



Biomass usage opportunities in Lithuanian energy sector in the context of Kyoto protocol requirements

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Global greenhouse effect and climate warming are caused by the anthropogenic (direct result of human activities) gases emissions. The main greenhouse gas (GHG) is carbon dioxide (CO₂). It is the natural component of air (0.33 %). Since the beginning of industrialization, the CO₂ amount in the atmosphere has increased about 25 %, because of more intensive coal, natural gas, fuel oil usage.

The main reason of CO₂ emissions is the combustion of fossil fuels. Therefore, the CO₂ emissions related to the energy consumption in all sectors. A reduction of these emissions can be achieved by two manners, by reducing the energy consumption or by developing and implementing less polluting systems of energy production.

Lithuania, with a total area of 65,200 km² and population of 3.7 million, is one of the three Baltic States. Lithuania ratified Kyoto protocol in 2002. It has the obligations to reduce these emissions to 8 % of the 1990 year level by the 2008 – 2012. It is foreseen that the average annual CO₂ emissions in 2005-2007 will be only 54.6 % of the Kyoto protocol requirements.

The main reasons of this fact are the following. Lithuania declared its independence from the Soviet Union in March 1990. Following the break-up of the former Soviet Union, Gross Domestic Product (GDP) in 1992 contracted by 38 % in Lithuania. A national banking crisis in 1996 slowed economic recovery, but now consumer's demand has recovered, and the economy is growing. During the transitional period, the industrial sector collapsed by more than half as a consequence of a Russian fuel blockade, and the loss of traditional Soviet markets. That is why there was a significant reduction of CO₂ emissions comparing to the 1990.

Nowadays about 70% of the residential house area in Lithuania is heated from district heating (DH) systems. There are ~ 50 DH companies of different fuel types and capacities in the country. A single monopolistic company of electricity production, transmission and distribution "Lietuvos Energija" was replaced by two electricity generating, one transmission and two distribution companies. One large dam on the Nemunas River for hydropower generation and one Kruonis Pumped Storage Power Plant (PSPP) have been built in Lithuania. A nuclear power station has been built in Ignalina (NPP), in the east of the country. It is the main source of electricity in the country is the Ignalina NPP, which generates cheaper electricity than thermal power plants (CHP) using fossil fuel. The total installed electricity-generating capacity exceeds the present domestic needs of Lithuania by 3 times. That is why a large amount of electricity is being exported.

Lithuania became a member country of European Union in May of 2004. One of the requirements for Lithuania in order to enter EU was the Ignalina NPP closure. Upon the closure of the both units (first block in 2005, second in 2010) of the Ignalina NPP the necessary measures must be in order to ensure the least costs of the development and operation of power and district heating systems, as well as higher reliability of electricity supply. These changes will cause the rise in CO₂ emissions in Lithuania for sure, that is why it is necessary to plan implementation of "cleaner" fuel to use in DH, CHP, or PP.

Nowadays a new market of international emission trading (one of the mechanisms of Kyoto protocol) is forming. It means that each energy device being of more than 20 MW capacity will get the permission of certain emission amount per energy unit produced. In case it exceeds this limit, the additional amount of emission can be bought. So, all companies, using environmental friendly fuel will have an additional profit for each produced energy unit. The fines are also foreseen in case companies avoid participating in this market.

Concerning Lithuanian situation, it has a lot of advantages in case this trading system starts working from 2005, as it has "free CO₂ amount", which companies can sell. It is foreseen that the average annual CO₂ emissions in 2005-2007 will be only 54.6 % of the Kyoto protocol requirements. If no emission reduction tool are implemented this number could be 7 % higher.

The international emission trading market has a positive impact to the pay-back time of investments in environment friendly technologies, as well as the opportunity to reduce rather high heat or electricity prices for consumers. So, this incentive creates good conditions for biomass usage, as this kind of fuel is considered to be CO₂ neutral.

Biomass is CO₂ neutral energy source, because the amount of CO₂ absorbed during photosynthesis corresponds to the amount emitted when the biomass is subsequently converted to be one of the major causes of the greenhouse effect. It means CO₂ is taken from the atmosphere and used by plants to grow. When these plants die and decay or are burnt, this CO₂ is released back in to the atmosphere. It is available under various forms - wood chips, wood pellets, straw, industrial wood waste, energy crops, biogas, firewood, etc. Usage of biomass has other advantages, such as fuel import reduction, new workplace creation and so on.

Today energy amount produced from biomass takes about 6 % of all primary energy consumption in the Lithuania. It is expected to raise this number till 8-9 % by the year 2010. The conditions for biomass implementation in Lithuania are very suitable: ~30 % of the territory is covered by forests, lower price comparing to the fossil fuel, relatively not expensive technologies for producing energy from biomass. The middle and eastern parts of Lithuania are richer of biomass resources, while western region is in rather poor conditions. Biomass takes the leader position comparing to other renewable energy resources among the implemented projects. The total installed capacity of plants, where biomass is used, is about 251 MW now.

Biomass implementation is a matter of the national priority, to be determined by the Lithuanian government. Currently many laws are established to stimulate biomass implementation. National Energy Strategy, National Program of Energy Efficiency Increase, Law of Energetic, Heat Law, Biofuel Law, Biofuel Production and Consumption in 2004-2010 Program, Environmental Protection Law, etc. should be mentioned among them. But still there is a gap between the legislation and implementation in reality.

At this time, 6.9 TWh has been exploited of the available 9.8 TWh biomass technical potential in the country. The potential of other similar projects is discussed, moreover where the connection to natural gas network is not planned. This solution could have positive impact on diversification of energy sector in Lithuania, as well as fuel import reduction, especially after Ignalina NPP closure.

According to the Danish Energy Management 2003 year final report on Enhancement of the Use of Local and Renewable Energy Sources in Lithuania, biomass market is dependent on the natural gas and fuel oil prices in the future. As the new alternative, straw the technical potential could rise from 0.99 TWh in 2002 till 7.05 TWh in 2020. Another idea is to plant energy crops on the unused areas, which take about 800 000 ha

of the territory. All in all, according to the mentioned report, from plant biomass it would be possible to produce 27.2 TWh in the nearest future: from the wood – 7.5 TWh, from the straw – 1.9 TWh, from the energy crops – 17.8 TWh.

Unfortunately, these results can remain only foreseen ones, as some threats for biomass usage exist in Lithuania. For example, there are plans to build cellulose plant in Lithuania and it would distort the biomass market because of changed demand and consumption. The same is about plans to build large CHP plant based on biomass in Vilnius. This intentions caused confusion for smaller biomass DH companies, especially in closer to Vilnius regions, as there is a risk of fuel lack. Growing biomass demand in the country, as well as its active export, can lead to the higher biomass prices in Lithuania. We can already observe this tendency during the last few years. It is very serious obstacle for biomass implementation, as investors are not willing to take such a risk of investing in technologies, that use this kind of fuel.

The growth of the biomass prices can be stopped by the supply side intensity, rather than demand side reduction. Also biomass import from Byelorussia is foreseen. This could lead to the more active biomass market, following the better quality of all included services.