

BIOMASS – A RENEWABLE ENERGY RESOURCE USED IN AGRICULTURE AND FORESTRY OF SLOVAKIA

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Abstract: *Non-renewable energy resources are producing 10% of the energy consumption in Slovakia. Primary energy consumption from fossil and nuclear fuels have to be reduced by 66% until the year 2050, although the consumption of renewable energy will be increased. At the present the most important renewable energy source – biomass, represents 0.2% of the total energy consumption. Biogas from different kind of organic waste is used just at a few farm or sewage treatment plants. Straw is burned for energy production at one locality. From the total amount of wood waste only 20% is utilised for energy or material input and bio-oil is produced at seven power plants throughout Slovakia. The reason of the limited biomass energy utilising is insufficient know-how of community about the feasibility of the opportunity evaluation.*

Key words: *biomass, renewable energy, Slovakia*

INTRODUCTION

Slovakian non-renewable energy resources are producing 10% of the energy consumption. In general, our own fossil energy resource is only brown coal, which has unfavourable effect on environment. At the present time level of extraction their stocks are for 25 years. The rest sources - as oil, natural gas or nuclear fuel, are imported from Russia [1]. The new energy policy of Slovakia for the future was prepared in 1997 [11].

By the year 2050 primary energy consumption in Slovakia has to be reduced by 66% to 60 GJ per person and year, from which fossil fuels will be reduced in 2050 by 83%, up to 25 GJ/person/year and by the year 2010 nuclear fuels will be excluded as energy source. As a some kind of compensation will serve enormous renewable energy consumption increase by 1566%, from 2.1 to 35 GJ/person/year [5]. At the present, share of utilised renewable energy represents 3,3% of total primary energy consumption. Almost all renewable energy comes from hydropower, since the rate of the most perspective energy resource - biomass is 0.2% [2]. According to NGO the biomass potential for Slovakia is 92 PJ/year. Supreme item is represented by energy plants, whose contribution to the energy balance can be 50 PJ yearly [1]. Energetic use of biomass in Slovakia is available from several sources as communal wastes, wood wastes, liquid biofuels, agricultural wastes and energy crops [5].

LAYOUT

1. Alternative use of agricultural waste and surpluses

Cereals are grown on 800,000 ha of arable land in Slovakia with straw production of 3 million t and one third of it is waste [2]. The theoretical potential of the straw, as an agricultural waste, produced yearly by the Slovak agriculture is approximately 2 mil. tons a year. The theoretical potential in case of its combustion in cogenerative units represents 1.6 bil. kWh of electric energy and 4.8 bil. kWh of thermal energy a year [5]. In spite of it the only experimental power plant on straw burning in Slovakia is the Agrozet in Zvolen. Now the straw is used mainly for agricultural purposes or it is exported to Austria [3]. An enormous energy potential is contained in biogas - from the animal produced excrements, as other kind of agricultural waste [5]. In fact, biogas is used only in few farms, e. g. in Bátka [2]. One of the newest biogas plants is at the farm of the Slovak Agricultural University in Nitra [8].

The biogas is also utilised in several sewage treatment plants, e. g. in Nižná or Dolný Kubín. The biogas potential of Slovakia is 15 PJ (10% from manure, 5 from other resources, mainly from water sewage treatment plants) but most farms are too small for processing organic waste. It means that the suitable biogas potential of Slovakia is only 5 PJ. There are problems with utilization of biogas technologies, because the contemporary technology is very expensive and the farmers are worried about the future of animal breeding in Slovakia. The production of biogas is 0,3-0,45 m³ from 1 kg of solid waste [2].

We produce 40 000 tons of communal organic wastes yearly also usable in production of biogas. From this amount we could recover 0.3 bil. kWh of electric energy [5]. Industrial and municipal solid wastes are reclaimed in plant specialised to alternative use of waste in Pezinok with production of 0.5 PJ. It was a first plant of this character in Central Europe [9].

2. Use of wood biomass

The forests cover 42% of the Slovakian area and thus wood wastes represents a big potential from a viewpoint of energy accumulation [2]. A large potential for biomass based projects are especially in the wood processing industry, having a considerable heat demand and high availability of low cost wood residues [12]. The wood wastes production in Slovakia is 2.3 million ton per year with energy potential of 27 PJ. Unfortunately only 20% of it is used for energy or material output. The annual production of wood bricks is 18.000 ton, but 90% of it is exported [9, 10].

3. Organic fuel production

A special category is represented by the cultivation of energetically usable rapidly growing wood species and plants with a possible annual profit of 4 PJ [5]. In Slovak conditions the most perspective energy plants are the fast growing trees for burning (experiments at Research Institute of Grasslands in Krivá na Orave [4] or at the Slovak Agricultural University in Nitra [6]), plants suitable for ethanol production by fermentation and plants rich in oil e. g. oil-rape. The rate of input and output energy in energy plant production is 1:1 or 1:1.3 for oil-rape and 1:5 for sugar-sorghum (equal to 11 ton of oil from 1 ha) [2]. There is already available technical equipment for the production of 5500 tons of bio-oil/year [2]. Seven power plants have been built to produce „bionafta“ (bio-petroleum or bio-oil) in Slovakia (5 with 500 t annual production and 2 with 1500 t production) [3]. The bionafta called MDT (30% esterificated oil MERO made from plants + 70% mineral oil) was successfully tested in Slovakia [4]. Gas station OMV Slovakia, Ltd. is a single one distributor of bio-oil in Slovakia, but the sales are still relatively small, in spite of lower price [7].

The planned area for energy production plants is limited to 400.000 ha (with energy potential of 100 PJ sufficient for heating of all houses in Slovakia) [2].

CONCLUSIONS AND FUTURE WORK

The most important fuel and energy resource in Slovakian condition, which could easily replace fossil and nuclear energy, is the biomass. More than 73% of the biomass arise from wood waste, since 42% of Slovakian area is covered by forest. However, in spite of incessant conventional energy resources decreasing and deterioration of the environment status, we are not giving sufficient attention to mentioned matter in question. At this time of switch-over to sustainable energy and endeavour for environmental awareness, we also have to solve the problem of peoples insufficient informing about the feasibility of biomass utilising at all.

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