PEAT INDUSTRY IN THE SIX EU MEMBER STATES - Summary report

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Report title

Peat industry in the six EU member states - summary report

Summary

The objective of this study is to give an image of the overall energy and socio-economic impacts of peat used for energy purposes in the European Union. The study covers the following countries: Finland, Ireland, Sweden, Estonia, Latvia and Lithuania. This study is an updating for the study carried out in 2006. The study is mainly focused on fuel peat, but also some information from horticulture peat is included in this report. The figures used in eth study are gathered from the years 2006 – 2008.

This is a summary report made on the basis of more detailed country reports and it contain information on peat producers, peat users, energy and socio-economic impacts of peat use in EU. The importance of fuel peat is described at the European Union, national, regional and local level. Changes since 2006 and future prospects of fuel peat are discussed.

The total average annual use of peat for energy purposes is about 3 640 ktoe (42 TWh) in the European Union during 2006 - 2008. The share of peat in primary energy consumption is highest in Finland and Ireland, about 5 - 7%, being 1.2% in Estonia and 0.6% in Sweden. There is no major changes on production and use of fuel peat has not occurred compared to the peat study made in 2006. In Finland some changes have occurred which favor use of peat. Also in Estonia some new peat fired power plants have been constructed.

The total average annual horticultural peat production in studied six countries is 12.5 million m^3. On average this is about 24% of all produced peat. The share of horticultural peat varies between 8% and 99% of total production in studied member states. Also other countries produce horticultural peat and the total production volume of these countries is 12.1 million m^3.

The value of fuel peat sales in the EU is about 425 million Euros, and the value of international trade is about 214 million Euros. The total employment effect of total fuel and horticulture peat production and fuel peat use is 27 700 man years. The approximate number of people getting heating energy from peat is 1.96 million people.

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Preface

This work was ordered and funded by the European Peat and Growing Media Association (EPAGMA). Contact person was Kari Mutka.

The work was coordinated by VTT in Finland and the person in charge was Teuvo Paappanen. The authors of this report were Teuvo Paappanen and Arvo Leinonen. This report is based on the results of country reports. The authors of the country reports were: Kevin McDonnnell from Ireland, Sulev Soosaar from Estonia, Ansis Šnore from Latvia, Albinas Cerniauskas from Lithuania and Teuvo Paappanen, Arvo Leinonen from Finland. The Swedish report was written by Teuvo Paappanen according to material received from Matti Parikka in Sweden.

This is the summary report made by VTT according to results of the country reports. The country reports are published under the title “Fuel peat industry in the EU 2010, Country Reports, Finland, Ireland, Sweden, Estonia, Latvia, Lithuania”.

This study is an updating for the study carried out in 2006.

Executive summary

The objective of this study is to give an image of the energy and socio-economic impacts of peat used for energy purposes in the European Union. The study covers peat production and all uses of peat for energy, including electricity generation, combined heat and power, district heating, domestic heating and industrial use. Socio-economic impacts are shown in terms of turnover of the industry, employment and other effects. The importance of peat is described at national, regional and local level. Also some information on horticultural peat is included in the study.

The most important producers and users of energy peat within the European Union, i.e. Finland, Ireland, Sweden, Latvia, Lithuania, Estonia and Scotland are included in the study. This study is a update of the study carried out in 2006. The figures used in the study are gathered from the years 2006 – 2008.

The most important statistics regarding the fuel peat industry in the EU is shown in Table 1. Technically and economically viable fuel peat resources in EU countries are approximately 1 655 Mtoe (19 200 TWh). The peat resources are large if compared to present use and will last from 50 years to hundreds of years depending on the country.

The number of peat producers is approximately 650. There are three large companies, about 70 middle-size companies and 550 entrepreneurs or contractors. The total value of fuel peat sales is 425 million Euros. Large companies are located in Finland and Ireland, medium-size companies in Sweden and Estonia and entrepreneurs or contractors in Ireland and Finland.

The total average annual peat use during last years has been 3 640 ktoe (42 TWh). Use has slightly increased mainly due to increased use in Finland. Three largest users are Finland (63 % of total use), Ireland (27%) and Sweden (8%), corresponding to 98% of the total use. Peat is used in CHP power plants (42% of the total use), in condensing power generation 39%, district heating 11% and residential heating 8%. The use of peat on different use categories has not changed since 2006 assessment. The total number of power plants is about 120. The approximate number of people getting heating energy from peat is 1,96 million people.

The annual production of horticultural peat is 12.5 million m^3 on average, while that of fuel peat is approximately 40 million m^3. The share of horticultural peat is therefore 24% from total production. In individual countries this share varies between 8% and 99%.

Horticultural peat is also produced in other EU countries, which are outside of this study. The total production volume of these countries is 12.1 million m^3. Therefore the total production is 24.7 million m^3 and if comparing this production to the total production of all kinds of peat the share of horticultural peat is 38%.

The total employment effect of peat production and use is 27 700 man-years, including direct and indirect employment.

The total value of international trade is at least 214 million Euros. The main importer of fuel peat is Sweden and main exporter is Latvia. All countries export horticultural peat.

Table 1. Peat industry in a nutshell in the six EU member states.

	Finland	Ireland	Sweden	Estonia	Latvia	Lithuania	**Total**
Fuel peat resources, ktoe	1 100 000	47 500	370 000	59 000	57 000	22 000	**1 655 500**
Annual peat use, ktoe	2280	987	290	72	2	4	**3640**
Annual horticultural peat production, million m^3	2,0	1,7	1,4	2,7	2,8	1,9	**12,5**
Number of peat producers	250	300	20	32	40	9	**650**
Number of machine and boiler manufacturers	22	1	9	9	0	0	**41**
Number of peat-fired power plants	55	3	30	22 [1)]	0	7	**117**
Number of people getting heating energy from peat	503 720	1 000 000	390 000	65 000	2 000	0	**1 960 720**
Value of domestic trade, million Euro	232	153	34	4	0	3	**425**
Value of international trade, million Euro	12,7	48,6	33,4	51,5	67,3		**214**
Employment of fuel and horticultural peat production and fuel peat use, man-years	12 350	6 130	1 720	4 160	1 900	1 500	**27 760**

[1)] The number of boilers is 35 in 22 power plants in Estonia

The total primary energy consumption in the six EU countries studied here is approximately 122 Mtoe of which about 3.6 Mtoe is produced with peat. Therefore the overall share of peat of primary energy consumption is 3% in these countries. The primary energy consumption in all 27 EU countries is about 1 800 Mtoe, of which the share of peat is 0.2%.

In Finland and in Ireland about 5 – 7% of primary energy consumption is produced with peat. In Estonia and Sweden this share is respectively 1.2% and 0.6% respectively. In Latvia and Lithuania the peat has a smaller contribution to primary energy consumption. In each county peat is used for slightly different purposes.

The importance of peat at national level is most significant in Finland, where over 13% of all fuel used by CHP-plants is peat. In district heating (DH) plants this share is 20%, and 7% for condensing power generation. The use of peat and wood is bound together. Due to technical and economical reasons peat can not fully be replaced with wood or other domestic fuels. Peat also decreases the dependence of energy production from imported fuels. The only alternative to peat is coal, which can not either replace all the peat, because of the technical characteristics of boilers.

In Ireland peat is one of the scarce domestic energy sources, and therefore it is included in the fuel mix. One of the principle energy sectors in Ireland is the electricity sector and of this peat contributes 13%. In Estonia about 4.3 % of from dis-

trict heat is produced with peat. In Sweden the importance of peat at national level is relatively low, 0.6% of primary energy consumption, but of CHP and district heat peat has the share of 4% and 6% respectively.

The regional benefits of peat production are mostly directed to rural areas, which suffer from migration of young people and from a workforce with a high average age, as well as from relatively low levels of income. Peat contractors usually practice agriculture or forestry or some kind of contacting work. Therefore peat brings extra income to people and regions which are less developed economically. The regional effects of peat use are most important in Finland. Peat is used in almost every large power plant and the production is quite evenly divided through out the country. In Estonia, Ireland and Sweden these benefits focus more unevenly.

All peat producing countries experience positive effects of peat use at local level. Small and medium size municipalities benefit from peat use, because the taxes paid by producers and users can form a significant part of the tax income.

In Finland peat is widely used trough out the country and is therefore an important part of the country's energy management which emphasizes the decentralized energy production with sufficient domestic content. Due to the EU's emissions trading scheme the peat use is estimated to decrease, but peat still remains as a significant contributor to energy supply. In Ireland peat use will continue for at least the next 15 years, which is the lifespan of existing power plants. What happens then is uncertain. One limiting factor is that peat resources in Ireland are not as significant compared with current use. In the Baltic countries fuel peat use has long traditions, but the use has substantially decreased from the peak values of the past. In Estonia and Latvia there is readiness and plans to increase the peat use and build the reserve supply for the emergency situations. In Estonia some concrete actions have been made since 2006 to increase peat use.

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1. Introduction and objectives of the study

The objective of the study is to give an image of the energy and socio-economic impacts of peat used for energy purposes in the European Union. The study covers fuel peat production and all uses for energy, including power generation, combined heat and power, district heating, domestic heating and industrial use. Socio-economic impacts are presented in terms of the turnover of the industry, employment and other effects. The importance of peat is described at national, regional and local level. The role of peat in security of energy supply is also discussed.

Also information of horticultural peat is included in the study. Information on horticulture peat includes horticulture peat production amount, socio-economic impacts and international trade. The study on horticulture peat is carried out in the same six EU member states covering the energy peat industry assessment. There is also horticulture peat production and use in other EU member states but information from those states are not included in this report.

The most important producers and users of energy peat within European Union, i.e. Finland, Ireland, Sweden, Latvia, Lithuania, Estonia and Scotland are included in the study.

This report summarizes the data from peat production and use given in the country reports. The time span of the review covers the years 2006 – 2008. All information from all countries was not available from this time span. Information from some countries cover a shorter period or the latest available annual statistics was used.

2. Fuel peat industry

2.1. Peat resources

The total amount of technically and economically viable fuel peat resources in different countries is about 1 655 Mtoe (19 200 TWh). Finland and Sweden have the largest peat resources in the EU countries, 1100 Mtoe (12 800 TWh) and 370 Mtoe (4 300 TWh) respectively (Figure 1). With present production rates the peat resources in Finland and Sweden will last hundreds of years. Other countries have significantly lower peat resources, but for example in Latvia and Lithuania the resources are large compared to the present use. The lifespan of peat resources is lowest in Ireland, about 50 years if compared to present use. Consequently, the peat resources are not the most limiting factor for considering the use of peat for energy in the future.

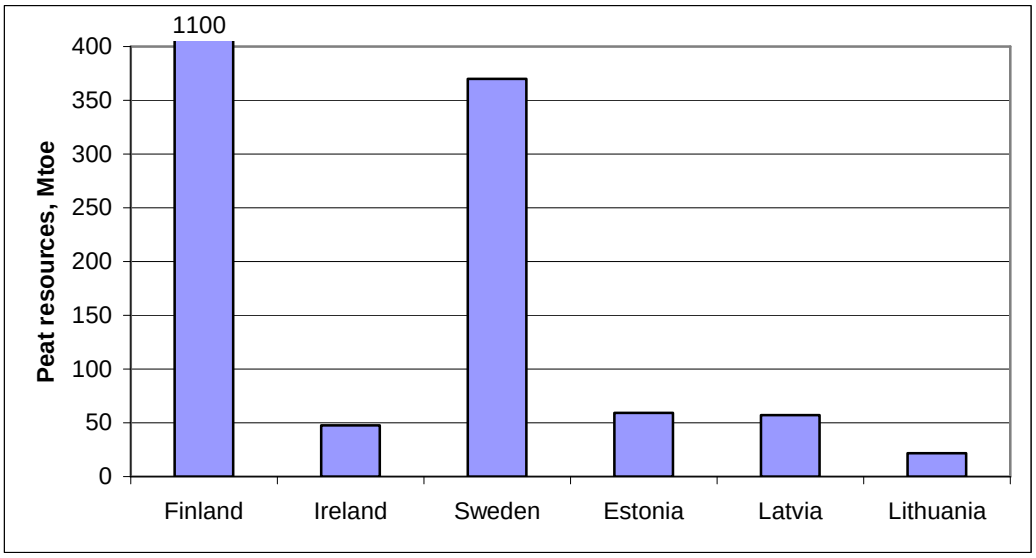

Figure 1. The total technical and economical fuel peat resources in six member states in EU (1 Mtoe is 11.63 TWh).

2.2. Fuel peat production

There are three types of fuel peat: milled peat, sod peat and briquettes/pellets. Milled peat is produced by milling peat from the surface of the peatland and drying it. Peat is normally dried at the peat site by solar radiation. The typical moisture content of peat used in power plants is 40% - 50%. Milled peat contains mainly pulverous peat, and it is typically burned in fluidized bed boilers.

Sod peat is produced by extracting peat from the peatland by processing it mechanically to sods, which are cylindrical, cubic or wave-like. The peat sods are fairly homogenous in diameter and shape, while the length of the sods may vary. Sod peat is used in grate or fluidized bed boilers. The moisture content of dry peat is the same or lower that of milled peat.

Peat briquettes are produced by compressing dry pulverous peat. The shape and size of briquettes is more uniform than those of sod peat. Also the moisture content is lower, between 10 and 20 %. Briquettes are mainly used in stoves and fireplaces on private households.

The total annual production volume of fuel peat in EU countries is about 3 250 ktoe (38 TWh) (Figure 2). The share of milled peat is 80% from the total production, that of sod peat 16% and the corresponding value of briquettes 4%. Two largest peat producing countries are Finland and Ireland, the annual production being 1920 ktoe (22.3 TWh) and 956 ktoe (11.1 TWh), respectively. The production in Sweden is 220 ktoe (2.6 TWh), in Estonia is 146 ktoe (1.7 TWh), in Lithuania 9 ktoe (0.1 TWh) and in Latvia 2.6 Ktoe (0.03 TWh). The peat production in Latvia and Lithuania is marginal compared to the other countries.

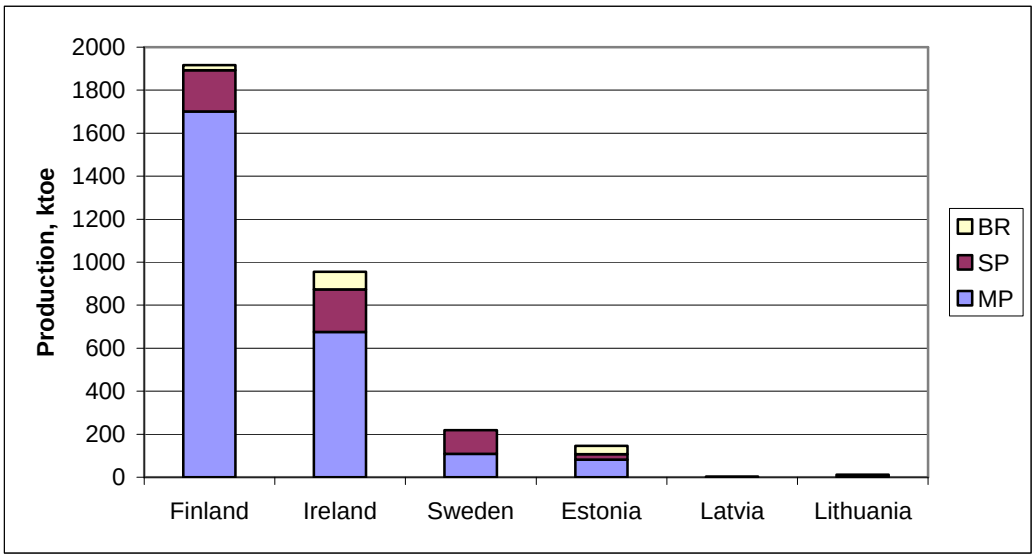

Figure 2. The average annual fuel peat production in six EU members states. MP –milled peat, SP – sod peat and BR – briquettes. Peat production figure in Finland is from the years 2006 – 2009, figure in Sweden from the years 2006 – 2008 and the others from the year 2008. 1 ktoe is 11 630 MWh.

2.3. Fuel peat production area

The total fuel and horticulture peat production area in EU countries is about 219 000 ha (figure 3). This includes areas managed by the producers: not necessarily all area is used for production at the moment. In Sweden the total peat production area (licensed area) in the assessment made in 2006 was 43 500 ha, but has fallen since to 30 000 ha. On the other hand area in Estonia has risen from 12 600 ha to 16 400 ha.

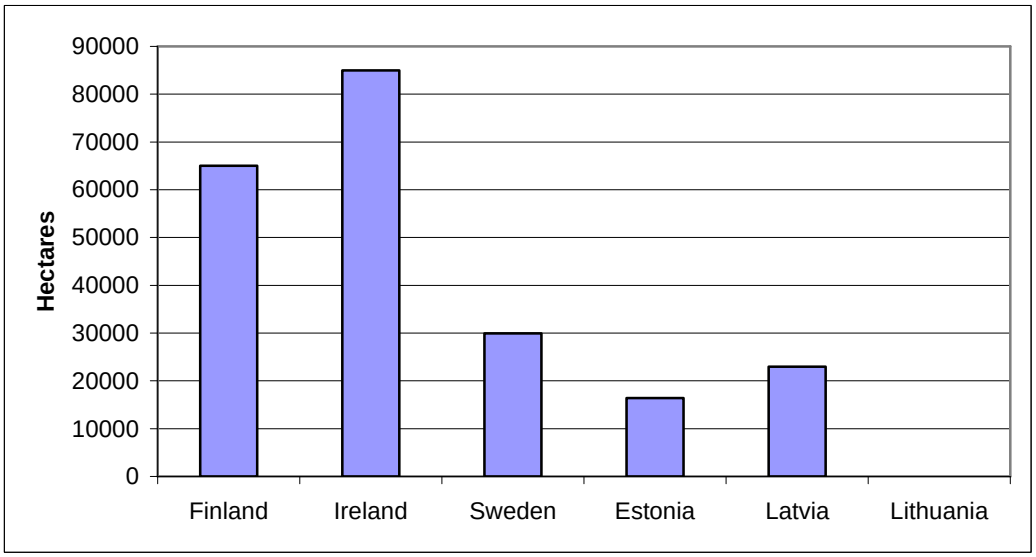

Figure 3. Fuel peat production area managed by the producers.

All production methods use solar radiation for peat drying. Peat is milled or lifted to thin, even layer to the field surface and turned periodically to improve drying. Production is quite weather-dependent and the annual production volumes can vary considerably. Peat producers have therefore adapted to this fact by building reserve supply and the delivery reliability of peat in general is good.

2.4. Fuel peat producers

The number of peat producers in EU is about 650 (Figure 4). There is no significant change since 2006 assessment, although in Sweden, Latvia and Lithuania the number of producers may have decreased slightly.

Producers can be divided into three groups. Three large companies, Vapo Oy in Finland, Board na Mona in Ireland and Turveruukki Oy in Finland produce approximately 80% of all fuel peat in EU. Swedish and Estonian companies can be regarded as medium sized enterprises, with Neova being the biggest peat producer in Sweden. Neova is the former RåSjö Torv bought by Finnish Vapo. The third group is small-scale producers. The number of them in Finland is 200 – 250. These are small companies or entrepreneurs, but they produce peat with modern machinery and get part or all the income from peat. Together they can guarantee fuel supply to the large power plants. The share of these producers is about 10% from total production. In Ireland there are about 300 small-scale contractors, which are usually 2-man enterprises and produce sod peat for households. Their combined share of the peat market is 20%.

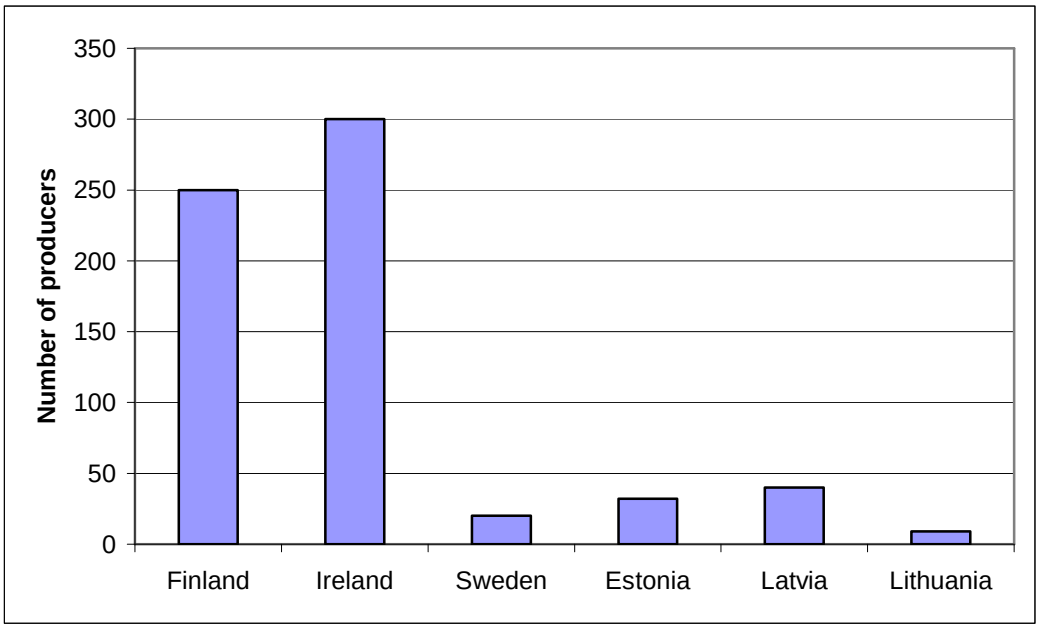

Figure 4. Number of peat producers.

The Finnish company Vapo Oy is owned by the Finnish state and EPV Energy Ltd. Finnish Turveruukki Oy is owned by municipalities. Irish Bord na Mona is a state-owned company. Swedish companies either have associations with the forest and energy industry and local municipalities or they are independent private com-

panies. In Baltic countries companies are partly or fully owned by foreign owners, e.g. Vapo Oy from Finland. Also in Latvia and Lithuania companies have private owners.

2.5. Fuel peat users

The average annual use of fuel peat in EU is about 3640 ktoe (42.3 TWh) of which 42% is used for CHP (Combined heat and power) production and 39% for production of condensing power. The share of peat in district heating is about 11% and in residential heating about 8% of the total (Figure 5).

In the assessment made in 2006 the total peat use was 3370 ktoe (39.1 TWh), so there is a slight increase on use since then. However too strict comparison of use is unreliable because some of the data of use is only from one year.

More detailed analysis of the use of peat in country level is shown in Figure 6. Since 2006 assessment fuel peat use in Ireland and Sweden has remained about the same. In Finland the peat use has slightly increased.

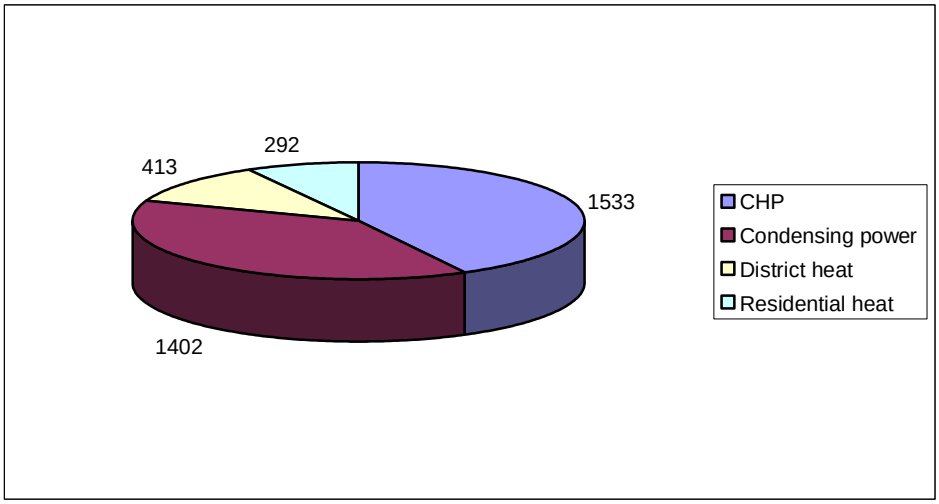

Figure 5. Peat use in different categories in EU, ktoe.

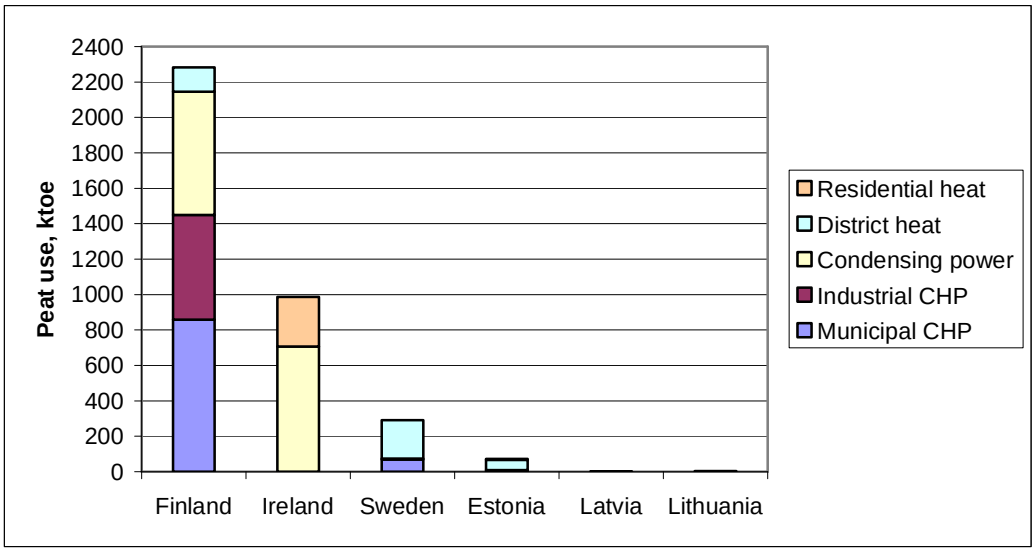

Figure 6. Average annual (2006 – 2008) peat use in different categories by country, ktoe. The peat use figure in Finland is from the years 2006 – 2009, the figure in Sweden from the years 2006 – 2008 and the others from the year 2008. 1 ktoe is 11 630 MWh.

In Finland the number of large peat-fired CHP power plants is about 55. The boiler output of these plants is 20 – 550 MW_{th} and in total about 7 200 MW_{th}. Power plants are municipal or industrial plants, or serve both sectors. Industrial power plants exists mainly in the forest sector, there peat is used to improve the heat value of by-products of the sector. There are also about 120 district heating (DH) plants using peat.

Ireland is the second largest fuel peat user in the EU. Ireland has three power plants which produce condensing power. The total output of these plants is 370 MW_e and the share of peat on electricity generation is 13%. Residential heating consumes about 26% of the total peat use.

Sweden has about 30 heating plants, nine of which are CHP plants and the rest stand-alone district heating plants.

In Estonia 51 ktoe of milled peat (593 000 MWh), 16 ktoe of sod peat (186 000 MWh) and 6.5 ktoe briquettes (76 000 MWh) were used in 2008, with the total of 73.5 ktoe (855 000 MWh). Milled peat is also used for production of briquettes, of which significant part is exported. In the domestic market peat is used in 35 boilers in 22 power plants of which the most significant are the briquette factories, one large DH boiler and two small CHP plants owned by peat producing companies. Two new CHP plant was started since 2008. Capacity of these plants is 50 MW_{th} each. Also one new CHP plant is under construction process. These plants will increase peat use in the future, although priority is given to wood fuels in these plants.

In Latvia fuel peat is insignificant at the moment, although studies have been made in order to use peat for production of district heat in towns and at CHP

plants. In Lithuania peat is mainly a fuel of private households, which accounts for 80% of the total use of peat. The rest is consumed by industrial boiler houses.

2.6. Machine and boiler manufacturers

The total number of machine and boiler manufacturers in the six EU countries is about 40 (Figure 7). The number includes only the manufacturers making special-purpose machines and equipment for peat production and use. In addition peat production uses tractors, excavators, trucks, wheel loaders etc. Machine manufacturers can be divided into two groups: production machines and transportation equipment. Finland is the most important machine manufacturer and much research work has been done to improve the efficiency and to reduce the environmental impacts of peat production. Also Ireland and Sweden manufacture machines. Machines are also exported or copies are made by local manufacturers.

Large boilers are manufactured by companies which act internationally. The three largest ones are Foster Wheeler, Kvärner Power and Wärtsilä. The employment and money related to boiler manufacturing are more important than those of production machine manufacturing.

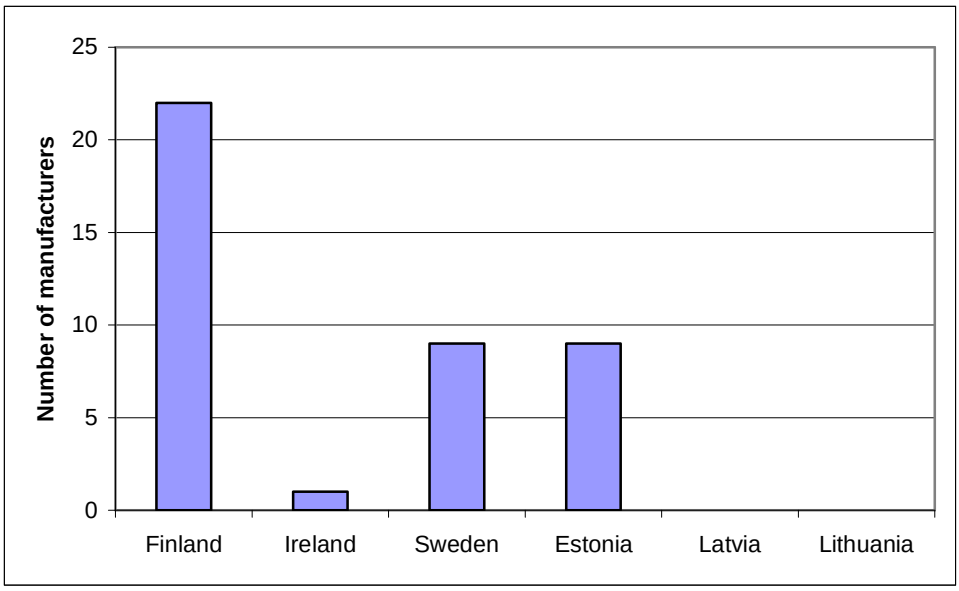

Figure 7. The number of machine and boiler manufacturers in different countries.

3. Production of horticultural peat

The production of horticultural peat is shown in table 2, for comparison it also show production of fuel peat. The average annual total horticulture peat production in six EU member states is 12.5 million m^3. The biggest horticulture peat producers are Estonia (2.7 million m^3) and Latvia (2.8 million m^3). There is also horticulture peat production in Finland (2.0 million m^3), in Ireland (1.7 million m^3), in Sweden (1,4 million m^3) and in Lithuania (1.9 million m^3)

The total average annual horticulture and fuel peat production in six EU member states is about 52.6 million m^3. The share of horticulture peat from the total peat production in six member states is 24 %.

Table 2. The average annual horticultural and fuel peat production and share of horticultural peat from total peat production. In the parentheses it is presented the original production unit.. Production quantities are converted to same unit (million m^3*) by using factor 0.3 tons/* m^3*. The figures are gathered from the years 2006 – 2008.*

	Horticultural peat, million m^3	**Fuel peat, million m^3**	**Share of horticultural peat, %**
Finland	2,0	23,0 (21.6 TWh)	8.0
Ireland	1.7 (~ 0.45 million tons)	13.0 (3.9 million tons)	11.6
Sweden	1.4	2.2	38.9
Estonia	2.7 (2. 56 Milled peat) (0.041 Block peat) (0.145 peat substrates)	1.8 (537 000 tons)	60.0
Latvia	2.8 (854 500 tons)	0.04 (11 000 tons)	98.7
Lithuania	1.9 (1.8 milled peat) (0.1sod peat) (1.9 Total)	0.1	95
Total	**12.5**	**40.1**	**Average 24%**

Horticultural peat is also produced in other countries, which are outside of this study. The total production volume of these countries is 12.1 million m^3. Therefore the total production in EU is 24.7 million m^3 and if comparing the this production to the total production of all kinds of peat the share of horticultural peat is 38%. The other countries and production volume of horticultural peat is shown below.

	million m^3
- France	0.3
- Germany	8.0
- Poland	1.9
- United Kingdom	1.6
- Austria	0.05
- Netherlands	0.05
- Spain	0.2
Total	**12.1**

4. Importance of peat as an energy source

4.1. Importance of peat at EU level

The total primary energy consumption in the six EU countries studied here is approximately 122 Mtoe (1419 TWh), of which about 3.6 Mtoe (41.9 TWh) is produced with peat. Therefore the overall share of peat of the primary energy consumption is 3% in these countries. The primary energy consumption in all 27 EU countries is about 1 800 Mtoe (20 934 TWh), of which the share of peat is 0.2%.

4.2. Importance of peat at national level

The importance of peat at the national level is the most significant in Finland. In Finland and in Ireland about 5 – 7% of primary energy consumption is produced with peat. The corresponding values for Estonia and Sweden are 1.2% and 0.6% respectively. In Latvia and Lithuania peat has small contribution to primary energy consumption (Figure 8). In this respect no major changes have occurred since 2006 assessment.

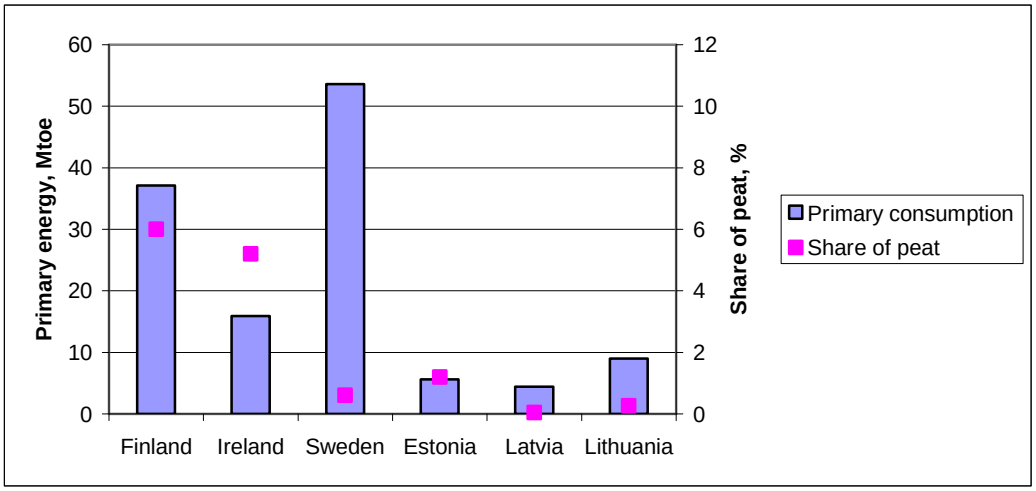

Figure 8. Primary energy consumption and share of peat from primary energy in different EU countries. The figures are gathered from the years 2006 - 2008.

In Finland over 22% of all fuel used by CHP-plants is peat and at the DH plants this share is 19%, and it is 8% for condensing power generation. The fundamental strategy of Finnish energy management is to emphasize the decentralized energy production which consists of many fuels and delivery sources and has sufficient domestic content. In Finland large investments have been made during the recent years in peat-fired plants and for the integrated use of peat and wood. The use of peat and wood is tied together. Existing power plants use wood fuels as much as availability and technical restrictions of boilers allow. The use of wood-based fuels can be in practice 20 - 50% from the total fuel input. Co-firing of peat and wood reduce the SO_2 outlets of peat combustion. Due to technical and economical reasons peat can not be replaced completely with wood. Good availability and low price of peat makes it a good fuel for power plants. Peat also decreases the dependence of the power generation of imported fuels. The only alternative for peat

is coal, which too, can not replace all the peat, because of the technical characteristics of the boilers.

In other countries the importance of fuel peat at national level is seen to be less significant. In Ireland peat is one of the scarce domestic energy sources, and therefore it is included to the fuel mix. One of the principal energy sectors in Ireland is the electricity sector and of this peat holds 13% in 2008 (Figure 9). Estonia is the biggest peat user among the Baltic Countries, about 1.2% of primary energy consumption and 4% of district heat is produced with peat (Figure 8). In Sweden the importance of peat at national level is relatively low, 0.6% of the primary energy consumption, but in CHP and district heating peat has a share of 4% and 6% respectively (Figure 8).

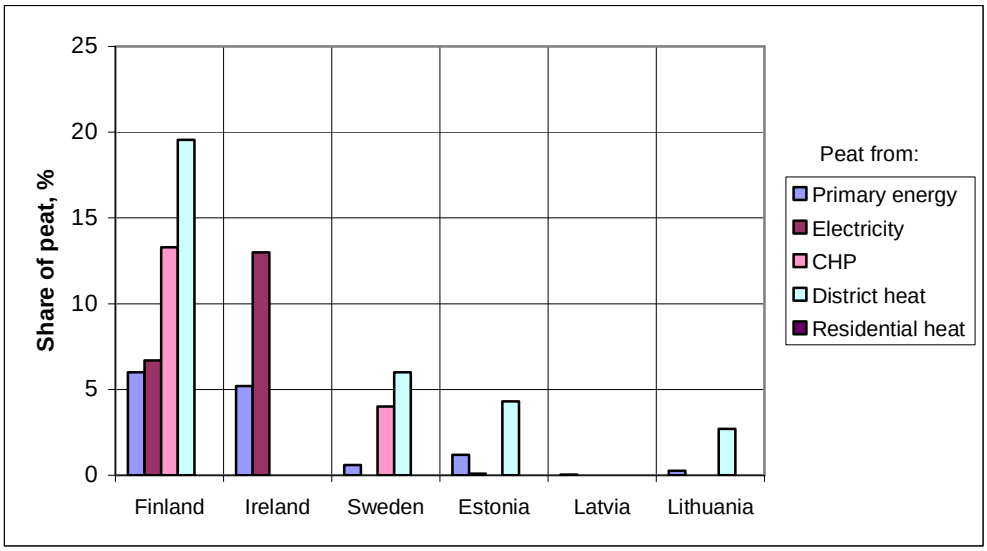

Figure 9. The share of peat from total fuel use on different categories of heat and power production. The figures are gathered from the years 2006 - 2008.

4.3. Importance of peat at regional and local level

The regional benefits of peat production and use are mostly directed to rural areas which suffer from migration of young people and from a workforce with a high average age, as well as from relatively low income. Peat contractors usually practice agriculture or forestry or some kind of contracting work in addition to the work in the peat sector. Therefore peat brings extra income to people and regions which are less developed and disadvantaged economically.

In Finland almost every large power plant uses peat and the production is quite evenly divided through out the country (Figure 10). On average, almost half of the fuel is peat on these power plants. In Estonia these benefits are focused more unevenly, counties of Pärnu and Tartu account for approximately 80% of all peat consumption and the share of peat in their energy balance is about 12%. Five counties of total 15 do not use peat as fuel. On the other hand production of peat is more evenly distributed, all counties produce peat at least to some extent.

In Sweden, the regions of Västerås, Uppsala and Örebro in Central Sweden are the main peat users. In Ireland the peat production is centered in the Midlands. Since 2006 the Midlands as a whole have suffered like rest of the country with the downturn of the Irish economy. During 2008 – 2009 Bord na Mona employed 2366 people at peak and have an average employment of 2064 plus many more indirectly trough transport, supplies and services. This employment has a major positive spin-off effects for the local communities.

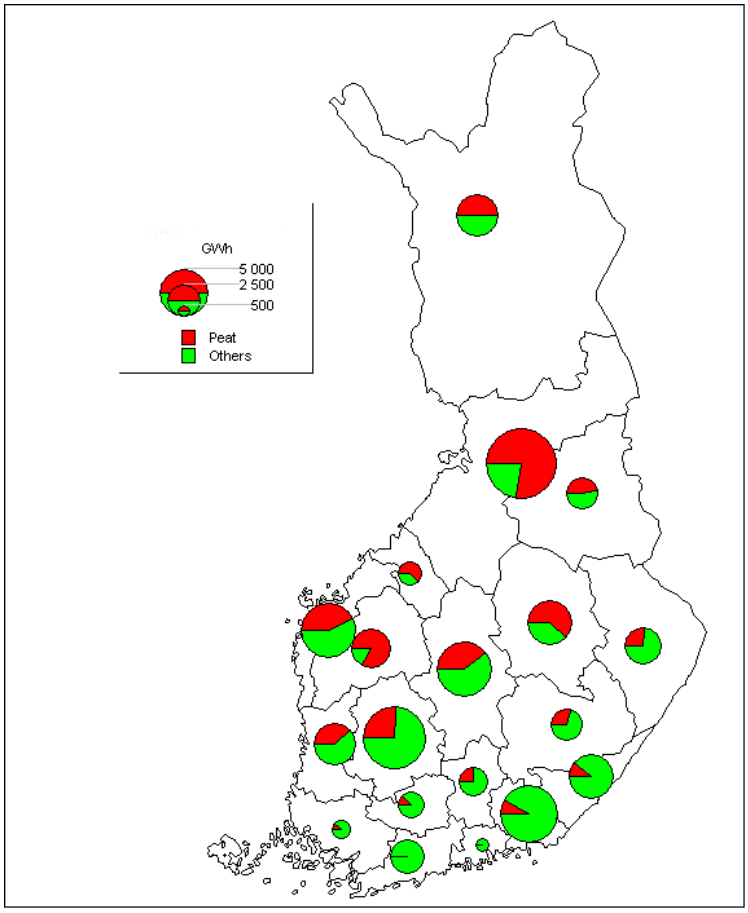

Figure 10. The use of fuel peat and other fuels on counties in Finland, statistics is from year 2003.

All peat producing countries experience the positive effects of peat use at local level. Small and medium size municipalities benefit from peat use, because the taxes paid by producers and users can form a significant part of the tax income. In Ireland and in the Baltic Countries peat is used for the heating of private households. Peat is cheap if a user harvests it for his/her own consumption. It also brings earnings to small-scale contractors.

5. The role of fuel peat in security of energy supply

Peat has both short-term and long-term role on security of energy supply. Although peat production is highly weather dependent, peat can be stored to reserve

supply stockpiles, which can easily cover the short-term interrupts on energy supply. For example reserve supplies in Finland and Estonia correspond to 7 – 17 months use.

The role of peat in energy supply is the most significant in Finland and in Ireland. In Finnish peat-fired power plants peat is either the main fuel or it supports and supplements the use of wood, in particular when problems arise with the availability and quality of wood. Other domestic alternatives for peat are by-products of the forest industry and agro-biomasses. However, due to shortages and the low energy density of these fuels, they can not replace peat. Peat decreases the dependence of energy production from imported fuels. The only viable alternative for peat could be coal which can not replace all peat, because of the technical characteristics of the boilers. The CO_2 emissions of natural gas are lower compared to coal and peat. However, the nationwide use of natural gas in not possible, because natural gas network covers only a small part of the southern Finland.

Ireland is an island country and due to its relative isolation, modest domestic fuel resources and lack of extensive international energy connections, existing energy resources must be utilised to a maximum. Peat will be used for at least the next 15 years, which is the life span of the existing power plants. What happens then is uncertain, either the existing power plants will continue to function, they will be closed or they will be renewed or replaced by new peat-burning stations. The new stations would use advanced technology that raises efficiencies above the present 38% or plants could start co-fueling peat and CO_2 neutral fuel. Other sources of energy, such as nuclear power, wind or wave power and bioenergy have also been studied. It is still important that indigenous resources such as peat, hydro and gas remain a significant contributor to the total energy demand in Ireland as part of a balanced energy strategy and also as security.

In Sweden the role of peat in security of energy supply as a whole is not seen to be so significant as in Finland. The share of peat on CHP and DH plants are 4% and 6% respectively.

In Estonia the reserve supplies of peat are high, corresponding to 7 – 17 months use. To guarantee the sustainable utilization of peat resources, the Government has fixed the annual extraction quotas of which only about one-third has been utilized annually during the last 10 years. This enables even the increase of production and use, but this does not have effect on the short-term security of energy supply, because it takes at least three years to prepare new production areas.

In Latvia and Lithuania the role of peat in energy supply is quite low at the moment. Natural gas and oil products are main the fuels. Also wood fuels are already or they could become an important energy source. In both countries the government does not encourage the use of peat as a fuel. However, in Latvia there are some plans to increase the share of peat, up to 5% of the primary energy, and also to build a reserve supply. Significant amounts of gas, coal and fuel oil are imported from Russia, which causes insecurity to the energy supply, because deliveries can be unstable. The total replacement of these fuels with peat can be difficult. However, for example Latvia has plans to increase the share of peat up to 4 -

5% from primary energy requirements. In Lithuania one opinion is that peat as a local fuel is not used enough. One hope is that private investments are made to peat fired power plants, which could serve as a good example.

6. Socio-economic assessment of peat industry

6.1. Employment effects fuel and horticultural peat production and use

The total employment effect of fuel peat production and use, divided between direct and indirect employment, is shown in Figure 11. The indirect employment impact cover the indirect impact of peat production and use in other business fields but also the indirect employment impact of consumption. The total employment effect of fuel peat production and use in six EU member states is about 27 700 man-years of which 9 800 is direct employment and 17 900 man-years indirect employment. The employment effects are most significant in Finland, about 12 350 man-years. The indirect employment impact for all countries is calculated using the Finnish figures.

In Finland the employment impact of fuel peat production and use is 10 150 man-years and the employment impact of horticulture peat production 2 200 man-years. In Finland the share of horticulture peat production (2 million m^3) is about 8 % of the total peat production (25 million m^3). In Finland the employment impacts of horticulture peat production is two times more than fuel peat production.

From other countries' employment impacts figures are not divided into fuel and horticulture peat production. We can assume that the employment impact of horticulture peat production is about 6 400 man-years and the rest 21 300 man-years is the employment impact of fuel peat production and use.

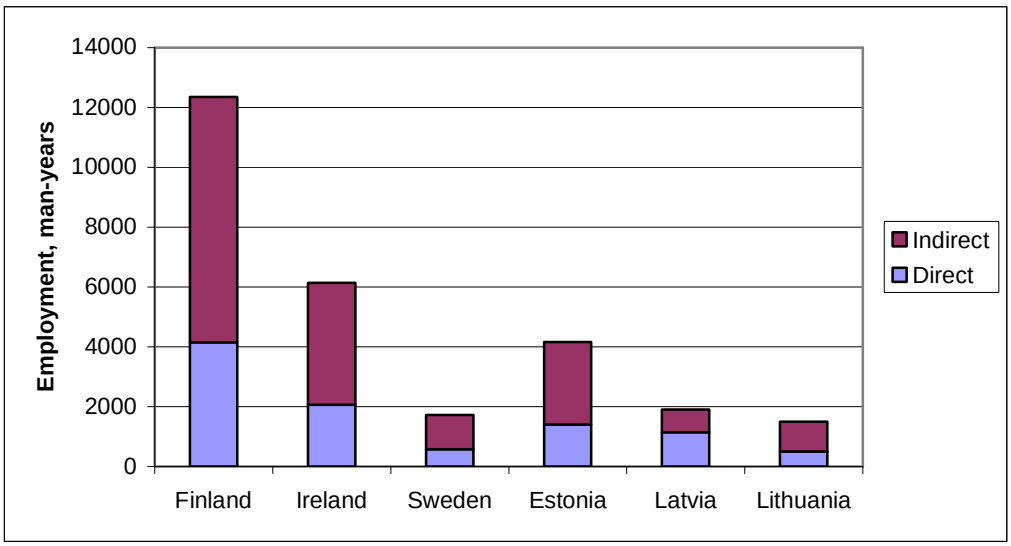

Figure 11. The annual employment impact of fuel and horticulture peat production and fuel peat use in six EU member states. The figures are gathered from the years 2006 - 2008.

6.2. Value of peat sales

The total value of domestic fuel peat sales in EU countries corresponds to about 425 million Euros (Figure 12). The combined share of sales in Finland and Ireland is about 90% and in Sweden 8% of all sales.

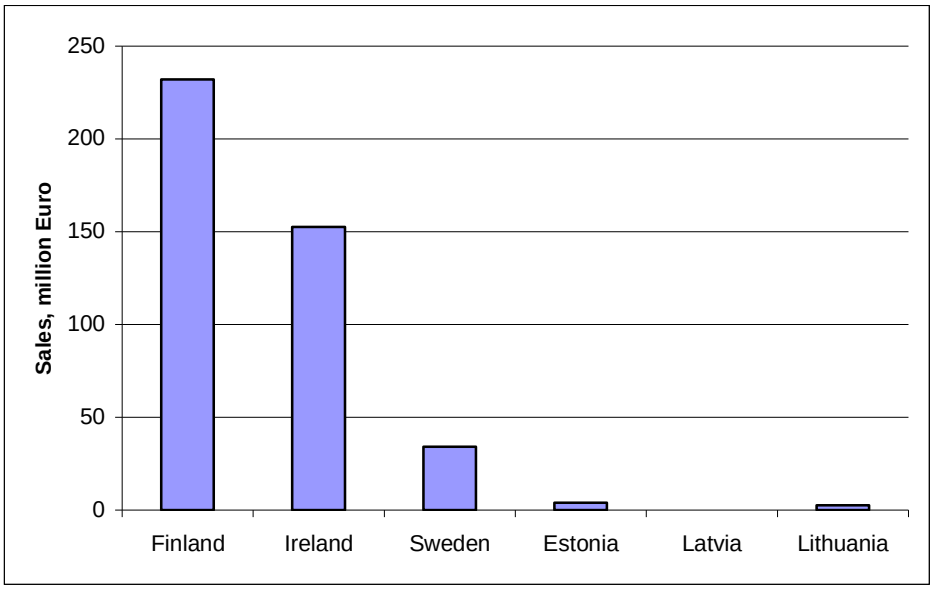

Figure 12. The total value of domestic fuel peat sales in EU countries, excluding taxes in 2008.

Peat is used in DH and CHP boilers to produce heat. In addition to this, households use peat in fireplaces and stoves. It can be estimated that in the EU almost two million people get heating energy from peat (Figure 13).

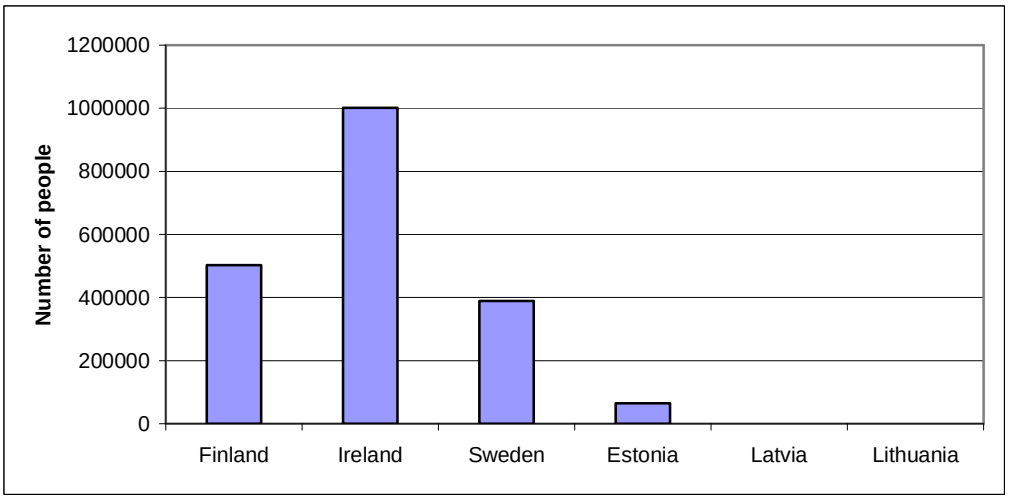

Figure 13. The approximate number of people getting heating energy from peat in 2008.

7. International trade of peat

Total value of peat trade is 214 million €. The most important countries doing international trade are Latvia, Estonia, Ireland and Sweden. Ireland and Sweden export horticultural peat. In addition Sweden imports fuel peat. For Estonia only value of trade is known, not the assortments of peat.

Table 4. International trade of fuel peat.

Country	Type of trade	Description	Value of trade, M€
Estonia	Export Import	1 million tons of fuel and horticultural peat 3 865 tons of peat	51.5 0.38
Sweden	Export Import	251 000 tons horticultural peat, total domestic production 1.4 Mm^3 364 000 tons fuel peat, 30% of used peat	19.8 13.6
Ireland	Export	1.63 Mm^3 horticultural peat, 90% of domestic production	48.6
Lithuania	Export	457 500 tons, mostly horticultural peat	-
Latvia	Export	919 000 tons, horticultural peat	67.3
Finland	Export Import	114 200 tons of all kinds of peat 98 700 tons of all kinds of peat	9.8 2.9
			213.7

8. Changes since 2006 and future prospects

Regarding the changes since 2006 and future prospects, maybe the biggest changes have occurred in Estonia and Finland.

In Estonia two new CHP plants have been built and some more are in planning phase. In Finland peat use will perhaps slightly increase, and some actions have been made by government authorities to ensure use also in the future.

In Ireland peat has a role in electricity production. The peat use will continue at least the lifetime of the present power plants, but the future is open as it was in 2006.

In Latvia and Lithuania present peat use is marginal. Both countries have some plans to increase the use, especially Latvia, but there is no certainty how these plans come true in practice.

Finland

During this decade the annual fuel peat use has been 20 – 29 TWh. It has been estimated that peat use in 2020 would be 28 – 29 TWh, including manufacturing of transport fuels using Fischer-Tropsch synthesis (1 TWh). The basis of the evalua-

tion is the introduction of new power plants, although the use of wood and other renewables is expected to increase according to climate and energy strategies.

The co-firing of peat with other fuels has promoted the use of renewable fuels. These renewable fuels often contain elements which can cause fouling and high-temperature corrosion in a boiler.

Peat production is quite weather dependent. Also the amount of reserve supply has decreased during 2000's. Therefore law about reserve supply was issued and it came into operation in 2007. It enables the producers to maintain reserve supply. The peat of reserve supply can only be used by permission of the authority. Compensation is paid to producer from the storages, which are officially classified as reserve supply. This compensation is meant to substitute the capital, storage and loss costs of reserve supply. The aid is granted to producers with average supply of peat over 100 000 m^3 a year. The compensation is 0.36 €/MWh per year.

In 2007 a law about feed-in tariff came into force. The aim of the law is to ensure that during increased demand of electricity the peat fired condensing power plants are started before large coal fired plants, in situations when condensing power is anyway needed.

Before 2005 peat had a tax on heat generation. This tax was 1.59 €/MWh (fuel), and it was removed in July 2005. At the same time tax refund on electricity generation for small plants (under 40 MVA) was removed.

Ireland

The fuel peat use has been relatively stable during recent years. Peat is consumed in three electricity generation stations with total capacity of 370 MW_e. These power stations have definite life span of 15 years, so what happens after that 3 outcomes are possible: they will continue operating as they are, they will close or they will be updated or replaced by new peat-burning stations that employ advanced burning techniques to raise efficiencies above the present 38%. This situation has not been changed since 2006.

The ESB predicts that future demand for electricity will grow by 3% annum, if this is the case it may prove imperative that these power plants are kept running. Overall in 2010 the Irish peat industry is in healthy positions its future however is uncertain. Sod peat harvested by contractors for domestic use will continue as it has in the past and Bord na Móna's briquetting and horticultural peat sectors predict no major change.

Regarding the total primary energy requirements the dominance of oil over period 1990 – 2008 is striking (over 55% in 2008). At the same time the use of natural gas increased by 211%, being about 9% in 2008. That share for peat is about 5%.

Natural gas is the dominant fuel in electricity generation with its share increasing to 55% in 2008. The share of peat is 13%. A significant reduction in GHG emissions could be achieved by the closure of Moneypoint coal fired power station

(915 MW), however this would have to be replaced by Gas, Peat, Oil or Wind. The total capacity of 3 present peat fired power plants is 370 MW. The construction and operation costs of peat plants large enough to replace Moneypoint would prove excessive. Also the peat resources compared to use are not very large. Gas would be the optimal answer with the commissioning of a new sub sea pipeline linking Ireland to Scotland. This however would raise the share of gas in the power sector to 80%.

Estonia

The fuel peat use in Estonia is increasing. Since 2005 two new CHP plants have been built. One was in the end of 2008 in Väo near Tallin. The capacity of the plant is 49 MW_{th}/25 MW_e. The plant is operated by Tallinna Elektrijaam OÜ (former Digismart OÜ) and owned by Tallinna Küte AS, which in turn is owned by international Dalkia Group. The main fuels are wood and peat.

In 2009 another new CHP plant was commissioned in Luunja municipality neighbouring Tartu City. The plant is owned by AS Fortum Tartu and operated by AS Anne Soojus. The capacity of the plant is 50 MW_{th}/25 MW_e. The fuels used are mainly wood (chips and waste) and milled peat.

As to utilization of peat fuel in cogeneration, perhaps at least three new plants will be started in next years. It is planned to commission a new CHP plant in Pärnu City already in 2011. The plant with capacity of 50 MW_{th}/25 MW_e will use wood and milled peat as fuels. Some other CHP are in the phase of preliminary planning. In all new plants the peat will be fired in combination with wood chips. In Ahtme (Ida-Viru county) the local DH utility AS Kohtla-Järve Soojus plans a 50 MW_{th}/24 MW_e plant to be ready by 2012. National power company Eesti Energia AS is planning a 20 MWe CHP plant in Jõhvi (Ida-Viru county) by the year 2013. It has to noted that in actual operation of new wood and peat firing CHP plants the priority is given to wood as the national system of electricity feed-in tariffs supports the generation of electricity from renewable sources and according to EU rules the peat is classified as a fossil fuel, therefore not eligible for higher feed-in tariffs.

As to extraction of peat, certain limitations are to be taken into account in Estonia. Referring to the *Sustainable Development Act* the Government has issued a regulation (no. 293, 12.12.2005) on sustainable utilization of peat introducing since 1 January 2006 new limitations on annual extraction volume, as well as fixing sizes of critical and exploitable deposits for every county. As compared to previous regulation the sum of critical deposits was left the same (1.59 billion tons), but the amount of exploitable deposits was reduced from 775.0 to 573.1 million tons. At the same time, the allowed annual extraction quota was cut from 2.780 to 2.653 million ton.

In Estonia, the harvesting of peat is taxed in frames of the national resource taxation system. Mineral resources extraction charge has to be paid for the extraction, use or rendering unusable of mineral resources belonging to the state. The declared objective of mineral resources extraction charges is to prevent and reduce possible damage caused by the use of resources and to encourage effective use of mineral resources

and deposits of minerals. The nine mineral resources under taxation include also peat. The rates of the charge for the period of 2006-2015 are given in table 5.

Table 5. Rates of mineral resources extraction charge (EUR/10^3 t).

Period	HD peat	LD peat
2006	575	895
2007	607	940
2008	633	984
2009	665	1035
2010-2014	1150	1406
2015	1208	1476

Latvia

Today in Latvia there are virtually no consumers of fuel peat left. The total use in 2008 was only 9 000 tons (2.6 ktoe). Companies have been granted licenses to extract peat in areas exceeding 23 000 ha total. In approximately 60% of these areas there are also fuel peat resources.

Regardless the above-mentioned, over the recent years the policy of the Government has been not to use peat as energy resource. It is possible that the situation might change in future. An indication is the “Guidelines of Energy Development 2007 – 2016”, a document approved by the Government.

Imported fossil fuels are preferred. Since these fossil fuels are mainly received from Russia, one needs to take into account that these supplies can be unstable, and may be used as means to reach political aims.

The role of peat could and it should be considerable. Both as substantial share of primary energy resources – up to 4-5%, and as reserves, which can be prepared during years favorable for peat extraction.

In the PHARE research “Peat extraction and usage in energy sector” (1997) it was calculated that apart from household usage, it would be useful to utilize peat in 12 towns with 18 boilers for peat-fired heating stations with 5-10 MW boiler capacities (one 20 MW) and two places for CHP-plants (one 30 MW_{th}/15 MW_e and one 60 MW_{th}/30 MW_e).

According to the optimistic scenario in 12 places additional 500 000 – 600 000 tons of peat could be used annually. Thereby the total use could reach 1 – 1,2 million tons, which means total boiler capacity of 590 MW. Of course, peat can also be used extensively by households.

Given the previously mentioned reasons, peat is very important in Latvia as a local fuel.

Lithuania

Energy peat industry has not increased drastically since 2006. Environmental authorities and society is against intensive peat burning due to fact that Lithuania has very limited amount of swamps and they are very important for natural land moisture balance. Scientist have proven that near industrial areas the swamps are very good atmosphere cleaning filters, thus it is demanded to safe them for ecologic reasons and do not exploit for the burning reasons, but they might be used for other sectors. Economic obstacles, such as CO2 tax for peat use, cannot compete with cheaper wood waste or straw briquettes.

There is no obvious support from state institutions for further developing energy peat industry. Private investment into energy sector might change whole picture if energy peat would be chosen for combustion. More good examples are needed.

There are five peat fired power plants in Lithuania with total boiler capacity of 27 MW. Two of them were constructed since 2006: 18 MW Raseiniai (company Raseiniu silumos tinklai) and 2 MW Juodupis (Juodupis komunalis).

There are 26 DH plants, so called bio-fuel boilers, which could combust bio-fuel mix with peat included. The share of these plants is about 18% of all similar kind of plants. The boiler capacity of bio-fuel plants varies between 1 – 61 MW and the total capacity is 390 MW.

There are plans to build four CHP plants by 2012. The boiler capacity of these plants is 2 – 25 MW_e and 8.5 – 50 MW_{heat}, and they would use bio-fuel or waste. At least one of them is not going to use peat due to technical restrictions, from rest there is no precise information.

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