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Study on Biomass Trade in the Czech Republic



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Author: CZ Biom – Czech Biomass Association
Petr Tluka
Vladimír Stupavský

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1 Biomass use in the Czech Republic

Biomass use in the Czech republic is developing. This is given as well due to the obligations given by the 2001/77/ES EU directive with the indicative goal of renewables rate in electric energy consumption of 8 % in 2010 and 13 % in 2020 by the 2009/28/ES directive.

This study gives an overview on biomass use in the Czech Republic, the biomass potential and the trade with biomass. This is a major aspect of the study especially with the view those indicative goals.

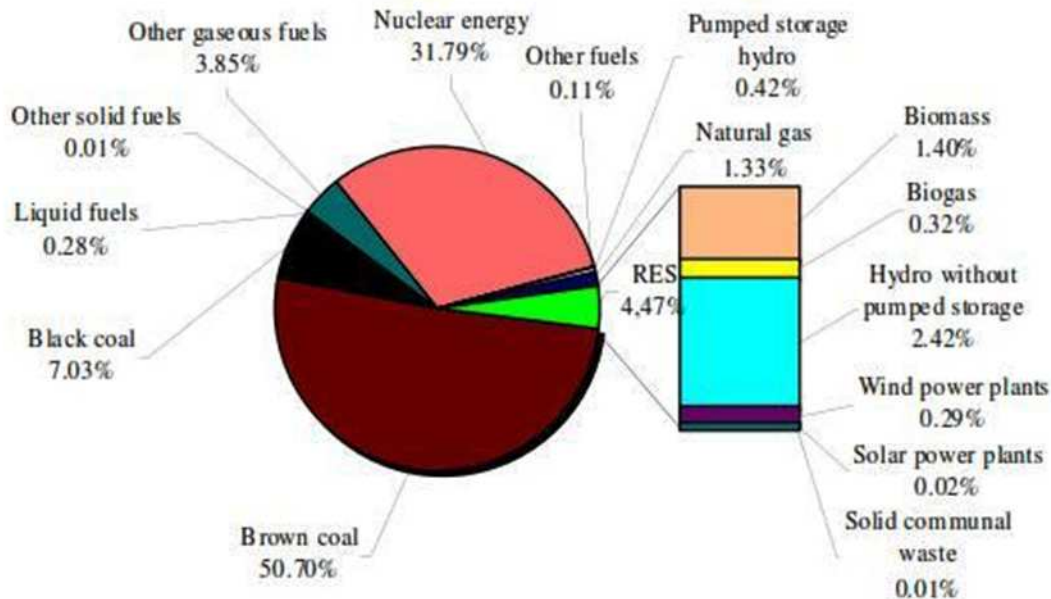
The Gross electricity production from renewable energy sources (RES) in 2008 made up 5.2 % of domestic gross consumption of electricity. The share is in this way far below the goal for 2010. Gross electricity production from renewable energy sources made up 4.47 % of total domestic gross production of electricity (including exports). The share of renewable energy in total primary consumption (PEZ) was 5.0 %.

Electricity production from RES in 2008

	Gross electricity production	Deliveries to the grid / net production	Share in green electricity	Share in gross domestic consumption	Share in gross electricity production
	MWh	MWh	%	%	%
Hydroelectric power plants	2 024 335.0	2 015 300.0	54.26%	2.81%	2.42%
Small hydroelectric power plants up to 1 MW	492 281.0	n.d./*	13.19%	0.68%	0.59%
Small hydroelectric power plants from 1 to 10 MW	474 603.0	n.d.	12.72%	0.66%	0.57%
Large hydroelectric power plants over 10 MW	1 057 451.0	n.d.	28.34%	1.47%	1.27%
Biomass total	1 170 527.4	581 328.8	31.37%	1.62%	1.40%
Wood chips etc.	603 047.9	471 234.4	16.16%	0.84%	0.72%
Cellulosic ethanol	458 468.7	21 812.0	12.29%	0.64%	0.55%
Vegetal substances	23 085.2	20 363.0	0.62%	0.03%	0.03%
Pellets	84 535.6	66 529.4	2.27%	0.12%	0.10%
Other biomass	1 390.0	1 390.0	0.04%	0.00%	0.00%
Biogas total	266 868.3	176 714.4	7.15%	0.37%	0.32%
Municipal sewage treatment plant	74 036.3	14 723.8	1.98%	0.10%	0.09%
Industrial sewage treatment plant	4 016.4	840.0	0.11%	0.01%	0.00%
biogas plants	91 580.0	72 239.8	2.45%	0.13%	0.11%
Landfill gas	97 235.6	88 910.8	2.61%	0.13%	0.12%
Solid municipal waste (BMW)	11 684.3	5 347.6	0.31%	0.02%	0.01%
Wind power plants (over 100 kW)	244 661.0	243 800.0	6.56%	0.34%	0.29%
Photovoltaic systems	12 937.0	12 937.0	0.35%	0.02%	0.02%
Liquid biofuels	0.0	0.0	0.00%	0.00%	0.00%
Total	3 731 013.0	3 035 427.8	100.00%	5.18%	4.47%

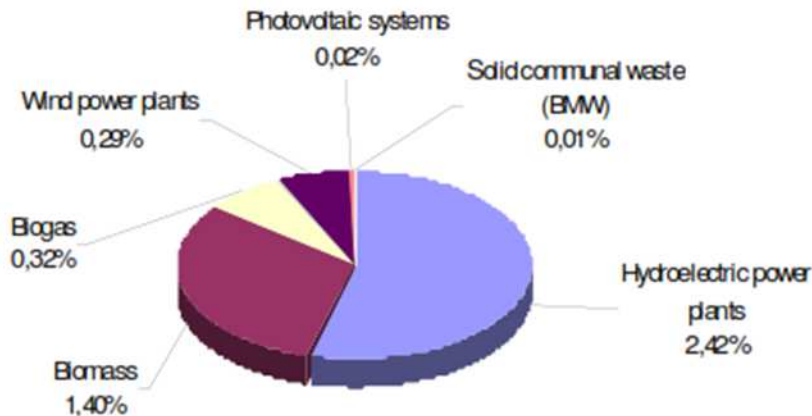
Note: for wind, hydroelectric and solar power plants net production is given according to ERO. (Source: MIT, ERO)

The energy use in the Czech Republic is based on the use of brown coal, which makes for over the half of the electricity sources. With the black coal it sums to almost 60 %. Considering, that the nuclear power makes over 30 % of the energy production, there is only a small part left for RES.



Electricity production in the Czech Republic according to source in 2008 (Source: MIT, ERO)

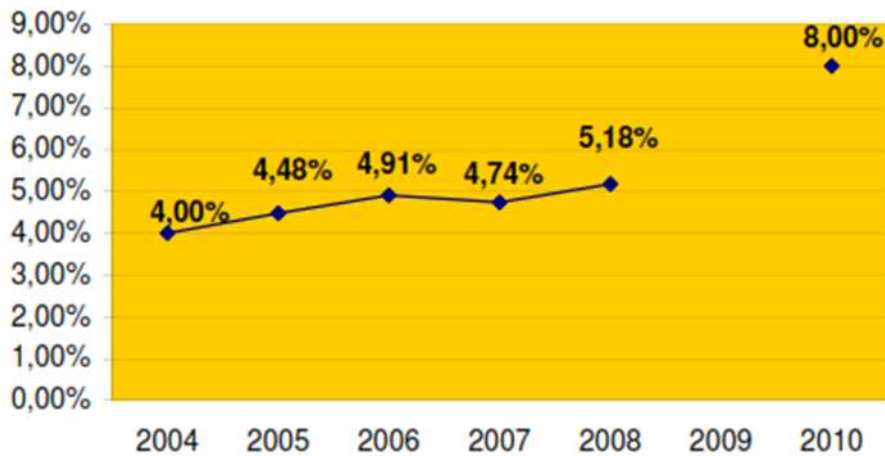
Within the RES has the biomass second position with almost 32 %, following the hydroelectric power, which takes almost 55 %. The share of renewables is shown on the chart bellow and in the following table.



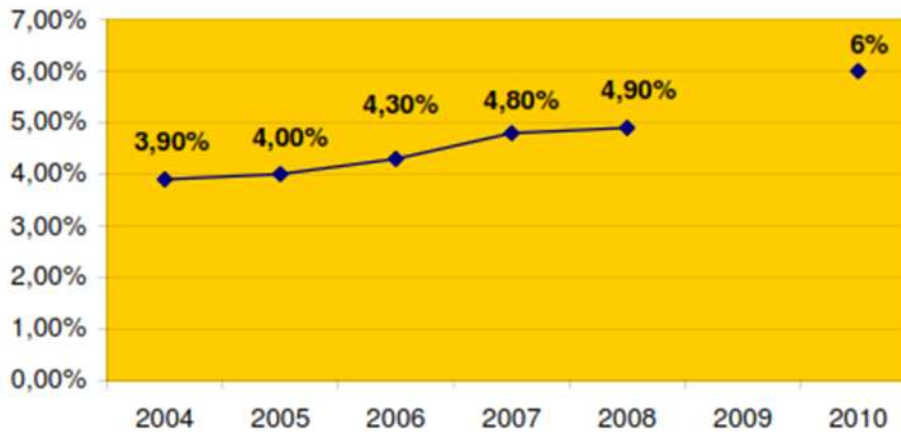
Share of individual RES in electricity production in the Czech Republic in 2008 (Source: MIT)

Note: The pie chart indicates the percentage share of the individual RES categories in total domestic gross electricity production (including export), where the total sum is equal to 4.47% (see tab.1).

As well the development of the RES and biomass use is developing only slowly. With the view of the indicative goal of 8 % share and 5,18 % of the share in 2008, there has to be some major boost in the next years to reach those goals.



Development of the share of electricity production from renewable energy sources in gross domestic electricity consumption



Development of the share of renewable resources in total primary consumption (PEZ)

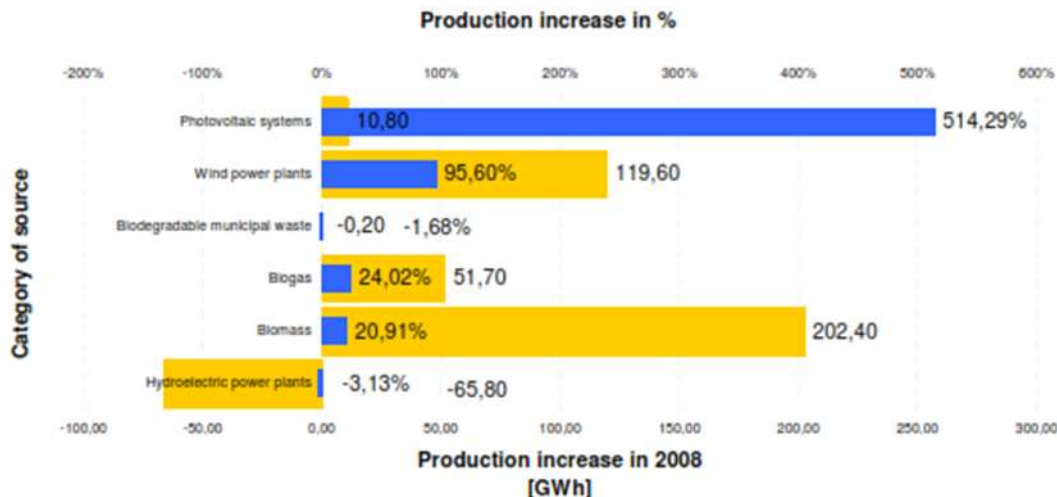
From the biomass has the biggest share electricity production from wood chips. However this is quite a new development. Other area, which has been developing abruptly during the last couple of years, is the electricity production from pellets and briquettes.

Time line of the development of gross electricity production

	Gross electricity production						Trend in gross electricity production from RES between 2007 and 2008
	2004	2005	2006	2007	2008	2009	
	GWh	GWh	GWh	GWh	GWh	GWh	
Hydroelectric power plants	2 019.40	2 380.91	2 550.70	2 089.6	2 024.3		-3.13%
Small hydroelectric power plants up to 1 MW	286.10	343.98	333.00	520.5	492.3		-5.42%
Small hydroelectric power plants from 1 to 10 MW	617.40	728.73	631.40	491.6	474.6		-3.46%
Large hydroelectric power plants over 10 MW	1 116.90	1 309.20	1 586.30	1 077.5	1 057.5		-1.86%
Biomass total	564.54	560.25	731.06	968.1	1 170.5		20.91%
Wood chips etc.	265.27	222.5	272.72	427.5	603.0		41.05%
Cellulosic ethanol	272.82	280.58	350.03	474.5	458.5		-3.37%
Vegetal substances	20.82	53.77	84.46	26.4	23.1		-12.50%
Pellets and briquettes	2.62	4.44	23.85	39.2	84.5		115.56%
Other biomass		0	0	0	1.4		
Biogas total	138.79	160.86	175.84	215.2	266.9		24.02%
Municipal sewage treatment plant	63.51	71.44	67.66	70.8	74.0		4.52%
Industrial sewage treatment plant	2.00	2.87	2.07	3.3	4.0		21.21%
Agricultural biogas	7.13	8.24	19.21	43.2	91.6		112.04%
Landfill gas	66.07	78.29	86.90	97.8	97.2		-0.61%
Solid municipal waste (BMW)	10.03	10.61	11.26	11.9	11.7		-1.68%
Wind power plants (over 100 kW)	9.87	21.44	49.40	125.1	244.7		95.60%
Photovoltaic systems	0.08	0.39	0.54	2.1	12.9		514.29%
Liquid biofuels	-	-	0.22	0.0	0.0		
Total	2 771.78	3 133.46	3 518.83	3 412.1	3 731.0		9.35%
Share in gross consumption	4.04%	4.48%	4.91%	4.74%	5.18%		0.44%

(Source: MIT)

The year-on-year increase in electricity production from RES was 318.9 GWh. In spite of a slight fall in production from hydroelectric power plants, total production from RES rose by 9.35%. The most significant growth was posted for electricity production from biomass and wind power plants. Photovoltaic systems posted the highest percentage increase (514.29%), but in terms of the total volume of electricity this only meant an increase of 10.8 GWh.



Source: MIT, 2009

2 Available biomass potential

Energy use of biomass in CR is connected to startup of support programmes in the second half of the nineties. Ever since the biomass use has been developing, however, often having to overcome political, social and economical barriers.

According to 2001/77/ES EU directive was estimated indicative goal of renewables rate in electric energy consumption of 8% in 2010. Plant biomass should contribute two-thirds to ensure this target. The new directive 2009/28/ES sets obligatory target 13% of renewables share in 2020.

Those targets have been set as well based on the biomass potential in the Czech Republic. For this purpose an „Independent expert commission for the estimation of CR energy requirements“ has been established. This so called “Pačes commission” has estimated the biomass potential of the Czech Republic with ensuring the food security level to prevent in a higher scale the competition of food and energy plant production. The base for the calculation has been used estimation for the different major areas of origin of biomass – the biomass harvested directly on agricultural land and on set asides, the biomass from forestry and residual biomass. Even though the theoretical energy potential coming from biomass has been estimated to 700 PJ/a, the technical potential is significantly lower as will be shown in the following chapters.

2.1 Agricultural residues

The total estimated energy given in this biomass on agricultural land has been summed to 237 PJ. This figure originates from the residues of agricultural production, which is 143 PJ, and of straw, grass and residues from other areas.

	Without straw	Straw	Grasslands	Other areas	Total
	PJ	PJ	PJ	PJ	PJ
Potential on agricultural land	143	50,6	40	3,3	237

Source: Pačes, 2006

In the last couple of years there has been a subsidy for setting aside of agricultural land in the Czech Republic. This has significantly increased the area of grassland. The 40 PJ mentioned above come in this way from a grass obtained from 980 thousand hectares of land.

area (thousand ha)	mass (th.t)	energy (PJ)
980	2 800	40

Source: Pačes, 2006

2.2 Wood

Potential of wood biomass, which can be used for energy production, has been estimated on 84,1 PJ. This figure comes from an annual wood logging in the Czech Republic which is 10,7 million.m³ of wood. For the material use is however necessary to calculate with approximately 50 % of this production. This gives the total potential of wood for energy purposes of about 42 PJ/a.

Estimation of wood potential in the CR	coefficient	total (th.m ³)
--	-------------	----------------------------

Timber lodging		17 678
Residues from timber logging	0,1	1 768
Wood residues from wood processing	0,25	4 420
thinning	0,25	4 420
cleaning	0,005	88
Dendromass for energy purposes total th.m³/year		10 695

Source: ÚHÚL 2007

The estimation of energy potential of wood in the Czech Republic

Dendromass for energy utilization	m ³	10 695 000
	t	5 375 521
	PJ	84,1

The total potential for energy utilization of biomass is in firewood (mostly in pieces) and wood pellets combusted in local boilers, about 10 %, and this potential is under the present conditions of the logging in the CR already practically exhausted. The potential for residual wood suitable for combustion in larger energy sources represents about 27 % of the total potential and this will be fully depleted by forest primary producers already in the near future, the appropriate expansion of this group are the remains of primary and secondary wood processing (from wood and paper industry) and imports from neighboring countries.

Greatest potential remains in the residual agricultural biomass (straw and hay from the agricultural crop production), this potential is currently used in the CR only to a minimum extent. This category can also include residues from the food industry.

2.3 Residual biomass

The residual biomass is creating the biggest group of biomass from a variety of sources. That for is as well the calculation difficult and depends strongly on implementing all the factors. In the table below are listed the major arts of residual biomass, the annual production (2006) and from this following the theoretical energy potential, which is 35 PJ of energy in a year.

Total potential of residual biomass in tons per year

Biomass type		Annual production (ths.t/year)	Annual production (PJ/year)	Usable for energy (PJ/rok)
By-products of animal production	Solid and liquid exkremments	42 510	21	6
	Animal biomass, fett	350	11,1	5
	Meat and bone meal	300	4,9	2,5
By-products from agricultural production	slops	1 200 (min. 600)	3,6	1,8
	Oil seed cake	1 000 (min. 600)	9	2
	Sugar beet pulps	73	0,2	0,1
	molasses	1 150	2	0,4
By-products from food production	grains	370	0,5	0,2
	other	-	-	-
Other BDW	Biodegradable part of municipal waste	1 500	10	3
	Biodegradable part of industrial waste	500	4	2
	Residues from kitchens	500	5	2,5
WWT sludges	Waste water treatment sludge	300	1,5	0,5
	Sludges from industrial WWT plants	-	-	-
Cellulosis leaches	Energy use according to MIT	1 069	8,9	8,9
Total			82	35

2.4 Liquid biofuels

The Czech Republic has set targets for the liquid biofuels which are for the use in transportation:

- 5,75 % share of liquid biofuels from the total amount of petroleum liquids in the year 2010
- 10 % share of liquid biofuels from the total amount of petroleum liquids in the year 2020

The production of liquid biofuels is as well given by the biomass potential of grain and rape seed. The potential of all the products is significantly growing from 2010 till 2020.

Amount of bio-ethanol products

	unit	2010	2020
Production of bio-ethanol from grain	Ths. tons	311,2	541,2
Production of grain	Ths. tons	1 089,1	1 894,1
Amount of slops	Ths. tons	342,3	595,3

Amounts of rape seed products

	unit	2010	2020
FARME	tis.t	223,8	389,2
Rape seed oil	tis.t	228,3	397,0
Rape seed	tis.t	585,3	1 018,0
Oil cake	tis.t	345,4	600,6

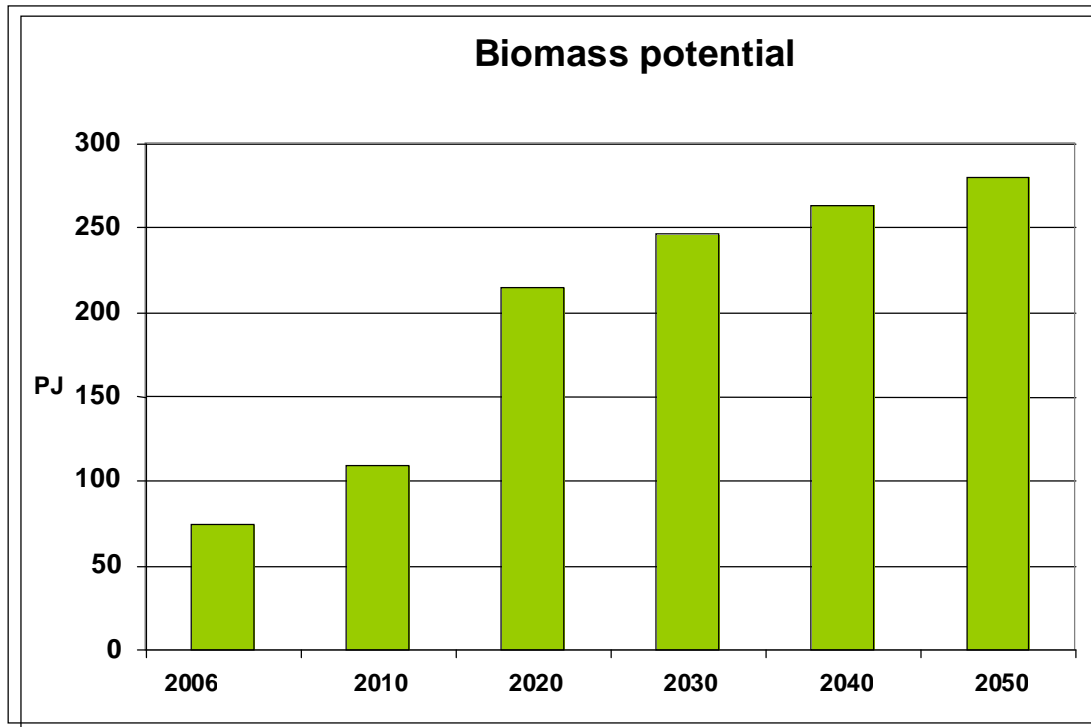
2.5 Total potential

With all the figures mentioned above could be the total potential of biomass in the Czech Republic summed to almost 700 PJ of energy. This number could be reached only in the case, that all the farmland, not used for food production, all the produced annual wood biomass and all the residual biomass from households and industry would be used for energy purposes.

With a moderate estimation of biomass use for energy this theoretical potential gives a technical potential of almost 300 PJ/year.

biomass	PJ
agriculture	214
forest	50
residual	35

Technical potential of biomass in the Czech Republic



3 Biomass market in the Czech Republic

The biomass market in the Czech Republic is still developing abruptly. Reasons for this development have been economic, social as well as political given by several subsidies. The major development has been done in the classification of biofuels. This classification is used for subsidies dividing biofuels to 5 different categories according to which sets the Energy Regulatory Office annually the feed-in tariffs. The overview of the categories and the price decision are listed further bellow. The usual division is to the matter of support to category 1st to 3rd (and 4 and 5 without subsidy), as it is in this way defined by the Decree Law on the RES. Residual biomass suitable for energy use comes mainly from agricultural production as a byproduct of food production. Specifically grown biomass has recently been gaining ground thanks to the possibility of using land that is not suitable for food production and by balancing the overproduction of food. Biomass of these two origins may then be further used either directly or further modified to a compact biofuels. In the coming years will the consumption of energy materials produced specifically for this purpose and used for direct combustion continue to increase. However, combustion will remain the relatively simple, rapid and low-risk solution for the biomass utilization. By the Act no. 180/2005 has been made a prerequisite for development of the utilization of energy crops for electricity production.

In the Czech Republic is from biomass primarily produced a thermal energy. The largest share of this production is the production of heat in private households, where a firewood is primarily used.

In addition to „traditional“ fuels – wood waste, sawdust and wood chips (579 thousand tones) and black liquor (224 thousand tones), non-agglomerated plant material have the major importance. Consumption of plant material pellets and briquettes increased (from 16 to 24 thousand tones). In 2008 total amount of 865 thousand tons of biomass was

used for electricity production, which is significantly more than in 2007 (by 200 thousand tones). Increase was mainly noted in wood waste, sawdust and wood chips.

3.1 Overview of usable types of biomass in energetics in terms of legislation

Exploitable biomass can be divided according to basic criteria. First according to the origin can be differentiated between the specifically grown biomass and residual biomass and further then by the form of the biomass. The legal categorization has been done according to the Decree No. 453/2008 Coll. including the origin of production, the suitability for energy utilization, and competition with other industrial sectors.

Summary of types of biomass and their origin and competitive industry by the Decree 453/2008 Coll.

Category	Type of biomass
1	Energy crops, SRC
2	Cereal straw, Oil crops straw, Corn residues, Barns, Sunflower meal, Rape meal, Devalued cereal and oil seeds, Other crop tissues, Sugar beet pulps, Brewer's draft, Grass, WWTP sludge, Wood 7 centimeters in diameter, Timber up to 1 m of length, Green wood chips, Used wood, Residues from the production of cellulose, Compost not fulfilling the quality criteria, Discards from pulping of waste paper and cardboard waste, Deinking sludge, Residual biomass from the leather and textile industries
3	Saw dust, Wood shavings, Cuttings and wood for material use, Scraps, cuttings and edgings, Firewood, Sulphate, sulphite leaches, crude Tall soap
4	Residual edible oil and fats, Vegetable oil and animal fats, Torch distilling, Alcohols from biomass, Other liquid biofuels, Bark, BDW from kitchens and canteens, BDCW and industry BDW

3.1.1 Agricultural biomass

The agricultural biomass in the Czech Republic is being used by some of the key players on the market as well as in bigger amounts it is being exported mostly to Poland. The domestic agricultural residues are the most used by Dalkia (Krnov - bran, Olomouc - sunflower and rapeseed meals from Setuza, Ústí nad Labem - slops from Trmice) Žlutice - straw, hay, Třebíč - straw, wood chips, Jindřichův Hradec - straw.

The exports for energetics into Poland cover mostly sunflower meal, rapeseed meal, bran, fodder flour, adulterated grain (oats, wheat, rye), straw bales, straw pelletizing.

3.1.1.1 Cereal straw, rape seed straw

In rural areas is still, despite the growing interest in this commodity, a very high potential at the arable land. Price is in a wide interval, limiting factors can be for example competitive source in the region, farmers will to cooperate, self price estimation of the straw by supplier - fuel vs. fertilizer, etc.

Potential competitors are manufacturers of compact biofuels (pellets, briquettes) and of a

small part from the construction industry (structural slabs), or unfavorable weather, which may prevent harvest of the straw from the field or the timely transport to the place.

3.1.1.2 Grass hay

It is used only rarely in the Czech Republic for energy purposes, even though the potential is high. It has slightly worse heating properties than straw. It is usually combusted in the form of compact biofuels, so that the hay is prior to combustion (or transport) grind, powdered and pressed in pelletizers (pellet).

3.1.1.3 Bran

This commodity has one of the most stable and lowest prices. The biggest competitor in withdrawal is the feed industry. Generally this applies to the entire category of agricultural biomass, which is used in compound feed.

3.1.1.4 Sunflower meal

The price is interannually in the range 60 to 90 Euros / t. Competition with livestock production is rather weaker. Ongoing withdrawal from Setuza (e.g. from Olomouc), sunflower is being pressed here in campaigns (usually 7 to 10 days in the month). The volume of scrap from one enterprise was in the interval 1500 - 2000 tons per month. Another source is Hungary, where the potential is far greater and the volume is between 2 to 4 thousand tons per month for combustion. Price here is around 60 to 65 Euros per ton (to be added transportation). Another important source is now Ukraine, the current price is set at 86 euro / the raw material is pelletized (higher heating value).

3.1.1.5 Rape seed meal

The main potential supplier is in CR the company Setuza and Oleofin. Production varies rapidly during the year, at the moment is none of the sources producing to full power. There is a greater market demand for the rapeseed meal as compared to sunflower meal. Its price starts at € 70 / t, but peaks during the year may be up to a limit of 200 EUR / t.

3.1.1.6 Adulterated grain

The price cannot be clearly defined, it is a spot trade, the cereal does not originate effectively. Price was in recent years on average traded for 1500 CZK / t, the equivalent of approximately 100 CZK / GJ.

3.1.1.7 Suppliers and producers of agricultural biomass

The market for agricultural, respectively plant biomass used for energy has not developed yet in the Czech Republic. The biomass is still, in terms of potential, being used in a small local sources or by power producers. The supply of pellets and

briquettes from crop biomass, as an alternative to more expensive and better quality certified wood pellets for heating of homes, is growing significantly.

Czech Republic has up to 1 million hectares of arable land which could be used for the cultivation of energy crops and SRC on arable land. Under this term can be thought of a special annual and perennial energy crops, short rotation coppice and agricultural standard crops with higher yields of above ground material, such as triticale.

Issue of growing special energy crops is followed with distrust by most farmers, which is caused by low knowledge of cultivation. To the question of cultivation of energy crops they sternly state that they are able to offer part of their fields for the cultivation of crops such as EC as a catch crop, but get discouraged by the cost of purchasing new machines. If the purchaser brings an economically interesting concept and would secure the machines, there would be a room to get interesting materials and conditions.

Farmers who are willing to supply phytomass from fields for the production of energy, jointly state the vital importance of enrichment of the soil by biomass, where they value higher the rape seed straw over the cereal straw and at the same time they highlight the risk associated with growing energy crops, where the material is transported from 99 % from the soil, what the multi-annual commitment leads to significant reduction in the quality of soils.

3.1.2 Residual biomass

3.1.2.1 Processed beet pulps

There is a great competition with livestock and in the last time as well biogas plants have become to be a competitor. Prices for dried sugar beet pulp on the market are around 80 euros / t (calorific value about 15 GJ / t).

3.1.2.2 Distilling burnouts

Price ranges from 1700 CZK / t, calorific value is in this case of the dry pelleted fuel about 17 GJ / t. However, the price may increase during the year rapidly, for example the price in VII/2009 was about CZK 3,000 / t (due to suppression of production). Competition is once again in the livestock industry.

3.1.3 Wood biomass

3.1.3.1 Saw dust

Sawdust is a wood waste (but not from the perspective of the Act. on waste) generated from the processing of wood in the wood industry. Nowadays it is not worth to combust the sawdust, due to the incorporation to the 3rd category. Here has been set only a small bonus. Sawdust is at the moment relatively expensive and highly demanded, there is a shortage, especially with a decrease of wood processing caused by the crisis, and it is increasingly used to produce pellets and briquettes. Further, the cycle producer-processor is usually closed and in advance contracted, where the majority of saw-mills have in advance secured the outlet for sawdust and shavings.

Forrest chips

Forest chips have the greatest potential, however this commodity is used the very most in heat and electricity industry. In constructing, logistics and supply it is convenient to contact specialized traders with this commodity (the experience, contacts, knowledge of the situation, own sources).

Price is below 120 CZK / GJ over the entire year, but larger amounts of chips may be due to competition in the energetics locally unavailable. Existing heating plants are using greatly this commodity, while at the same time the interest in the chips is increasing significantly.

3.1.3.2 Pellets and briquettes

This commodity can be in terms of energy divided into 2 categories - industrial pellets and pellets for small sources and for private households. Industrial pellets (usually darker in color) are of blended bark and other impurities and has a significantly higher ash content and substances problematic for combustion process and boiler, or are even made from materials coming from agriculture (straw, grain residues and chaff). High quality (white) pellets have the given price ceiling up to natural gas, as it forms the closest replacement for heating in matter of operation comfort. For heating industry are therefore not interesting. Current prices are starting from 150 EUR at the producer, wholesale prices starting from 3900 to 4000 CZK / ton and that only in the summer months. In winter, up to 6,000 CZK / t. Customers from a producer from Germany or Austria pay up to 170 EUR.

3.1.3.3 Wood chips from short rotation coppice

The SRC are only rarely grown in the CR (SRC total area of plantations is approximately up to 400 ha). There is a possibility for wood chips from SRC from Poland. Chiups from SRC are Those chips are in category 1.

3.1.3.4 Suppliers and producers of wood biomass

The situation in the CR can be in terms of supply of forest biomass divided into 2 groups:

- 1) The owners and managers of forest land
 - state enterprise Lesy České republiky,
 - state enterprise Vojenské lesy a statky ČR,
 - municipal forests,
 - non-forest lands suitable for afforestation,
 - Private forest owners.
- 1) Processing and supply companies
 - Wood processing industry
 - Producers and suppliers of compact biofuels (pellets a briquettes)
 - Wood chips producers, timber logging companies
 - Short rotation coppice

Most important supplier in the number of managed forest land is Lesy ČR in tow with Vojenské lesy a statky ČR, which manages the majority of forests in the CR. Municipal and private forests are in the CR rather minor, 75% of these areas do not exceed the area of 5 hectares. However, several larger units, which have a larger volume of for

energy usable biomass, can be found. These smaller entities are organized into several groups, where the most important is SVOL (Sdružení vlastníků obecných a soukromých lesů v ČR) and those stakeholders should rather be contacted through this association.

3.1.3.5 Producers and suppliers of compact biofuels (pellets and briquettes)

Production of briquettes and pellets from biomass is increasing in recent years and this trend is expected as well in the coming period. Production capacity is mainly governed by the quantity of processed material, which is limited and demand in the market which is growing. Thus there are produced in addition to wood-based pellets and briquettes as well compact biofuels from other kinds of biomass, mostly of crop origin. High percentage mostly of wood pellets is also exported abroad, mainly to Austria and Germany.

Production and utilization of pellets and briquettes from biomass in the year 2008

	Briquettes (tons)	Pellets (tons)
Capacity of production lines	133 767	395 786
National production	76 622	193 896
Import	6 922	1 819
Export	47 010	112 763
Internal consumption of producers	2 640	822
Balance differences and changes in inventories	18 347	-837
Deliveries to the market for final consumption	52 241	81 293
Consumption of larger companies	5 215	56 135
For electricity production	1 645	43 279
For heat production (including producers)	3 570	12 856
Balance difference and changes in inventories	20	2 336
Consumption in small companies and in households	49 666	23 649

Source: MIT 2009

Prices of pellets widely vary. High-quality certified wood pellets reach in the winter months prices of up to 6000 CZK / t. These pellets are directed at the small household boilers and heating of private houses.

3.1.4 Other biomass

3.1.4.1 Digest from biogas plants

Digest is the rest of the biomass from biogas production in biogas plants. For energetics can be used only drained digest. Digest as a fuel may be used only from agricultural biogas plants, which process larger quantities of plant biomass (corn silage, haulage), which is well drainable and represents remains of unresolved fibers from the fermentation process. Here it is possible to achieve 50 % of solids. Subsequently is digest additionally dried by waste heat, which is generally produced at the operation of biogas plants in abundance. The dried fuel occurs in Germany or Austria in pelleted form. In the CR, there is rarely the equipment for its modification (centrifuge, drying, pelletizing) as it is capital intensive (total of 4 to 8 million CZK). Calorific value is about 8 GJ / t. So far only a single agricultural biogas plant with adequate facilities to adjust

digest is being constructed in city Decin. Here it should be mentioned that the biogas plants in the CR are currently experiencing a rapid development and they are every year de facto doubling their number, respectively the performance. Currently there is in about every 14 days a new biogas plant put in operation.

3.1.4.2 Meat and bone meal

Calorific value of meat and bone meal is about 16 MJ / kg. Estimated amount of meat and bone meal production in the CR is cca 300 thousand tons/a. The purchase price is 100 - 200 CZK / t, but there is no bonus (category 4). There are however unclear legislative requirements for using meat and bone meal as a fuel.

3.1.5 Biodegradable fraction of waste

The use of waste in the production of energy is understood to be the incineration of solid municipal, hospital and industrial waste or the use of so-called alternative fuels based on waste. Municipal waste in particular contains 50 – 65% of biodegradable components, which are also considered to be a renewable source. The Czech Republic in comparison with other countries makes only minimal use of municipal waste to produce energy, while the majority of such waste is put into landfills. This is starting to change according to the new EU legislation, however due to the low starting point is Czech Republic still on the last ranks within the EU.

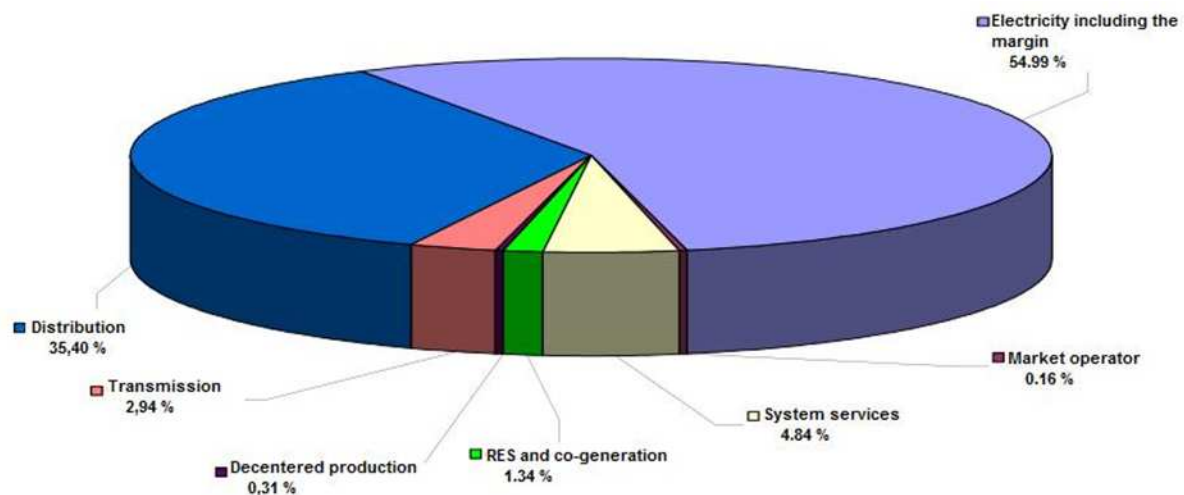
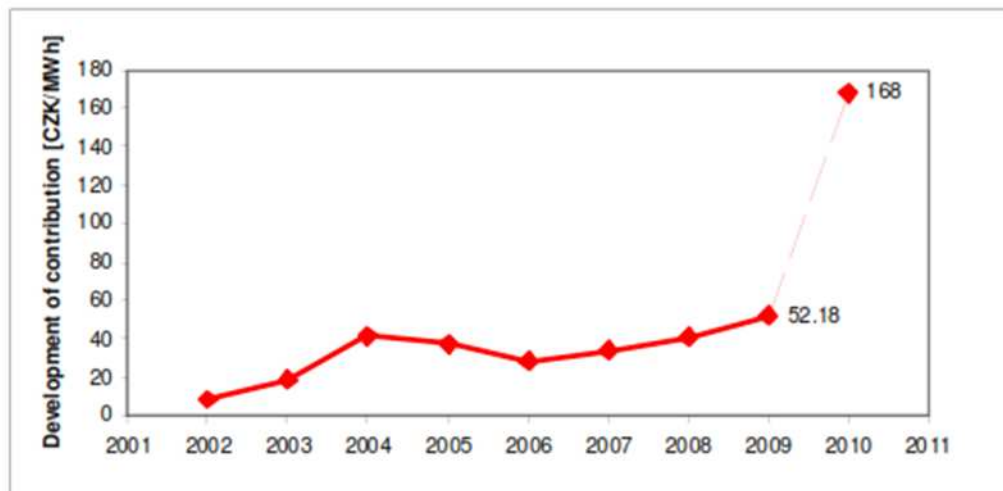
4 Price developments

As already mentioned before, there has been a major development in the legislation of energy use of biomass within the last couple of years. This gives us some of the tendencies for the price development. One of the major acts has been the 180/2005 Coll. on the promotion of electricity production from renewable resources came into force in 2005. This act stipulates the basic framework for promotion of electricity production from RES and introduces a system for promotion in the form of purchase prices and green bonuses. The operator of the relevant regional distribution company is always obligated to purchase electricity from RES to cover losses in the system of purchase prices or to pay green bonuses. The purchase prices and green bonuses are stipulated through the applicable pricing decision of the Energy Regulatory Office on the promotion of renewable resources, combined electricity and heat production and secondary sources. The prices are further covered by the joint contribution of end users in form of fixed prices. The amount of the contribution is always stipulated by the Energy Regulatory Office for the subsequent calendar year. The total actual costs for the promotion of all promoted sources since 2002, when the amount of such promotion was stipulated for the first time, have already exceeded CZK 10 billion and these continue to rise quickly. The costs in the individual years are given in table No. 14 below.

Actual ancillary costs for the promotion of RES (Source ERO)

Actual ancillary costs for the promotion of RES (CZK billion)						
2002	2003	2004	2005	2006	2007	2008
0.540	0.641	1.102	1.343	1.646	2.100	2.658

(Source: ERO)

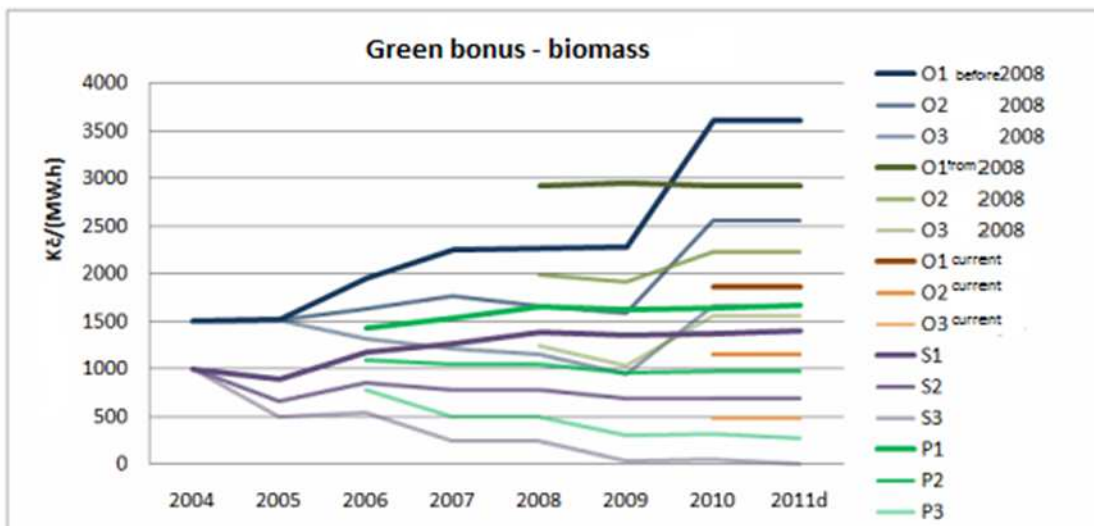
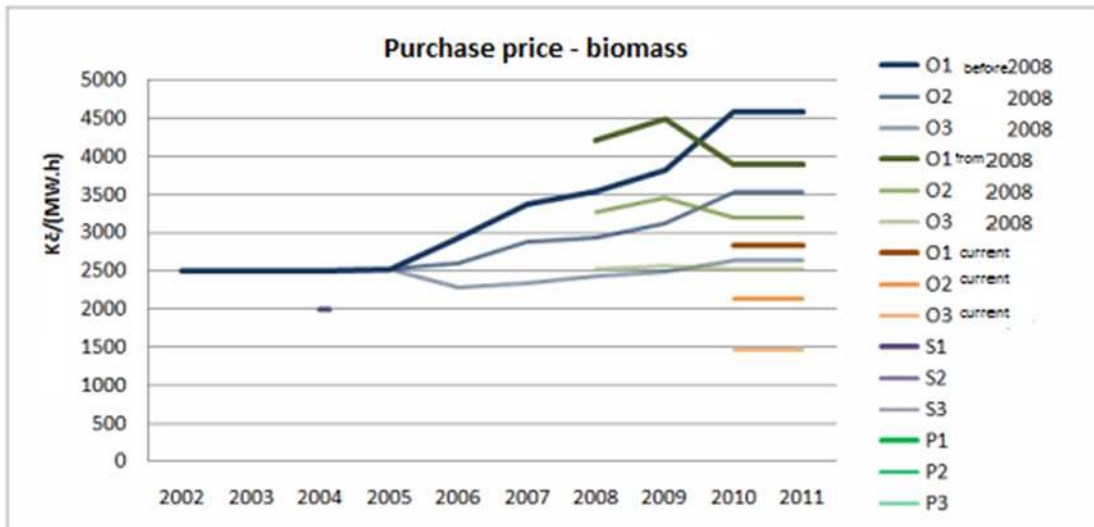


Share of the individual components of the price for electricity deliveries for customers at NN level in 2008

In connection with the development of unstable RES categories (e.g. photovoltaic or wind systems) the demands for the connection of new production sources or increases in existing capacities are significantly reflected in the payments by the DS operator and subsequently are of course reflected in the end price for the customer. In a 2007/2008 year-on-year comparison, photovoltaic systems recorded a growth of almost 1500% in terms of installed capacity and gross production exceeded 12.9 GWh.

The growing price for electricity from RES is as well visible on the following graphic. The prices differ according to the category of the biomass, which is being utilised.

Purchase prices and green bonus for biomass



Source: Bechník, 2010

5 Trade

In 2008 more than 700 thousand tons of biomass suitable for energy purposes have been exported. It is more than 20% higher amount than in 2007. Most of this increase involved raising briquettes and pellets export.

Utilization of biomass in energetics of the Czech Republic in the year 2008 in tones

Fuel	For power production	For heat production	Total
Waste wood, wood chips, saw dust, etc.	579 384	1 023 816	1 603 200
Firewood	-	34 719	34 719
Crop materials	15 120	22 390	37 511
Briquettes and pellets	44 925	16 403	61 327
Cellulose leaches	224 342	787 471	1 011 814
Other biomass	1 345	0	1 345
Total	865 116	1 884 799	2 749 916
Estimation of private household consumption			3 397 340
Export of biomass suitable for energy use			719 503
Total energetically used or exported biomass			6 866 759

Source: MIT 2010

During the last couple of years has been in the Central Europe increasingly developing a cross-border trade with biomass, especially due to increasing share of biomass in energy consumption.

The biggest importer in the region is Italy, followed by Austria. In Austria, 90 % of the imports of firewood come from the Czech Republic, Slovakia and Hungary. Austria is in this case the dominant consumer of the Czech Republic

Most of the international trade focuses on wood and wood products. The importance of liquid biofuels trade has been decreasing during the last couple of years.

5.1 Wood

As can be seen in following two tables, the export of wooden biomass is not increasing compared 2007 and 2008 in all categories. The major increase has been especially at wooden biomass which can be directly used for energy production. From this category it is especially wood chips and briquettes and pellets. The reason for higher exports are especially higher demand for those products in Germany and Austria, but as well in other European countries.

Energy biomass – external trade statistics (tones)

	2007		2008		Index	
	Import	Export	Import	Export	Import	Export
Firewood	7 125	76 875	3 053	68 675	43%	89%
Chips etc.coniferous	36 862	101 032	25 460	129 804	69%	128%
Chips etc. non-coniferous	1 219	72 820	1 249	125 451	102%	172%
Sawdust	6 893	137 964	7 862	123 336	114%	89%
Wood waste	12 911	100 934	23 372	70 074	181%	69%
Briquettes and pellets	7 591	102 115	9 500	202 163	125%	198%
Total	72 601	591 740	70 496	719 503	97%	122%

Data source: Ministry of Industry and Trade; Czech Statistical Office

There is significant increase in burned biomass volume for electricity production (especially wood chips and wood waste). Export increased as well. Particularly firewood and wood briquettes and pellets were exported. On the other side, the internal Czech market with biomass for energy production is declining as there has been less fuels supplied to households.

Cross-border trade with chips, sawdust, pellets and wood waste amounts compared to the firewood at much higher values. Part of this amount is used for non energy purposes, such as paper, chipboard and pulp industry. The largest volumes of wood chips and wood waste flows from Germany to Austria and from Austria to Italy. Czech Republic and Slovakia are primarily exporters of commodities to all the surrounding countries except of the Ukraine.

Czech Republic – Annual exports and imports of biomass in the period 2008 – 2009

(in thousand tons in a year)	export					import
	CR - WORLD	CR - AU	CR - DE	CR - SR	CR - PL	WORLD - CR
Firewood, roundwood, loppings	75	63	5	2	0,1	10
Wood chips (softwood)	130	75	52	5	1,5	27
Wood chips (hardwood)	130	125	0,5	4	0	1,4
Wood waste, sawdust, pellets and briquettes	380	135	164	55	12	33
Straw, agriculture biomass, crop pellets	12	0	0,5	0,1	10	0,1

Poland – Annual exports and imports of biomass in the period 2008 – 2009

(in thousand tons in a year)	export					import
	PL - WORLD	PL - CR	PL - SR	PL - DE	PL - DK	WORLD - PL
Firewood, roundwood, loppings	50	0	0	32	11	3
Wood chips (softwood)	48	6	3	42	1	38
Wood chips (hardwood)	14	2	0,5	7	6	44
Wood waste, sawdust, pellets and briquettes	350	0,2	1,5	163	144	186
Straw, agriculture biomass, crop pellets	3	0,5	0	0	1,5	25

Slovakia – Annual exports and imports of biomass in the period 2008 – 2009

(in thousand tons in a year)	export					import
	SR - WORLD	SR - CR	SR - PL	SR - HU	SR - AU	WORLD - SR
Firewood, roundwood, loppings	54	2	16	2	27	60
Wood chips (softwood)	46	4	18	7	18	3
Wood chips (hardwood)	4	0,5	0	0,3	1,5	140
Wood waste, sawdust, pellets and briquettes	270	24	16	130	73	25
Straw, agriculture biomass, crop pellets	14	4	4	5	0,2	0,5

Note: CR - Czech Republic, SR - Slovakia, PL - Poland, DE - Germany, AU - Austria, DK - Denmark, HU - Hungary

Source: UHUL, 2009

Trade with wood

	Coniferous industrial wood												Coniferous sawnwood					
	Production				Imports				Exports				Production		Imports		Exports	
	Logs		Pulpwood (round and split)		Logs		Pulpwood (round and split)		Logs		Pulpwood (round and split)							
	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
Austria	12,93	11,20	2,64	2,70	6,1	5,7	1,22	1,20	0,59	0,55	0,13	0,19	11,03	9,80	1,45	1,55	7,64	6,95
Czech Rep.	10,00	8,50	5,86	4,98	0,58	0,55	0,20	0,13	2,30	1,83	0,55	0,40	5,19	4,41	0,39	0,39	2,26	1,90
Finland	24,55	20,23	20,34	18,78	2,04	1,12	4,15	4,64	0,22	0,22	0,38	0,48	12,40	9,50	0,56	0,50	7,07	5,80
France	13,98	14,30	5,48	5,50	1,13	1,11	0,85	0,54	0,94	0,87	1,10	1,02	8,01	8,10	3,70	3,40	0,87	0,78
Germany	42,80	37,00	13,55	9,60	3,26	2,20	0,41	0,25	4,81	4,50	0,53	0,55	24,04	23,50	3,55	3,40	8,43	9,00
Poland	12,93	13,50	11,05	11,15	2,12	0,10	0,90	0,95	0,18	0,18	0,08	0,07	2,84	3,10	0,46	0,46	0,50	0,51
Romania	4,55	4,70	0,53	0,40	0,28	0,32	0,04	0,05	0,02	0,01	0,00	0,00	2,88	2,95	0,02	0,03	1,73	1,75
Spain	3,26	3,58	3,16	3,50	1,54	1,08	0,27	0,05	0,16	0,10	0,04	0,01	2,38	2,50	3,08	2,31	0,09	0,09
Sweden	39,90	29,60	28,50	26,90	0,78	0,70	2,79	2,80	2,10	1,30	1,69	1,54	18,49	17,10	0,27	0,20	11,33	11,00
Others 1)	41,74	40,34	19,52	20,87	5,61	4,33	3,66	2,78	3,90	3,29	5,14	4,98	27,74	26,66	29,00	24,36	8,92	8,09
Total Europe	206,64	182,95	110,63	104,29	21,44	17,21	14,49	13,39	15,22	12,85	9,64	9,24	115,00	107,62	42,48	36,60	48,84	45,87
Russia	65,20	61,40	40,60	40,50	0,20	0,20	0,10	0,10	19,00	13,60	10,70	9,70	20,42	21,12	0,01	0,01	16,77	14,54
Others 2)	6,63	6,63	1,71	1,71	...	...	...	...	...	...	...	...	3,63	3,64	0,90	0,90	2,17	2,17
Total CIS	71,83	68,03	42,31	42,21	0,20	0,20	0,10	0,10	19,00	13,60	10,70	9,70	24,05	24,76	0,91	0,91	18,94	16,71
Canada	146,54	146,54	10,65	10,65	2,82	2,82	0,45	0,45	3,31	3,31	0,15	0,15	50,88	45,00	0,53	0,90	32,39	24,00
USA	163,75	159,01	103,03	102,46	1,76	1,69	0,02	0,02	7,59	7,44	0,57	0,57	59,51	52,29	30,99	24,50	1,58	1,59
Total North America	310,29	305,55	113,68	113,11	4,58	4,51	0,47	0,47	10,90	10,75	0,72	0,72	110,39	97,29	31,52	25,40	33,97	25,59

5.2 Pellets, wood chips, wood briquettes

Wood briquettes production in CR developed since the early nineties and pellets production since second half of nineties. From 2004 processing of „alternative“ plant pellets from agricultural waste is sharply increasing. However there is only a significance of wood based pellets and briquettes. The market with herbal compact biofuels is still developing. On the example of pellets can be shown the ratio between production and export.

Production, import and export of pellets and briquettes

	Pellets		Briquettes	
	herbal	wooden	herbal	wooden
Production	110	158	1	106
Import	10	4	0	22
Export	0	134	0	65
National use	120	28	1	63

There has been in the year 2008 produced 193 896 tons of pellets. However, only 81 293 tons of this production has been consumed in the Czech Republic and on the other side 112 763 tons have been exported. This is quite significant and has been already shown on other examples. The production of biofuels in the Czech Republic is developing abruptly, however the internal market with biofuels is not developed yet. In this way it is difficult to fulfill the targets set for the share of biofuels.

Balance of briquettes and pellets from biomass (2008)

	Briquettes (tones)	Pellets (tones)
Capacity of processing plants	133 767	395 786
Domestic production	76 622	193 896
Import	6 922	1 819
Export	47 010	112 763
Own consumption of producers	2 640	822
Stat.diff. and stock changes	18 347	- 837
Inland consumption	52 241	81 293
Consumption in large companies	5 215	56 135
For electricity generation	1 645	43 279
For heat production (incl.producers)	3 570	12 856
Stat.diff. and stock changes	20	2 336
Consumption in small companies and households	49 666	23 649

Data source: Ministry of Industry and Trade

The import in 2007 amounted to at least 7 500 tones. The briquettes were imported from Austria, Poland and Germany. Briquettes and pellets were imported from Ukraine and Slovakia. Both products are mostly exported to Austria, Germany, export to Italy is increasing.

Briquettes and pellets consumption in 2004 – 2007 (tones)

	2004	2005	2006	2007
Briquettes	2 183	2 426	8 702	11 730
Pellets	1 375	3 617	21 620	34 686
Total	3 558	6 043	30 322	46 416
for electricity generation of it	1 227	2 726	15 518	24 321

Data source: Ministry of Industry and Trade

5.3 Rape methyl ester and bio-ethanol

5.3.1 Rape seed oil methyl ester

The compulsory addition of fraction of methyl ester of rape seed oil to liquid fuels for transport has started in september 2007. At that time the compulsory fraction was 2 % of the volume. This has increased and ever since 1.1.2009 the compulsory fraction has increased to 4,5 %.

Production, imports and exports of RME in the year 2009

National production	154923
Import	10866
Export	29911
Balance	306
Gross consumption	135572

Import in tons	
Austria	2148
Germany	3925
Netherlands	151
Poland	1571
Slovakia	3071
Total	10866

Export in tons	
Austria	2170
Germany	1979
Poland	23414
Slovakia	2347
Total	29911

Source: MIT, 2010

The national production has been according to MIT in the year 2009 over 150 000 tons of RME. Most of this production has been used within the Czech Republic. This has not always been the case. For example in the year 2005 has been produced 126 thousand tons of RME and exported has been 131 thousand tons. This could have been caused only due to the low national consumption of 3 thousand tons and imports of almost 8 thousand tons. In other words could be said, that in 2005 has the Czech Republic been solid producer and exporter of RME.

Development of RME in the Czech Republic

	2003	2004	2005	2006	2007	2008	2009
Production	113 500	85 144	126 894	110 574	81 806	76 672	154 923
Import	60	3 120	7 811	22 532	8 339	43 657	10 866
Export	43 500	52 414	131 536	110 515	53 572	34 352	29 911
National market	70 060	35 850	3 169	22 591	36 573	88 121	135 572
Production capacity	198 075	202 000	194 500	194 500	346 000	333 000	420 000

Source: MIT, 2010

5.3.2 Bioethanol

The national production of bioethanol has been in the year 2009 almost 90 thousand tons. This number could be compared to the production from the year 2006 when the statistically relevant production was only 1 800 tons. This means that within 4 years has the production of bioethanol shown a significant increase. This is as well a hope for the following years. Most of the production is being used in the Czech Republic. Exported have been in the year 2009 almost 51 thousand tons of bioethanol.

National production	89625
Import	32939
Export	50953
Balance	-3325
Gross consumption	74937

	2003	2004	2005	2006	2007	2008	2009
Production	-	-	-	1 790	26 509	60 236	89 625
Import	-	-	-	-	-	21 317	32 939
Export	-	-	-	-	17 027	31 908	50 953
National market	-	-	-	1 781	287	51 634	74 937
Production capacity	-	-	-	-	-	160 000	160 000

6 Transport

6.1 Railway

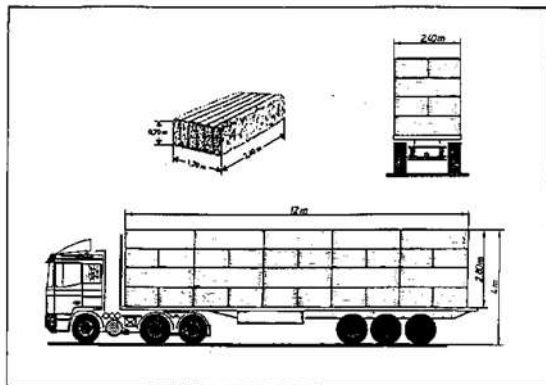
Railway is in the Czech Republic mostly used for transport on longer distances. The biggest company providing those services is ČD Cargo with a standard trains or with a modern wagons called Innofreight which is used for example by the biggest paper producing company in the Czech Republic Mondi.

Most common is the transport of wood or solid materials as wood chips. Other biomass as for straw bales are being transported with railway only rarely. One of the exceptions is the heating company Žlutická teplárenská.

6.2 Trucks

This mean of transportation is being used for shorter distances. At the moment, the price for a kilometer with a truck with capacity of 90 m³ varies around 30 CZK. In a short distance track system, there is mostly being fixed price used.

For bales of straw are being used special trucks which are of a lower weight.



Czech heating plant use for the transport of bale straw semi trailer trucks with an extra trailer. This system is using among others Jindřichův Hradec heating plant or trucks with extra trailer (Třebíč heating plant).

7 Promotional measures favorable for regional/international trade

7.1 Support for RES electricity

The basic act for the support of RES for energy production is the Act No 180/2005 on the promotion of electricity produced from renewable energy sources, which implemented the EU Directive 2001/77/EC in Czech legislation. Main aspects of this act are preferential connection to the grid which includes the obligation for operators of the regional grid systems and the transmission system operator to purchase all electricity from renewable sources, the guarantee of revenue per unit of electricity produced over a 15-year period as of the date a plant is put into operation, the possibility of choosing between two support systems - minimum feed-in tariffs – all the electricity produced can be sold to the relevant distribution system operator and green bonuses (premium on the market price of electricity) – electricity produced from renewable sources can be placed on the single electricity market and finally the support of electricity used for internal consumption (not supplied to the grid).

7.1.1 Feed in tariff and Green Bonuses

A feed-in system for RES-E and cogeneration came into force in 2002. This scheme only led to a few new renewables installations. The RES Act adopted in 2005, extended this system by offering a choice between a feed-in tariff (a guaranteed price) or a “green bonus” (an amount paid on top of the market price).

Feed-in tariffs apply to electricity supplied and metered at the delivery point between the generating plant and the respective distribution system operators. Green bonuses apply to electricity supplied and metered at the delivery point between the generating plant and the regional system operators and supplied by the generator to an electricity trader or eligible customer. Producers can choose if they sell electricity for purchase prices or offer it to trader for „market-price“ and simultaneously get extra green bonuses – paid by the operator of Transmission System). The green bonus and feed-in-tariff system are more described in the chapter covering the price for biomass as this is one of the major factors.

7.1.2 State programme for the promotion of energy efficiency and the use of renewable energy resources

State programme part A- EFEKT (MIT) Investors in electricity production from RES have the possibility of obtaining promotion from the state programme for the promotion of energy efficiency and the use of RES. Subsidies from part A of the programme (under the responsibility of the MIT) were up to 40% of investment costs or a maximum of CZK 5 million in 2008.

Part B of the state programme for the promotion of energy efficiency and the use of RES represents programmes of the Ministry of the Environment ensured through the State Environment Fund of the Czech Republic. In 2008 these programmes focused only on promotion for investments in the use of renewable energy resources for environmentally friendly heating. Projects supporting electricity production from RES were not promoted in 2008.

7.2 Support for all RES

The Programme “Promoting the cultivation of crops for energy use in 2007” was incorporated into the national support programme, specifying the conditions for granting subsidies in 2007. The objective is to promote the establishment and maintenance of standing crops for energy use with an aid of CZK 3,000 per hectare. In this programme, stated energy crops must be grown specifically for energy use. In 2007, 1,771 hectares were sown with energy crops and approximately CZK 5,314,000 were allocated.

7.2.1 Support for growing energy crops in the agricultural sector (Ministry of Agriculture)

7.2.1.1 European Regional Development Fund- State Environmental Fund (SFŽP)

The Operational Programme for 2007-2013 includes the subsidy scheme “Exploitation of Renewable Energy Sources”.

OP Environment:

Field support: 3.1 - Construction of new facilities and renovation of existing facilities in order to increase the use of RES for heat production, electricity generation and cogeneration.
Sub-support:
3.1.1 Construction and reconstruction of heat sources using RES.
3.1.2 Construction and reconstruction of sources of electricity using RES.
3.1.3 Construction and renovation resources for the combined generation of electricity and heat using RES.
The maximum amount of subsidy for one project in Sub-aid 3.1.3 may reach 100 million. 3.1.3 In sub-projects will be accepted only where at least 20% - out of their own technological consumption - of the heat produced is used. Projects with that use a minor amount of heat will be accepted in the sub-support 3.1.2.

Source: EREC, 2010

OP Enterprise and Innovation

As part of the Operational Program Enterprise and Innovation occurred on the 25th April 2007 on the publication of the 1st Challenges Eco-energy program, which was intended only for small and medium-sized businesses. The financial allocation from EU funds for the programme Eco-energy is 121.6 million Euro.

7.3 Liquid biofuels

There is no direct support for biofuels. There is only given a mandatory minimum values of biofuels blended with fuel:

- as of 1 January 2008, 2% of the total amount of motor-vehicle petrol fuel;
- as of 1 January 2009, 3.5% of the total amount of motor-vehicle petrol fuel;
- as of 1 January 2009, 4% of the total amount of motor-vehicle diesel fuel.

7.4 Tax relief

There is a tax according to the Act. No. 586/1992 Sb., on income taxes. Free from taxation are according to this law incomes from the operation of defined plants using RES.

8 Conclusion

The use of bioenergy in the Czech Republic is developing, however not equally in all the RES. Development can be seen especially in the use of liquid biofuels in transport, in pellets and briquettes and in the use of residual biomass. On the other side, there is only a minor market with biomass within Czech Republic. This is one of major barriers for reaching the National targets for RES use.

Czech Republic is an important exporter within Central Europe especially for wood, wood by products and other biomass which can be directly used for energy production. Most of the exports go to Germany and Austria.

The state of the art in the biomass use in the Czech Republic is obvious from two documents. One of them is the Report on the Fulfilment of the Indicative Target for Electricity Production from Renewable Energy Sources for 2008 and in the REAP. The Report states, that the targets set can not be fulfilled under current conditions. In order to reach those goals, a major drive from the politics or national market development

would have to take place. The REAP however sets only minimal goals and actions, which do not set any change in the current approach.

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