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Report on meeting the indicative target for the production of electricity from renewable sources in 2004

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

September 2005

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1. INTRODUCTION

As a Member State of the European Union, the Czech Republic has committed itself to increasing the production of electricity from renewable energy sources (RES). In 2003-2004, efforts to determine the potential of renewable sources and discussion of what was achievable as regards the contribution to be made by such sources and of the forms and amount of support to be provided were key elements of the debate on the State Energy Concept and the amendments to the Energy Act and resulted in the adoption of Act No 180/2005 Coll. on the promotion of the production of electricity from renewable sources, following a debate in the Chamber of Deputies which continued for over a year.

This Act provides for an unprecedented system of support in the form of fixed purchase (feed-in) prices and, where necessary, supplements to market prices for electricity, and also guarantees a level of return on each unit of electricity produced for a period of 15 years. It thus created the basic conditions for business-oriented decision-making on investments in projects which exploit renewable sources to produce electricity. The system of support for RES, supplemented since 2004 by the possibility of receiving support from the EU structural funds, should result in the 8% target for the contribution to be made by renewable sources to gross national electricity consumption being met.

This report provides information on the production of electricity from renewable sources in 2004, outlines the prospects for the period to 2010 and specifies the conditions for achieving the targets set, including an estimate of the costs involved. It also contains a description of the basic support programmes implemented by the Ministry of Industry and Trade and the Ministry of the Environment.

The report has been drawn up by the Ministry of Industry and Trade in conjunction with the Ministry of the Environment and the Energy Regulatory Office.

Notes on the statistical data used:

This report contains statistical data collected by the Ministry of Industry and Trade from the comprehensive national statistics kept on renewable sources. The statistical methods have been significantly strengthened and clarified since 2003. Data from 2003 is presented in this report for the purposes of comparison. The statistical data was extracted by the Ministry of Industry and Trade from the databases of the Energy Regulatory Office (ERÚ), the Czech Statistical Office (ČSÚ), the State Energy Inspectorate (SEI), the Czech Hydrometeorological Institute (ČHMÚ) and the State Environmental Fund (SFŽP). Detailed statistical information is presented in the findings of the statistical survey entitled "Renewable energy sources and waste used for energy production purposes in 2004", published by the Ministry of Industry and Trade in July 2005."

2. INDICATIVE TARGET OF THE CZECH REPUBLIC FOR THE PRODUCTION OF ELECTRICITY FROM RENEWABLE ENERGY SOURCES

Individual Member States' indicative targets for the contribution to be made by RES come from Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market. They are specified as the percentage contributions to be made by RES electricity to gross electricity consumption in each Member State. The Directive also sets an overall target of 22.1% for the European Community.

Under the Directive, Member States are required to adopt measures and support schemes which will lead to an increase in the production of electricity from renewable sources. The specific forms of measures are left to the discretion of individual Member States but they must be compatible with the rules governing the internal market in electricity and commensurate with the indicative targets, so as to ensure that the latter are met in 2010.

In the Accession Treaty (Act of Accession, Annex II, Chapter 12 (A)(8)(a)), the Czech Republic committed itself to meeting an indicative target of 8% for the contribution to be made by RES electricity to gross national consumption in the Czech Republic in 2010.

The indicative target has been incorporated into Act No 180/2005 Coll. on the promotion of the production of electricity from renewable energy sources and amending certain acts, by which the Directive was transposed into Czech law.

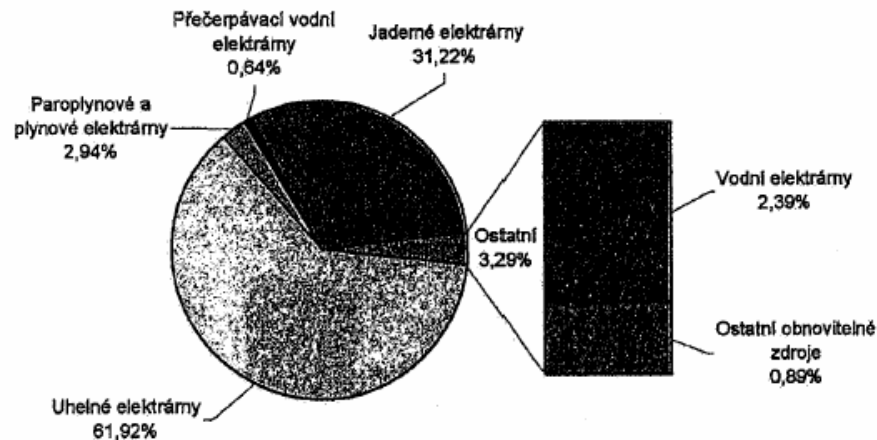
Indicative targets for EU Member States

Actual situation in 2002		target 2010
Belgium	1.4	6.0
Czech Republic	3.9	8.0
Denmark	20.0	29.0
Estonia	0.2	5.1
Finland	24.72	31.55
France	14.4	21.0
Ireland	5.1	13.2
Italy	16.8	25.01
Cyprus	0.0	6.0
Lithuania	4.6	7.0
Latvia	48.0	49.3
Luxembourg	2.2	5.72
Hungary	0.6	3.6
Malta	0.0	5.0
Germany	8.1	12.5
Netherlands	3.4	9.0
Poland	2.0	7.5
Portugal	21.8	39.04
Austria	68.0	78.13
Greece	5.8	20.1
Slovakia	20.2	31.0
Slovenia	30.4	33.6
Spain	12.6	29.4
Sweden	46.0	60.06
UK	2.8	10.0

3. TRENDS IN THE PRODUCTION OF ELECTRICITY FROM RENEWABLE ENERGY SOURCES

3.1. Energy mix in the Czech Republic in 2004

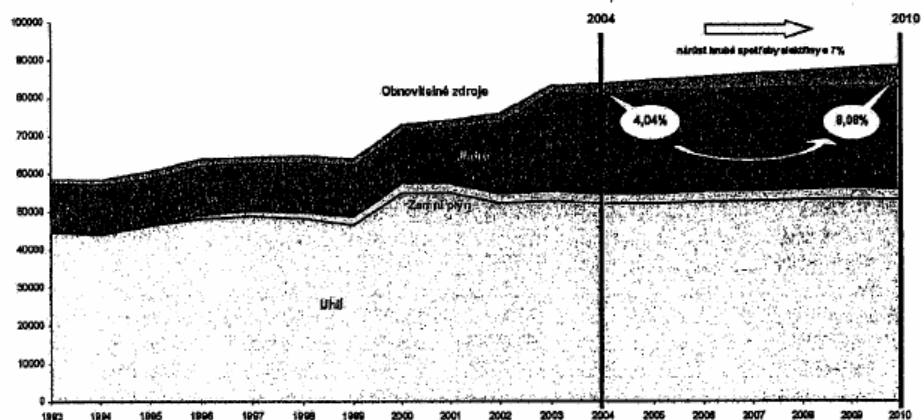
For electricity production purposes the Czech Republic mainly uses coal, which, over the long term, has accounted for more than 60% of total electricity production. The second most important source is nuclear energy, which accounts for over 31%.



*Ostatní = other; Uhoľné elektrárny = coal fired power stations;
 ostatní obnovitelné zdroje = other renewable sources;
 Vodní elektrárny = hydropower plants;
 Jaderné elektrárny = nuclear power plants;
 Přečerpávací vodní elektrárny = pumped-storage power hydropower plants;
 Paroplynové a plynové elektrárny = steam-gas and gas-fired power stations*

Fig. 1 Electricity production in the Czech Republic, by source, in 2004 (source: Ministry of Industry and Trade)

Since 1993, electricity production in the Czech Republic has risen, both to cover growing domestic consumption (68.62 TWh in 2004) and for export (18.48 TWh in 2004). Compared with 2003, production in nuclear power plants increased by about 0.8 TWh, at the expense of coal-fired power stations, and the contribution made by renewable sources to overall electricity production also rose. Electricity production from natural gas has remained unchanged at 2.5 TWh, and this source is used mainly for regulating the electricity system.



*Uhlí = coal;
 Zemní plyn = natural gas;
 Jádro = nuclear;*

Obnovitelné zdroje = renewable sources;

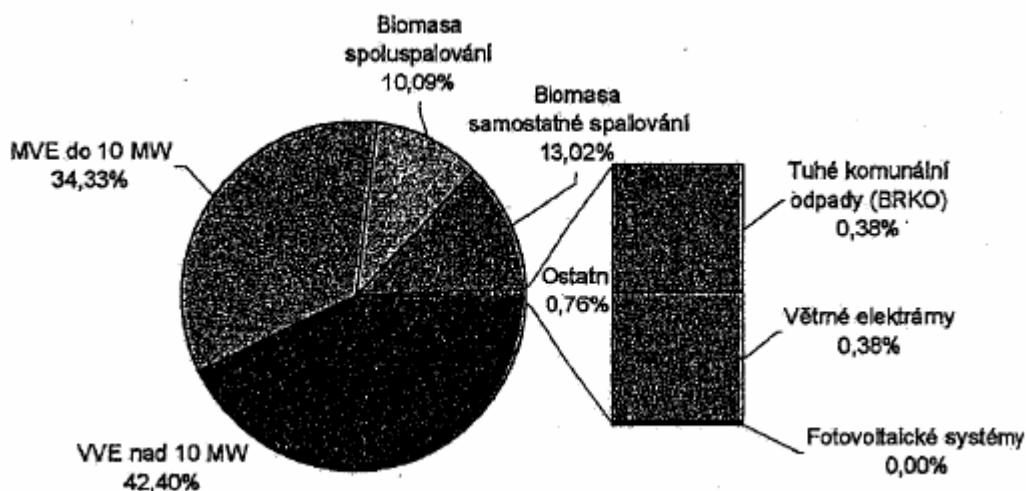
nárůst hrubé spotřeby elektřiny o 7% = 7% increase in gross electricity consumption

Fig. 2 Electricity production in the Czech Republic, by source, 1993–2004 and looking ahead to 2010 (source: Ministry of Industry and Trade)

3.2. Production of electricity from renewable sources

In 2004, gross electricity production from renewable energy sources (RES) accounted for 4.04% of national gross electricity consumption. Gross RES electricity production accounted for 3.3% of total national gross electricity production.

In 2004, hydropower plants accounted for the largest share of RES electricity production (2019 GWh). This was followed by biomass (593 GWh), where a significant contribution (296 GWh) was made by using wood pulp extracts for energy production (the electricity produced practically being used up in the producers' own production facilities). Biogas is another major source as regards RES electricity production (139 GWh). Wind farms (9.9 GWh) and waste incinerators (10 GWh) are of only marginal significance. To date, electricity has been produced in photovoltaic systems only for demonstration purposes.



MVE do 10 MW = small hydropower plants up to 10 MW;

Biomasa spoluspalování = biomass, co-firing;

Biomasa samostatné spalování = biomass only;

Větrné elektrárny = wind farms;

Fotovoltaické systémy = photovoltaic systems;

Tuhé komunální odpady (BRKO) = solid municipal waste;

VVE nad 10 MW = large hydropower plants over 10 MW;

Ostatní = other

Fig. 3 Contribution of individual RES to electricity production in the Czech Republic in 2004 (source: Ministry of Industry and Trade)

Table 1. Electricity production from RES in 2004

Gross electricity production	Supply to grid	Share of green electricity		Contribution to gross national electricity consumption	Contribution to gross electricity production
MWh	MWh	%		%	%
Hydropower plants	2 019 400.0	1 615 520.0	72.8794%	2.9431%	2.3946%
Small hydropower plants, up to 1 MW	286 100.0	228 880.0	10.3252%	0.4170%	0.3393%
Small hydropower plants, 1-10 MW	617 400.0	493 920.0	22.2818%	0.8998%	0.7321%
Large hydropower plants, over 10 MW	1 115 900.0	892 720.0	40.2724%	1.6263%	1.3232%
Biomass, total	592 704.8	222 827.3	21.3905%	0.8638%	0.7028%
Woodchips etc.	272 948.5	201 274.7	9.8506%	0.3978%	0.3237%
Wood pulp extracts	296 297.0	0.0	10.6933%	0.4318%	0.3513%
Vegetable matter	20 839.7	19 670.7	0.7521%	0.0304%	0.0247%
Pellets	2 619.6	1 881.9	0.0945%	0.0038%	0.0031%
Biogas, total	138 793.4	81 913.2	5.0090%	0.2023%	0.1646%
Municipal wastewater treatment plant gas	63 590.6	15 342.8	2.2950%	0.0927%	0.0754%
Industrial wastewater treatment plant gas	2 001.2	363.7	0.0722%	0.0029%	0.0024%
Agricultural biogas	7 130.4	4 405.4	0.2573%	0.0104%	0.0085%
Landfill gas	66 071.2	61 801.3	2.3845%	0.0963%	0.0783%
Solid municipal waste	10 031.0	3 421.2	0.3620%	0.0146%	0.0119%
Wind farms (>100 kW)	9 870.8	9 743.3	0.3562%	0.0144%	0.0117%
Photovoltaic systems	77.3	9.2	0.0028%	0.0001%	0.0001%
Total	2 770 877.3	1 933 434.2	100.0000%	4.0382%	3.2856%

(source: Ministry of Industry and Trade)

3.3. Biomass

In the long term, biomass is the most promising of the renewable sources for the Czech Republic as far as electricity production is concerned. The technology required for its use is well-developed and there are no problems as regards the stability of supply, as is the case, for example, with wind power, solar power and hydropower. The stability of supply may be maximised by simultaneously using biomass and a non-renewable source.

The use of biomass for energy production purposes means the burning of woody or other vegetable matter, including wood pulp extracts. The following types of biomass were used to produce electricity in 2004:

- sawdust, bark, woodchips, wood waste
- vegetable matter
- pellets
- wood pulp extracts

3.3.1. Sources using biomass operated in the Czech Republic in 2004

In 2004, the major part of the electricity produced from biomass was generated by means of co-firing with coal in large heat- or electricity-plant boilers, in most cases with a fluid-bed or grate furnace. The total installed capacity of facilities which could be used for the production of electricity from biomass by means of co-firing with coal is about 1200 MWe. The capacity in the case of actual production using biomass may fluctuate between 100 and 150 Mwe, depending on the technically feasible biomass/coal ratio.

In 2004, the total installed capacity of sources burning biomass only was 135 MW (large sources). Sources with a small installed electrical capacity (up to 250 kW) have so far been established only in a few isolated cases. A total of five facilities with a combined installed capacity of 800 kW were operating in 2004.

3.3.2. Electricity production from biomass in 2004

Year	No of facilities	Installed capacity kW	Gross electricity production MWh	Supply to grid MWh
2003	18	739 410	372 972,4	17 383,3
2004	30	1 227 250	592 704,8	222 827,3
Difference	12	66.0%	58.9%	1181.8%

* incl. total capacity of sources co-firing biomass with coal (source: Ministry of Industry and Trade)

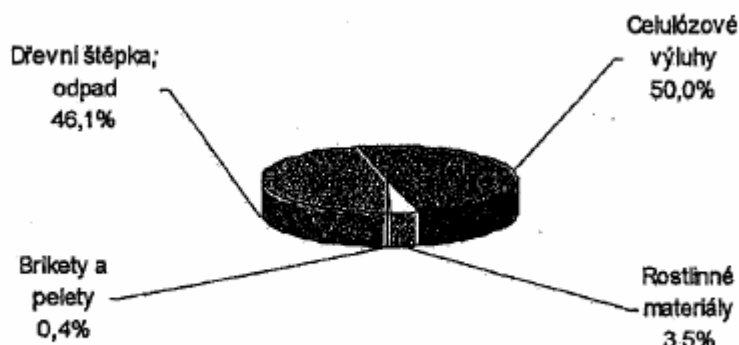
As a result of the favourable purchase (feed-in) price for electricity in the case of the co-firing of biomass and non-renewable fuel (CZK 2000 /MWh), electricity production in large sources rose sharply in 2004. ČEZ, a.s. accounted for 25% of the electricity produced from biomass, producing 149 GWh. The other main producers of electricity from biomass were still Dalkia ČR, a.s., Plzeňská teplárenská, a.s. and the mainly traditional producers Biocel Paskov, a.s. and Frantschach Energo a.s. Total production at sources with a small installed electrical capacity (up to 250 kW) was about 1200 MWh.

A total of 414 000 tonnes of biomass were used to produce electricity in 2004 - 143.5% (244 000 tonnes) more than in 2003 (170 000 tonnes). This increase came mainly from the wood waste, sawdust and woodchip categories (191 000 tonnes), but also from wood pulp extracts. The energy contained in the biomass used to produce electricity amounted to 4 155 069.6 GJ.

Table 2 Electricity production from biomass in 2004, by type of biomass

	No or	No of facilities	Installed electrical capacity (MW)	Electricity production (MWh)	Own use, inc. losses (MWh)	Supply to grid (MWh)	Direct supplies (MWh)	Fuel consumption
Wood chips, waste	12	32	1 081.2	272 948.5	41 471.8	201 274.7	30 202.0	243 834.4
Wood pulp extracts	3	5	133.2	296 297.0	156 855.0	0.0	139 442.0	157 202.7
Vegetable matter	2	8	179.9	20 839.7	1 169.0	19 670.7	0.0	11 589.8
Briquettes and pellets	2	2	94.0	2 619.6	482.7	1 881.9	255.0	1 227.2

(source: Ministry of Industry and Trade)



Rostlinné materiály = vegetable matter;
 Brikety a pelety = briquettes and pellets;
 Dřevní štěpka = wood chips, waste;
 Celulózové výluhy = wood pulp extracts

Fig. 4 Share of individual biomass types in electricity production (source: Ministry of Industry and Trade)

Besides “traditional” fuels – wood waste, sawdust and woodchips (244 000 tonnes) and wood pulp extracts (157 000 tonnes), increased use of vegetable matter was recorded in 2004 (12 000 tonnes), and wood pellets and vegetable waste pellets (1000 tonnes) were used on an experimental basis. It is clear from the graph that both agglomerates and vegetable matter were of marginal significance.

Comparing the production of electricity and heat from biomass, it is clear that over 80% of the biomass used for energy production purposes in the Czech Republic is used to produce heat. The vast majority of the biomass used is waste biomass in the form of sawdust, woodchips and wood pulp extracts. A sizeable portion of the biomass suitable for energy production purposes is exported from the Czech Republic.

Table 3 Use of biomass for energy production purposes in 2004 (tonnes)

Fuel	for electricity production	for heat production	Total
Woodchips, sawdust, etc.	243 834	864 912	1 108 747
Firewood	–	36 794	36 794
Vegetable matter	11 590	11 498	23 087
Briquettes and pellets	1 227	2 251	3 478
Wood pulp extracts	157 203	862 042	1 019 245
Total	413 854	1 777 497	2 191 351
Estimated consumption of wood in households			1 500 000
Export of biomass suitable for energy production purposes			322 955
Total biomass used for energy production purposes or exported			4 014 306

(source: Ministry of Industry and Trade)

3.3.3. Outlook for the period to 2010

Owing to the fall in the purchase price for electricity produced from co-firing biomass with non-renewable fuel, it is unlikely that the trend which occurred in 2004 will continue into 2005. However, co-firing will continue to be a relatively simple, quick and low-risk way of making use of biomass and will continue to be used.

It is expected that several dozen projects for the building of facilities which exclusively use biomass produced in agriculture (the energy potential of cultivated biomass is about five times greater than that of waste biomass) will be implemented by 2010. The total capacity of such facilities would be at least 60 MWe. About 250 000 ha of land will be needed in order to produce the corresponding amount of biomass to cover production at such facilities.

Act No 180/2005 Coll. has created a specific condition for developing the cultivation of special-purpose energy crops. This area has hitherto been marked by a significant absence of stability as regards purchase prices, which has caused problems in terms of decision making in the agricultural sector. However, a significant increase in the use of agricultural crops for energy production cannot be expected before 2008.

3.4. Hydropower

Hydropower is currently the most significant renewable source for electricity production in the Czech Republic (and in many other countries). The installed capacity of hydropower plants in the Czech Republic accounts for 8% of the total capacity of the sources used for the production of electricity. It accounts for more than 2% of electricity production, depending on the conditions prevailing in a given year. The major part of the Czech Republic's hydropotential has already been exploited for a long time, in particular for the purposes of regulating the electricity system.

3.4.1. Hydropower plants operated in the Czech Republic in 2004

Some 1330 hydropower plants, with a total installed capacity of 1014.43 MW, and three pumped storage plants, with a total capacity of 1145 MW, were operating in the Czech Republic in 2004.

Table 4 Electricity production at hydropower plants in 2004, by installed capacity

	Installed capacity MW	Gross electricity production MWh	Supply to grid MWh
Hydropower plants, total	1 014.43	2 019 400	1 615 520
up to 1 MW _e	120.07	286 100	228 880
1–10 MW _e	141.58	617 400	493 920
10 or more MW _e	752.78	1 115 900	892 720
Pumped storage plants	1 145.00	543 400	543 400

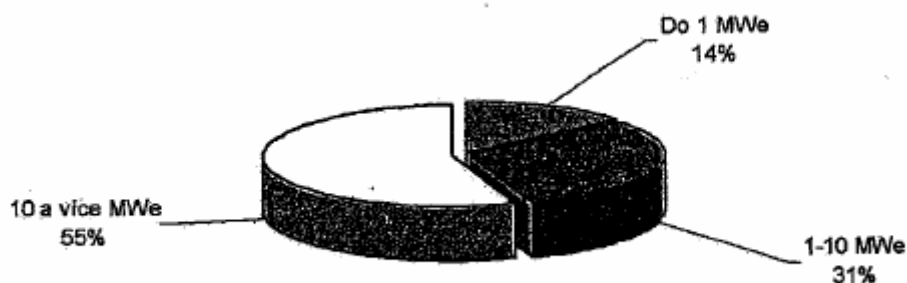
(source: Ministry of Industry and Trade)

3.4.2. Electricity production in 2004

Year	No of small hydropower plants	Installed capacity kW	Gross electricity production MWh	Supply to grid MWh
2003	approx. 1330	1 004 260	1 383 467	1 106 774
2004		1 014 430	2 019 400	1 615 520
Difference	-	1.0%	46.0%	46.0%

(source: Ministry of Industry and Trade)

Large hydropower plants accounted for most of the electricity produced from hydropower. Production increased significantly compared with 2003, owing mainly to improved hydrological conditions and the reinstatement of power plants damaged during the floods in 2002.



10 a více MWe = 10 or more MWe;
Do 1 MWe = up to 1 MWe;
1-10 MWe = 1-10 MWe

Fig. 5 Share of hydropower plants in electricity production, by capacity category (source: Ministry of Industry and Trade)

3.4.3. Outlook for the period to 2010

The major part of the hydropower potential not yet exploited in the Czech Republic is concentrated in small watercourses and amounts to about 500 GWh per annum. However, the hydrological conditions associated with the remaining, untapped potential are worse than for the already exploited potential, and operators will therefore have to wait longer for a return on investments. Using the remaining potential involves the construction of about 100 MW of installed capacity at small hydropower plants with a 2-5 metre fall. The construction of small hydropower plants depends mainly on economic conditions and on the amenability of river basin managers to the implementation of such projects.

3.5. Wind power

In the Czech Republic, the overwhelming majority of wind power is used to produce electricity destined for supply to the distribution network. There are also power plants with a low installed capacity which serve their owners' own needs, but these tend to be isolated, one-off installations.

3.5.1. Wind farms operated in the Czech Republic in 2004

At the end of 2004, 30 wind farms comprising 48 turbines with a combined installed capacity of 16 442 kW had been licensed. 32 units with an installed capacity over 100 kW had a combined installed capacity of 16 230 kW.

Nine new wind farms with a total installed capacity of 4400 kW and eight small wind farms (<100 kW) with a total installed capacity of 106 kW were brought into operation in 2004. **The installed capacity of wind farms increased by 44% compared with 2003.**

3.5.2. Electricity production in 2004

Year	No of installations	Installed capacity kW	Gross electricity production MWh	Supply to grid MWh
2003	21	9 980	3 900	3 900
2004	30	14 380	9 871	9 743
Difference	9	44,1%	153,1%	149,8%

(source: Ministry of Industry and Trade)

The average rate of use of wind farms with an installed capacity exceeding 100 kW which were in operation throughout 2004 was 12%.

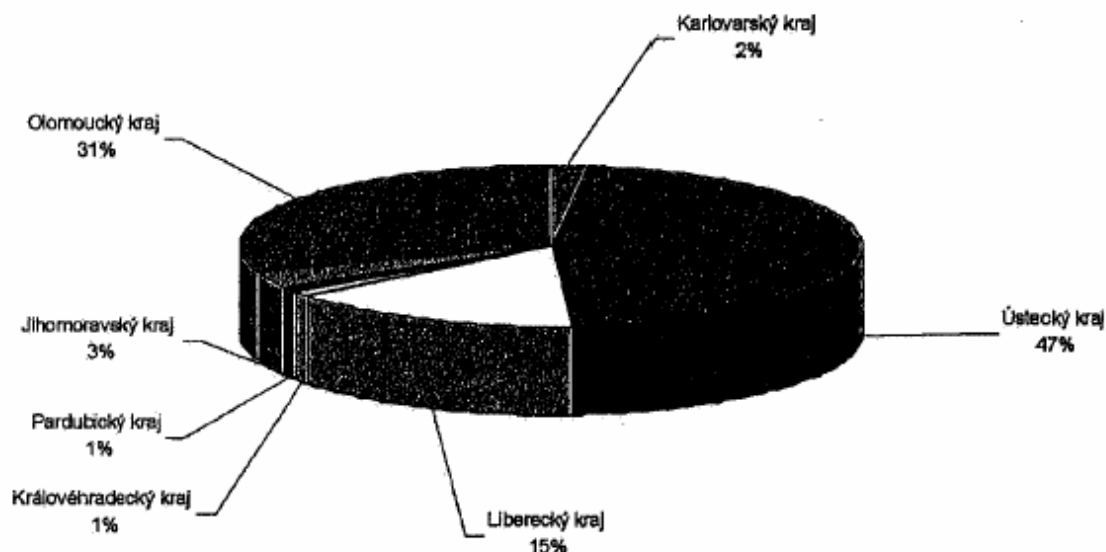


Fig. 6 Electricity production at wind farms in 2004, by region (source: Ministry of Industry and Trade)

3.5.3. Outlook for the period to 2010

For some time now, there have been plans in the Czech Republic to build wind farms with a total capacity of about 2000 MW, but, on the basis of the projects which were the subject of an EIA at the end of 2004, it is likely that some 350 wind farms with a total installed capacity of 582 MW will be built by 2010. Assuming a 15% utilisation rate, such power plants would, when built, produce about 760 GWh of electricity, which is roughly the same as the amount of electricity currently produced from biomass.

The projects accounting for the highest number of wind farms are located in the central part of the Ore Mountains and, for example, in the Vysočina hills, southern Moravia and the Jizerské mountains. In view of the experience thus far with relatively complex negotiations concerning the siting of wind farms, it is likely that some of the projects in the pipeline will not come to fruition.

3.6. Biogas

There has been a tradition of using biogas in the Czech Republic mainly thanks to the anaerobic fermentation which is part of the technology used at municipal wastewater treatment plants. **In recent years, however, the use of landfill gases to produce electricity in small sources equipped with internal combustion piston engines has proved to be a very promising option.**

In 2004, 95 369 000 m³ of biogas was used for energy production purposes – 23.5% more than in 2003 (77 220 000 m³). The biggest contribution to this increase came from landfill gas, of which the volume used increased to 37 516 000 m³ – 59.8% more than in 2003 (23 475 000 m³).

59% of the electricity produced from biogas was supplied to the public grid at an advantageous price. This share was 9% up on 2003, thanks to the increase in the use of landfill gas.

3.6.1. Biogas installations operated in 2004

Most electricity is produced by burning landfill gas in boilers, but in recent times sources the use of sources equipped with piston engines (partly involving cogeneration) has developed rapidly.

The use of biogas from municipal and industrial wastewater treatment plants, as a product of anaerobic fermentation processes, is also relatively widespread. Such biogas is used in boilers or cogeneration units equipped with piston engines for the production of electricity and heat. There are also several biogas installations in operation in the Czech Republic which are designed to process waste from livestock production.

3.6.2. Electricity production in 2004

Year	No of installations	Installed capacity kW	Gross electricity production MWh	Supply to grid MWh
2003	81	24 985	107 856,1	11 868,1
2004	119	32 540	138 793,4	81 913,2
Difference	38	30,2%	28,7%	590,2%

(source: Ministry of Industry and Trade)

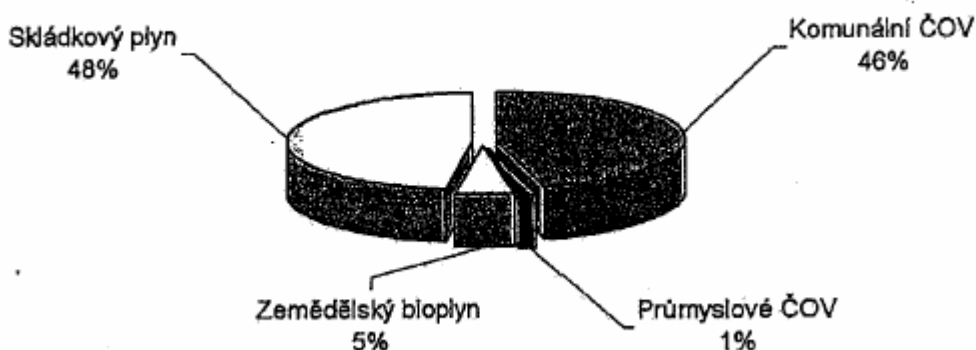
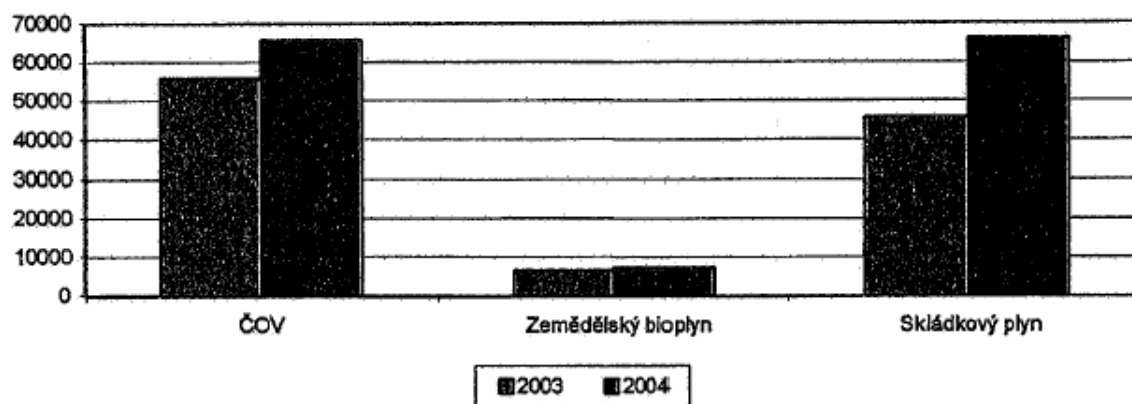


Fig.7 Share of individual categories of biogas in the production of electricity (source: Ministry of Industry and Trade)

Landfill gas 48%
Municipal wastewater treatment plant gas 46%
Agricultural biogas 5%
Industrial wastewater treatment plant gas 1%



ČOV = wastewater treatment plants; Zemědělský bioplyn = agricultural biogas; Skládkový plyn = landfill gas

Fig.8 Electricity production in 2003 and 2004, by category of biogas (MWh)
(source: Ministry of Industry and Trade)

3.6.3. Outlook for the period to 2010

According to available information, a number of projects for the use of landfill gas in cogeneration units are at the planning stage. It is also likely that more installations for the production of electricity from agricultural biogas will be built, with a total installed capacity of about 20 MW. The potential for using biogas from municipal wastewater treatment plants has already largely been exploited, and no major changes can be expected, even as small wastewater treatment plants are built.

3.7. Solar power

Photovoltaic systems currently make a negligible contribution in terms of electricity production. **In 2004, gross electricity production in selected photovoltaic systems amounted to 77.3 MWh.**

3.7.1. Photovoltaic systems operated in the Czech Republic in 2004

In the past few years, photovoltaic systems with a capacity of 20 kWp have been installed, for study purposes, at VŠB in Ostrava, ZČU in Plzeň, TU in Liberec and MF UK in Prague. The company ČEZ, a.s. operates a system with an installed capacity of 10 kWp on a site at the Dukovany nuclear power plant. Smaller systems with a capacity of 3 kWp are located at the Czech Technical University and the PRE, a.s. building in Prague. As part of the “*Slunce do škol*” (“Sun for schools”) measure, a number of other systems with a capacity of 1.2 kWp have been installed.

3.7.2. Electricity production in 2004

Year	No of installations	Installed capacity kW	Gross electricity production MWh	Supply to grid MWh
2003		non-balanced		
2004	12	126	77,3	9,2
Difference	-	-	-	-

(source: Ministry of Industry and Trade)

3.7.3. Outlook for the period to 2010

In view of the technical capacities and the investment costs of available photovoltaic technologies, there is unlikely to be any significant increase in installed capacity or electricity production in the immediate future.

Recently established installations will continue to be more for demonstration purposes, and commercial use is realistic only in the case of microsystems serving local needs, without supplying the grid.

As part of the “*Slunce do škol*” project, the State Environmental Fund in 2004 selected a total of 22 actions in the field of photovoltaic systems to which support would be granted. Nineteen of these systems will have an installed capacity of 1.2 kW_p, one an installed capacity of 20 kW_p, and two an installed capacity of 40 kW_p. The last-mentioned larger systems will be located at universities in Brno (fitted in June 2004), Liberec and Prague. All the systems are expected to have been established by the end of 2005, thus providing 122.8 kW_p of installed capacity.

3.8. Solid municipal waste (biodegradable municipal waste)

Biodegradable constituents account for 50-65% of municipal waste in particular and they are also considered to be a renewable source. Compared with other countries, the Czech Republic makes very little use of municipal waste for energy production purposes, most such waste being landfilled.

3.8.1. Installations operated in the Czech Republic in 2004

There are currently three municipal waste incinerators operating in the Czech Republic, and electricity is produced at two of them.

3.8.2. Electricity production in 2004

Year	Gross electricity production	Supply to grid
	MWh	MWh
2003	9 588,0	3 265,7
2004	10 031,0	6 609,8
Difference	4,6%	102,4%

(source: Ministry of Industry and Trade)

3.8.3. Outlook for the period to 2010

There is unlikely to be any increase in the production of electricity from municipal waste by 2010. Available information indicates that there are several plans for building installations for producing energy from waste. If these plans are implemented, the quantity of waste used for energy production would increase threefold, with a correspondingly higher contribution to electricity production.

4. EXPENDITURE AND IMPACT ON THE PRICE OF ELECTRICITY

4.1. Obligatory purchase of electricity produced from renewable sources in 2004

In 2004, distribution companies were required under the Energy Act to purchase RES electricity at prices set by the Energy Regulatory Office (Table 5). These additional costs were reflected in prices to final customers in the form of a nationwide uniform contribution to the production of electricity from RES.

The level of the contribution is set by the Energy Regulatory Office in advance for the following year. On the basis of the purchases effected, funds are then transferred between individual distribution companies so that those which are obliged to purchase larger amounts of RES electricity are not placed at a disadvantage.

Table 5 Minimum purchase prices for RES electricity in 2004

Type of renewable source	Min. purchase price (CZK / MWh)
Small hydropower plants	1 550
Wind farms put into service after 1.1.2004	2 700
Wind farms put into service before 1.1.2004	3 000
Production of electricity from the burning of biomass	2 500
Production of electricity from the co-firing of fuel mixtures of biomass and fossil fuels	2 000
Production of electricity by burning biogas in plants put into service after 1.1.2004	2 400
Production of electricity by burning biogas in plants put into service before 1.1.2004	2 500
Electricity production using geothermal energy	3 000
Electricity production using solar power	6 000

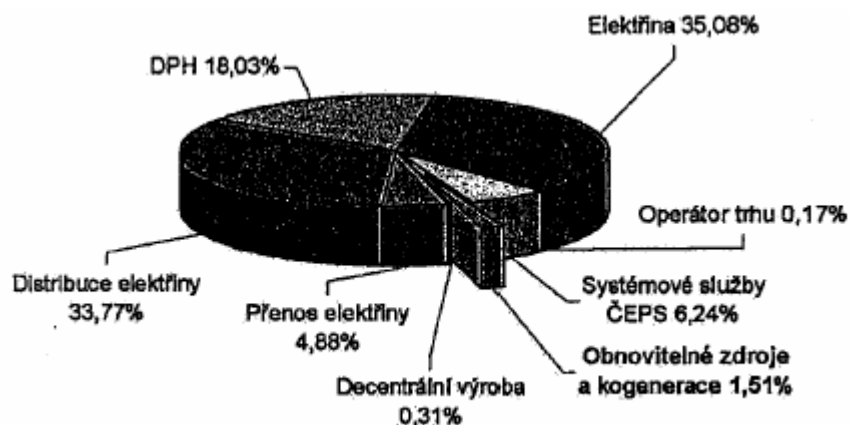
(source: Energy Regulatory Office)

Comparison of the data on the obligatory purchase of electricity in 2003 and 2004 (Table 6) reveals a marked increase in purchases both in terms of the quantities purchased (+65%) and in terms of the value in CZK (+55%). There was a significant increase in the contribution by final customers to supporting RES (+136%).

Table 6 Purchase of RES electricity in 2003 and 2004

Year	Production (GWh)	Purchase (CZK millions)	Contribution from final customers (CZK / MWh)
2003	785	1 350	CZK 12.30
2004	1 299	2 090	CZK 29.04

(source: Energy Regulatory Office)



DPH = VAT;
 Systémové služby ČEPS = system services ČEPS;
 Operátor trhu = market operator;
 Elekřina = electricity;
 Obnovitelné zdroje a kogenerace = renewable sources and cogeneration;
 Decentrální výroba = decentralised production;
 Přenos elekřiny = electricity transmission;
 Distribuce elekřiny = electricity distribution

Fig. 10 Poměry individual components of the average price of electricity at low voltage
 (source: Energy Regulatory Office)

4.2. Estimate of expenditure needed to meet the indicative target

In order to achieve the planned share of RES in the production of electricity, is it not only necessary to maximise the use of existing available installed capacities for it is also crucial to build new sources which make use of RES. Table 7 sets out the estimated cost of investment in establishing installed capacities, as compared with the current situation. In the case of burning biomass, there may be, depending on the changes that are made to requirements under the Act on the protection of the air (emission limits), an increase in the estimated investment costs, as a reflection of necessary changes in the measurement and capture of pollutants.

Table 7 Structure of newly installed capacity of sources for the use of RES

RES	Installed electrical capacity (kW)	Investment costs (CZK '000)	Electricity production (MWh/year)	CO2 emission reduction (tonnes/year)
Small hydropower plants	100 000	5 000 000	400 000	468 000
Wind farms	580 000	17 400 000	986 000	1 153 620
Biomass	150 000	6 000 000	1 073 000	1 255 410
Biomass – co-firing	0	0	230 000	269 100
Biogas	40 000	800 000	260 000	304 200
Total	870 000	29 200 000	2 719 000	3 450 330

(source: Ministry of Industry and Trade)

Experience to date with support schemes shows that support equivalent to around 30% of total project expenditure provides an adequate incentive for investors. The Czech Republic can obtain funding mainly from the EU structural funds, for which 25% co-financing from the State budget is required. Until the end of 2006 these funds will be distributed under existing Ministry of Industry and Trade and Ministry of the Environment programmes. The use of such funds in the period 2007-2013 is currently at the preparatory stage.

In order to obtain a true picture of overall support for the production of electricity from RES it is necessary to add in the extra costs of ensuring the reliable operation of the electricity system. In the case of the assumed increase in the production of electricity on wind farms, it will be necessary to maintain the higher production reserve needed to cover outages due to weather conditions. These system services have been quantified at CZK 3 billion per annum.

Table 8 Total expenditure on the promotion of the production of electricity from RES in 2010

indicator	unit	value
Obligatory purchase of electricity	CZK millions /year	4 820
System services	CZK millions/year	3 000
Increase in installed capacity	kW/year	870 000
Investment to ensure installed capacity	CZK million	29 200
private sector (70%)	CZK million	20 440
public sector (30%)	CZK million	8 760
from State budget (25%)	CZK million	2 190
structural funds (75%)	CZK million	6 570

(source: Ministry of Industry and Trade, Energy Regulatory Office)

5. PROMOTION OF ELECTRICITY PRODUCTION FROM RES

5.1. Act on the promotion of electricity production from renewable sources

Act No 180/2005 on the promotion of the production of electricity from renewable energy sources entered into force on 1 August 2005 and now provides previously missing guarantees for the long-term stability of the support needed for commercial decision-making. With effect from 1 January 2006, this Act introduces a new support system, the main features of which are as follows:

- entitlement to connect facilities for the production of electricity from RES to the electricity system
- **guaranteed return on each unit of electricity produced for a period of 15 years from the date of putting into service**
- **choice between two support systems**
 - **minimum purchase price** – under which all electricity produced can be sold to the operator of the relevant distribution system
 - **green bonuses (supplements to the market price for electricity)** – under which electricity produced from renewable sources can be placed on the single market for electricity
- support for electricity used to meet own needs (not supplied to the electricity system)
- maintenance of the level of purchase prices for already operating facilities/installations for a period of 15 years
- maximum 5% year-on-year reduction in purchase prices for new facilities/installations

5.2. State Programme for the Promotion of Energy-Saving and the Use of Renewable Energy Sources

Those investing in the production of electricity from RES can obtain support under the State Programme for the Promotion of Energy-Saving and the Use of Renewable Energy Sources. Subsidies under Part A of the Programme (administered by the Ministry of Industry and Trade) may amount to as much as 30% of investment costs, subject to a maximum of CZK 3 million. Subsidies under Part B of the Programme (administered by the Ministry of the Environment) may, in the case of municipalities and the not-for-profit sector, amount to as much as 90% of the basis for the calculation of aid and, in the case of businesses, may amount to as much as 40%. Credits equivalent to 35% of costs (interest-free) may be granted to non-business entities, and credits equivalent to 90% of costs may be granted to businesses, generally at an

interest rate of 4% per annum over a 12 year period. Contributions may also be granted to partly cover the interest on the loan (reduction of the 4% interest rate) In 2004, the Ministry of Industry and Trade and the Ministry of the Environment granted subsidies to support the production of electricity from RES amounting to CZK 96.5 million, and credits amounting to CZK 42.7 million. 2.8 MW of installed electrical capacity was established and the annual production of electricity was quantified at 11.8 GWh/year.

Table 9 Investment aid for the production of electricity from RES under the State Programme in 2004

Dept	sub-programme			expenditure (CZK '000)	subsidy (CZK '000)	loan (CZK '000)	Heat production (GJ/year)	Electricity production (MWh/year)	Installed electrical capacity (kW)
MPO	small hydropower plants			13 152	1 770			892	213
	landfill gas			1 000	500			964	140
	photovoltaic system							3	3
	Department, total	169	3 270	0				1 859	356
Ministry of the Environment	5A – Small hydropower plants	640	0	1 458	0	169	75		
	6A – Hydropower plants	0	0	27 000		0	2 600	1 200	
	7A - biomass	500		22 212	14 278	10 879	7 104	1 074	
	10A - slunce do škol ("Sun for schools")	881		70 992	0	14	74	128	
	Department, total	1 021	93 204	42 736		10 893	9 947	2 477	
State Programme, total		2 000	96 474	42 736	10 893	11 806	2 833		

(source: Ministry of Industry and Trade, Ministry of the Environment)

5.3. EU structural funds

Those investing in the production of electricity from RES have been able, from 1 May 2004, to obtain support from the structural funds of the European Union. Such support is obtained through two operational programmes:

- the **"Průmysl a podnikání"** operational programme (Ministry of Industry and Trade)
The operational programme for 2004-2006 includes a subsidy scheme entitled **"Obnovitelné zdroje energie"** (renewable energy sources), designed for small and medium-sized businesses intending to use renewable energy sources. The programme is intended to assist the construction,

renovation or rebuilding of facilities for the use of RES, the introduction of production technologies and production installations which have a low energy demand, a minimum impact on the environment and use facilities for the production of electricity from RES, and the combined production of electricity and heat using RES. Subsidies may amount to as much as 46% of the investment costs, subject to a ceiling of CZK 30 million. CZK 0.5 billion is available for the period 2004-2006.

- **"Infrastruktura" operational programme** (Ministry of the Environment)
This operational programme includes a subsidy scheme entitled "**Využívání obnovitelných zdrojů energie**" (Using renewable energy sources), designed for legal persons established for non-business purposes. The programme is intended to assist the reconstruction and building of power plants using biomass or other renewable energy sources for the production of electricity, the conversion of existing systems to use renewable energy sources (e.g. heat pumps etc.), the use of renewable energy sources for supplying heat from municipal boiler-houses, and the construction of combined sources of electrical and thermal energy using biomass and biogas. Subsidies from the ERDF (European Regional Development Fund) may amount to as much as 75% of the basis for the calculation of aid (eligible expenditure), subject to a ceiling equivalent to EUR 10 million. A measure may additionally be co-financed by the State Environmental Fund up to an overall level of 90%. Funding equivalent to up to 50% of eligible costs may be obtained from the State Environmental Fund for design documentation, subject to a limit of 3% of the basis for the calculation of aid and a ceiling of CZK 3 million. For the period 2004-2006, all ERDF resources are for Priority 3. There is a total of EUR 142 million available for the improvement of environmental infrastructure, of which EUR 44.1 million has been allocated from public sources (ERDF EUR 30.9 million + municipal budgets EUR 7.9 million + State Environmental Fund EUR 5.3 million) for Measure 3.3 – Improvement of air protection infrastructure (RES comes under Measure 3.3.).

5.4. Support for the cultivation of energy crops in the agricultural sector

Aid amounting to CZK 5500/ha was granted by the Ministry of Agriculture to growers for the cultivation of energy crops on arable land, on the basis of Government Regulation No 86/2001 Coll., up to and including 2003.

In 2004, such aid was paid at the rate of CZK 2000/ha from the PGRLF (Agricultural and Forestry Support and Guarantee Fund a.s.), and this was also notified to the European Commission as existing State aid. A total of about CZK 1 988 000 was paid out.

In 2005, programme 1 U - Aid for the cultivation of crops for energy production purposes – was classified under a national programme of aid known as the Rules governing the conditions for the award of subsidies for 2005 pursuant to Section 2 and Section 2d of Act No 252/1997 Coll. on agriculture. The aim of this programme is to support the establishment and maintenance of crops for energy production purposes at the rate of CZK 2000/ha. The energy crops specified in the programme must be grown on arable land specifically for energy production purposes. On the basis of the applications submitted, it may be assumed that about 1020 ha of land has been sown with energy crops and that some CZK 2 040 000 will be paid out.

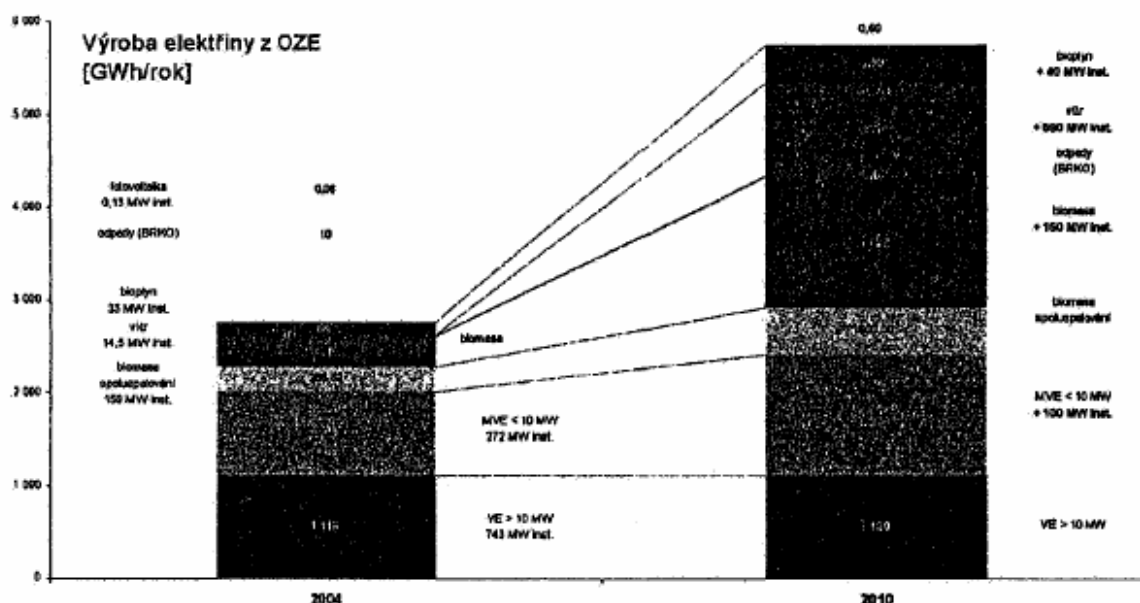
In the European Union, support for energy crops at the rate of EUR 45/ha is included in the set-aside system. In the Czech Republic, it is not part of the SAPS scheme.

6. CONDITIONS FOR MEETING THE INDICATIVE TARGET

Meeting the 8% indicative target means producing 5.7 TWh¹ of electricity from renewable sources in 2010, which represents an increase of 3 TWh compared with the current situation. The essential prerequisites for achieving this are:

- ensuring a level of production at large hydropower plants of 1.1 TWh
- maximising the use of existing capacities for the co-firing of biomass – 0.5 TWh production
- **building new capacities to be brought into operation in the period 2005–2010**

Having regard to the availability of usable energy potential, the key to meeting the indicative target is to build installed capacities in terms of biomass (about 150 MW), small hydropower plants (about 100 MW) wind power (about 600 MW) and biogas. As for the other renewable sources, either their potential is already being fully exploited or their use is impracticable in the timeframe in question.



vítr = wind;

biomasa = biomass;

biomasa spalování = biomass, co-firing;

MVE = small hydropower plants;

odpady (BRKO) = waste (biodegradable municipal waste);

bioplyn = biogas;

VE = hydropower plants;

fotovoltaika = photovoltaics;

Výroba elektřiny z OZE [GWh/rok] = electricity production from RES [GWh/year]

¹ The value specified for electricity production from RES in 2010, i.e. 5.7 TWh, is based on the assumption that electricity consumption in the Czech Republic will increase by about 1.2% per annum, to 71.8 TWh in 2010. If gross electricity consumption were to be maintained at the current level of 67 TWh, 5.4 TWh would suffice to meet the indicative target. However, in view of current levels of economic growth and the process of moving closer to the level of the EU15, it is unlikely that electricity consumption will remain unchanged.

*Fig. 10 Contribution of individual RES needed to meet the indicative target
(source: Ministry of Industry and Trade)*

The main limiting factors as regards the construction of new facilities for producing electricity from renewable sources are the competitiveness of the product on the electricity market and the return on the investment made in implementing the projects. The main factors affecting the viability of investments in this area are as follows:

- the high specific cost of investment in the construction of facilities
- the low market price for RES electricity owing to the instability of supplies
- the need for long-term planning owing to the length of the preparatory phase of a project, including administrative hurdles (building permit procedures)

The following conditions need to be met in order to ensure value for money with regard to investments:

- maintenance of the current level of purchase prices
- absence of limits on support for economically feasible methods of exploiting RES (in particular co-firing)
- investment aid amounting to 20-30% of investment costs
- stability of support in the agricultural sector

7. CONCLUSION

RES electricity accounted for 4.04% of gross electricity consumption in the Czech Republic in 2004. This was 1.24% higher than in 2003.

Gross RES electricity production increased by 893 GWh (48 %) from one year to the next. Hydropower plants accounted for most of this increase. Gross electricity production at hydropower plants increased by 46%. This dramatic increase occurred because 2003 had been a very dry year and some hydropower plants had been damaged as a result of the floods in 2002. Electricity production from biomass increased by 58.9% and electricity production from biogas increased by 28.7% compared with 2003.

Gross electricity production	Contribution to gross national electricity consumption		Share of gross electricity production
MWh	%		%
Hydropower plants	2 019 400.0	2.9431%	2.3946%
Biomass, total	592 704.8	0.8638%	0.7028%
Biogas, total	138 793.4	0.2023%	0.1646%
Solid municipal waste	10 031.0	0.0146%	0.0119%
Wind farms (>100 kW)	9 870.8	0.0144%	0.0117%
Photovoltaic systems	77.3	0.0001%	0.0001%
Total	2 770 877.3	4.0382%	3.2856%

The key to further increasing the RES share in the production of electricity is investment in the construction of new facilities, especially where the use of biomass is concerned.



economic conditions to ensure that investments are attractive

- **maintenance of the current level of purchase prices**
- **support for, and maximising the use of, economically feasible methods of producing electricity from RES (in particular co-firing of biomass with coal)**
- **20-30% investment aid for new projects (use of EU structural funds)**
- **stable support in the agricultural sector (subsidies for the cultivation of energy crops)**