

BIOMASS FOR SUSTAINABLE DEVELOPMENT IN LATVIA

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Introduction

The paper describes the present situation of biomass and other renewable energy resources utilization in Latvia, as well as the possibilities for future development. Perspective Latvian energy consumption was worked out according to the renewable energy resources utilization, taking into consideration possible level of efficient use of these resources with promoting modern technologies and with ecological aspects of the energy sector development.

Latvia is located at the eastern part of the Baltic Sea. Latvia is bordering Estonia to the north, Russia to the East, Byelorussia and Lithuania to the South and the Baltic Sea to the West. The area of Latvia is approximately 63,700 km². Along the Baltic Sea the climate is mostly coastal climate with mild winters and chilly summers. In the eastern part the summers are warmer and the winters colder.

1. Energy Supply

Latvia is not rich in natural energy resources. We do not have gas, coal and, for the time being, also oil resources of its own. Firewood, peat, and hydro resources are the only significant local energy resources. The amount of electric energy produced in Latvia does not meet the demand; consequently part of power has to be purchased from the neighbouring countries - Estonia, Lithuania, Russia. About 70% of the energy resources are imported, therefore to promote the use of local and renewable energy resources in Latvia is essential.

Table 7. Primary energy resources supply in Latvia

Energy resources	1990	1998	1999	2000
	PJ	PJ	PJ	PJ
Gas	106	43.8	46.0	50.7
Oil products	193.2	69.1	65.7	50.5
Coal	26	4.3	3.6	2.8
Import of electricity	13	1.9	7.0	6.4
Electricity hydro	16.3	15.5	9.9	10.2
Wood	15.5	37.7	38.2	34.3
Peat	4.2	3.0	1.5	2.4
Other	4.6	0.2	0.9	1.8
Total	378.8	175.5	172.7	159.1

Some positive changes are observed in the structure of total consumption of primary energy resources, owing to the increasing consumption of domestic energy resources. Increasing prices of imported energy resources explains this tendency and also role of energy efficiency

measures. In 2000 the part of domestic (wood and peat) and renewable (small hydro and wind) energy in total energy supply was 24.6 %.

The comparison of Primary energy and Electricity supply by years is shown in Table 1 and 2.

Table 2. Electricity supply in Latvia

Components of Electricity supply	1997	1998	1999	2000
	GWh	GWh	GWh	GWh
CHP	1547.7	1348	1350	1312
HPP	2952	4302	2758	2828
WPP	1.55	1.8	2.1	4.42
Import (Net) of electricity	1822.7	530	1955	1778
Total consumption	6323.95	6181.8	6035.1	5922.42

2. National policies and frame conditions for renewable energy use

The process of renewable energy resources using is associated with the corresponding legislation in the area of energetic and environmental protection that should be put in good order, mainly as concerns taxes, subsidies and prices. The existing Energy Law cannot solve problems completely, although, in accordance with paragraph 40 of the Energy Law, a licensed electrical energy distribution utility shall purchase within its license area surplus electrical energy from small hydro power stations with installed capacity up to 2 MW, wind power plants with capacity up to 2 MW, and solar energy equipment, which have been put into operation until the 1st of January 2005. This regards the remainder of produced electricity after consumption for the own needs of the producer and corresponds to the electricity standards established in the state. This surplus electricity is purchased within the period of eight years from the moment the plant operation began at the price that equals the double average sales tariff for the electrical energy. After expiration of the above period the purchase price of such surplus electrical energy will be equal to the single average sales tariff.

In accordance with the Energy Law energy consumer shall have the right to choose the most convenient type of heat supply complying with the binding regulations issued by the relevant municipality and considering determined heat supply development perspective in the municipality territory.

Municipalities shall organize heat supply within their administrative territories in the course of performing the permanent functions as defined in legislation and:

- provide conditions for efficient operation of district heating systems and fuel supply;
- do heat supply development forecasts and planning in compliance with administrative territory development, environmental protection, culture monument protection and other conditions;
- determine heat supply development perspective within the administrative territory planning process, taking into account environment protection and culture monument protection regulations, possibilities for use of local fuel and evaluating security of heat supply and long term costs and approve such perspective with the Regulator;
- for the purpose to implement heat supply development perspective municipalities shall define the areas where district heating systems shall be maintained and developed and where energy consumers shall have the right to choose other type of heat energy supply;

- co-ordinate heat supply type of new objects corresponding to approved conception of heat supply development;
- co-ordinate extension of heat supply objects and construction of new heat supply objects in the administrative territory corresponding to approved conception of heat supply development.

3. Biomass for Energy

The National Program on the Development of Power Engineering of Latvia is drafted for 15 years and it defines a set of activities to provide people of Latvia with a stable energy supply, both in terms of quantity and quality, at possible lower cost providing at the same time innovation and development of energy systems and reduction of their environmental impact. The main goal of Energy sector activities in Latvia that corresponds to climate change mitigation policy as well is an increase of energy efficiency, switching to the local and renewable energy resources where it is verified.

Biomass of firewood occupies the most important place among domestic and renewable energy resources.

The main goal of Latvia's forestry activities which corresponds to sustainable development, and that means the forest and forest land management and use in such a way, which retains its biodiversity, productivity, renew ability, vitality as well as its present and future potential to contribute to ecological, economical and social sphere at a local, national and global level, and which is not hazardous to other ecosystems.

To ensure the conservation of the area of existing forests, the following main principles have been started in the forest Policy Plan:

- to restrict the transformation of forest land into other land-use systems;
- to promote the afforestation of abandoned agricultural lands through different kinds of state's instruments, including subsidies.

Consideration of these principles would allow the forest area in Latvia to be increased to about 48-52% of the total country's area till the year 2020.

The aim of forest management is that the utilization of the forest resources today does not reduce future possibilities for forest utilization. The establishment of new stands must follow harvesting of mature stands. Latvian forests are regenerated either naturally or artificially. Seeding or planting has reforested 70% of clear cutted area and 30% area usually net wet peat soils and good quality broad-leaved stands are regenerated naturally.

The main part of the energy resources consumption is energy consumption for heat production. In accordance with the Energy Law energy consumer shall have the right to choose the most convenient type of heat supply complying with the binding regulations issued by the relevant municipality and considering determined heat supply development perspective in the municipality territory.

Latvia heat supply is based on municipal heat utilities. Boiler houses of industries and private companies provide part of heat supply. One-third part of all boiler houses in Latvia using already now biomass as the main or reserved fuel. At present firewood as fuel is predominantly used by household in rural area and recently it's also used at the boiler-houses. The forests are the most important nature wealth in Latvia. The area covered by forests is calculated estimated at about 28840 km² equal to 44.9 percent of the country territory.

Biomass potential in Latvia is from forestry and wood industry – firewood, felling residues and wood wastes from mechanical wood processing, field crops residues - straw.

Although the present, as well as forecasted price for fuel wood are low in Latvia the higher transportation costs make the present use of wood for energy production profitable in places,

where the biomass resource is located not far from the biomass utilization unit. With the price of oil and gas becoming higher and with more efficient biomass burning equipment using the wood is expected to become more economically attractive.

The total potential of wood fuel availability including firewood, forest residues, brushwood and wood processing residuals is shown in Table 3. If the sawn milling production increases according to the forecast the wood fuel availability will increase to 5.77 Mm³.

Table 3. Potential volume of wood fuel in Latvia (million m³)

	1997	2000		2010		2020	
		Technical potential	Energy use	Technical potential	Technical potential	Technical potential	Technical potential
Allowable cutting	8.34	9.29		10		12	
Wood fuel total	2.88	5.4	5.1	5.42	5.18	5.77	5.21
fire wood	1.5	2.5	2.5	1.63	1.63	1.81	1.81
tops and branches	0.6	0.7	0.6	0.8	0.8	0.9	0.8
Precommercial thinning	0.5	0.6	0.6	0.79	0.75	0.86	0.7
wood processing residuals	0.18	1.3	1.2	1.7	1.6	1.7	1.5
brushwood	0.1	0.3	0.2	0.5	0.4	0.5	0.4

The main barriers for the forest residue exploitation are:

- transportation cost as well as harvesting/handling cost are very high compare with the real price of the forest residues at the user facility;
- there are no regulations or directives which could affect collecting of forest residues.

At present "Production of Wood and Wood Products" is one of the biggest industrial sectors in Latvia. It is mainly oriented towards the external market. This almost the only sector of Latvian industry where production outputs have gone up twice compared to 1990.

Part of the wood wastes (wood chips, other wood wastes) are using directly in the wood-processing and furniture enterprises as a fuel for their own boiler houses.

Technical potential of wood wastes for energy use was estimated and defined as 6.9 – 10.8 PJ per year for year 2005-2010.

International programs financially supported favoured introduction of modern technologies in Latvia for heat production from wood by the governments of Denmark and Sweden. Within the framework of these programs the following wood-chips fired boiler houses are either reconstructed or constructed in Malpils – 4 MW (1994), Balvi - 2.4 MW (1993), Aluksne – 5 MW, Janmuiza (region of Cesis) - 3 MW (1994), Slampe – 3 MW, Rujiena – 1.5 MW, Gulbene – 4.5 MW (1994), Dubulti (in Jurmala) - 7 MW (1996), Rauna – 1.5 MW, Jekabpils – 1.5 MW, Viesite – 1.4 MW and Daugavgriva (in Riga) - 7 MW, Tukums – 10 MW (2003).

Latvian companies prepare wood-chips and export it to the EU countries. One of the fuel types that are produced from wood waste is wood waste bricks. Various companies produce them. Part of bricks is exported to Denmark and other countries.

Production of charcoal is one of the ways to utilize wood waste. Charcoal is very popular in the European and the Near East markets and it is exported. It is traded also in Latvia, one can buy a package of charcoal mainly in petrol filling stations. There are sufficient resources of raw material in Latvia, which suffice production of about 10÷20 th. tons of charcoal a year. At this stage a lot of small firms are involved in this business, 40 of them are united in the Association of charcoal producers.

4. Biomass from Agriculture

Use of bioenergy is exceptionally significant in such a country like Latvia, where there are scanty domestic energy resources.

It should be pointed out that due attention has not been paid until now in Latvia to cultivation of rapid growing tree plantations for energy industry purposes. It is possible to have such plantations, as there are areas of unused land in Latvia. Within some years when full cycle of wood waste usage is mastered, it could be topical to have rapid-growing tree plantations for wood biomass.

Of the total straw production only a small part is using now for energy purpose. The major part is used in agriculture' own production as bedding in livestock housing systems etc. It was realized first Straw Project in Latvia in 1999. Installed capacity of the boiler in Saulaine is 250 kW and with yearly straw consumption up to 1200 t.

Rape oil can be produced and used as a substitute for diesel fuel. On international scale this issue has been resolved theoretically and technically.

Working group that deals with use of biogas and biomass at Ministry of Agriculture has calculated if 15% of arable land in Latvia was used for rape cultivation and if oil presses were installed in farmsteads (small units and factories) it would result in annual production of 240 th. t diesel fuel substitute for competitive primary cost. The same process produces fodder additive of high value containing protein, oil and vitamins, as well as glycerin.

In the nearest future production of bio-ethanol (spirit) from grain, potatoes and sugar beets can be started as agricultural production branch. Production of spirit can be increased by 4 mill. deciliters upgrading the existing spirit production units. It would be sufficient to have 650 th. t of petrol with 5% ethanol content in the year 2005. Thus not only farmers will have guaranteed purchases in a limited market, but it will be also environmentally friendly solution, because of improved content of emissions. If petrol prices rise, ethanol produced from grain could become competitive.

5. Environmental aspects

As stated in the first National Communication of the Republic of Latvia under the UN Framework Convention on Climate Change in 1990 the CO₂ emissions in Latvia were about 83.1% from the total amount of the Green House Gas (GHG) emissions, and their main source was fossil fuel combustion for heat and power production. According to the first National Communication of the Republic of Latvia the annual GHG emissions in Latvia till year 2000 will not exceed the base level of 1990, even if no specific actions are undertaken. Main reasons for this are:

- transition from planned to a market economy after the year 1990 caused a considerable drop in the economic activities and energy consumption which resulted in the reduction of GHG emissions also;
- the energy efficiency has increased because of the competition and new price policy;
- replacement of obsolete production base with modern, environmentally sound technology, particularly in industrial and energy sectors is under way;
- it was forecasted that the area of managed forest will increase during 1990-2020 from 43% up to 52%, which will result in about 20% increase of CO₂ sequestration.

Conclusions

Key assumptions for expected Energy sector development in accordance with environmental aspects and optimization of the energy supply system are:

- switching to environmentally less hazardous fossil fuels;
- increase of share of cogeneration in DH production;
- improving the average efficiencies of CHP plants from 75-80% in 1994 to 84-86% in 2020;
- improving the efficiency of regional (small and medium) DH plants by 3-9%;
- reduction of heat losses in DH network from 20-25% to about 8% in 2020 and power transmission losses;
- increased use of biomass for DH production;

One of the goals of the energy policy and climate change mitigation policies in Latvia is the promotion of the development of renewable sources of energy - biomass energy, hydro-, wind- and geothermal energy.

Biomass utilization needs some changes in legislation system in Latvia, in technologies of biomass burning, as well as in biomass storage system and activities for biomass effective utilization should especially be aimed at the

- harmonization of the taxes, prices and tariffs;
- harmonization of the legislation in energy;
- implementation of the EU environment quality standards to reduce the NO_x, SO₂ emissions;
- certification of imported fuels and establishment of fuel quality control mechanism.

Legislation on energy sector should be perfected in the nearest years basically working in drafting of new laws and regulations in compliance with the government declaration and policy, requirements of external and domestic markets and development of power supply services in the state.

References

1. P.Shipkovs, G.Kashkarova, I.Purina. Role of Non-Traditional Energy Sources in Energy Balance of Latvia. "Experimenting with Freer Markets: Lessons from the Last 20 Years and Prospects for the Future" 21 International Conference of International Association of the Energy Economists. Quebec, Canada, Vol. 2, 1998, 165-173 pp.
2. G.Kashkarova, I.Apene, E. Lammer. How to mitigate climate change. Study on the assessment of policy and technology options in Energy and Forestry sectors in Latvia. Ministry of Environmental protection and regional Development of the Republic of Latvia. Riga, 1998, 135 pp.
3. P.Shipkovs, G.Kashkarova, D.Kashkarovs. Biomass Energy Strategies for Central & Eastern European Countries. Latvia- Country Report, 33 pp. CD FAIR CT 98-3826, "Development of a Bioenergy Market Development Plan for Central & Eastern Europe", Consolidated Progress report, UK, 1999.
4. P.Shipkovs, G.Kashkarova, J.Shipkovs. Solar Energy and other Renewables for Energy Conservation in Latvia in new Conditions – Energy Market Liberalization. Conference Proceedings of the International Conference NORTH SUN 2001, the Netherlands, May 2001.