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Perspectives for R&D in bioenergy in the Baltic States

Is there now a window of opportunity?

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What is bioenergy?

- In this context, bionenergy refers to the sophisticated use of plants and crops for energy purposes.
- The concept includes technological, agricultural, and institutional perpectives, e.g. new combustion technology or finding the optimal mix of crops for a particular purpose.
- Bioenergy is paticularly complicated because it combines technology, biology and social issues (such as agriculture)
- Biomass (i.e. products, waste, and residues of biological origin) can be used for heat and electricity generation or to produce fuels.
- Bioenergy has attracted increasing attention as a means to combat emissions of green-house gasses.

Bioenergy in the Baltic States

- The Baltic States use significant amounts of biomass especially for heating (16% in Estonia, 15% in Latvia, and 18% in Lithuania)
- Other use of bionenergy is insignificant
- The domestic resources are big in relative terms. The countries are sparsely populated with small towns and settlements and very few big cities. Becuase bioenergy has to be consumed near its source, this structure is almost optimal for giving it a key role in the energy systems of the Baltic States.

An example

- According to Swedish estimates a standard family house could receive its entire heat and electricity from 0.5 hectares with either poplar or willow (salix). The potential for salix production in Scandinavia on **superfluous** arable land is approximately 1.2 million hectares, which theoretically could produce energy to the extent 260 PJ or 70TWh annually. Total primary energy supply in Estonia only barely exceeds 200 PJ, while total electricity generation in Estonia is approximately 12 TWh annually.

Bioenergy developments worldwide

- Bioenergy is sometimes competing with food production for land.
- A main issue is thus to develop bioenergy from sources not requiring the use of fertile agricultural land.
- Forest and agriucltural residues and municipal waste are promising sources.
- Bioenergy is perceived an important piece of the energy puzzle in the EU, and in particular in the Nordic countries.

Facts favouring the use of bioenergy in the Baltic States

- Increased self-sufficiency in energy
- Bioenergy can be made environmentally friendly, especially reducing harmful emissions
- No long-haul transports are required because the source is usually near consumption (because of the absence of big cities)
- Bioenergy can provide jobs in the countryside

- Developing bioenergy can promopt R&D in technology, agriculture, biology and create an important domestic high-tech industry

Factors slowing down the introduction of bioenergy

- The base year for emission reductions was set at 1990. All of the Baltic States meet this target without particular efforts, because of the collapse of the Soviet-style industry.
- Bioenergy has to compete with other sources, often more entrenched (such as oil shale or nuclear power)
- Cooperation of the farmers is required, i.e. bioenergy is an issue of agricultural policies
- Bioenergy is new and partially unknown

Basic energy statistics

Table 2. Basic energy statistics 2006 in Mtoe1 **(with RES)**

Energy	Estonia	Latvia	Lithuania	Denmark	Sweden	Finland	Norway	Iceland
Total production**2**	3.86 (0.62)	1.85 (1.84)	3.26 (2.23)	29.52 (2.96)	32.34 (14.81)	18.11 (8.65)	223.66 (11.6)	3.26 (3.26)
Net Imports	1.88 (-0.10)	3.17 (-0.39)**3**	5.46 (-0.01)	-8.08 (0.30)	19.8 (-)	20.95 (-0.08)	-197.6 (0.03)	1.10 (-)
Gross Inland Consumption	5.42 (0.53)	4.63 (1.43)	8.43 (0.79)	20.91 (3.26)	50.34 (14.81)	37.82 (8.58)	25.03 (11.63)	4.35 (3.26)
Final Energy Consumption	2.77 (0.40)	4.20 (1.02)	4.72 (0.58)	15.63 (1.00)	33.22 (5.07)	26.68 (4.43)	18.39 (1.06)	2.38 (0.50)
Energy intensity (toe/MEuro* 100)	551	327	435	109	160	241	120	359

Emission statistics

Table 3. Emission of CO_2 (2007)

	Estonia	Latvia	Lithuania	Denmark	Sweden	Finland	Norway	Iceland	EU-27
CO_2 intensity (tCO_2/toe)	3.09	1.96	1.79	3.04	1.21	1.89	1.73	0.82	2.5
CO_2 emissions per capita (kg/capita)	12,4	3,97	4,5	11,7	6,7	13,5	9,3	11,7	9,2

Production of biofuels in the Baltic States

- All of the Baltic States produce biofuels, mainly for exports. Total production of biodiesel is 400,000 tonnes (2008). The Nordic EU members produced 700,000 tonnes.
- Main products are bioethanol and biodiesel
- Biogas, which is perceived as the 1st generation biofuel having the best perspectives, is produced on a lesser scale.

Bioenergy R&D in Estonia

- Experiments (in cooperation with Finland) on reed have been promising. Reed grows in large amounts and can be developed into a fuel for heating.
- This will not be sufficient for Estonian demand, but because reed is gaining international interest, R&D in Estonia can be important
- Reed can be used for the production of biogas and in particular in CHPs (co-generation of heat and power). It will probably need to be mixed with other substancies for the optimal mix.

Bioenergy R&D in Estonia (continued)

- Currently, there are experiments carried out by the EMÜ on anaerobic digestion, today not known in detail.
- Municipal waste can be an important source for biogas
- However, Estonian technological R&D is insignificant. Equipment is imported with little constribution from Estonian producers.
- The fact that Estonia invests in developing bioenergy without parallel product development points at structural weaknesses.

Bottlenecks in Estonia

- Cooperation between business and public research institutes needs to be developed (problem well identified)
- Shortage of financing for research institutes (problem well identified)
- The Estonian domestic market is too small for developing a big industry (i.e need to have an international perspective)
- Cooperation patterns with the farmers needs to be established
- The role of oil shale?

Latvia

- Latvia is one of the leading countries in the EU with regard to the share of renewables to domestic primary energy supply - 84% .
- Wood is exported and other energy is imported, thus the consumption is less based on renewable energy.
- One of Latvia's potentials is the concentration of municipal waste to Riga, which could be used for the production of biogas. However, a system based on imported natural gas is already in place.

Latvia (continued)

- Latvian R&D focus on CHP (four in use in Latvia).
- However, there is no particular technological development taking place in Latvia, but instead studies on fuels and fuel-mix and institutional arrangements.
- Present CHP technology is aimed at big cities. In Latvia there is only Riga of such size.
- Need for micro- and small-scale CHPs. Who developes?

Lithuania

- The decommissioning of the Ignalina power plant is a major challenge for Lithuania. At present, most of the power will be replaced by natural gas.
- Lithuania thus needs a long-term solution, which most likely will be the construction of new nuclear capacity. However, this might risk the “crowding out” of other energy-related programmes.

Lithuania (continued)

- Experiments in Lithuania have been carried out on straw.
- In particular straw-based boilers are not particularly developed and are 2-3 times more expensive
- However, there is no technological R&D in Lithuania in parallel with the R&D on straw.
- Experiments have been carried out on CHPs using different biomass (mixing gas)
- Cooperation patterns with farmers need to be developed

Conclusions

- Bioenergy is widely used in all three Baltic States, but especially technological R&D is lagging behind
- Attitudes and lack of knowledge might hamper the development of bioenergy
- The incentives (e.g. Kyoto emission reductions) are not strong enough for the implementation of bioenergy and other renewables.
- The main concern for the Baltic States is security of supply in general, not a particular technology.
- Influential interest groups favour their ”own” energy

Conslusions (continued)

- Little cooperation between the Baltic States (for various reasons)
- Strong exporting industry of low value-added products
- Lack of coordination between R&D projects both within the countries and internationally.

Potential for bioenergy and related technology

- Becoming “testing grounds” for new technologies developed elsewhere. The openess especially in Estonia in other areas of technology may spill over.
- Small- and micro-scale CHP may turn out to be one of the most important fields of bioenergy technology in the future on a gobal scale. The Baltic States could have a significant potential in this field, because of the population structure.
- Moreover, important elements of this technology is already in place and important knowledge exists.

Conslusions (continued)

- 2nd generation biofuels are high on the agenda in the Nordic countries. Although practically no R&D takes place in this field in the Baltic States, developments elsewhere might make it possible for the Baltic States to participate in commercialising this technology.
- R&D in CHP is significant in the Nordic countries, thus cooperation regarding small- and micro-CHP would have potential.

Conclusions (continued)

- The size of the Baltic States (in populaion terms) can be turned into a strength; practical knowledge of the functioning of bioenergy in the energy system can be gained while simultaneously developing domestic R&D, especially in technology, but also on particular aspects of various biomass (contents, optimisation etc.)

Thank you.

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