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Renewable energy and bio-fuel situation in Estonia

Report Categories:

Agriculture in the Economy

Bio-Fuels

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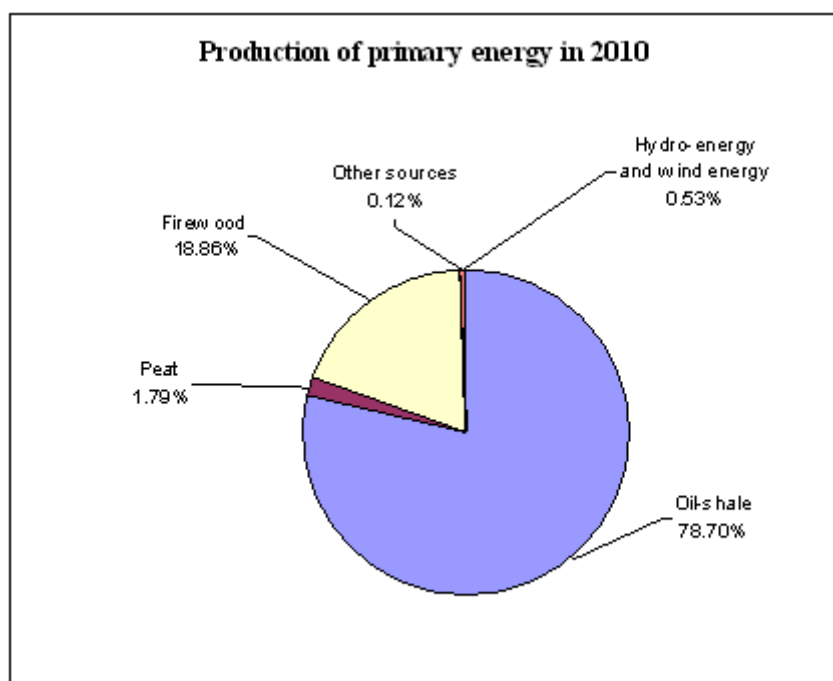
Report Highlights:

In 2010, Estonia's primary energy production exceeded 205 thousand TJ with over 75 percent produced from oil-shale and 18 percent from wood. Estonia energy demand is satisfied through domestic production (75 percent) and imported supplies, mainly natural gas and both gasoline and diesel oil (25 percent). Estonia's National Renewable Energy Action Plan set's a 2020 target for Estonia at 25 percent share of energy achieved from renewable energy sources in gross final energy consumption with at least 10 percent share of bio-fuels of final energy consumption in transport sector.

General Information:

Energy production

In 2010, Estonia's domestic energy production accounted for about 75 percent of total energy supplies. The balance of requirements (25 percent) was met through imported energy resources (mainly natural gas, gasoline and diesel oil). The structure of primary energy production in Estonia is presented on the chart below. Over the past few years the structure has changed only slightly. Compared to 2005, the share of energy production sourced from oil-shale decreased by 2 percent in favor of renewable energy sources.



Source: based on Estonian Statistical Database

In Estonia, the structure of energy production shows that oil-shale is of prime importance. However, compared to previous years, the share of energy production from oil-shale has decreased slightly. The renewable energy sources (RES) with the highest potential are biomass, wind, and hydro power.

Energy production from firewood accounted for over 18 percent in 2010. In 2010, the share of other renewable energy sources (hydro- and wind energy) was only 0.53 percent of total energy production. However, a positive trend is emerging as those energy sources have been on the rise recently.

Nevertheless, it is predicted that in upcoming years energy production from renewable sources will be on a small scale.

Mandatory EU targets for renewable energy

According to the National Renewable Energy Action Plan, Estonia's target for 2020 is a 25 percent share of energy from renewable energy sources in gross final energy consumption with at least 10 percent share of bio-fuels in final energy consumption in the transport sector. EU directives also set indicative targets concerning renewable energy. The 2010 goals for Estonia were set at a level of 5.1 percent of RES in gross electricity production and 5.75 percent of bio-fuel share in fuel consumed in transport sector. Estonia is committed to the "Long-term national development plan for the fuel and energy sector until 2015." The plan called for 12 percent of gross national energy consumption to be from renewable sources and for 5.1 percent of the electricity consumption to be from RES by 2010 and 18 percent by 2015.

Renewable energy sources

The renewable energy source with the greatest potential is biomass as over a half of Estonia's land area is forested and about a quarter is in agricultural production. The National Renewable Energy Action Plan suggests that the land resource that can be potentially used for generating biomass is about 3.7 million Ha (out of which over 2.2 million Ha is forested). The estimated potential of biomass energy exceeds 20 TWh/years per the private forecast published at <http://www.reeep.org>.

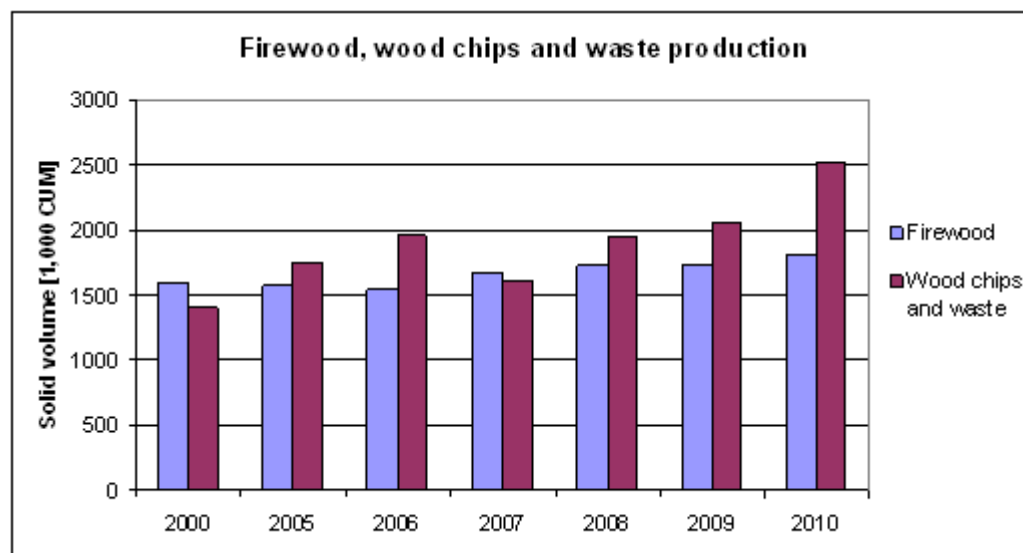
The second largest potential RES is wind power due to Estonia's geographical location off the Baltic Sea. Hydro-energy production also is a possibility but only via small hydro power plants. Solar and geothermal energy productions are insignificant as renewable energy sources. The table below shows the shares of renewable energy sources in electricity production.

Energy source	Production, GWh			
	2005	2006	2007	2008
Wind energy	53.9	76.3	91	133
Hydro energy	21.5	13.5	22	28
Other (biomass, biogas, black liquor)	33	38	36	38
Total	108.4	127.8	149	199

Source: National Report on current status of biogas production – the Republic of Estonia. Monus Minek SEES (www.gashighway.net)

As over half of county's territory is forested, the country has also a great potential for energy production from wood-based fuels - firewood, wood by-products, forest residues or waste wood. National Renewable Energy Action Plan shows that forest that can be potentially used for biomass production cover over 2.2 million Ha. The most common tree species are willow, grey alder, birch, and aspen. Those trees are characterized by a rapid increment of branches, especially during the first years of growth. Therefore, the cultivation of those trees on short rotation lands (less than 15 years) seems the most promising way to supply the biomass. Renewable Energy Policy Review reports that the firewood and wood chips are mainly used in households for heating.

The chart below presents the production of primary energy from firewood and wood chips and waste in recent years. The trend in production is increasing, especially in wood chips and wood waste.



Source: Renewable Energy Policy Review

Bio-Fuels

According to the National Renewable Energy Action Plan, Estonia is to accomplish by 2020 a target of at least 10 percent share of bio-fuels in final energy consumption in transport sector. Additionally, an indicative target has been set for 2020 at the level of 5.75 percent share of bio-fuels in fuel consumption. In 2009, Estonia was far from that objective as the share of bio-fuels in final consumption in transport sector was calculated at 0.26 percent (source: Biofuels Platform <http://www.biofuels-platform.ch>).

Crops that are mainly used for bio-fuel production are grains (for bio-ethanol) and rapeseed (for biodiesel). The grains that can be potentially used for bio-ethanol production are wheat, rye, barley, potato, and sugar beet. However, due to the fact that the costs of ethanol production from cereal are lower than from the potatoes, the grains are mostly used for bio-ethanol production. The role of sugar beet as a feedstock for bio-ethanol production is limited since Estonia does not have a production quota. Rapeseed is a type of energy crop used for biodiesel production. However, in Estonia it is not cultivated on a very large scale mainly due to limited growing area, disease, and significant demand for fertilizers. The growing area of oil crops (mainly rapeseed) remains at about 50 thousand Ha.

Biofuels Platform shows that so far bio-ethanol production was not reported. However, according to Estonian National Broadcasting Corporation ERR, a large new bioethanol plant is to be constructed. The facility is to be located in Narva. Contracts have already been concluded with farmers, which state that farmers are to supply 300,000 tons of rye and wheat for the production of 100,000 tons of liquid bio-fuels. The construction of the plant is to begin at the end of 2011 and take 18 to 24 months to

complete (source: EER News (<http://news.err.ee/economy/ddf35c8a-2fbe-4649-9804-ed43da79acec>)).

There is one biodiesel plant, AS Biodiesel Paldiski (capacity of 100,000 tons of biodiesel per year). The feedstock for the production is rapeseed oil. Due to limited growing potential of rapeseed, most of feedstock is imported. The plant, found in 2004, began operations in 2007. According to the EurObserv'ER's Biofuels Barometer 2011, in 2009 Estonia produced 24,000 tons of biodiesel.

However, the financial health of the company was poor and in 2010 the company filed for bankruptcy. The Baltic Course reported that after the bankruptcy AS Biodiesel Paldiski plant was sent to auction in early 2011 with a US\$ 9 million starting list price, an amount significantly lower than the list price when the facility was placed for sell in September 2010 (at US\$ 31 million).

Estonia is a small producer and consumer of biogas. In 2007 almost 12 NCUM of biogas were produced (similar level as in 2008). In 2007, the share of biogas by raw material follows: landfill gas (71 percent), sewage sludge (23 percent), and manure (6 percent). Biogas produced is consumed by the domestic market. It is mostly burnt in flare (41 percent), used for heat production (30 percent) and for power production (24 percent). The balance is used for technological purposes. In 2007 energy produced from biogas accounted for 0.16 percent of the heat energy used in Estonia and 0.14 percent of the total electricity consumption.

The European Bank for Reconstruction and Development (EBRD) reported that most Estonian rivers are short (less than 10 kilometers) and the terrain is relatively flat. For this reason, less than 50 rivers have flows exceeding two CUM per second and only 14 rivers have flows over 10 CUM per second.

These are unfavorable supply conditions for large hydro-power plants. Nevertheless, there are many sites suitable for small hydro-power plants. The potential of hydropower resources in Estonia is estimated at 25-35 MW with total annual output potential of 0.2-0.4 Thousand Wh. In 2009, the country had over 30 small hydro-power plants operating with total capacity of 5.3 MW.

Wind is the most important source of renewable energy. Due to its location by the Baltic Sea, mean wind speeds are high throughout the area. The wind potential in the coastal zone is regarded to be higher than in the other Baltic countries. The EBRD study shows that about 20 percent of Estonia territory is suitable for wind power production; however, there is an obstacle to the wind power plants construction, which is the low grid capacity.

The total wind power is rising regardless. As of June 2009, Estonia had 83.4 MW of installed wind energy capacity. Compared to October 2006, capacity has increased by almost 50 MW. At the end of 2010 installed wind energy capacity totaled 149 MW. Currently, the largest operational wind installations are the Viru-Nigula wind farm, with a capacity of 24 MW, and the Pakri-1 wind farm, with a capacity of 18.4 MW (source: "General background of Estonian Wind Power Sector" – presentation by Jaan Temp, the Chairman of Estonian Wind Power Association).

According to a Polish report see www.gramwzielone.pl, the GE Company is to supply Estonia with 45 MW of wind power, which is one third of the total wind power capacity reported at the end of 2010.

The GE Company is to provide the wind farm in Paldiski (Parki peninsula) with 18 wind turbines. The plant is to be operational in 2012. Official data show that at the end of 2010 Estonia had wind turbines with total power generation capacity of 149 MW and when together with turbines under construction the total amounted to 570 MW (<http://www.gramwzielone.pl/zielone/artykul/Nowe-elektrownie-wiatrowe->

[GE-w-Estonii](#)).

Geothermal energy does not play any big role as a renewable energy resource; as the geothermal conditions are not favorable and the geothermal gradient is lower than the average level. No thermal waters are found in Estonia.

Solar energy has limited potential as a renewable energy source due to the very small territory (about 45,230 square kilometers) and Estonia's geographical location (northern latitudinal placement). Conditions are unfavorable for making use of solar energy. Only seasonal use of solar plants would be possible. The average insulation of the country is low (2.7 kWh/ m²).

Sources of information:

- Estonian Statistical Database
- National Report on current status of biogas production – the Republic of Estonia. Monus Minek SEES (www.gashighway.net)
- National Renewable Energy Action Plan Estonia
- EREC – Renewable Energy Policy Review – Estonia
- Biofuels Platform: Results of the European policy (<http://www.biofuels-platform.ch>)
- EER News (<http://news.err.ee/economy/ddf35c8a-2fbe-4649-9804-ed43da79acec>)
- <http://www.baltic-course.com/eng/energy/?doc=35869>
- <http://ebrdrenewables.com/sites/renew/countries/Estonia/profile.aspx>
- General background of Estonian Wind Power Sector – Presentation by Jaan Temp, the Chairman of Estonian Wind Power Association.
- <http://www.gramwzielone.pl/zielone/artykul/Nowe-elektrownie-wiatrowe-GE-w-Estonii>