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Ministerstvo průmyslu a obchodu

Ministerstvo životního prostředí

2006 Report on the Achievement of the Indicative Target for Renewable Electricity

pursuant to Section 7 of Act No 180/2005 on the promotion of electricity produced from renewable energy sources

September 2007

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1. INTRODUCTION

The Czech Republic, as a Member State of the European Union, is committed to increasing electricity generation from renewable energy sources. The determination of the potential of renewable energy, discussions on its realistically attainable share, and talks on the forms and rate of assistance were important subjects in 2003 and 2004 in the dialogue on the State Energy Concept and the amendment to the Energy Act; after more than a year's debate in the parliamentary Chamber of Deputies, they resulted in the adoption of Act No 180/2005 on the promotion of electricity produced from renewable energy sources.

This legislation created stable conditions for business decisions by defining a system of support entailing the use of feed-in tariffs or surcharges on the market prices of electricity. It also guarantees an amount of revenue per unit of electricity produced over a 15-year period. The renewable energy source support system, accompanied since 2004 by the prospect of aid under the EU Structural Funds, is instrumental in achieving the target of an 8% share of renewable sources in gross domestic energy consumption. The self-standing gross inland consumption has a major impact on the attainment of the stated share of renewable sources.

This report provides information on renewable electricity in 2006, outlines the outlook until 2010, and sets out the preconditions required to achieve the stated targets together with a rough assessment of the costs. It also includes supplementary information in the form of a description of the basic support programmes implemented by the Ministry of Industry and Trade and the Ministry of the Environment.

The report was drawn up by the Ministry of Industry and Trade in liaison with the Ministry of the Environment and the Energy Regulatory Office.

Notes on statistics:

The report contains statistics collated by the Ministry of Industry and Trade in the context of comprehensive national statistics on renewable sources. The statistical methodology has been significantly built up and clarified since 2003. For the sake of the comparability of data, the figures used in this report are from 2003. Statistics were obtained from research conducted by the Ministry of Industry and Trade and from the databases of the Energy Regulatory Office, the Czech Statistical Office, the State Energy Inspectorate, the Czech Hydrometeorological Institute, and the State Environmental Fund. A comprehensive statistical picture is provided by the results of the statistical survey 'Renewable Energy Sources in 2006', published by the Ministry of Industry and Trade in August 2007.

2. THE CZECH REPUBLIC'S INDICATIVE TARGET FOR RENEWABLE ELECTRICITY

Individual Member States' indicative targets regarding the proportion of renewable energy sources are taken from Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market. They are defined as percentages of electricity production in gross domestic energy consumption in each Member State. The Directive also defines an overall 22.1% target for the European Community.

The Directive obliges the Member States to take measures and adopt support programmes that will lead to an increase in electricity production from renewable energy sources. The specific forms of measures are a matter for individual countries, but must be consistent with rules for the internal market in electricity and proportional to indicative targets so that they are achieved in 2010.

Under the accession treaty (Act of Accession, Annex No II, section 12, A, paragraph 8a), the Czech Republic is committed to achieving an indicative target of an 8% share of renewable electricity in gross inland consumption in the Czech Republic in 2010.

The indicative target is part of Act No 180/2005 on the promotion of electricity produced from renewable energy sources, which transposes the Directive into Czech law.

Indicative targets of EU Member States

At present, complete data on renewable electricity production in the EU are only available for 2005

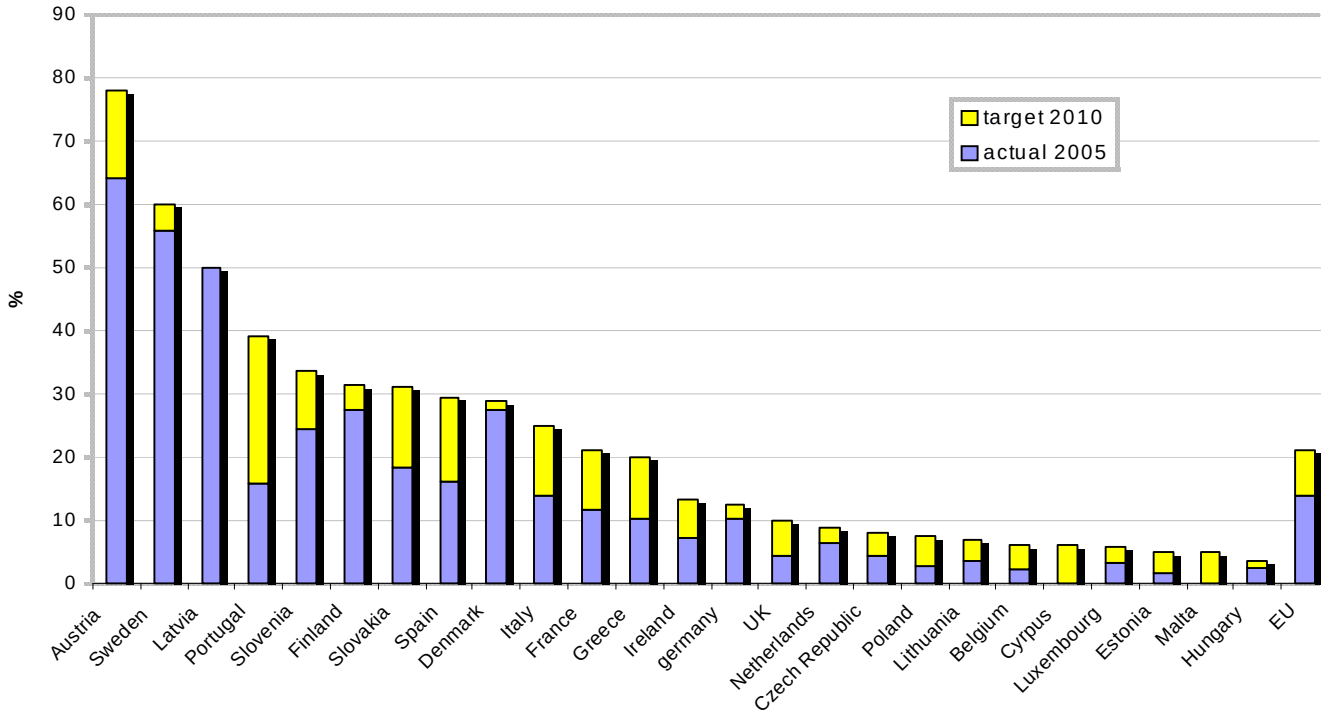

Figure 1 EU Member States' indicative targets for renewable electricity production up to 2010

3. DEVELOPMENTS IN RENEWABLE ELECTRICITY

3.1. The Czech Republic's energy mix in 2006

In the Czech Republic, coal is the main source used for electricity production, with a long-term share of more than 60% in total electricity production. The second most important source is nuclear power, with a share of over 30%.

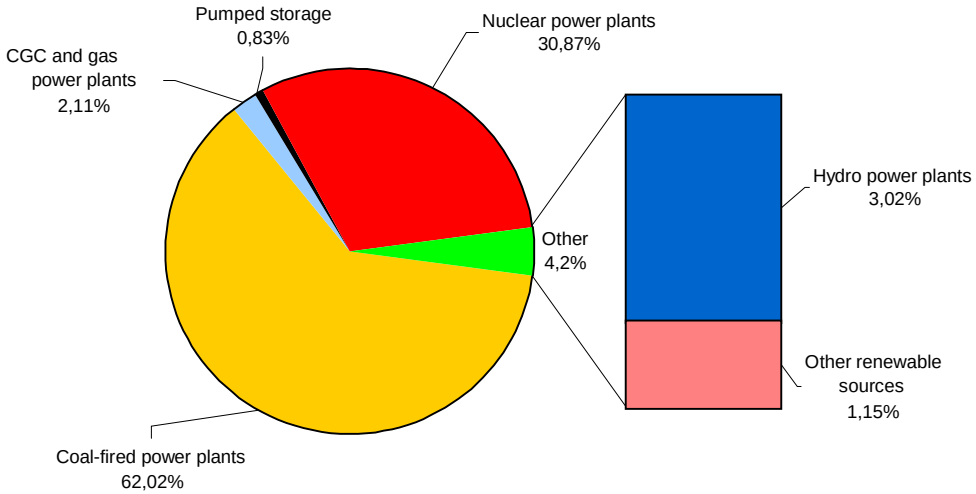

Figure 2 Electricity production in the Czech Republic by source in 2006 (source: MIT)

Compared to the previous year, gross electricity consumption increased by 2.55% to 71,730 GWh. However, compared to 2005 gross electricity production decreased by 2.97% to 84,361 GWh.

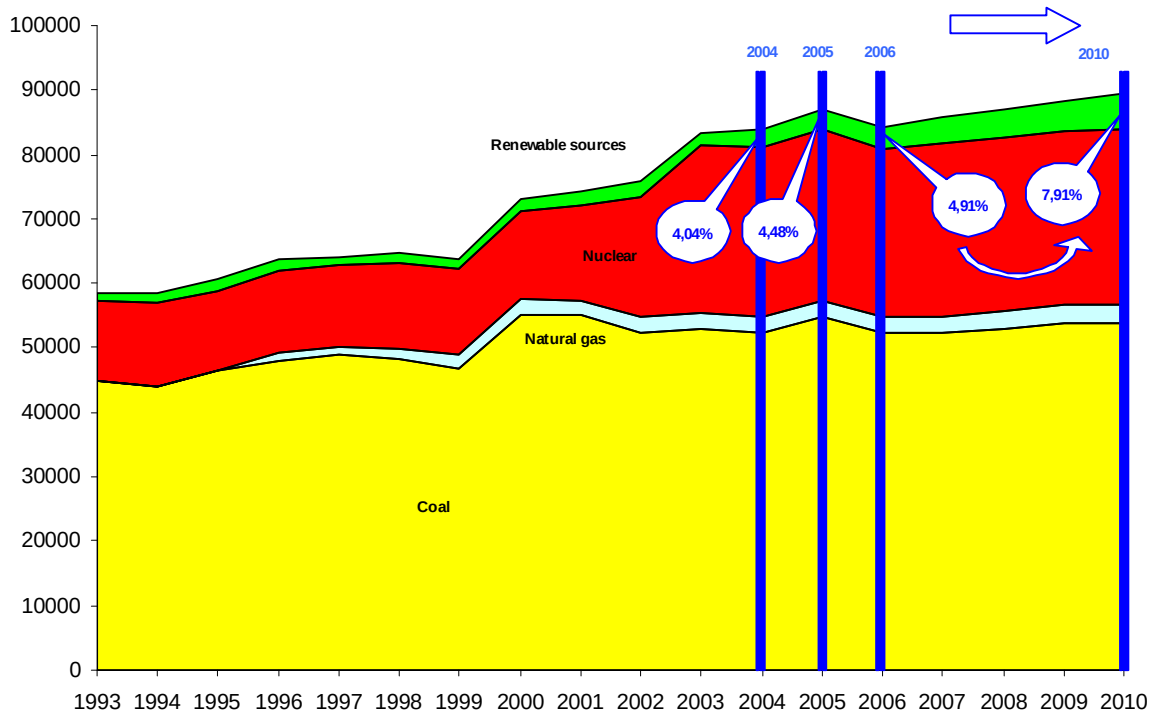

Figure 3 Electricity production in the Czech Republic by source 1993-2006, outlook up to 2010

3.2. Renewable electricity production

In 2006, gross renewable electricity production accounted for 4.91% of gross inland electricity consumption. Gross renewable electricity production contributed 4.17% to overall gross inland electricity production.

The highest share of renewable electricity production in 2006 came from hydro power (2,551 GWh). This was followed by biomass (731 GWh), although a significant proportion (350 GWh) of the electricity produced comes from the energy use of cellulose extract, where the electricity produced is consumed internally. This volume is not much different from the preceding period. The exploitation of biogas (176 GWh) can also be viewed as a significant source of renewable electricity. Wind plants (49.4 GWh) and waste incineration plants (11.3 GWh) are only of marginal significance. Electricity production in photovoltaic systems is still only for demonstration purposes (0.54 GWh).

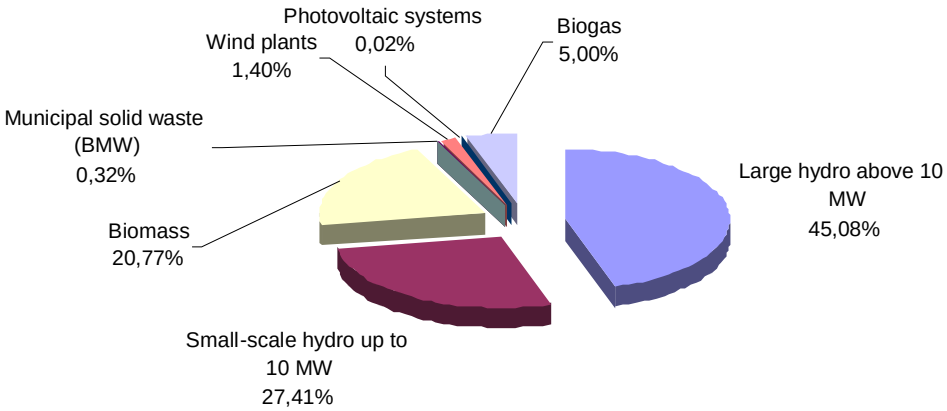

Figure 4 Share of individual renewable energy sources in electricity production in the Czech Republic in 2006 (source: MIT)

Table 1. Renewable electricity production in 2006

	Gross electricity production	Supply to grid / net production	Share in green electricity (%)	Share in gross inland consumption	Share in gross electricity production
	MWh	MWh	%	%	%
Hydro	**2,550,700.0**	**2,540,100.0**	**72.49%**	**3.56%**	**3.02%**
Small-scale hydro up to 1 MW	333,000.0	**no data**	9.46%	0.46%	0.39%
Small-scale hydro 1 MW to 10 MW	631,400.0	**no data**	17.94%	0.88%	0.75%
Large hydro above 10 MW	1,586,300.0	**no data**	45.08%	2.21%	1.88%
Total biomass	**731,066.4**	**285,746.4**	**20.78%**	**1.02%**	**0.87%**
Wood chips etc.	272,724.5	190,673.1	7.75%	0.38%	0.32%
Cellulose extract	350,027.7	0.0	9.95%	0.49%	0.41%
Vegetable materials	84,464.5	76,040.0	2.40%	0.12%	0.10%
Pellets	23,849.7	19,033.3	0.68%	0.03%	0.03%
Total biogas	**175,837.2**	**99,755.9**	**5.00%**	**0.25%**	**0.21%**
Municipal wastewater treatment plants	67,661.6	16,126.0	1.92%	0.09%	0.08%
Industrial wastewater treatment plants	2,069.6	407.0	0.06%	0.00%	0.00%
Biogas plants	19,210.5	6,953.3	0.55%	0.03%	0.02%
Landfill gas	86,895.5	76,269.6	2.47%	0.12%	0.10%
Municipal solid waste (BMW)	**11,264.4**	**4,435.6**	**0.32%**	**0.02%**	**0.01%**
Wind plants (above 100 kW)	**49,400.0**	**49,100.0**	**1.40%**	**0.07%**	**0.06%**
Photovoltaic systems (estimate)	**540.0**	**200.0**	**0.02%**	**0.00%**	**0.00%**
Liquid biofuels	**22.3**	**20.7**	**0.00%**	**0.00%**	**0.00%**

Total	**3,518,830.3**	**2,979,358.6**	**100.00%**	**4.91%**	**4.17%**

Note: net production according to ERO reported for wind, hydro and solar power plants. *(Source: MIT, ERO)*

Table 2. Development of gross electricity production over time

	Gross electricity production						Trend in renewable electricity production 2005-2006
	2004	2005	2006	2007	2008	2009	
	GWh	GWh	GWh	GWh	GWh	GWh	%
Hydro	**2,019.40**	**2,380.91**	**2,550.70**				**7.13**
Small-scale hydro up to 1 MW	286.10	343.98	333.00				-3.19
Small-scale hydro 1 MW to 10 MW	617.40	728.73	631.40,				-13.36
Large hydro above 10 MW	1,116.90	1,309.20	1,586.30,				21.17
Total biomass	**564.54**	**560.25**	**731.06**				**30.49**
Wood chips etc.	265.27	222.5	272.72				22.57
Cellulose extract	272.82	280.58	350.03				24.75
Vegetable materials	20.82	53.77	84.46				57.08
Pellets	2.62	4.44	23.85				437.16
Total biogas	**138.79**	**160.86**	**175.84**				**9.31**
Municipal wastewater treatment plants	63.51	71.44	67.66				-5.29
Industrial wastewater treatment plants	2.00	2.87	2.07				-27.87
Farm biogas	7.13	8.24	19.21				133.13
Landfill gas	66.07	78.29	86.90				11.00
Municipal solid waste (BMW)	**10.03**	**10.61**	**11.26**				**6.13**
Wind plants (above 100 kW)	**9.87**	**21.44**	**49.40**				**130.41**
Photovoltaic systems	**0.08**	**0.39**	**0.54**				**38.46**
Liquid biofuels	**-**	**-**	**0.22**				**-**
Total	**2,771.78**	**3,133.46**	**3,518.83**				**12.30**
Share in gross consumption	**4.04%**	**4.48%**	**4.91%**				**0.43%**

(Source: MIT)

The year-on-year increase in renewable electricity production is 386 GWh. However, this growth is 5.6 GWh lower than in the preceding period. Higher production was again achieved primarily on account of the higher large-hydro production. Conversely, small-scale hydro registered a significant decrease in production (by 108 GWh). Although wind power has reported the fastest development, the low overall values here mean this momentum is barely reflected in the total volume of renewable electricity. Biomass electricity has broken free of its stagnation. However, the situation on the market in waste biomass has not changed very much since the previous year.

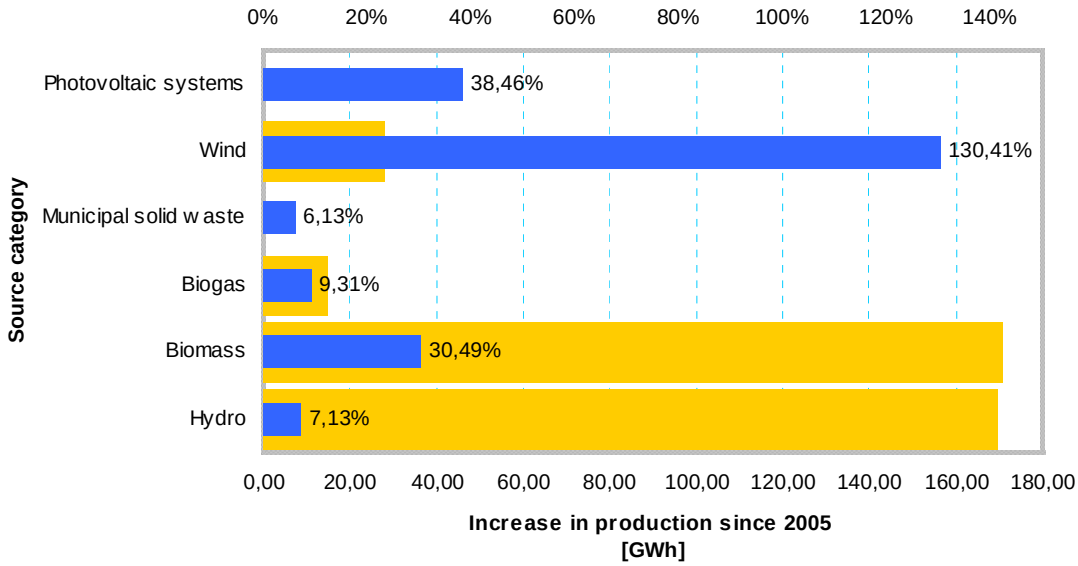

Figure 5 Growth of production since 2005, by source category (source: MIT)

3.3. Biomass

Of the renewable sources, biomass has the greatest technically exploitable potential for electricity and heat production in the Czech Republic. The use of biomass is traditional, especially for heat generation. Electricity produced from biomass has no problems regarding supply stability, and stability can be maximized even further by the parallel use of biomass and fossil fuels. However, there are limits to biomass. The greatest constraint is accessibility. Biomass forestry for energy purposes is effective only up to a range of 50 km from the proposed site of use. Biomass is also limited by the area of land available on account of food safety.

The energy use of biomass entails the incineration of wood or vegetable matter, including cellulose extract, alone or in combination with fossil fuels with a view to producing electricity and/or heat. The following types of biomass were used for electricity production in 2006:

- **sawdust, bark, particles, wood waste**
- **vegetable materials**
- **pellets**
- **cellulose extract**

3.3.1. Installations using biomass operated in the Czech Republic in 2006

In 2006, 731 GWH of electricity was produced from biomass, which is more than in the previous year (560 GWh).

Some of the electricity produced was supplied to the grid (39%), while 57% was reported as internal consumption (including losses). Only 4% of gross electricity production comprises direct supply to third parties. Of the total 731 GWh, co-firing with coal accounted for 349 GWh; a further 373 GWh was produced in large on-site CHP plants. New bio-CHP plants (electricity plants) produced 9 GWh.

3.3.2. Biomass electricity production in 2006

Table 3. Trend in the development of biomass electricity

Year	Gross electricity production MWh	Supplied to the grid MWh
2003	372,972.4	17,383.3

2004	565,000.0	222,827.3
2005	560,251.9	210,379.2
2006	731,066.3	285,746.4
Difference 2005-2006	170,814.4	75,367.2
	+30.49%	**+35.82%**

** including total capacity of plants co-firing biomass with coal (source: MIT)*

Besides conventional fuels – wood waste, sawdust and particles (250,000 tonnes) – and cellulose extract (185,000 tonnes), an increase in the consumption of non-agglomerated vegetable matter (62,000 tonnes) and pellets and briquettes from vegetable materials (16,000 tonnes) was also documented in 2006. In 2006, 512 tonnes of biomass were used in electricity production, which is substantially more than in 2005 (389,000 tonnes). There was a rise in the use of wood waste, sawdust and particles by 60,000 tonnes. The energy contained in the biomass consumed to produce electricity was 5,609,813 GJ.

3.3.3. Biomass electricity production by type of biomass in 2006

Table 4. Biomass electricity production by type of biomass in 2006

	Number of resp.	Number of plants	Electricity production	Own use, including losses	Supplied to the grid	Direct supply	Fuel consumption
	-	-	MWh	MWh	MWh	MWh	t
Wood particles, waste	16	23	272,724.5	78,257.3	190,673.1	3,794.1	250,150.2
Cellulose extract	2	2	350,027.7	331,976.4	0.0	18,051.3	184,619.0
Vegetable materials	3	5	84,464.5	7,821.5	76,040.0	603.0	62,146.0
Briquettes and pellets	6	6	23,849.7	1,598.5	19,033.3	3,217.9	15,519.3

(Source: MIT)

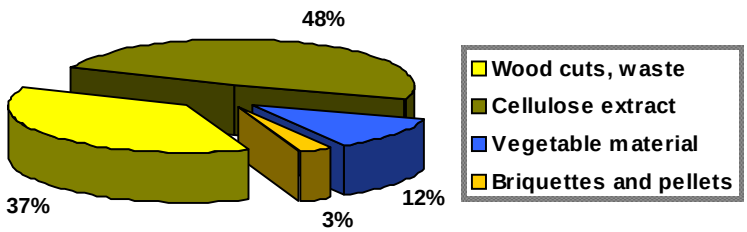

Figure 6 Share of individual types of biomass in electricity production (source: MIT)

3.3.4. Comparison of electricity and heat produced from renewable energy sources in 2006

The comparison of electricity and heat produced from biomass shows that 80% of biomass used for energy purposes in the Czech Republic is consumed in the generation of heat. For the most part, this is waste biomass in the form of sawdust, particles and cellulose extract. Some of the energy recoverable biomass is exported from the Czech Republic.

Table 5. Energy use of biomass in 2006 (tonnes)

Fuel	For electricity production	For heat production	Total
Waste wood, particles, sawdust, etc.	250,150	881,457	1,131,607
Fuel wood	–	54,102	54,102
Vegetable materials	62,146	12,307	74,453
Briquettes and pellets	15,519	8,134	23,653
Cellulose extract	184,619	883,578	1,068,197
Total	**512,435**	**1,839,578**	**2,352,012**
Estimate of wood consumption in households			**3,087,549**
Export of biomass suitable for energy purposes			**516,455**
Total biomass used or exported for energy purposes			**5,956,016**

(Source: MIT)

3.3.5. Outlook up to 2010

In 2006, there was an increase in the consumption of energy material cultivated directly for energy purposes and used for direct burning. Nevertheless, co-firing will remain a relatively simple, fast and low-risk solution for the use of biomass.

Act No 180/2005 forms the basis for the development of the use of energy crops for heat and electricity production. In this area, the lack of feed-in tariff stability, leading to problematic decision-making in the agricultural sector, still has a considerable influence.
The total energy produced from biomass was 61.8 PJ in 2006. Close to 60% of this energy was produced in households. After deducting land requirements to accommodate the needs of biogas and biofuels, there are 1,327,433 ha of land for the cultivation of energy crops. In practice, however, this land cannot be used to its full potential on account of accessibility and transport issues. Experience has shown that a maximum of 75% (995,575 ha) can be used. Bearing in mind that the average energy contained in fuel is 130 GJ/ha, this results in a value of 129 PJ.

3.4. Hydro power

Hydro power is the most important renewable source for electricity production, in particular on account of its appropriate parameters for the regulation of the grid. The installed hydro capacity in the Czech Republic is more than 1 GW_e and accounts for 8% of the total installed capacity of electricity production sources. Last year, it contributed 3.5% to gross electricity production. The share in green electricity production was more than 72%. A major part of the Czech Republic's hydro potential has been exploited in the long term for the regulation of the grid. A huge disadvantage of this source is its dependence on hydrological conditions during the period of analysis. Given the high proportion of hydro electricity production in green electricity, this dependence will necessarily create fluctuations in the total volume of green electricity produced in years that are not so wet.

3.4.1. Hydro power plants operated in the Czech Republic in 2006

Gross hydro electricity production in 2006 was 2,551 GWh. It was up by 7.16% year on year, mainly because it was wetter than in the preceding period.

Table 6. Hydro electricity production in 2006 by installed capacity

	Gross electricity production MWh	**Net electricity production** MWh	**Installed capacity** MW
Total hydro power plants	2,550,700	2,540,100	1,028.5
up to 1 MW_e	333,000	**n/a**	106.4
1–10 MW_e	631,400	**n/a**	169.3
10 or more MW_e	1,586,300	**n/a**	752.8

n/a – data not available *(Source: ERO)*

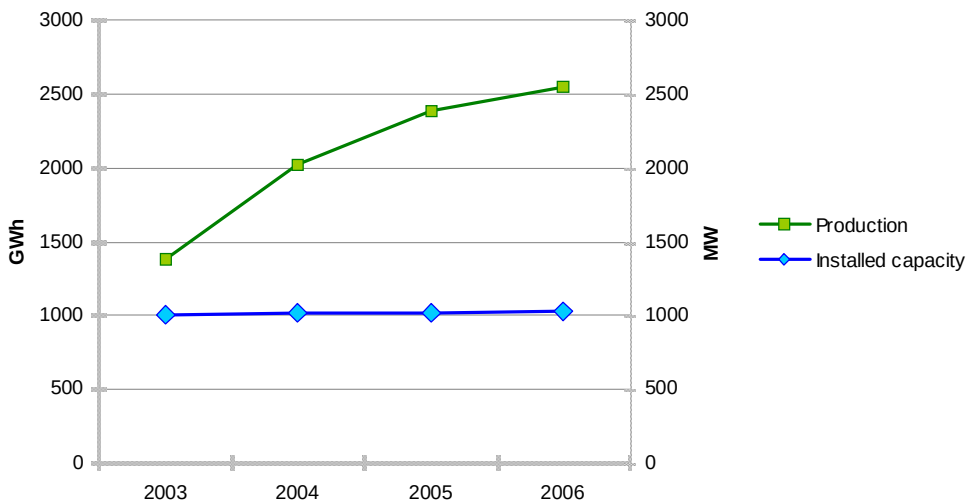

Figure 7 Growth of hydro electricity production and installed capacity (source: MIT)

3.4.2. Electricity production in 2006

Table 7. Trend in hydro electricity production

Year	Number of hydro power plants	Installed capacity kW	Gross electricity production MWh	Supplied to the grid MWh
2003	approx. 1,330*	1,004,260	1,383,467	1,106,774
2004		1,014,430	2,019,400	1,615,520
2005		1,019,500	2,379,910	2,370,300
2006		1,028,500	2,550,700	2,540,100
Difference 2005-2006	-	9,000	170,790	169,800
		0.88%	**+7.18%**	**+7.13%**

**) The exact number of small-scale hydro power plants is not tracked in energy statistics*

(Source: ERO)

Large hydro power plants in particular contributed to hydro electricity production. There was a further continuation of the trend of rising production, caused primarily by the improved hydrological conditions in 2006.

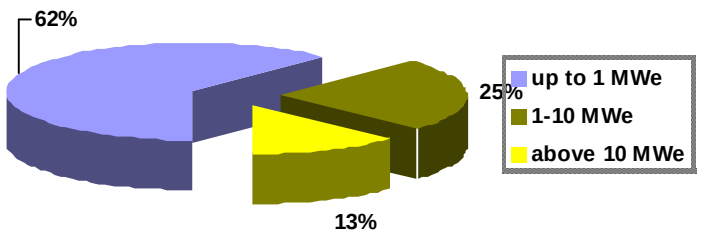

Figure 8 Share of hydro capacity categories in electricity production

3.4.3. Outlook up to 2010

Hydro power has been a long-term source of energy, and as such the potential offered by water is almost exhausted. There are only a handful of localities – located on smaller watercourses – remaining for small-scale hydro. This potential is a tenth of the capacity currently exploited. The tapping of the remaining potential requires the construction of approximately 100 MW of installed capacity in small-scale hydro power plants with a head of 2 to 5 m. The construction of small-scale water projects depends primarily on economic conditions and on the constructive approach of the administrators of individual river basins to the implementation of these projects.

3.5. Wind energy

Wind energy in the Czech Republic is overwhelmingly used for the production of electricity intended for supply to the grid. Power plants with a small installed capacity are also used for the owner's own requirements, although these tend to be isolated installations.

3.5.1. Wind plants operated in the Czech Republic in 2006

By the end of 2006, 43.5 MW of wind power had been installed in the Czech Republic. The highest rise in installed capacity was recorded between 2005 and 2006. The total installed capacity almost doubled in this period. In 2006, 45 projects with a total capacity of 18.5 MW were put into operation. Gross production from these sources is 49.4 GWh, i.e. 27.9 GWh more than in 2005.

3.5.2. Electricity production in 2006

Table 8. Trend in wind electricity production

Year	Number of plants (installations above 100 kW)	Installed capacity kW	Gross electricity production MWh	Supplied to the grid MWh
2003	21	9,980	3,900	3,900
2004	30	14,380	9,871	9,743
2005	44	25,095	21,442	21,263
2006	51	43,500	49,400	49,100
Difference 2005-2006	**7**	18,405	27,958	27,837
		73.34%	**130.39%**	**130.41%**

(Source: ERO)

3.5.3. Outlook up to 2010

The rise in wind installed capacity was achieved by means of State aid in the form of subsidized feed-in tariffs and investment aid.

Numerous plans to construct wind plants with a total capacity of approximately 2,000 MW have existed for a long time in the Czech Republic. However, a feasible scenario would be the overall construction of around 350 wind plants with a maximum total installed capacity of 650 MW. Based on information about projects currently under construction, it is estimated that the total installed capacity will increase by up to 100 MW in the next year. Projects with the largest number of wind plants are situated in the central section of the Krušné hory mountains and in places such as Vyso•ina, south Moravia and the Jizerské hory mountains. Taking into account the experience gained in the relatively complicated debates on the location of wind plants, it can be assumed that some of the planned projects will not be implemented.

From the perspective of technical and energy efficiency, on the continent wind plants are more a source of problems than a competitive energy source. Besides an increased need for backup sources, their large-scale construction creates bottlenecks in the system and congests lines. Therefore, it can be expected that the steady rise in their total installed capacity will be accompanied by waning support in such a way as to keep to reasonable efficiency of operation (600 – 700 MW in the Czech Republic).

3.6. Biogas

Thanks to anaerobic fermentation, the exploitation of biogas in the Czech Republic generally enjoys a tradition as part of the technology of municipal wastewater treatment plants. The biogas produced here is mainly used for internal consumption. However, in recent years the use of landfill gases for electricity production at small plants with internal combustion piston engines has proven to be a highly promising development. In the previous period, total production from biogas climbed by almost 10%.

In 2006, 122,902,000 m^3 of biogas was used, which is over 14% more than last year (107,761,000 m^3). Most of this growth can be attributed to the use of landfill gas, the exploited volume of which increased to 50,925,000 m^3, which is almost 15% more than in 2005 (44,330,000 m^3). The exploitation of biogas from municipal and industrial wastewater treatment plants fell by 2.7%, while the exploitation of agricultural biogas rose sharply by 179%.

3.6.1. Biogas plants operated in 2006

Landfill gas in particular is used in electricity production. The installation of plants with piston engines (to some degree including CHP plants) is an area of dynamic development.

The exploitation of biogas from municipal and industrial wastewater treatment plants as a product of anaerobic fermentation processes is also relatively widespread. This biogas is used in boilers or cogeneration units with piston engines for electricity and heat production. There are also several biogas stations in the Czech Republic processing waste from livestock production in agriculture.

3.6.2. Electricity production in 2006

Table 9. Trend in biogas electricity production

Year	Number of plants	Installed capacity kW	Gross electricity production MWh	Supplied to the grid MWh
2003	81	24,985	107,856	11,868
2004	119	32,540	138,793	81,913
2005	135	36,271	160,857	93,413
2006	154	39,964	175,837	99,756
Trend 2005-2006	**19**	3,693	14,980	6,343
		+ 10.18%	**+ 9.31%**	**+ 6.79%**

(Source: MIT)

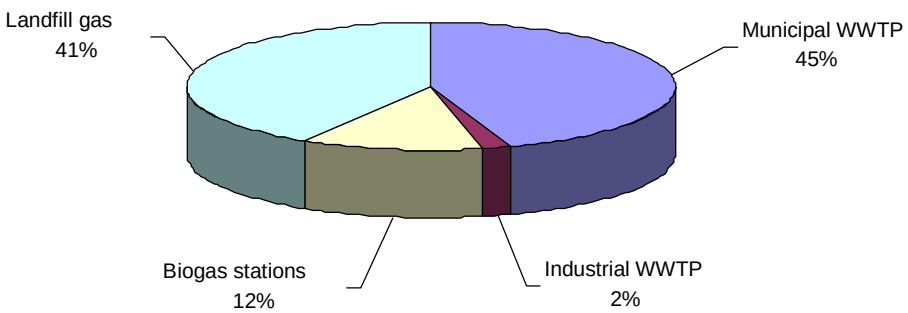

Figure 10 Share of individual biogas categories in electricity production

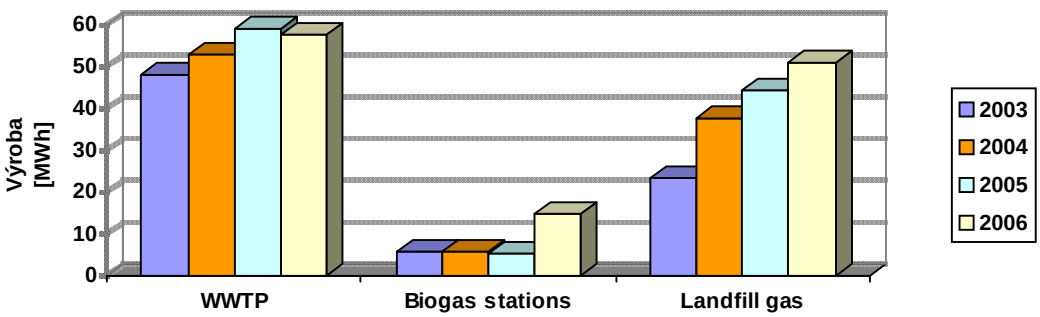

Figure 11. Electricity production in 2003-2006 by biogas category (MWh)

3.6.3. Outlook up to 2010

Numerous plans for the use of landfill gas are currently at project preparation stage. The construction of further biogas stations producing electricity with a total installed capacity of approximately 20 MW can be expected. The potential for the exploitation of biogas from municipal wastewater treatment plants is for the most part exhausted. Nor can any significant changes be anticipated in connection with the construction of small treatment plants.

3.7. Solar energy

Photovoltaic systems are still of negligible benefit from the perspective of electricity production. In 2006, gross electricity production in licensed photovoltaic systems was 200 MWh.

3.7.1. Photovoltaic systems operated in the Czech Republic in 2006

In the reporting period, several significant photovoltaic projects were completed. These included the new installations in Opatov (60 kW_p) and Hrádek n. N. (61 kW_p), on the building of the Ministry of the Environment in Prague (25kW_p), in Zápy (75 kW_p) and Masaryk University in Brno (40 kW_p).

3.7.2. Electricity production in 2006

The figures referred to in the 'Status of Photovoltaics 2006' yearbook, published by Czech RE Agency, can be considered accurate.

Table 11. Trend in the installed capacity of photovoltaic panels

Year	Installed capacity Off-grid kW_p	Installed capacity On-grid kW_p	Total kW_p
2003	130	200	330
2004	147	216	363
2005	178	292	470
2006	194	546	740
Difference 2005-2006	+ 16	+ 254	+ 270
	+ 8.99%	**+ 86.99%**	**+ 57.45%**

Source: Czech RE Agency

The Ministry of Industry and Trade estimates the total installed capacity of photovoltaic systems at 771 kWp in 2006 (with year-on-year growth by at least 241 kWp) and electricity production in these systems at an aggregate of approximately 0.54 GWh.

3.7.3. Outlook up to 2010

In the light of the technical possibilities of available photovoltaic technology, capital costs and reliable support of photovoltaics in the form of feed-in tariffs and/or green bonuses, a further increase in installed capacity and electricity production can be expected. Assuming the rapid development of this sector and an annual rise in installations by 1 MW, in 2010 the total installed capacity can be estimated at 5 MW, with annual production from these plants of 6 GWh. Although the overall potential cannot be estimated, these plants will not play a crucial role in electricity production by 2010 despite the fast development of this energy sector. On the other hand, the system in place is such that commercial application is feasible and electricity supply to the grid can be expected.

3.8. Municipal solid waste (BMW)

The energy use of waste entails the burning of municipal, hospital and industrial solid waste, and/or the use of alternative fuels that are of waste origin. In particular, municipal waste contains 50 – 65% biodegradable parts, which can also be viewed as a renewable source. Compared to other countries, the Czech Republic makes only minimum use of municipal waste in energy production; most of this waste is landfill waste.

3.8.1. Plants operated in the Czech Republic in 2006

In the Czech Republic, there are presently three municipal waste incineration plants in operation; electricity is produced in two of them.

3.8.2. Electricity production in 2006

Table 12. Trend in the production of electricity from municipal solid waste

Year	Gross electricity production MWh	Supplied to the grid MWh
2003	9,588.0	3,265.7
2004	10,031.0	3,421.2
2005	10,612.3	3,825.6
2006	11,264.4	4,435.6
Difference 2005-2006	+ 652.1	+ 610.0
	+ 6.14%	**+ 15.95%**

(Source: MIT)

3.8.3. Outlook up to 2010

A significant increase in electricity production from municipal waste cannot be expected by 2010. However, the information available indicates that there are several long-term projects for the construction of plants that will involve the energy use of waste. If these plans materialize, it is estimated that the quantity of waste recovered for energy purposes could triple, with the corresponding benefit in electricity production.

4. COSTS AND THE IMPACT ON THE PRICE OF ELECTRICITY

4.1. Compulsory purchase of renewable electricity in 2006

By virtue of Act No 180/2005 (the Act on the Promotion of the Use of Renewable Sources), in 2006 distribution companies were required to purchase renewable electricity at prices set by the Energy Regulatory Office (Table No 12). The costs connected with the promotion of renewable sources were reflected in the regulated prices of electricity for all final customers in the Czech Republic in the form of a national uniform contribution to renewable electricity production.

The amount of the contribution is set in advance by the ERO for the following year. By reference to actual purchases resources are subsequently transferred between individual distribution companies so that those who are required to purchase the largest quantity of renewable electricity are not disadvantaged.

Table 13. Minimum feed-in tariffs of renewable sources in 2006

Type of renewable source	Minimum feed-in tariffs of electricity supplied to the grid CZK/MWh	Green bonuses CZK/MWh
Small-scale hydro put into operation after 1 January 2006	2398	1340
Small-scale hydro put into operation after 1 January 2005 inclusive, and retrofitted small-scale hydro	2170	1120
Small-scale hydro put into operation prior to 1 January 2005	1690	640
Wind plants put into operation after 1 January 2007 inclusive	2460	1950
Wind plants put into operation between 1 January 2006 and 31 December 2006 inclusive	2510	2000
Wind plants put into operation between 1 January 2005 and 31 December 2005 inclusive	2750	2240
Wind plants put into operation between 1 January 2004 and 31 December 2004 inclusive	2890	2380
Wind plants put into operation prior to 1 January 2004	3020	2690
Electricity production via the burning of pure biomass category O1	3375	2255
Electricity production via the burning of pure biomass category O2	2890	1770
Electricity production via the burning of pure biomass category O3	2340	1220
Electricity production via the incineration of biogas in plants put into operation after 1 January 2006 inclusive	3040	1920
Electricity production via the incineration of biogas in plants put into operation between 1 January 2004 and 31 December 2005	2570	1450
Electricity production via the incineration of biogas in plants put into operation prior to 1 January 2004	2670	1550
Electricity production via the exploitation of geothermal energy	4500	3510
Electricity production via the exploitation of solar radiation for plants put into operation after 1 January 2006 inclusive	13460	12750
Electricity production via the exploitation of solar radiation for plants put into operation prior to 1 January 2006	6410	5700
Electricity production via the co-firing of fuel mixtures of biomass category S1 and fossil fuels	-	1275
Electricity production via the co-firing of fuel mixtures of biomass category S2 and fossil fuels	-	790
Electricity production via the co-firing of fuel mixtures of biomass category S3 and fossil fuels	-	240

(source: ERO)

Feed-in tariffs for 2006 were laid down in Energy Regulatory Office Price Decision No 10/2005, laying down prices of electricity and related services. This price decision can be found at www.eru.cz in the section 'Price Decisions'.

A significant year-on-year increase in purchases in terms of materials (+14.61%) and Czech crowns (+12.46%) is clearly evident from a comparison of data about compulsory electricity purchases in 2003-2006 (Table No 14).

Table 14. Comparison of renewable electricity purchases in 2003-2006

Year	Actual purchases		Contribution from final customers
	GWh	TCZK	CZK/MWh
2003	785	1,350	12.30
2004	1,299	2,090	29.04
2005	1,581	2,383	28.92
2006	1,812	2,680	18.68
Difference 2005-2006	+ 231	+ 297	- 10.24%
	+ 14.61%	**+ 12.46%**	**- 35.41,%**

(source: ERO)

4.2. Indicative costs of achieving the indicative target

Besides maximizing the use of existing available installed capacity, a key factor in the fulfilment of the planned proportion of renewable energy sources in electricity production is the construction of new plants designed to exploit renewable energy sources. Table 15 shows indicative capital costs of implementing installed capacity compared to the current situation.

Table No 15 Structure of the new installed capacity of plants designed to use renewable energy sources

Renewable energy source	Installed capacity (kW)	Capital costs (TCZK)	Electricity production (MWh/year)	Reduction in CO2 emissions (tonnes/year)
Small-scale hydro	100,000	13,000,000	450,000	526,500
Wind plants	400,000	15,400,000	760,000	889,200
Biomass	170,000	13,600,000	1,190,000	1,392,300
Biomass – co-firing	0	0	230,000	269,100
Biogas	30,000	3,900,000	210,000	245,700
Sum	**700,000**	**45,900,000**	**2,840,000**	**3,322,800**

(Source: MIT)

It follows from experience gained in energy support programmes that aid of around 30% of the total project implementation costs is an adequate incentive for investors. The Czech Republic plans obtain financial resources predominantly from the EU Structural Funds; to draw on these funds, 25% co-financing from the national budget is required. Up to the end of 2006, these resources were distributed via the existing programmes run by the Ministry of Industry and Trade and the Ministry of the Environment (see below). The first calls for subsidy proposals under the EIOP 2007-2013 were issued in mid-2007. To express the total support of renewable electricity production, the costs of ensuring the reliable operation of the grid should be factored in. Given the envisaged growth of electricity production from wind plants, it will be necessary to maintain a higher capacity reserve to cover any outage caused by weather conditions.

Table 16. Total cost of supporting renewable electricity production in 2010

Indicator	Unit	Value
Compulsory purchase of electricity	CZK (millions)/year	4,820
System services	CZK (millions)/year	3,000
Increase in installed capacity	kW	700,000
Investment to safeguard the installed capacity	CZK millions	23,494
of which private sector (70%)	CZK millions	16,446
public sector (30%)	CZK millions	7,048
of which national budget (25%)	CZK millions	1,762

Structural Funds (75%)	CZK millions	5,286

(Source: MIT)

5. PROMOTING RENEWABLE ELECTRICITY

5.1. Act on the Promotion of Electricity Produced from Renewable Energy Sources

Act No 180/2005 on the promotion of electricity produced from renewable energy sources, which guaranteed the long-term, stable support required for business decisions, entered into effect on 1 August 2005. As of 1 January 2006 this Act introduced a new support system, the key features of which are:

- the right for a plant for renewable electricity production to be connected to the grid
- **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
  - **green bonuses (surcharges on the market price of electricity)** – electricity produced from renewable sources can be placed on the single electricity market
- the support of electricity used for internal consumption (not supplied to the grid)
- the preservation of the level of feed-in tariffs for 15 years for plants already in operation
- a maximum year-on-year decrease in electricity feed-in tariffs for new plants of 5%

5.2. State programme for energy saving and the use of renewable energy sources

Investors in renewable electricity production have the opportunity to receive aid from the State programme for energy saving and the use of renewable energy sources. Subsidies from Part A of the programme (coordinated by the Ministry of Industry and Trade) may be a maximum of 30% of capital costs, but no more than CZK 2.8 million. Subsidies from Part B of the programme (coordinated by the Ministry of the Environment) may be a maximum of 90% of the basis for the calculation of the aid in the case of local government units (municipalities) and non-profit organizations. In 2006, subsidies for the support of renewable electricity production totalling CZK 31.3 million were granted from MIT and MoEnv resources. Capacity of 1.2 MW was installed and annual electricity production was quantified at 7.1 GW/year.

Table No 17. Investment aid for renewable electricity production under the State programme in 2006

Ministry	Sub-programme	Costs (TCZK)	Subsidies (TCZK)	Heat production (GJ/year)	Electricity production (MWh/year)	Installed capacity (kW)
MIT	Small-scale hydro	21,349	5,708		1,164	405
	Firedamp gas	16,636	2,528	20,770	5,930	774
	Total for ministry	37,985	8,236	20,770	7,094	1,179
MoEnv	3.A. Heating, water heating, electricity production in the education system the healthcare system…	29,767	23,034	3,463	49	14
	Total for ministry	29,767	23,034	3,463	49	14
Total		67 752	31,270	24,233	7,143	1,193

Source: Evaluation of the State programme for energy saving and the use of renewable energy sources in 2006

EU Structural Funds

From 1 May 2004, investors in renewable electricity production had the opportunity to obtain aid from the EU's Structural Funds. This took place via two Operational Programmes:

Industry and Enterprise Operational Programme (MIT)

The Operational Programme for 2004-2006 included the subsidy scheme **Renewable Energy Sources**, intended for small and medium-sized enterprises with the aim of promoting the use of renewable energy sources. The scheme focused on the construction, restoration or reconstruction of plants for the use of renewable energy sources, on the roll-out of production technology and production installations with low energy performance, minimum environmental impact, and the use of facilities for the production of renewable energy, and on the combined generation of electricity and heat using renewable energy sources. Subsidies may be a maximum of 46 % of capital costs, but no more than CZK 30 million. In 2006, aid for 55 projects with total capital costs of CZK 1.817 billion, projected capacity of 32.25 MWi and envisaged electricity production of 140.1 GWh was approved. Subsidies payable after implementation of the project are CZK 641 million.

Table No 18. Investment aid for renewable electricity production under the Operational Programme in 2006

	Number of projects (-)	Costs (TCZK)	Subsidies (TCZK)	Heat production (GJ/year)	Electricity production (MWh/year)	Installed capacity (kW)
Small-scale hydro	27	599,151	216,348	-	58,742	13,919
Wind plants	5	256,177	73,744	-	16,143	7,500
Photovoltaics	4	260,002	89,904	-	1,807	1,800
Cogeneration – biomass*)	3	75,225	26,193	3,528	15,023	1,894
Cogeneration – biogas*)	16	626,424	234,715	42,644	48,367	7,137
Total	**55**	**1,816,979**	**640,904**	**46,172**	**140,082**	**32,250**

Source: CEA statistics

Explanatory notes:

**) including a steam turbine plant for biomass electricity production*

***) including electricity production from municipal waste landfills*

5.3. Infrastructure Operational Programme (MoEnv)

The Operational Programme for 2004-2006 includes the subsidy scheme **Exploitation of Renewable Energy Sources**, intended for legal persons set up for non-business purposes. The scheme focuses on the construction and reconstruction of plants using biomass or other renewable energy sources to produce electricity, on transforming current systems into systems using renewable energy sources (e.g. heat pumps), on the use of renewable sources for heat supply from municipal boiler houses, and on the construction of combined sources of electricity and heat using biomass and biogas. Subsidies from the ERDF (the European Regional Development Fund) may be a maximum of 75% of the basis for the calculation of aid (eligible costs), but no more than the equivalent of EUR 10 million. In addition, a project can be co-financed from the State Environmental Fund (SFŽP) up to a total amount of 90%. SFŽP resources may be used to obtain a subsidy for project documentation of up to 50% of eligible costs; this may be a maximum of 3% of the basis for the calculation of investment aid, but no more than CZK 3 million. For the 2004-2006 period, total ERDF resources for Priority 3: 'Improvement in the environmental infrastructure' are EUR 142 million, of which EUR 44.1 million from the public purse (ERDF EUR 30.9 million + municipal budgets EUR 7.9 million + SFŽP EUR 5.3 million) is earmarked for Measure 3.3 'Improvement in infrastructure for the protection of the air' (renewable energy sources fall under Measure 3.3).

5.4. Promoting the cultivation of energy crops in the agricultural sector

Programme 1. U. – Promoting the cultivation of crops for energy use in 2007 was incorporated into the national support programme of ‘Principles’ specifying the conditions for the granting of subsidies for 2007 by virtue of Sections 2 and 2d of Act No 252/1997 on agriculture. The objective of this programme is to promote the establishment and maintenance of standing crops for energy use with 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 was disbursed.

Aid for the cultivation of energy crops (‘carbon credits’) is based Council Regulation (EC) No 1782/2003 and is provided in all EU countries at EUR 45 per hectare for any crop to be used for energy purposes. The conditions are governed by Governmental Order No 80 of 11 April 2007 laying down certain conditions for the provision of a payment for the cultivation of energy crops. An uninterrupted plot of arable land with an area of at least 1 hectare must be used for the cultivation of energy crops. Energy crops must be grown on the land as the main crop in the year concerned. As at August 2007, applications for aid for the cultivation of energy crops on approximately 59,920 ha had been registered.

6. Requirements for the achievement of the indicative target

The achievement of the 8% indicative target is tantamount to the production of 5.9 TWh* of renewable electricity in 2010, i.e. growth by 2.42 TWh compared to the current situation. A fundamental prerequisite for the achievement of this state of affairs is:

- large hydro production of 1.6 TWh
- maximized exploitation of existing capacities for the co-firing of biomass – production of 0.5 TWh
- the construction of new capacities put into operation in 2007-2010

Bearing in mind the availability of exploitable energy potential, a key factor in achieving the indicative target is the construction of installed capacity in biomass (approximately 200 MW), small-scale hydro (approximately 100 MW), wind (approximately 700 MW) and biogas. Other renewable sources have exhausted their potential or are unfeasible in the given timescale.

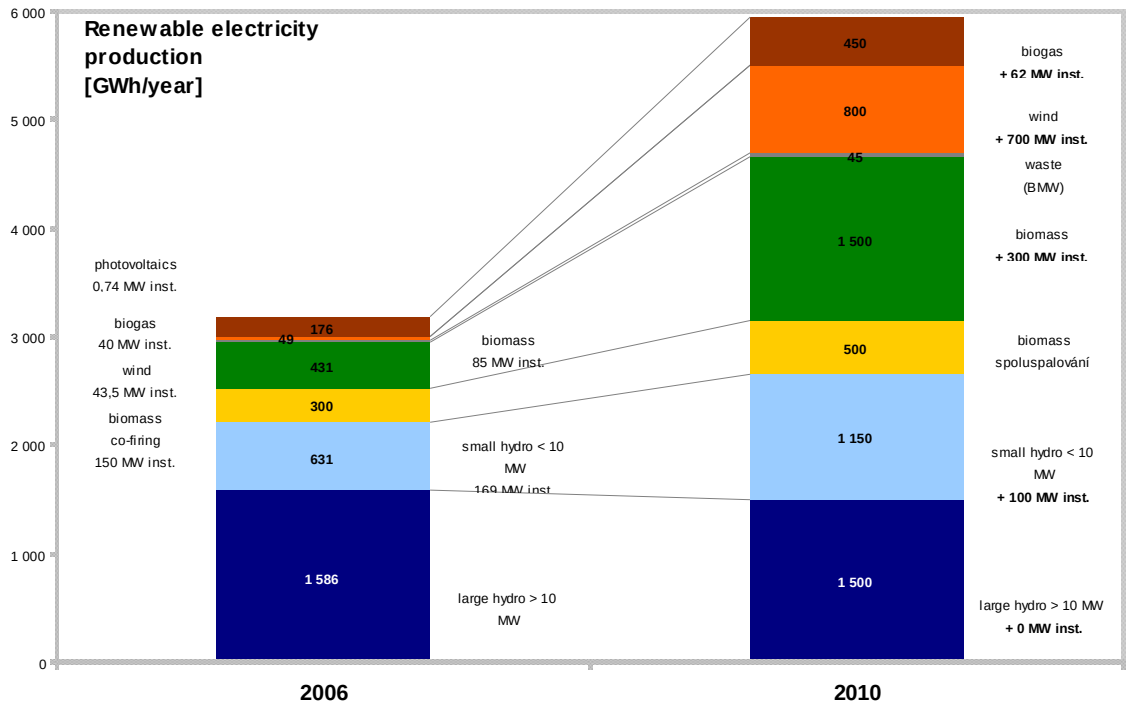

Figure 12 Estimated share of individual renewable energy sources in the achievement of the indicative target

The construction of new plants for the production of renewable electricity is limited by the competitiveness of production on the electricity market, i.e. the return on investments in the implementation of projects. The following are the main factors influencing the return on investments in this field:

- the high specific capital cost of constructing a plant
- the low market price of renewable electricity due to the instability of supply and the impossibility of supplying large unit capacities
- the need for long-term planning given the duration of the preparatory phase of the project, including administrative barriers (building permit proceedings)

To safeguard the economic advantages of investments, the following conditions are envisaged:

- preservation of the current level of feed-in tariffs
- unlimited support for economically viable methods of using renewable energy sources (especially co-firing)
- investment aid covering 20-30% of capital costs
- stable support in the agricultural sector

* The 5.9 TWh figure for renewable electricity production in 2010 was reached based on the premise that electricity consumption in the Czech Republic would rise by approximately 1.2% per year to 75.1 TWh in 2010. If gross electricity consumption were to remain at the current 72 TWh, 5.7 TWh would be enough to achieve the indicative target. However, given the current values of economic growth and approximation to the EU-15 level, electricity consumption stagnation is unlikely.

7. CONCLUSION

The proportion of renewable electricity in gross electricity consumption in the Czech Republic in 2006 was 4.91%. Compared to 2005, this share increased by 0.43%.

Gross renewable electricity production went up by 386 GWh, i.e. 12.3%, year on year. Most production was recorded from hydro power plants. Gross hydro electricity production increased by 7.13% year on year. Biogas electricity production went up by 9.31% year on year. Compared to 2005, electricity production from wind also increased by 130 %. Biomass electricity production grew by 30.5%.

	Gross electricity production	Share in gross inland consumption	Share in gross electricity production
	MWh	%	%
Hydro	2,550,700.0	3.56%	3.02%
Total biomass	731,066.4	1.02%	0.87%
Total biogas	175,837.2	0.25%	0.21%
Municipal solid waste (BMW)	11,264.4	0.02%	0.01%
Wind plants (above 100 kW)	49,400.0	0.07%	0.06%
Photovoltaic systems (estimate)	540.0	0.00%	0.00%
Total	3,518,830.3	4.91%	4.17%

The indicative target for renewable electricity production in 2010 is highly unlikely to be achieved. Renewable electricity production has increased recently. However, bearing in mind that the main share in the increased production comes from hydro power plants, whose installed capacity has remained the same in recent periods, the good hydrological conditions in the last few years have been the principal factor behind this trend. Yet this trend cannot be expected to continue in the future. The other main reason is that, when the indicative target was set, there was great hope that the market in biomass for energy purposes – the theoretical potential of which is high – would be developed. However, this market has failed to advance on account of its low economic appeal, and therefore the lack of energy biomass on the market hampers the further development of installations using biomass.

The principal reasons resulting in the non-fulfilment of the indicative target are thus:

- **the irregularity of above-average hydrological conditions**
- **the insufficiently developed market in energy biomass, especially on account of the inadequate production of energy biomass**

8. SOURCES USED

Ministry of Industry and Trade

- **Obnovitelné zdroje energie v roce 2006 [*Renewable Energy Sources in 2006*]**

Energy Regulatory Office

- **Ro• ní zpráva o provozu ES • R 2006 [*Annual Report on the Operation of the Czech Republic's Energy Sector*], ERÚ 2007.**
- **Sd• lení ERÚ o výrob• elekt•iny z OZE [ERO Communication on Renewable Electricity Production] (2007)**