OPPORTUNITIES AND CHALLENGES OF FOREST BIOMASS UTILIZATION

Dóra Szalay – Viktória Papp

Institute | **University of Sopron, Faculty of Forestry, Institute of Forest and Environmental Techniques**
Bajcsy-Zsilinszky u. 4., Sopron 9400, HUNGARY

INTRODUCTION

Lignocellulose biofuels can be produced from a wide range of raw materials including agricultural by-products, forest residues, and other non-food crops such as short rotation coppices (SRC). The dendromass from forest residues is characterized by high bark content, which generates a high ash amount during utilization. Bark content adversely affects both biochemical and thermochemical processes; so their use for liquid lignocellulose biofuels is a particular challenge. It is questionable whether it is a good solution to build new plants with high investment costs, or rather dendromass from forest should be utilized directly to the base material supply of combined heat and power production in the near future. During the work, we made a calculation to determine the amount of obtained electricity from one ton dendromass and the distance, which can be reached with electric vehicles.

MATERIAL AND METHODS

Our calculations were based on statistical and special literature data, and on complex analysis of the regulatory background.

- We were considering the data of both CHP and only electric power plants.
- During our calculations, the distance that can be reached by electric car projected for the use of 1 ton of biomass.
- For electric vehicles, we assumed an average fuel consumption of 20kWh/100km.
- At the determination of the amount of accountable energy, we used the multiplier defined in RED II. The energy content such as forest residues defined in Part A of its Annex IX, is only recorded at double multiplier for lignocellulose biofuels. However, the contribution of dendromass-based electricity to road transport has to be taken into account by a multiplier of four.

Main characteristics of two Hungarian biomass power plants (based on the data Veolia, 2018)

Power plant	Base material	Efficiency of energy conversation (total) η_t [%]	Effective efficiency (electricity to network) η_e [%]	Effective efficiency (heat + electricity to network) η_{e+th} [%]
Szakoly	woody	28.4	25.4	25.4
Pannongreen	woody	45.9	26.6	40.7

The annual raw material consumption and heat and electricity production:

- Szakoly: 140-150 kt/yr woodchips
  133 GWh electricity
- Pannongreen: 400 kt/yr dendromas
  312 GWh electricity
  167 GWh heat

RESULTS AND CONCLUSION

Commercially available technologies for the production of lignocellulose biofuels are not yet ready to contribute extensively the goals of renewable fuels through economical operation. In the near future, meeting the growing energy demand of transport may be mainly with increasing of renewable electricity production, because of lower investment needs. One of the main solution can be to use biomass with decentralized CHP plants with ecological benefits and relatively stable availability. The results show that it can be reached 39-45 km distance with use of 1 ton of wood-based biomass electricity by car. The length of the way can be much longer in the case of plant generated only electricity. But it is by no means negligible from the point of view of energy efficiency that the examined CHP plant generates an additional 1498 MJ of thermal energy from each ton of dendromass.

The amount of electricity can be production from 1 ton of wood and the distance, which can reach with electric vehicles

Average consumption of electric vehicle: 20 kWh/100 km

Product	Technology	Energy-content [10^{-4} ktoe]	Distance [km]	Multiplier (RED II)	Account [10^{-4} ktoe]
Electricity (Szakoly)	Electric power plant	0.79	45	4	3.16
Electricity (Pécs)	Combined heat- and power plant	0.67	39	4	2.68

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Source :Veolia (2018): Erőműveink, https://www.veolia.hu/hu/letesitmenyeink