; these wood wastes are economically viable resources.

Small percent of the energy from biomass is generated in relatively modern installations. Some industrial units, especially in the wood processing industry, have acquired industrial boilers for steam and hot water preparation from biomass (including sawdust) and at the same time, several towns in the mountains introduced hot water boilers for district heating running on wood fuel and biomass residuals.

In Romania there are more than 550 small industrial hot water and steam boilers running on fossil fuel with wood co-combustion and 10 hot water boilers between 0.7 MW and 7MW for heating (totaling 45MW).

By 2005 six towns have 32 MWt urban heating installations running on wood fuel in operation or are under construction.

2. ACTUAL BIOMASS POTENTIAL

Biomass potential is regionally distributed over Romania. Fuel wood and wood waste is mostly found in the Carpathians and Sub Carpathians, while agricultural waste is available in the South Plain and Moldavia, biogas in the South and Western plains.

The basic biomass resources from Romania are the following:

Forest background

The total area of the forests is about 63.700 km^2 of which 60 % in the mountains. The total volume of wood in the Romanian forests is about to 1.6 billion m^3. The average annual growth of the forests is 33.000 thousand m^3 per year. The exploitable potential is about 22.000 thousand m^3. The waste resulting after wood-cutting consists of branches less than 3 centimeters thick, knots, and roots. So far in Romania the technologies for the knots and roots recovery have not been utilized.

Fuel wood comes from parts of the cut tree crowns that have no industrial utilization and parts of the wood to be processed but whose quality is low (is damaged, rotten, etc.).

Wood waste from industrial wood processing that can be utilized as sources of energy are: the bark, trunk pieces, sawdust, veneer waste, wood dust. Their volume is great (about 50 % of the processed wood amount) but most of them are utilized as secondary raw material in wooden plates manufacturing and cellulose industry.

In the case of the waste resulting from forestry and the fuel wood, we considered a volume of exploitable wood with an average density of about 750 kg/m^3.

Taking into consideration the average humidity of the waste resulting from wood processing, we considered the LCV (low calorific value) to be about 14.000 kJ/kg.

Fig. 1. Energetic potential allocation of biomass.

Agriculture

The area of agricultural soil in Romania is about 148.000 km^2, of which 94.200 m^2 is arable land. The residues from agricultural crops could be entirely utilized as fuel. Considering the possibilities of collecting and baling it in order to be transported the following types of agricultural waste could be utilized: straw, stems, corncobs, grapevine cords.

From the industrial processing of industrial plants the waste that could be utilized as energy sources consists of sunflower seed husks, hemp and flax dust. Considering the average moisture content of the agricultural waste the LCV (low calorific value) was considered to be about 18.000 kJ/kg.

Biogas results from the anaerobic fermentation of organic waste such as: manure, organic waste from the food industry, organic mud from the food industry, slurry (mud) from the used water treatment stations.

Energetic potential allocation of biomass in Romania's counties is presented in figure 1.

3. BIOMASS APPLICATIONS

There are good opportunities for biomass development in Romania.

Biomass applications for biomass can be grouped into the following main segments:

• substitution of part of the fossil fuels in existing district heating schemes (wood chips);

• enhanced uses of biomass as industrial fuels (wood chips and logs as industrial fuel for steam or hot water boilers) instead of oil;

• improved uses of biomass for new district heating schemes for small towns and villages near the resources, in the countryside, where the population has no access to central co-generation or gas supply;

• uses of straw and other agricultural by-products in appropriate biomass boilers for heat supply of farms and small villages (in the medium term);

• the top priority is the use of biomass for thermal applications, substituting oil. Assuming an available biomass energy supply, district heating systems represent the most immediate and low-cost biomass application in Romania especially CHP plants, industrial co-generation and co-firing;

• the most promising regions for the agricultural waste utilization are the South Plain and the West Plain where agricultural production is high;

• in the Carpathians Mountains and Sub Carpathians area where firewood and wood waste are available, there are opportunities to develop district-heating plants;

• the expected development of the wood industries will encourage the rehabilitation of the existing boilers from the existing auto producer's thermal plants which account about 550 steam boilers, or the construction of the new ones.

4. PROGNOSIS OF BIOMASS ENERGY EVOLUTION

The available forecast for energy generation from biomass up to 2020 is based on two models:

- BAU scenario - "Business-as-usual" models the future development based on present policies with existing barriers and restrictions (BAU)
- Policy scenario - models the future evolution based on the currently available best practice strategies of EU member state (PS)

The figures 2, 3, 4 and 5 present a possibility for electricity and heat generation from renewable energy resources based on these scenarios.

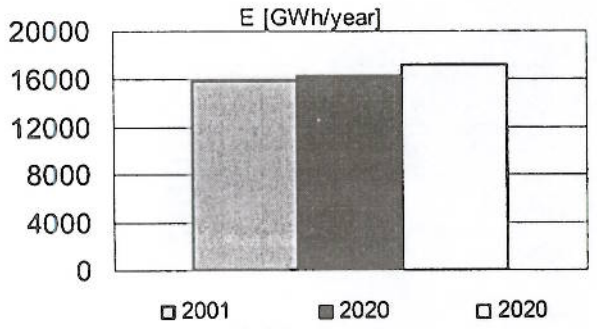

Fig. 2. Electricity generation from RER (BAU).

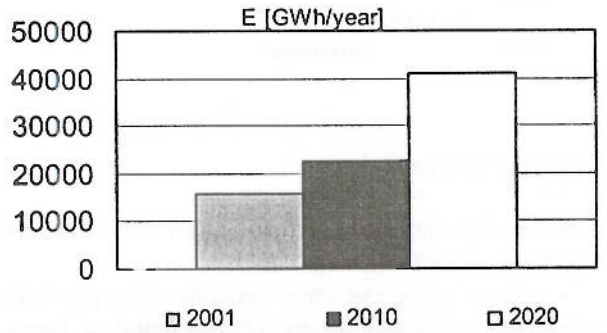

Fig. 3. Electricity generation from RER (PS).

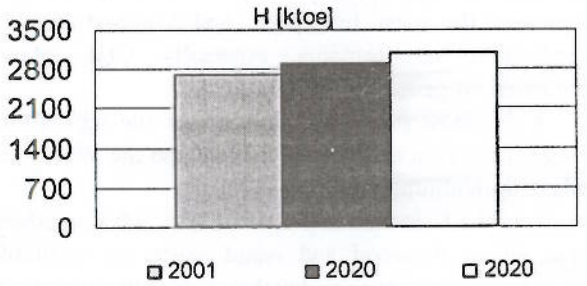

Fig. 4. Heat generation from RER (BAU).

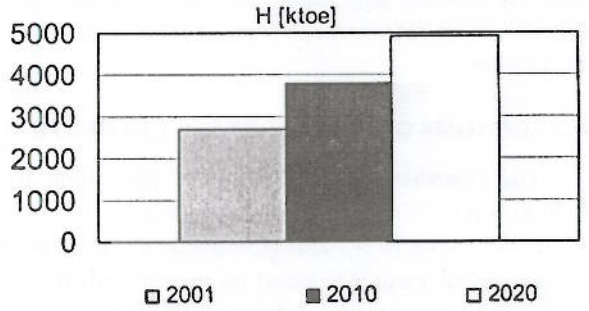

Fig. 5. Heat generation from RER (PS).

The values for electricity and heat generation presented in the foregoing figures can be obtained using Romania's renewable energy resources potential as presented in the next figures:

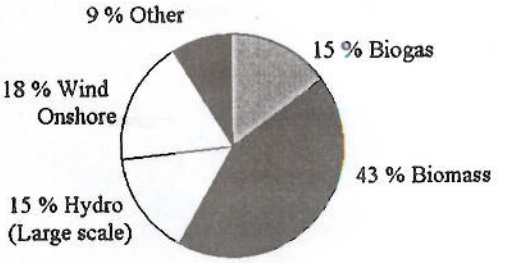

Fig 6. RER quota for electricity production in 2020.

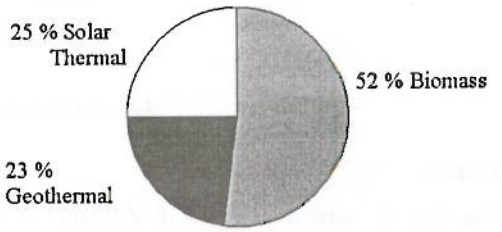

Fig. 7. RER quota for heat production in 2020.

According to figures 6 and 7, biomass represents the most part of RER.

4. CONCLUSIONS

Biomass is the most important renewable resource in the Romanian territory. Traditionally, it has been used by the rural population and on the towns' outskirts, but with traditional equipments and technologies.

The potential market for biomass applications is very large but specific stimulants will be needed in order for this potential to be realized.

EU technologies for energy production using biomass can be implemented without special modifications.

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