THE BIOMASS

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ABSTRACT

Biomass is considered an important energy resource in many developing countries. The investigation of biomass supply options is often an integrated part of regional development projects all over the world. Increased environmental-political opposition to the use of fossil fuels and nuclear energy has led to growing focus on renewable energy sources. Biomass from agriculture and forestry and industry is an important renewable energy resource. Bioenergy is a strategic resource used in the work to fulfil the Kyoto agreement to replace fossil fuels and to mitigate green house gas emissions and the global climate change. Many countries already use a significant share of biofuels in their energy supply. To reach the EU goal of 12 % renewable energy by 2010, the European bioenergy production must rise by 861 TWh (74 Mtoe).

1. BIOMASS ENERGY UTILIZATION IN EUROPE

Wood-fuel is the dominant biofuel in the European region and markets are established in some of the countries like Sweden, Austria, Finland and Denmark. Other countries like Germany, the Netherlands and the UK are very expensive areas for wood energy utilisation. In central parts of Europe traditional use of wood fuel is still dominant even if new trends with investments in industrial use is coming up. [1]

Currently, 3% of the energy production in the European union on average is based on the use of wood biomass. The utilization of biofuels has been widely adopted in the Nordic EU countries and in Austria in which 10-20% of energy production is based on renewable bioenergy.

In order to introduce large-scale wood energy systems for the changing societies in Europe, a strong emphasis has to be put on the key elements of the energy sector. Security of wood fuel supply, reliable energy conversion technology, provision of supporting services for new energy applications (such as transportation of pellets to maintain boiler, burner and feeding devices), price competitiveness, and improved fuel quality are necessary preconditions for sustainable production and marketing. This is a real challenge for international Research and Development organisations and institutions that work in the bioenergy sector.

The EU´s plan to double the share of renewable energy production from 1995 to 2010 through development of a new industry is calculated to generate 900 000 additonal jobs, of which 515 000 would be from the increased use of biomass fuels. This will especially provide opportunities for rural areas in Europe to improve livelihoods and reduce migration of people from the countryside to cities. Production of ‘green energy’ can be based to a great extent on the existing skills and knowledge of local people.

EU countries have commited themselves to reducing their greenhouse gas enissions in the Kyoto Protocol first commitment period (2008-2012) by 8% from 1990 levels. Increasing the use of renewable energy sources such as wood, to replace fossil fuels, can substantially contribute to meeting these greenhouse gas reduction targets. In addition, biofuells could replace electricity for heating purposes entirely – at least in the Nordic countries. Switching from electricity to biofuels in heating applications would provide the opportunity to utilize the great potential of electricity in, for example, industrial processes.

A cost effective method to significantly reduce CO_2 emissions in Europe is to replace power generation based on coal condensing plants with cogeneration of electricity and heat from biomass. [2]

2. EXISTING BIOMASS ENERGY STUDIES

The review established that many existing studies are partial or opaque, although based at least partially on LCA methodology. There is a wide range of relative transparency and treatment and use of disaggregated and aggregated data. Equally, the full range of possible techniques are used in allocation, as well as, in some studies, no allocation at all. Indeed, the main outcome of the critique of existing studies is the dual observation that transparency is essential but often lacking, and approaches to allocation are often partial, implicit, arbitrary and,

hence, confusing and misleading. In particular, practitioners often mix procedures (and terms) to address allocation in different studies and different parts of the process chain. For example, the following terms are used variously to describe varied approaches to allocation by substitution; "expanding the systems boundaries", "specifying reference systems" and "using substitution credits".

For example, in one biodiesel study, relatively transparent, complete details are provided for the derivation of primary energy inputs, however, only partial details are provided for the calculation of CO_2 emissions, and no other greenhouse gas emissions are considered. The allocation procedure adopted for the main results is based on the calorific values of all co-products (rape straw, rape meal and glycerine), although none of these are used as a fuel currently. Another study is a comparative assessment of emissions of road transport fuels, which includes a high level of transparency and evaluation of the effects of allocation procedures. However, allocation by price, consistent with the associated economic assessment, is not considered. In general, this work updates that of the earlier ETSU (now Future Energy Solutions) report. Hence, it may be affected by some of the data weaknesses of the earlier work.

A further study includes a range of different allocation procedures (calorific value, mass and price) are considered, and their effects on results are demonstrated. However, the main results are based on a mixture of allocation procedures (mass for raw rapeseed and rape straw, price for rapeseed oil and rape meal, and biodiesel and glycerine), and not all are logically consistent. Kaltschmitt & Reinhardt include detailed LCA calculations of several biofuels (wood residues, short rotation coppice, perennial grasses, cereals, bioethanol from several sources, rapeseed oil and rape methyl ester). Greenhouse gas emissions have been calculated in a consistent and relatively transparent manner. In addition, comparisons and sensitivity analysis are included, and a vast range of citations and references are used. Allocation is achieved using various methods, although the main option chosen is based on price.

One of the most transparent biofuels studies establishes a standard method for describing the process chain and reporting calculation procedures and reference sources. Allocation of relevant primary energy inputs and greenhouse gas emissions outputs is based on market prices. The explanation for this is included, namely, that "Typically, substitution is preferred ... However, many of the co-products of biofuel technologies have no separate main means of production ... In the absence of a physical basis for partitioning, it becomes necessary to use an allocation procedure based on the relative economic value of main and co-products".

In summary, then, the review process revealed that there are various ‘problems’ with existing studies, not internally, but in terms of their potential use in development of the BIOMITTRE Tool, and in the extent to which clarity, transparency, and a standardised approach are achieved currently. Such problems mean that many of these studies do not provide directly comparable results, since the approaches taken to greenhouse gas and cost-effectiveness calculations varies, as does the standard of data upon which these calculations are based. [3]

3. BIOMASS UTILISATION IN SLOVAKIA

Heat generated from biomass is cheaper. On the other side, the monopoly of housing corporations in district heating exists and they do not opt for decreasing prices of heat for final consumers, because they have their market secured.

Considering the present situation and premises, present prospects for using biomass for electricity production are lapsing of effect. Therefore the aims and measures for the support of biomass use on the national and regional levels should be oriented mainly to the use of biomass for heating.

The combined production of heat and electricity appears to be the most advantageous. But by reason of energy effectiveness (since the technology are new and costly) it is necessary to consider bigger units with a total output of at least 10 MW in the planning of such demonstration investments. At the same time, the waste heat off-take must be ensured in the sufficient amount also during the summer months, whether for hot supply water

production or other technology usage. It requires thinking about the construction of such unit in some city or within a suitable industrial establishment.

The purchase price of the electricity generated from the renewable energy resources (biomass) must be increased from present 0,033 per kWh at least to the 0,060 EURO per kWh to improve the competitiveness of biomass CHP plants in comparison to other electricity resources supplying the electricity grid in Slovakia. [4]

Biomass is most promising renewable energy source (RES) in Slovakia. Nowadays, using of renewable energy sources is more and more discussed question. The main reason for these discussions is increasing price for production and supply of heat what is important problem for mayors of municipalities, directors of schools or companies as well as for all inhabitants in Slovakia. The high contribution to the solving of the problems could bring development of renewable energy sources utilisation, including biomass. The greatest share of technically usable potential out of all renewable energy sources is covered by biomass (42 %) with the greatest potential of wooden biomass.

Despite the high usable biomass potential in Slovakia, present utilisation of biomass is low. Biomass share on the total primary energy consumption is less than 3%. In accordance with the Conception of Utilisation of Renewable Energy Sources, the present utilisation of biomass figures only 2,6% of the total primary energy consumption. Just approx. 17 % of the technically usable potential of renewable sources in Slovakia is used, still vast potential of energy remains unused accordingly.

The greatest share of technically usable potential out of all renewable energy sources is covered by biomass (42 %), which corresponds to the annual energy value of 40,453 TJ. The potential of biomass for energy purposes is mainly in generation of heat. Considering the conditions in Slovakia, the estimation of utilisation of forest and agriculture biomass, wood residues and food processing waste is feasible.

Table 1 Technically usable potential in TJ / year

Sort of biomass	Technically usable potential	Present Use	Present use	Unused potential
	TJ/year		%	TJ/year
Biomass	40 452	12 683	31,35	27 770
Forest biomass	6 710	1 778	26,5	4 932
Wood processing industry	15 861	9 497	59,9	6 364
Agriculture biomass	8 359	216	2,6	8 143

Source: Conception of Development of Renewable Energy Sources, 2003

Table 2 Economic and market potential of biomass in TJ

	Economic potential	Market potential
Individual boilers	1 998	40
District heating networks	6 156	1 242
Electricity through CHP	1810	520
Wood processing industry	1 274	950
Domestic waste	630	187
Total	11 868	2 932
% of technically available potential	42,7 %	10,6 %

Source: Energy profile of SR, Austrian Energy Agency, 2003.

Nowadays in Slovakia, apart from the general declaration of the biomass use support in almost all national politics, the over-elaborated detailed strategy is still missing, as well as consecutive measures and actions on the

national and regional levels. It implies also the legislation absence, which should regulate in details the terms of biomass and other renewable energy sources utilisation. No study aiming on cost calculation (market prices) of different renewables for heat and electricity generation in connection with achievement of RES share target on 2010 on national level has been elaborated. [5]

The possibilities to produce energy out of biomass/biogas are in Slovakia rather good as the available annual biomass potential is more than 35 PJ. But its utilization is markedly behind any potential possibilities. The annual energetical value of the used biomass is approximately only 9 PJ (i.e. 25 % from the total potential). A full utilization would enable to cover approximately 5 % of the primary power sources consumption, mainly on the local and regional level (the current state is only 1 %).

According current statements a main source of the biomass is traditional fuel wood. Values and proportions of the particular sources on the available biomass potential are given in the hereinafter figure.

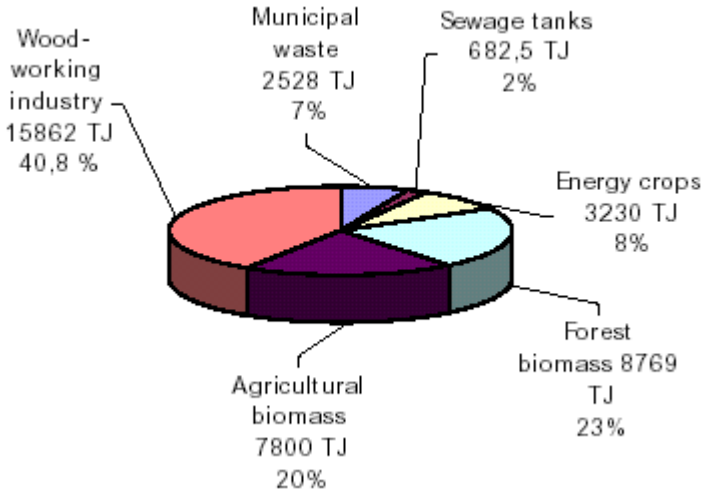

Fig. 1: Available potential of biomass in Slovakia (Uni Nitra, 2003)

Concerning business environment, in Slovakia there has not been any precept of law to ensure the purchase cost of the electrical power produced specially from the biomass yet. Only the acquisition cost for purchase of the electricity power produced by small-scale producers has been stated. Currently it is 1, 45 Slovak crowns / 1 kWh .

Relatively low prices of the fossil fuels act unincentively against the biomass energy utilization. Supporting the traditional energy sources (gasofication by the Slovak Gas Industry) the state becomes dependent on the fuels import. In case of the brown coal the state subsides into the mining are about 200 millions Slovak crowns what is, related to the current extent of coal-mining, more than 50 Slovak crowns per 1 ton of brown coal. [6]

4. CONCLUSIONS

Currently, 3% of the energy production in the European union on average is based on the use of wood biomass. Heat generated from biomass is cheaper. Considering the present situation and premises, present prospects for using biomass for electricity production are lapsing of effect. Therefore the aims and measures for the support of biomass use on the national and regional levels should be oriented mainly to the use of biomass for heating. Biomass is most promising renewable energy source (RES) in Slovakia. Considering the conditions in Slovakia, the estimation of utilisation of forest and agriculture biomass, wood residues and food processing waste is feasible.

5. REFERENCES

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