

SUSTAINABLE ENERGY



TECHNOLOGY AT WORK

## **Technology at Work** **T@W**

# **ETS Country Profile-Poland**

Report by



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## 1 GENERAL COUNTRY OVERVIEW

Poland is the largest country in the Central Europe with the area of 311,904 km<sup>2</sup> and the population of 38<sup>1</sup>. Forests cover 30.1% of the country's land area, *i.e.* 9.26. Agricultural areas are a vital element of the Polish economy and occupy about 54% of total land. Some 38% of the population live in the rural areas.

The Polish economy is currently going through a phase of rapid change. In 2004 the increase of GDP amounted to 5.3%, which was the highest level in seven years. Intensified commercial activity related chiefly to the period of the accession. In 2005 the pace of economic growth slackened to 3.2%. Despite this, GDP per capita achieved the level of half the EU-25 average (EUR 11.6 thousand). As it follows from the data of the Central Statistics Office, the growth tendency could be observed again in the first quarter of 2006 when real GDP was higher than a year before by 5.2%. These data confirms the growth recorded in the Polish economy.

The basic assumption of Poland's economic development in the years 2008-2012 as illustrated in NAP II is the estimate of continuance in economic growth in the next five to ten years.

In order to achieve the abovementioned scenario of economic development, Poland would be required to meet numerous conditions, among them there are: the control of the government deficit, maintaining the debt-top-GDP ration, decreasing tax burdens in a way enabling the achievement of fiscal targets, absorption of the financing from the EU funds.

Table 1 Starting point after the EU enlargement: General economic and sustainability indicators for Poland in 2004 as a percentage of EU 25 '2003 or factor EU25/PL.

	<b>Poland</b>	<b>„EU 25”</b>	<b>% or factor</b>
Population (mln)	38 231	451 864	<b>8,46</b>
GDP (bln €)	202	9 599	<b>2,10</b>
Employment (mln)	13 782	196 772	<b>7,00</b>
Expenditure on research (bln €)	1,2	169	<b>0,70</b>
Energy intensity, (kg of oe/1000€ GDP)/(factor EU25/PL)	650,1	209,9	<i>factor 3,10</i>
Share of green electricity cons. (%)/(factor EU25/PL)	2,0	12,7	<i>factor 6,35</i>
Expected production/share of biofuels '2005 (%)/(factor EU25/PL)	<b>0,5</b>	<b>1,2</b>	<i>factor 2,40</i>

<sup>1</sup> Central Statistical Office (GUS). 2007. *Statistical Yearbook of the Republic of Poland*. GUS: Warsaw

A significant aspect for Poland, which certainly has an impact on the pace of economic development is the process of using the means from the EU Structural and the Cohesion Funds. The means from the EU funds in their majority are directed at supporting the investment. The financing concerns infrastructure investments as well as the investments of direct and indirect productive character. Pursuant to the forecasts prepared for the National Development Plan, the EU transfers at the level of 1% GDP result in a 5% increase in investments. The use of the EU funds is, therefore, directly correlated with the CO<sub>2</sub> emission volume in Poland.

### **1.1 Description of relevant strategies for fulfilling national/international targets on mitigation of climate change**

Poland is the third largest greenhouse gas emitter in Central and Eastern Europe, after Russia and Ukraine. Polish economy is highly carbon intensive. Over 80% of Polish energy needs is covered by hard coal, with a significant share of a highly CO<sub>2</sub> intensive lignite. Hard coal and lignite also dominate the final energy consumption structure. Coal is not only burnt in power plants but a significant amount of it is used directly by various branches of industry, over a million of small local heating units and boiler houses.

The Framework Convention on Climate Change was signed by Poland in 1992 and ratified it in 1994. In the year 1997 the quantitative target for the GHG emission reduction was formulated in the Kyoto Protocol, which Poland signed in 1998. Under the Protocol Poland was obliged to reduce GHG emission by 6% by in the period 2008-2012 compared with the 1988 base year. This was justified by fact that from the second half of 1989 the deep economic recession started in Poland and 1988 year was the last year. Intensive restructuring processes under way in the Polish industry led to efficiency improvements. The fall in CO<sub>2</sub> emissions is also linked with the general structural changes in the whole economy and a shift from heavy industry to less energy intensive services. Finally, stricter environmental policies also played a role, especially those with respect to emissions of particulate matter as well as sulphur and nitrogen oxides (a side effect of actions in this field is the decrease in carbon dioxide emissions). The tendencies, which were observed in the 1988 and 2004 period were following:

- over 33% CO<sub>2</sub> emission reduction in the whole country, including some 30% in the electricity and heat producing sectors,
- 53% CO<sub>2</sub> emission reduction in the tertiary and household sectors mainly due to reduced energy efficiency measures leading to reduced heat demand as well as switch to less CO<sub>2</sub> intensive fuels.

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<sup>4</sup>UNFCCC. 2007. *National Inventory 2005*. URL: [http://unfccc.int/files/national\\_reports/annex\\_i\\_ghg\\_inventories/national\\_inventories\\_submissions/](http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/)

Table 2 GHG emissions by sector<sup>4</sup>.

Percentage share of source sectors in biexacy emissions	Share [%]		
	CO <sub>2</sub> without LUCF	CH <sub>4</sub>	N <sub>2</sub> O
TOTAL	100.00	100.00	100.00
1. Energy	95.42	39.98	8.38
A. Fuel Combustion	95.35	0.83	8.38
1. Energy Industries	55.60	0.14	2.59
2. Manufacturing Industries and Construction	11.47	0.11	0.63
3. Transport	10.90	0.29	3.59
4. Other Sectors	15.45	0.26	1.35
5. Other	1.93	0.04	0.21
B. Fugitive Emissions from Fuels	0.07	39.15	NE
1. Solid Fuels	0.0002	25.69	NE
2. Oil and Natural Gas	0.07	13.47	NE
2. Industrial Processes	4.23	0.80	15.05
A. Mineral Products	2.09	NE	NE
B. Chemical Industry	1.17	0.69	15.05
C. Metal Production	0.97	0.12	NE
D. Other Production	NE	NE	NE
G. Other	NE	NE	NE
3. Solvent and Other Product Use	0.18	NE	0.40
4. Agriculture	NE	32.51	71.90
A. Enteric Fermentation	NE	23.14	NE
B. Manure Management	NE	9.30	18.96
D. Agricultural Soils	NE	NE	52.89
F. Field Burning of Agricultural Residues	NE	0.07	0.05
5. Land Use, Land-Use Change and Forestry	NE	0.01	0.0009
A. Forest Land	NE	NE	NE
B. Cropland	NE	NE	NE
C. Grassland	NE	NE	NE
D. Wetlands	NE	NE	NE
E. Settlements	NE	0.01	0.0009
F. Other Land	NE	NE	NE
6. Waste	0.17	26.70	4.28
A. Solid Waste Disposal on Land	NE	17.51	NE
B. Wastewater Handling	NE	9.19	4.22
C. Waste Incineration	0.17	NE	0.06

Table 3 and Figure 1 Annual GHG emissions in Poland by pollutant and sector.

Pollutant	2005	
	Emission in CO <sub>2</sub> eq. [Gg]	Share [%]
CO <sub>2</sub> – net emission (with LUCF)	294 814.12	
CO <sub>2</sub> – without LUCF.	324 818.66	81.74
CH <sub>4</sub>	38 678.15	9.73
N <sub>2</sub> O	31 140.11	7.84
HFCs	2 436.34	0.61
PFCs	285.05	0.07
SF <sub>6</sub>	22.56	0.006
TOTAL without CO <sub>2</sub> from LUCF	397 380.88	100.0
TOTAL with LUCF	367 376.33	

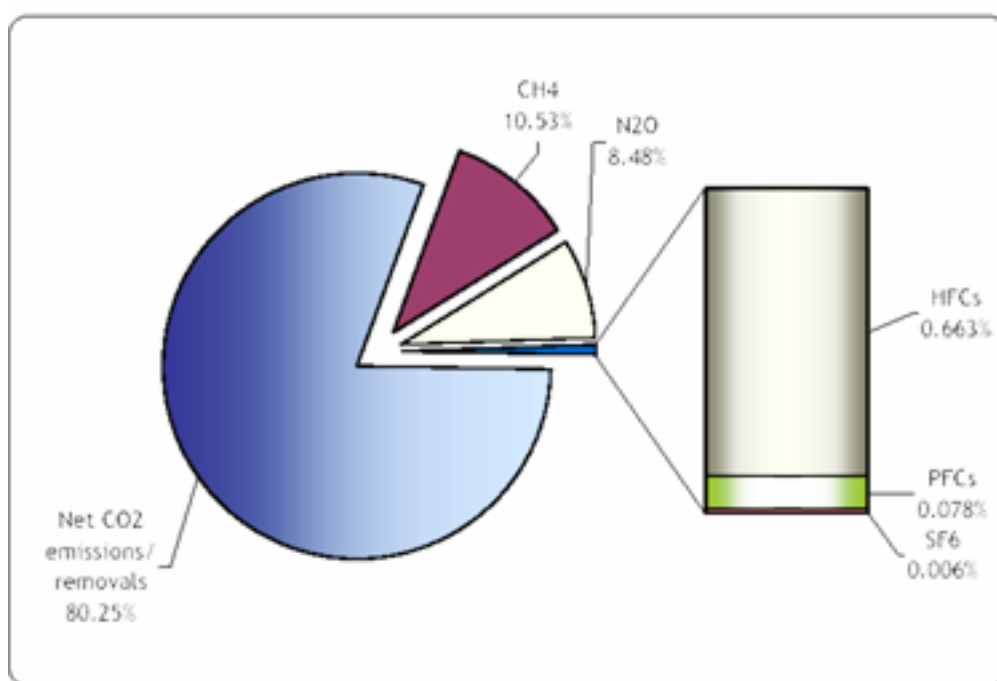


Table 4 Changes in GHG emissions compared with the base year.

Pollutant	Base year	2005	(2005-base)/base
	Emission in CO <sub>2</sub> eq. [Gg]	Emission in CO <sub>2</sub> eq. [Gg]	
CO <sub>2</sub> – net emission (with LUCF)	461 951.16	294 814.12	-0.36
CO <sub>2</sub> – without LUCF.	494 885.88	324 818.66	-0.34
CH <sub>4</sub>	49 256.41	38 678.15	-0.21
N <sub>2</sub> O	42 478.82	31 140.11	-0.27
HFCs	26.44	2 436.34	91.14
PFCs	250.18	285.05	0.14
SF <sub>6</sub>	13.15	22.56	0.72
TOTAL without CO <sub>2</sub> from LUCF	586 910.88	397 380.88	-0.32
TOTAL with LUCF	553 976.16	367 376.33	-0.34

## **1.2 What is the situation for fulfilling national/international emission reduction commitments and how is the issue addressed**

### **1.2.1 National Climate Policy**

The '*Climate Policy to 2020*'<sup>6</sup> adopted the strategic national goal of achieving 40% reduction of greenhouse gas emissions in 2020 compared with 1988. If linear path towards achieving this goal was assumed, in the period 2005-2007 the mean annual greenhouse gas emission levels from the installations participating in the scheme should not exceed 212 million Mg of CO<sub>2</sub>. The actions, which should according to the Climate Policy document, lead to achieving those goals are presented in the tables below. One of the main midterm priorities (for 2006-2012) set in this document was the increased utilisation of renewables (RES). Among the priority tasks are: promotion, and increased utilisation of RES in the power sector.

Even the most optimistic visions of the country's economic development would not lead to the emissions exceeding the Kyoto targets, however, would not allow to achieve the targets of the Climate Policy (40% of emission reduction)<sup>7</sup>.

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<sup>6</sup> Ministry of Environment. 2003. Climate Policy of Poland to 2020. Adopted by the Council of Ministers on 04.11.2003. URL: [http://www.emisje-co2.pl/pdf/raporty/polityka\\_klimatyczna.pdf](http://www.emisje-co2.pl/pdf/raporty/polityka_klimatyczna.pdf)

<sup>7</sup> Ministry of Environment. 2006. *Draft of the NAP for 2008-2012*. June 2006.

Table 5 Comparison of support mechanisms for renewable energy<sup>5,6</sup>.

No.	Name of measure	Purpose of adoption	Greenhouse gas	Implementing Ministry	Type of instrument
<b>BASIC MEASURES*</b>					
1.	Obligation to purchase energy from renewable sources	Promotion of renewable energy generation	CO <sub>2</sub>	Ministry of Economy, Labour and	legal
				Social Policy (MGPiPS)	
2	Financial support for investment projects in combined heat and power production	Promotion of combined heat and power production	CO <sub>2</sub>	Ministry of Finance (MF)/ MGPiPS	financial
3	Introduction of a system of incentives for enterprises encouraging energy saving investment projects	Improvement of energy efficiency and promotion of renewable energy generation	CO <sub>2</sub>	MF/ MGPiPS	financial
4	Introduction of a system of incentives for the public sector concerning the launch of investment projects leading to rational energy consumption	Improvement of energy efficiency and promotion of renewable energy sources	CO <sub>2</sub>	MF/ MGPiPS	financial
5	Prevention and reduction of methane emissions from fuel production and distribution	Improvement of energy efficiency	CH <sub>4</sub>	Ministry of Environment (MS)/ MGPiPS	legal
6	Energy efficiency labels	Improvement of energy efficiency	CO <sub>2</sub>	MGPiPS	legal
<b>ADDITIONAL MEASURES*</b>					
7	Use of the best available techniques (BAT)	Implementation of the IPPC Directive	CO <sub>2</sub>	MS	legal
8	Introduction of financial mechanisms supporting energy production from renewable sources	Promotion of renewable energy generation	CO <sub>2</sub>	MS/MF	legal/ financial
9	Certificates of origin of electricity from renewable energy sources	Promotion of renewable energy generation	CO <sub>2</sub>	MGPiPS	legal
10	Introduction of green certificates	Promotion of renewable energy generation and combined heat and power production	CO <sub>2</sub>	MS	legal
11	Exemption from excise tax on electricity production from hard coal-bed methane	Emission reductions	CH <sub>4</sub>	MF	legal

\* basic measures, i.e. resulting from the strategies and policies adopted and the measures already launched

\* additional measures, serving to ensure the achievement of additional greenhouse gas emission reductions.

Table 6 Comparison of support measures to reduce GG in the industrial sector<sup>5, 6</sup>.

No.	Name of measure	Purpose of introduction	Greenhouse gas	Implementing Ministry	Type of instrument
<b>BASIC MEASURES*</b>					
1	Improvement of energy efficiency of light sources	Improvement of standards (energy-saving lighting standards)	CO <sub>2</sub>	MGPiPS (Ministry of Economy, Labour and Social Policy)	legal
2	Improvement of the efficiency of electrical engines	Improvement of standards	CO <sub>2</sub>	MGPiPS	legal
<b>ADDITIONAL MEASURES*</b>					
3	Adoption of regulations limiting the consumption of fluorinated greenhouse gases	Reduction of emissions of fluorinated greenhouse gases	HFCs, PFCs, SF <sub>6</sub>	MGPiPS	legal
4	Application of the best available techniques (BAT)	Implementation of the IPPC Directive	CO <sub>2</sub>	MS (Ministry of Environment)	legal
5	Commitments of enterprises to reduce CO <sub>2</sub> levels from industrial processes, i.e. iron and steel production	Improvement of standards	CO <sub>2</sub>	MS	legal
6	Support for the development of environmentally friendly and technically viable methods for greenhouse gas emission reductions	Improvement of standards	HFCs, PFCs, SF <sub>6</sub>	MGPiPS	legal/financial
7	Prevention and reduction of methane emissions from fuel production and distribution processes	Improvement of standards	CH <sub>4</sub>	MS/MGPiPS	legal
8	Voluntary agreements with industry	Energy efficiency	CO <sub>2</sub>	MGPiPS	legal
9	Development of a set of instruments to support the activity of small and medium-sized enterprises, mainly in the scope of handling innovations and improvement of productivity	Rational energy consumption	CO <sub>2</sub>	MGPiPS	financial
10	Promotion of environmentally friendly and efficiently practices and technologies in industrial activities	Improvement of standards, promotion of low-emission technologies	CO <sub>2</sub>	MS	educational
11	Determination of the priorities of research and development work on modern environmentally friendly and material- and energy-saving production technologies	Improvement of standards, development of modern technologies	CO <sub>2</sub>	MGPiPS, KBN (Committee for Scientific Research)	legal

\* basic measures, i.e. resulting from the strategies and policies adopted and the measures already launched

\* additional measures, serving to ensure the achievement of additional greenhouse gas emission reductions.

Table 7 Comparison of support measures to reduce GG in the transportation sector<sup>5,6</sup>.

No.	Name of measure	Purpose of introduction	Greenhouse gas	Implementing Ministry	Type of instrument
BASIC MEASURES*					
1	Improvement of infrastructure for bicycle riders and pedestrians	Promotion of the use of bicycles	CO <sub>2</sub> , N <sub>2</sub> O, ozone	MI (Ministry of Infrastructure)	legal and administrative
2	Construction of motorways, ring roads and expressways	Improvement of air quality by increasing traffic smoothness	CO <sub>2</sub> , N <sub>2</sub> O, ozone	MI	legal
3	Adoption of more demanding emission standards for internal-combustion engines	Emission reductions	CO <sub>2</sub> , N <sub>2</sub> O, ozone	MI	legal
ADDITIONAL MEASURES*					
4	Promotion of public transport	Improvement of air quality by the use of public transport	CO <sub>2</sub> , N <sub>2</sub> O, ozone	MI/MF (Ministry of Finance)	legal and administrative
5	Development of rail transport, including combined transport	Improvement of air quality	CO <sub>2</sub> , N <sub>2</sub> O, ozone	MI	mixed
6	Implementation of local transport plans (schools and enterprises)	Collective transport (school students and enterprise employees)	CO <sub>2</sub> , N <sub>2</sub> O, ozone	MI	organisational
7	Promotion of transport plans to service enterprises	Collective transport of enterprise employees	CO <sub>2</sub> , N <sub>2</sub> O, ozone	MI	voluntary
8	Promotion of cycling transport	Promotion of the use of bicycles	CO <sub>2</sub> , N <sub>2</sub> O, ozone	MI/MS (Ministry of Environment)	educational
9	Promotion of "environmentally clean" vehicles	Change of the consumer lifestyle	CO <sub>2</sub> , N <sub>2</sub> O, ozone	MI/MF	legal and educational
10	Improvement of the quality of waterway transport	Growth of the quantity of commodities transported by waterways	CO <sub>2</sub> , N <sub>2</sub> O, ozone	MI/MS	legal and administrative
11	Improvement of road traffic flow and parking for heavy load vehicles in towns	Improvement of traffic in towns	CO <sub>2</sub> , N <sub>2</sub> O, ozone	MI	legal
12	Technical projects related to vehicle design	Promotion of vehicles causing less pollution of the environment	CO <sub>2</sub> , N <sub>2</sub> O, ozone	MI	legal
13	Effective organisation of rail and road systems	Emission reductions	CO <sub>2</sub> , N <sub>2</sub> O, ozone	MI	organisational
14	Information and upbringing activities concerning the need to change behaviour	Change of consumer lifestyle	CO <sub>2</sub> , N <sub>2</sub> O, ozone	MI/MS	educational
15	Measures to change patterns of long-distance travels in favour of railways	Change of behaviour	CO <sub>2</sub> , N <sub>2</sub> O, ozone	MI/MS	educational
16	Measures to reduce greenhouse gas emissions from air transport	Emission reductions	CO <sub>2</sub> , N <sub>2</sub> O, ozone	MI	legal
17	Promotion of marine and inland navigation	Promotion of freight transport by water	CO <sub>2</sub> , N <sub>2</sub> O, Ozone	MI	educational

\* basic measures, i.e. resulting from the strategies and policies adopted and the measures already launched

\* additional measures, serving to ensure the achievement of additional greenhouse gas emission reductions.

Table 8 Comparison of support measures to reduce GG in the agricultural sector<sup>5,6</sup>.

No.	Name of measure	Purpose of introduction	Greenhouse gas	Implementing Ministry/ Implementing institution	Type of instrument
<b>BASIC MEASURES*</b>					
1.	Dissemination of the Code of Good Agricultural Practice**	Promotion of measures to limit pollutant emissions from agricultural production	N <sub>2</sub> O, CH <sub>4</sub> , CO <sub>2</sub>	MRiRW (Ministry of Agriculture and Rural Development)	educational
2.	Dissemination of the use of energy-saving technologies in agricultural production	Promotion of energy-saving technologies	CO <sub>2</sub>	MRiRW	educational
3.	Dissemination of the implementation of new technologies using vegetal products as energy fuel and biogas-generating technologies of manure disposal	Promotion of technologies limiting greenhouse gas emissions	CO <sub>2</sub>	MRiRW	educational
4.	Afforestation of farmland	Promotion of afforestation	CO <sub>2</sub>	MRiRW, MS, MF	financial
<b>ADDITIONAL MEASURES*</b>					
1.	Dissemination of the use of unconventional energy sources in agriculture and rural areas	Promotion of renewable energy sources	CO <sub>2</sub>	MRiRW	educational
2.	Development of new technologies for growing and harvesting vegetal biomass designed for use as a renewable energy source and raw material for industry	Promotion of new technologies	CO <sub>2</sub>	Scientific units/MRiRW.	research

\* basic measures, i.e. resulting from the strategies and policies adopted and the measures already launched

\* additional measures, serving to ensure the achievement of additional greenhouse gas emission reductions.

\*\* The Code of Good Agricultural Practice contains a set of environmentally friendly principles of management in agricultural production. The Code was approved by the Minister of Agriculture and Rural Development and the Minister of the Environment.

Table 9 Comparison of support measures to reduce GG via sinks in forestry<sup>5,6</sup>.

No.	Name of measure	Purpose of introduction	Greenhouse gas	Implementing Ministry	Type of instrument
<b>BASIC MEASURES*</b>					
1	Measures in support of afforestation	Afforestation	CO <sub>2</sub>	MS/MRiRW (Ministry of Environment/ Ministry of Agriculture and Rural Development)	financial
2	Prevention of land-use change	Reduction of deforestation	CO <sub>2</sub>	MS	financial
3	Maintenance of rational forest management	Protection of forest ecosystems	CO <sub>2</sub>	MS	legal
4	Protection of the ecological stability of forests	Conservation and protection of forests	CO <sub>2</sub>	MS	financial
<b>ADDITIONAL MEASURES*</b>					
5	Plan for the use of timber for energy generation purposes	Energy supply from timber	CO <sub>2</sub>	MS	educational
6	Research on the magnitude of carbon sinks	Enhancement of knowledge on carbon sinks	CO <sub>2</sub>	MS	research

\* basic measures, i.e. resulting from the strategies and policies adopted and the measures already launched

\* additional measures, serving to ensure the achievement of additional greenhouse gas emission reductions.

Table 10 Comparison of support measures to reduce GG via waste management<sup>5,6</sup>.

No.	Name of measure	Purpose of introduction	Greenhouse gas	Implementing Ministry	Type of instrument
<b>BASIC MEASURES*</b>					
1	Waste reduction at source	Reduction of the quantity and adverse impact of waste at source	CO <sub>2</sub> , CH <sub>4</sub>	MS (Ministry of Environment)	legal
2	Waste recovery and recycling	Waste recovery and recycling	CO <sub>2</sub> , CH <sub>4</sub>	MS	legal
3	Modernisation of solid waste landfills	Legal provisions on the landfill and disposal of waste	CO <sub>2</sub> , CH <sub>4</sub>	MS	legal/organisational
4	Landfill of organic waste	Limitation of the landfill of organic waste at landfills	CH <sub>4</sub>	MS	legal
5	Minimisation and recycling of waste	Reduction of the quantity and adverse impact of waste	CO <sub>2</sub> , CH <sub>4</sub>	MS	legal
6	Incentives to rational waste management	Financial incentives to rational waste management		MS	financial
7	Monitoring emissions from landfills	Control of CH <sub>4</sub> and CO <sub>2</sub> emissions	CO <sub>2</sub> , CH <sub>4</sub>	MS	legal
8	Waste sorting before its landfill	Rational waste management	CO <sub>2</sub> , CH <sub>4</sub>	MS	legal
<b>ADDITIONAL MEASURES*</b>					
9	Enhancement of waste reduction	Reduction of the quantity and adverse impact of waste at source	CO <sub>2</sub> , CH <sub>4</sub>	MS	organisational

\* basic measures, i.e. resulting from the strategies and policies adopted and the measures already launched

\* additional measures, serving to ensure the achievement of additional greenhouse gas emission reductions.

### 1.2.2 Kyoto flexible mechanisms

Poland has at its disposal at the moment a significant surplus (ca. 130 million Mg) of GHG emissions compared with the Kyoto target undertaken in 1997. Even the most optimistic economic development forecasts give no ground to assume that the target in the form of achieving a 6% reduction in the emission in the period of 2008- 2012 might be threatened.

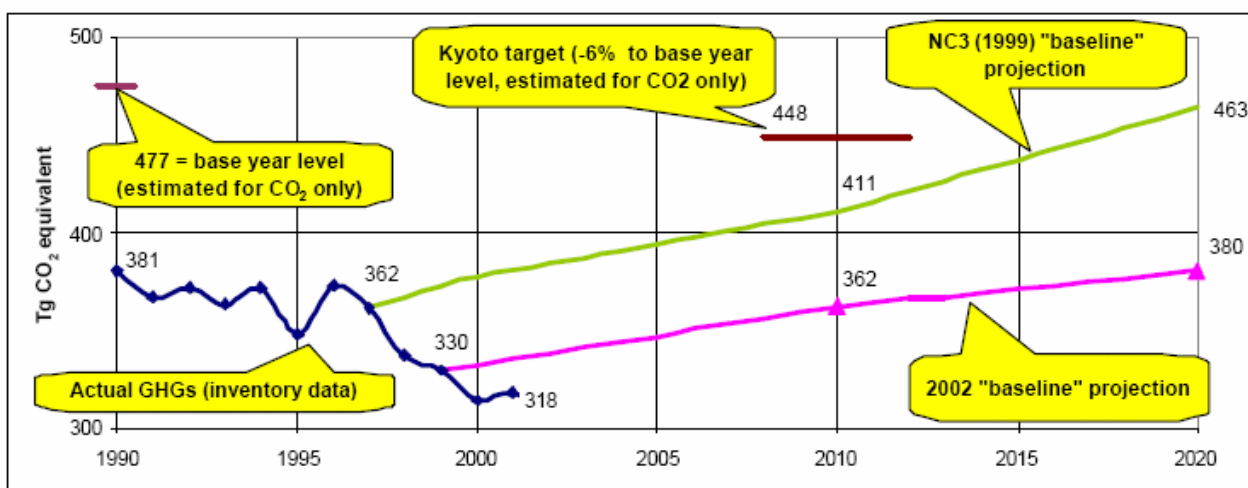
Poland has already achieved its target and in the perspective of 2012 there are no threats to sustaining the volume of CO<sub>2</sub> emission on a level lower than it results from the Kyoto Protocol. NAP II takes this special situation into consideration. It needs to be stressed that despite the achievement of Kyoto targets, actions aimed at the reduction of the GHG emission volume are undertaken all the time, e.g. through elimination or modernisation of ineffective installations, which is connected with implementation of technologies compliant with the requirements of the best available. Furthermore, increased use of renewable energy sources is promoted, and their use increases yearly. Number of allowances which in each year of the period will constitute a reserve for joint implementation projects reducing or limiting emissions of installations covered by community scheme was determined in the NAP II. The reserve of allowances assigned for joint

implementation projects (JI) was determined for approved (implemented and under development) and endorsed (LoE), planned for realization JI projects.

Most projections for CO<sub>2</sub> emissions during the next decades estimate that emissions in 2010 will remain significantly below the 1988 levels. The studies differ, however, in their assumptions concerning the conditions underlying such a development. While some hold that efficiency increases in the economy through the introduction of market principles are sufficient, others postulate the need for an active abatement policy, including a range of specific measures in order to address rising emissions from the growing economy. Increasing road transport volume and increasing industrial production are the main contributors to rising CO<sub>2</sub> emissions.

Range of scenarios were assessed in the Country Study in 1996 concerning climate change issues with a time horizon until 2030. Depending on scenario, the emission ranged from 385 million tones CO<sub>2</sub> to 502 million tones CO<sub>2</sub> in the year 2010 and from 380 million Mg CO<sub>2</sub> to 578 million Mg CO<sub>2</sub> in the year 2030. Most forecasts for CO<sub>2</sub> emission in Poland during the next decades assume that emission in the first commitment period (2008-2012) will continue to be lower than in 1988. The result of another projection by UNFCCC is presented in .

Figure 2 GHG emissions by sector<sup>9</sup>.



The 2004 study<sup>10</sup> shows that the commitment for Poland can reach 468.6Mt CO<sub>2</sub> eq. and based on the reference scenario Poland would meet the commitment with a margin of 6.1%. Total energy emissions are decreasing in presented scenarios, however, the transport emissions are increasing in all scenarios. According to the estimates, CO<sub>2</sub> emissions will decrease by 0-25%, CH<sub>4</sub> by 8-12%, and N<sub>2</sub>O by 6-12% in the years 2010-2020.

<sup>9</sup> UNFCCC. 2005. *National Inventory Submissions 2005: Poland* of 31 August 2005. URL:

[http://unfccc.int/national\\_reports/annex\\_i\\_ghg\\_inventories/national\\_inventories\\_submissions/items/2761.php](http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/2761.php)

<sup>10</sup>Poland's Third National Communication under the United Nations Framework Convention on Climate Change, 2001 and *Poland's Climate Policy. The strategies for greenhouse gas emission reductions in Poland until 2020*. The latter document was adopted by the Polish Council of Ministers on November 4, 2003 and submitted to the European Commission on 22 March 2004. URL:

<http://ec.europa.eu/environment/climat/pdf/countries/poland.pdf>

Table 11 GHG projections for Poland in 2010 (MtCO<sub>2</sub> eq.)<sup>5</sup>.

	<b>Base year 1988</b>	<b>with measures passive</b>	<b>with measures reference</b>	<b>with measures progress</b>
Carbon dioxide (incl. LUCF)	441.9			
Carbon dioxide (excl. LUCF)	476.6	408.0	413.0	413.0
Methane	66.0			
Nitrous oxide	21.8	24.2	25.4	26.7
HFCs	0.022			
PFCs	0.820			
SF6	0.002			
Total (excl. LUCF)	565.3	432.2	438.4	439.7
Total (incl. LUCF)	530.5			
% change rel.to base year (excl. LUCF)				
% change rel.to base year (incl. LUCF)				

	<b>Base year 1988</b>	<b>with measures passive</b>	<b>with measures reference</b>	<b>with measures progress</b>
Energy	492.5			
Industrial processes	20.1			
Solvents				
Agriculture	31.5			
LUCF	-34.7			
Waste	20.3			
Total (excl. LUCF)	565.3	432.2	438.4	439.7
Total (incl. LUCF)	530.5			

Note: base year values from CRF2001; passive and reference scenarios for CO<sub>2</sub>; passive, reference and progress scenarios for N<sub>2</sub>O; no scenarios for CH<sub>4</sub> and F-gases

	<b>excl. LUCF (all gases)</b>		<b>excl. LUCF (CO<sub>2</sub> and N<sub>2</sub>O only)</b>	
	<b>MtCO<sub>2</sub>e</b>	<b>% 1988 level</b>	<b>MtCO<sub>2</sub>e</b>	<b>% 1988 level</b>
Base year 1988 (from projections)	565.3	100.0	498.5	100.0
Commitment	531.3	94.0	468.6	94.0
With existing P&Ms – passive			432.2	86.7
Gap			-36.4	-7.3
With existing P&Ms – reference			438.4	87.9
Gap			-30.2	-6.1
With existing P&Ms – progress			439.7	88.2
Gap			-28.9	-5.8

Note: projections are available only for CO<sub>2</sub> (without LUCF) and N<sub>2</sub>O; reference scenario is taken as "with measures" projection; no "with additional measures" projection provided by Poland

An update of the above projections show that Poland's development is presently in line with the "chance scenario", which might suggest that GHG emissions will not increase in coming years. According to estimates, Poland will meet its commitment to keep GHG emissions below their 1988 level.

Regulations concerning approval of JI projects were defined in amended law (Act on Emission Allowance Trading Scheme Dz.U.2004.281.2784) Simultaneously, new law determining regulations allowing for trading of assigned amount units (AAUs), use of Green Investment Scheme (GIS) and Clean Development Mechanism (CDM) in order to reduce GHG emissions is under preparation. For the purpose of preparations of this legal framework, development of Polish strategy for use of flexible mechanisms in the context of GHG emission reductions after 2012, is necessary.

With regard to the necessity of transposing regulations of directive 2004/101/EC (Linking Directive), particularly for the purpose of avoidance of double counting of emission reductions and due to the lack of adopted guidelines in this regard (project of EC decision) it is proposed to use allowances assigned for auctioning in order to avoid double counting of new, not approved JI projects. Poland already fulfils GHG emission reduction target defined in the Kyoto Protocol.

As an Annex I country Poland may benefit from participation in the Kyoto Mechanisms, particularly from Joint Implementation. Low GHG emission abatement costs, as well as substantial experience in attracting and managing foreign assistance projects make Poland an attractive host country for JI projects.

Table 12 List of confirmed JI projects in Poland<sup>11</sup>.

	PROJECT 1	PROJECT 2	PROJECT 3		PROJECT 4	PROJECT 5		PROJECT 6	
Name of the project	Small Hydro on the Bóbr river, Leszno-Głogów	30 MW wind farm in Zagórze	Landfill gas in Zakopane		Geothermal project in Stargard	Landfill gas - Mazurski bounding		Lake Ostrowso wind farm	
Approval date	14.05.2001	10.01.2005	25.01.2005		05.10.2005	31.03.2006		31.01.2007	
Total emission reductions from a project in 2008-2012	23 425	220 563	10 588	94 412	181 185	23 340	455 403	395 527	
% of emission reduction accepted as ERU	50	85	100		100	100		85	
Baseline description	Domestic conventional power plant emissions	Domestic conventional power plant emissions	Domestic conventional CHP emissions		Average emissions of this district heating plant	Domestic conventional CHP emissions		Domestic conventional power plant emissions current and forecasted	
% of emissions covered by the 2003/87/EC Directive	100	100	100		100	100		100	
Emission reduction forecasted	11 715	187 479	10 588		181 185	23 340		338 198	750 505
Name of the company participating in the ETS if relevant					Stargard DHI plant				
Identification number of company participating in ETS					№ KPRU 283, PL-6283-05				
ERU issued for 2008	2343	39 895	1 983	0	36 237	4 968	0	67240	
ERU issued for 2009	2343	38 717	1 924	0	36 237	4 968	0	67240	
ERU issued for 2010	2343	37 485	2 193	0	36 237	4 968	0	67240	
ERU issued for 2011	2343	36 307	2 260	0	36 237	4 968	0	67240	
ERU issued for 2012	2343	35 075	2 328	0	36 237	4 968	0	67238	

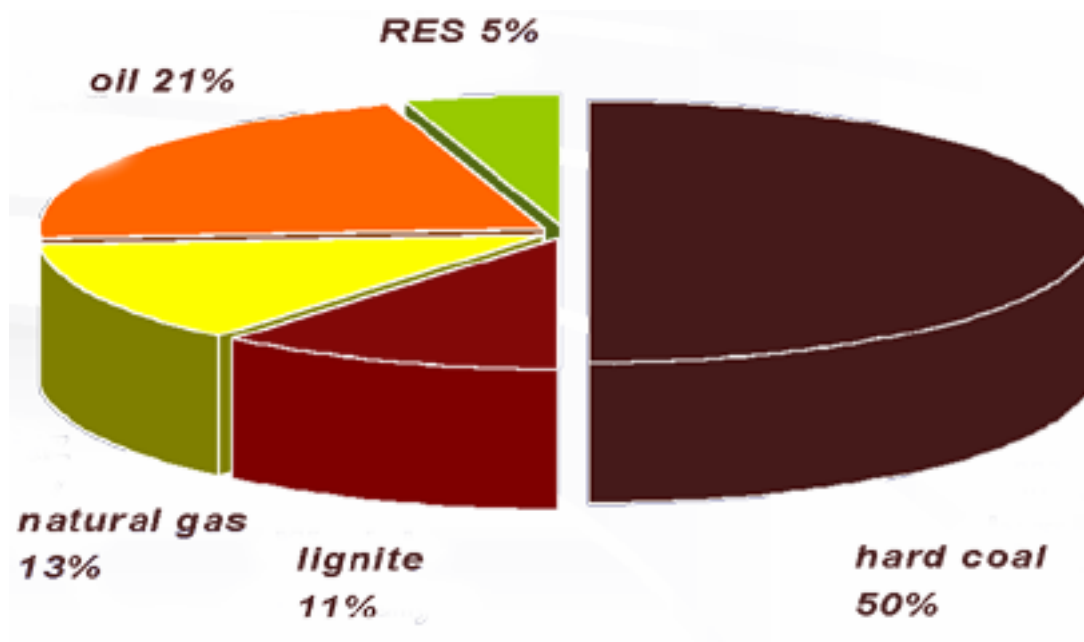
<sup>11</sup> after NAP II

### 1.3 Description of the national energy system with regard to energy production facilities (centralised/decentralised and priorities of cogeneration), fuel types and production efficiency.

The important drivers for change in the energy sector result from the EU membership in several aspects domains. Restructuring has been unfolding as the energy markets have been liberalised, and several companies from Western and Northern Europe have been moving in as investors in the energy sector.

The total primary energy supply in 2006 amounted to 3,253.1 PJ. The structure of primary energy production and consumption has been changing in the last years. Domestically produced hard coal still dominates this structure, but its share in the national energy consumption has 48.9% in 2006. At the same time the share of crude oil in the national energy consumption increased from 16.8% in 1998 to 20.5% in 2006 and of natural gas from 9.8% in 1998 to 12.5 % in 2005. The share of other: non-fossil primary energy carriers (fuel wood, waste fuels, hydro energy and other renewable sources) has been growing slowly though is 5.5 % of total primary energy consumption.

Figure 3 Fuels share in the primary energy consumption in Poland in 2005<sup>12</sup>.



#### 1.3.1 Heat

Heat supply constitutes one of the most important sectors in the Polish energy economy, as ca. 50% of primary energy is utilised for heat production. Simultaneously, space heating and domestic warm water constitute ca. 80% of energy consumption in housing sector. Heat production and distribution play an important role in energy balances of the cities. Approximately 54% (70% in towns) of the total heat demand is covered by the DH networks (CHP and heat only boilers - HOB). However, in

<sup>12</sup> Z.Kamiński. 2007. Presentation by the Ministry of Economy: New challenges facing Poland at the 3x20% EU challenge. URL: [http://www.mos.gov.pl/oze/materialy\\_informacyjne/poleko\\_2007/prezentacje/Z.Kamienski\\_MG.pdf](http://www.mos.gov.pl/oze/materialy_informacyjne/poleko_2007/prezentacje/Z.Kamienski_MG.pdf)

rural areas and small towns heat demands are covered mainly by non-licensed (often - individual) heat installations.

The formerly state owned DH companies were divided into hundreds of small entities. Thus DH sector is nowadays dispersed and there is no complete statistical data on the sector. Some data concerning licensed companies are available in the office of the President of Energy Regulatory Authority-URE; global data are available in GUS the Main Statistical Office. The number of economic entities providing activity in the heat supply sector exceeds 3,000 (boilers of different size and quality), but only ca. 850 of those are licensed by URE. The majority of DH companies sell very small amounts of heat.

There are no official statistics on the heat sale (a lot of local HOB are producing heat without measurements). It is worth to underline that heat sale strongly depends on the weather conditions and can differ by up to 30-40 % for a given year.

There are some 1,117 DH companies of different ownership structure municipal, state owned, private or industrial. The licensed heat produce in 2006 65 189,4 MW<sub>th</sub> of the installed capacity in Poland, of which some 17% produce heat in cogeneration. The heating companies dispose of very diverse spectrum of heat generation, however, the majority is small boilers. Almost 2/3 of heating enterprises possess boilers of a capacity below 50 MW and half of it below 10 MW. Only a few of enterprises have boilers above 1,000 MW and those are active also in the electricity production. The installed capacity of the licensed heat producers is currently some 65 GW and real capacity 62 GW. Almost 1/3 of the heat generation capacity is located in two voivodships: Slaskie and Mazowieckie. The lowest shares in the domestic heating capacity are in Lubuskie, Swietokrzyskie, Podlaskie and Warminsko-Mazurskie voivodships (2% each).

Most of the heat was produced by enterprises which deal both in the production and distribution of heat. Currently 62% of all heating enterprises are owned by public bodies of which 74% owed by municipalities and 26% by the state. The remaining enterprises belong to the private sector of which 25% by foreign entities. By the end of 2005 almost half of the generated capacity was produced by private sector of which 60% was foreign. Permanent decrease of heat production in different heat sources is observed since 1980, due to the economic downfall in 80's and restructuring of the industrial sector as well as more efficient heat use in the following decade. At the same time the share of co-generated heat in the total heat production in CHP plants increased.

For the licensed heat production more than 60% of heat was produced in co-generation; more than 60% was delivered to consumers, the rest was used for own use and heat losses. In Poland hard coal is used by CHPs and big DH, whereas, in small boilers gas and oil have more importance. Hard coal was mainly used for heat production, its share amounting to 78.3%, whereas, for other fuels 7.8% for heavy fuel oil and 5.0% for natural gas. The utilisation of biomass by the licensed heat producers was 3.9% in 2005, an increase by 40% in comparison with the year 2002.

Companies usually operate DH system in a single city (or part of it), but there are also others, which operate several DH plants and networks in different cities situated in one or several of provinces. This process has not been finished yet and organizational forms are still changing. The most important of which is the ongoing privatisation of CHP and DH companies, usually through the sale of shares or through tenders intended to sell small DH systems as a whole.

Most heat and power plants have prepared, in cooperation with heat distribution companies and city authorities, projects of connection of new district heat recipients, in the framework of revitalization of housing resources of older parts of cities.

In agreement with city authorities, low emission reduction programmes are executed. In the last years, the price of natural gas increased very significantly. Long-term forecasts indicate a steady increasing trend of the price of this resource. So far, the price of district heat was competitive to the energy from natural gas. Therefore, currently an increasing trend can be observed of the customers leaving the gas or oil heating methods.

The booming development of individual gas heating systems occurred about 10 years ago. This segment of the heat industry market is currently undergoing the period of decision making concerning the change or modernization of the installations. Due to the costs of use (the increase of gas prices indicated above), many users decide to start using district heat again. This phase also covers the years 2008-2012.

The prices of district heat have been stable for many years, as opposed to the price of gas. Due to a complicated and long process of obtaining building permits, the institutions that are potentially competitive to district heat should be currently known and recognised. This situation is not confirmed. No investment in competitive heating installations can be noted. The increase of the district heat market in the period from 2008 to 2012 will be based on the existing district heat systems.

A closer look at the market proves that peak of the energy-efficiency processes in the building sector in large urban agglomerations is already over. The new housing resources keep steadily increasing the commissioned power levels. This process will intensify in the following years. The policy of the economic opportunities announced repeatedly by the government, related to the construction of 3 million dwellings, may result in an increased demand for district heat. Considering the time perspectives of the process of implementing this task, its effects will result in an increased demand for heat exactly in the period of 2008-2012.

The struggle to reduce greenhouse gases emission promotes in the EU countries the use of combined systems of power generation. The implementation of the directive No 2004/8/EC should, therefore, consistently lead to the parallel development of district heating according to the above assumed increment indexes. Elevated prices of emission rights, due to the economic indexes obtained, justify especially the development of the combined heat generation.

### **1.3.2 Electricity**

In 2005 120.04 TWh of electricity was generated in utility power plants, 118.05 TWh of which in condensing systems, and 26,817 TJ of heat. The production balance of utility power plants in 2005 is as follows:

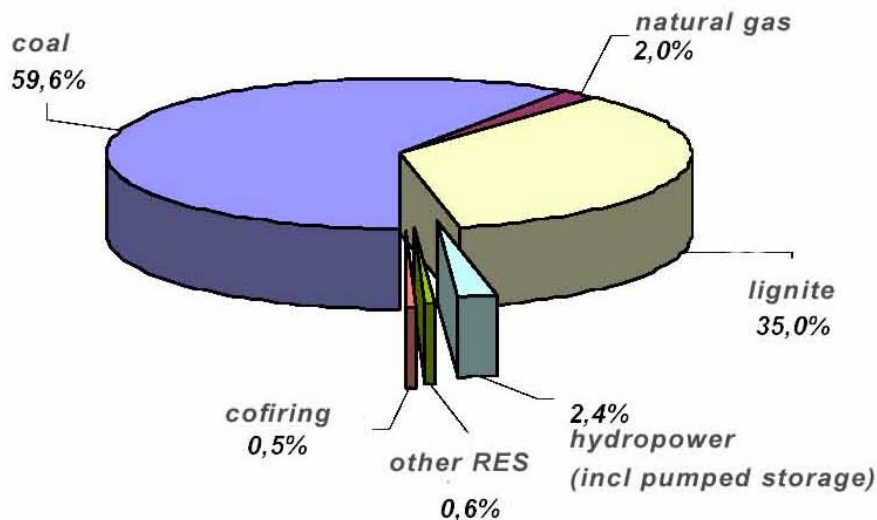
- heat generation 26 817 TJ including from biomass 1.72 TJ;

- electricity generation in cogeneration 4.02 TWh;
- electricity generation in condensing systems 116.03 TWh, of which from RES (biomass) 0.7 TWh;
- from coal 115.33 TWh.

In 2005 the utility power plants emitted 116,610,960 Mg of CO<sub>2</sub>. This emission was a result of electricity generation in condensation and combined heat and power generation. Since there is no possibility to divide the production stream into both production manners, it is suggested to consider the emission from cogeneration as an emission equivalent to the amount established pursuant to the principle of determining the emission allowances for cogeneration. In the case of combined heat and power generation it is suggested to assume allocation principles resulting from the need of cogeneration promotion, pursuant to Directive 2004/8/EC.

The total installed power capacity in Poland amounted to 34.6 GW and the generation was 161,859 GWh in 2006, and 156,931 GWh in 2005. Electricity generation in Poland is mainly based on hard coal and lignite as *ca.* 59.6% and 35.0% of the capacity is installed in the hard coal/lignite fired power plants. The remaining share consists of hydro power mainly in pumped storage 2.4%, followed by natural gas 2.0% co-firing of biomass 0.5% and other RES 0.6%. The demand for electricity amounted to 149,847 GWh in 2006, an increase by 3.5% compared with 2005.

Figure 4 Electricity production in Poland in 2006.



Refurbishing of generation capacities in Poland has been inconsistent over the past 30 years, resulting in an aging system. More than a half of the current capacities were built in the 1970's. Approximately 60% of the system installations are more than 15 and 40% more than 20 years old. There are investment plans to expand the existing transmission and distribution networks. Biggest generation capacity is located in the Southern part of Poland in the Śląskie Voivodship.

The domestic distribution network consists of following items:

- 1 line 750 kV, 114 km,
- 65 lines 400 kV; 4 830 km,
- 165 lines 220 kV, 7 913 km,
- 14 lines 110 kV, 34 km,
- 94 trafo stations, 166 inverters.

By 2025, a stable growth of electricity consumption is assumed, however, by 2010, this trend will be growing and then falling until it reaches the steady yearly level of 8%. The first five years is a period of intensive use of different EU funds, which are to fully integrate the Polish economy with EU and prepare it to enter the Euro zone. The planned development of housing construction is supposed to be one of the factors the economy, as it is the case of Spain. The levelling of the buying power in Poland and abroad and the decreasing interest rates increase the investment power of Polish households. It is planned that they will probably have twice the metric area per person as the current average. These households will be better equipped in power-consuming devices, but they will use less heat for heating and gas for cooking. In 2005, there has been a significant increase of the added value in construction industry, which increased to 6.5% as compared to 2.6 % growth in 2004. The growing trend of electric power consumption in households and industry sectors related to housing construction and furnishing will last at least to 2020. The second factor influencing the growth of electric power consumption will be the quick growth of the tertiary sector; the current growing tendency has received an additional stimulus in the form of the possibility to provide services in many EU countries. In this area, the largest growth of consumption will fall in the first 5 years. The industry will experience two trends: on one hand, the growth to meet the demands of the speeding domestic economy and the growing export, on the other hand, restructuring and modernization that lower the consumption. The factors of decrease will mainly concern other energy agents than electric power. An important factor of energy consumption growth will be the computerization of Poland. The construction of IT networks is only in its initial phase for example, in California, comparable form the point of the number of inhabitants, in 2000, the increase of electric power consumption for the purposes of supplying the network servers exceeded 3,000 MW; many European countries experience the same phenomenon, although to a lesser scale.

### **1.3.3 Renewable energy in Poland**

As per the official data of the Central Statistical Office (GUS) in 2006, in Poland some 210,513 TJ of energy was obtained from renewable energy sources, which is 6.5 % of the total primary energy balance. Most of this energy was obtained from solid biomass: 91.4% of the total RES, followed by hydroenergy (3.5%), liquid biofuels (3.3%), biogas (1.2%), wind (0.4%) and geothermal (0.3%). Some minor shares of energy from biodegradable municipal solid waste (0.008%) as well as solar energy (0.005%) was also produced.

Figure 5 Primary energy supply from renewable energy sources in 2006 (TJ).

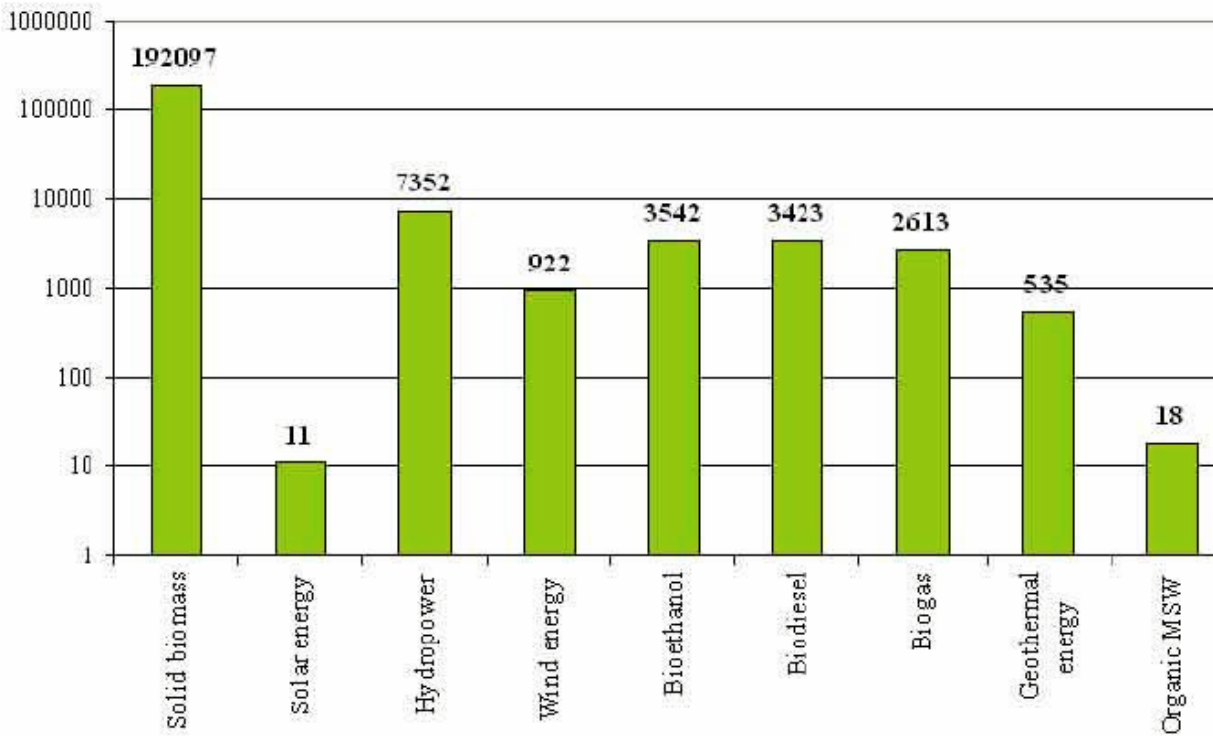
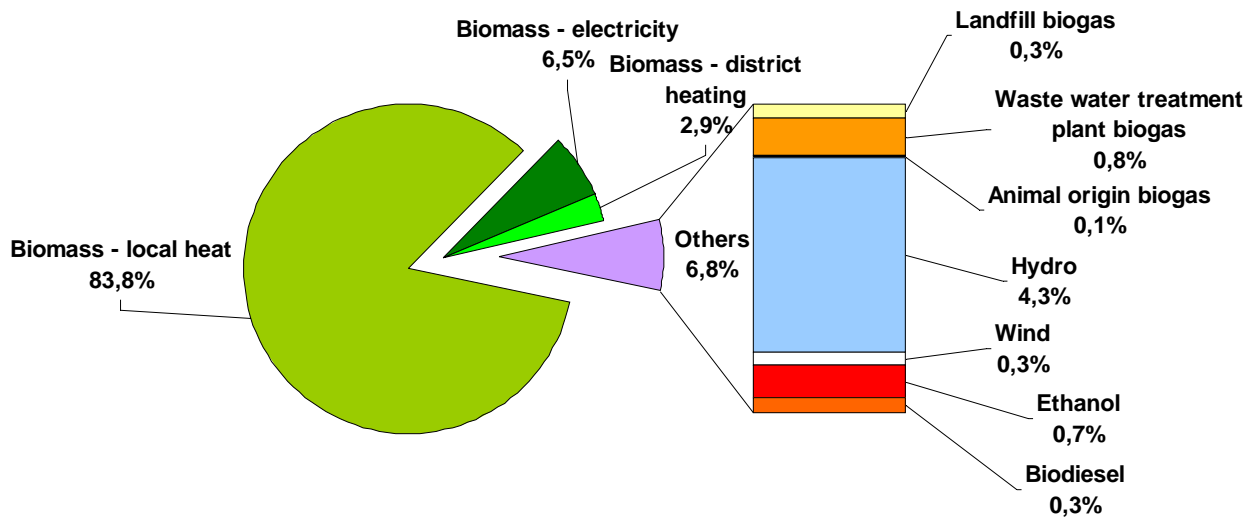


Figure 6 Renewable energy shares.



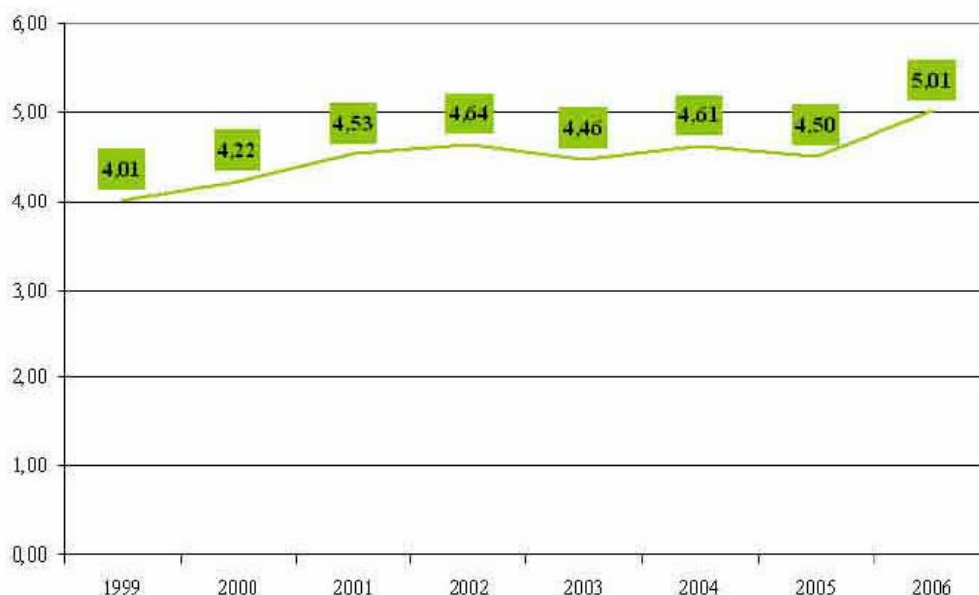
Between 2000-2006 an increase in the supply of primary energy from most of renewable energy sources was noted.

Table 13 Primary energy supply from RES in the years 2000-2006, TJ.

RES	Years						
	2000	2001	2002	2003	2004	2005	2006
Solid biomass	150,485	160,406	163,308	164,163	170,056	174,431	192,097
Solar energy	-	-	1	1	4	6	11
Hydro energy	7,580	8,369	8,204	6,017	7,494	7,924	7,352
Wind energy	20	49	219	448	512	488	922
Bioethanol	-	-	-	-	-	2,404	3,542
Biodiesel	-	-	-	-	-	2,471	3,423
Biogas	1,211	1,477	1,353	1,624	1,941	2,243	2,613
Geothermal energy	124	120	263	311	318	476	535
Biodegradable MSW	32	11	10	14	13	30	18

The RES share in the primary energy demand in 2006 was 5.01% (increase by 1% since 1999).

Figure 7 RES shares in the domestic primary energy demand, 1999-2006.



Compared with the year 2005 in 2006 an increase in the domestic production and use of biofuels was noted, due to legal enforcements. In case of bioethanol it was 47.3% increase in supply and 61% increase in demand; in case of biodiesel 38.5% and 128.4%. Domestically used biodiesel was entirely used as an admixture to motor spirits. At the same large share of biofuels produced in Poland have been exported: 28% of bioethanol and 59% of biodiesel.

As a consequence of the EU obligations undertaken by the Polish government, renewable electricity production has in recent years considerably gained on importance. In 2006, according to the Energy Regulation Office (URE), there were 886 RES installations (with a concession) with a total installed capacity 1,509.6 MW (co-firing excluded), by which 4,221 GWh of energy was produced. Besides hydro power plants the share of electricity production of renewable sources is very small in 2007 there were 6 electricity generators producing electricity using biomass, 80 producers using biogas, 124 wind installations, 692 hydropower plants and 18 co-firing installations.

Table 14 Installed capacity and RES electricity production in 2005-2006 (GUS as per URE data).

RES	2005			2006		
	No of installations	Installed capacity	Energy production	No of installations	Installed capacity	Energy production
	No	MW	MWh	No	MW	MWh
Biomass electricity	7	189.8	467,975.7	6	238.8	503,846.2
Biogas electricity	67	32.0	104,465.3	74	36.8	116,691.9
Wind energy	64	83.3	135,291.6	104	152.6	257,037.4
Hydropower	672	1,002.5	2,175,559.1	684	1,081.4	2,029,635.6
Co-firing	16	–	877,009.3	18	–	1,314,336.6
<b>Total</b>	<b>826</b>	<b>1,307.5</b>	<b>3,760,301.0</b>	<b>886</b>	<b>1,509.5</b>	<b>4,221,547.7</b>

Figure 8 Production of electricity from RES in MWh 2000-2006.

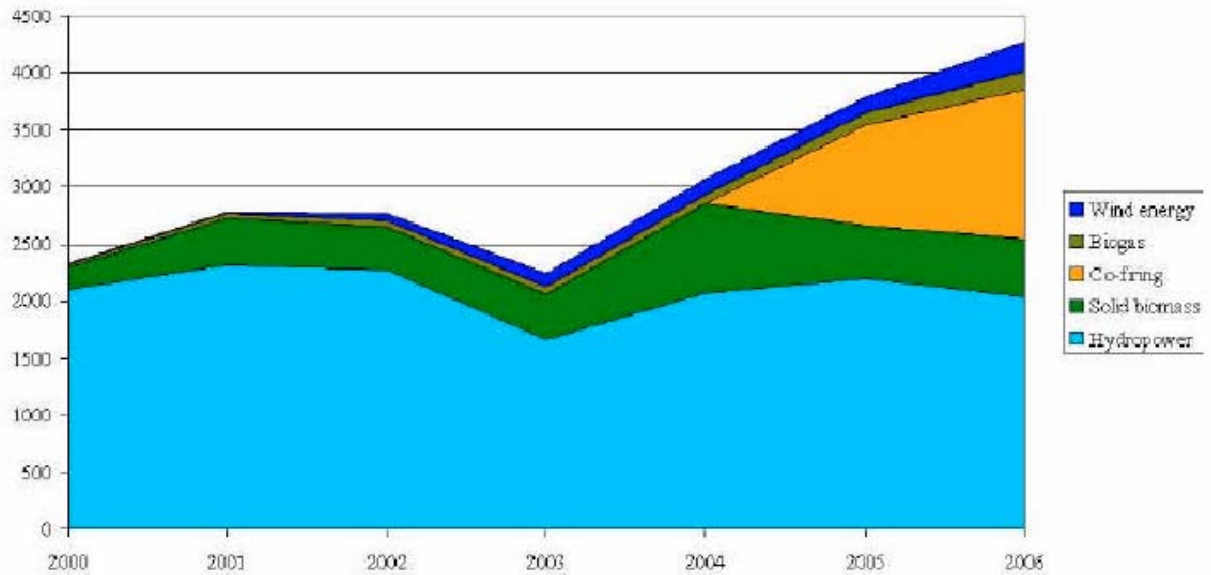
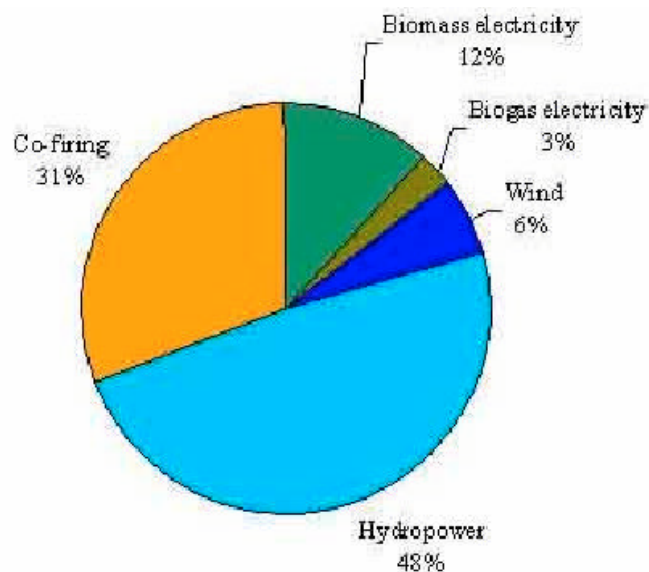


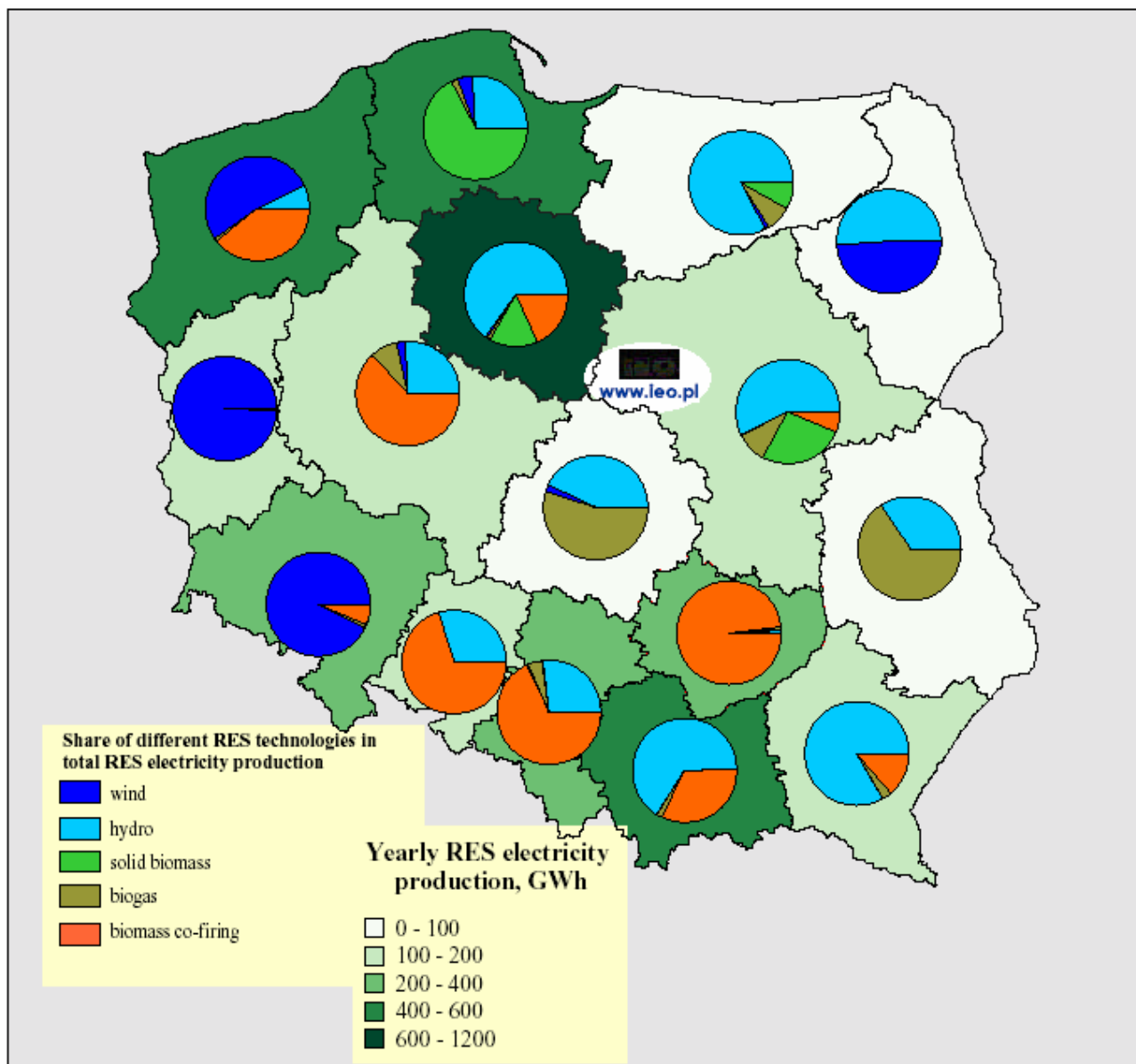
Figure 9 Electricity production RES shares, 2006.



Most of RES generated electricity in 2006 was produced by hydropower plants, however, after 2004 co-firing has gained on importance. The increase in installed capacity of wind energy was also noted, however, this technology is in the initial phase of its development and its shares are not significant yet.

The RES development is conditioned by the availability of local resources as well as possibilities of their use. Thus, already on this stage of development regional differences have become significant.

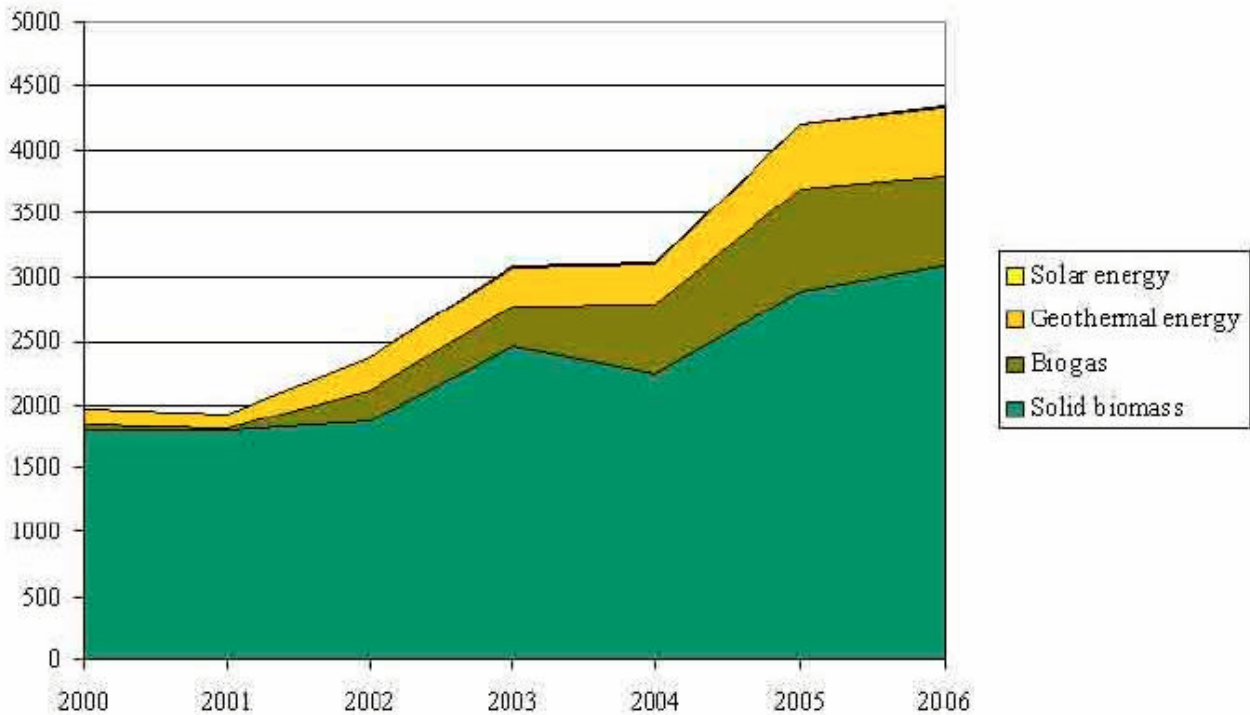
Figure 10 Structure of RES electricity production regionally by Voivodships, 2006.



In 2006 RES electricity was produced mainly in those Voivodships where bigger hydropower plants or CHPs with co-firing facilities are located (the South of the country). However, gradually the role of the northern regions will strengthen, mainly due to the significant wind energy resources and large number of new wind energy projects.

In Poland in 2006 some 4,341 TJ of renewable heat was produced. Solid biomass has dominated this production (71%), however, in recent years the utilisation of geothermal energy and biogas have become more significant. The solar energy- of which 11 TJ was produced in 2006 has had so far a modest share in the overall energy balance (0.25%), however, its use have become more and more significant, especially as far as small individual installations are concerned (almost threefold increase in production since 2004).

Figure 11 Production of heat from RES in TJ 2000-2006.



<sup>35</sup>Ministry of Environment. 2006. *The Status of the Current Activities to Implement Emission Trading Scheme in Poland* (paper prepared for Ministerial news conference on 15 February 2006). URL: [http://www.mos.gov.pl/mos/news/press\\_releases/2006.02.15/status.pdf](http://www.mos.gov.pl/mos/news/press_releases/2006.02.15/status.pdf)

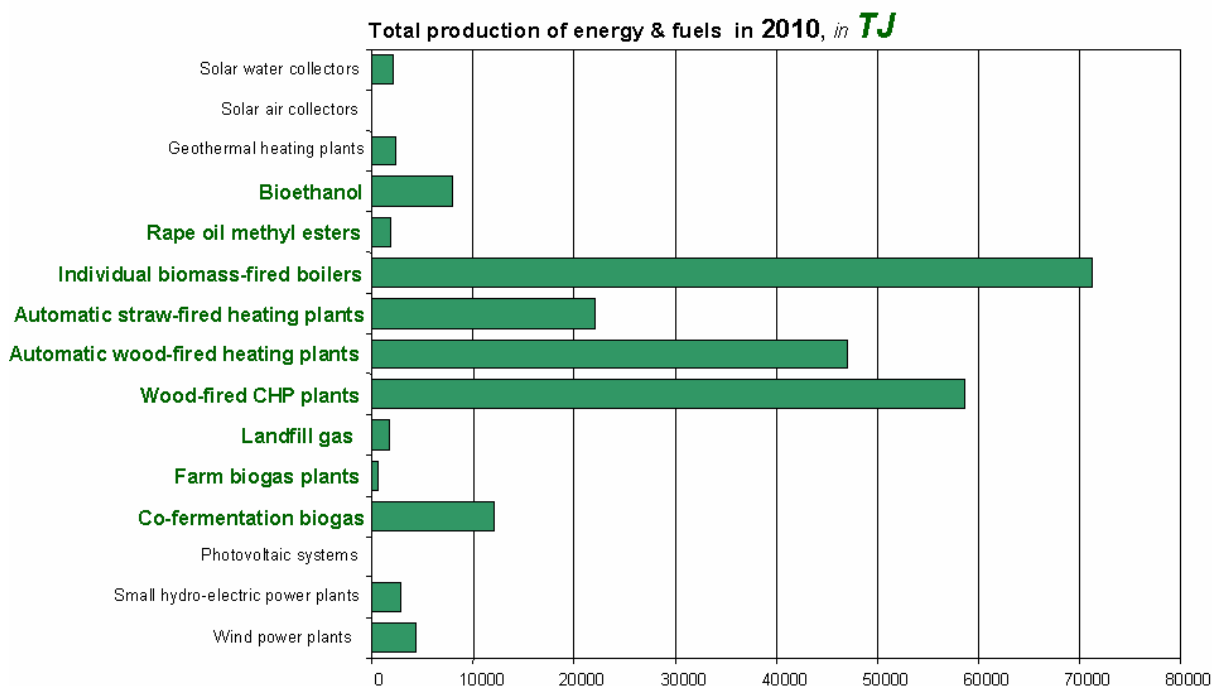
## 2 LEGISLATION

### 2.1 Description of regulation that supports the SET areas

#### 2.1.1 Renewable energy

The late 1990s mark the start of political interest in creating conditions for renewable energy development. The “*Resolution on the Increase of Utilization of Renewable Energy Sources*” approved by the Parliament in 1999 was a milestone. Subsequently the Parliament called on the Council of Ministers to prepare the “*Development Strategy of the Renewable Energy Sector in Poland*” and its harmonization with the energy- and environmental policies. The Ministry of Environment took over the task of preparing the *Strategy* on behalf of the Council of Ministers. The *Strategy* adopted by Parliament in 2001, is a key document supporting renewable energy in Poland. It stipulates short-, mid- and long-term objectives for renewable energy. The objective is to increase the share of renewable energy in Poland's primary energy balance to 7.5% in 2010 and to 14% in 2020. Biomass energy is recognized as the most promising and most important renewable energy source in the next 10-20 years.

Figure 12 Targets for renewable energy production in 2010 assumed in the “*Development Strategy of Renewable Energy Sector*”.



The policy-making documents, including the afore mentioned *Strategy*, are of strategic nature and deal with specific areas of the country's development. Historically, the following crucial policy documents concerned utilisation of RES: the “*National Development Plan for the years 2004-2006*”, “*Development Plan of the Polish Rural Areas 2004-2006*” (for the years 2007-2013 replaced by the operational programme under NDP), “*National Environmental Policy for 2003-2006 with the 2007-2010 perspective*” (for the years 2007-2013 replaced by the operational

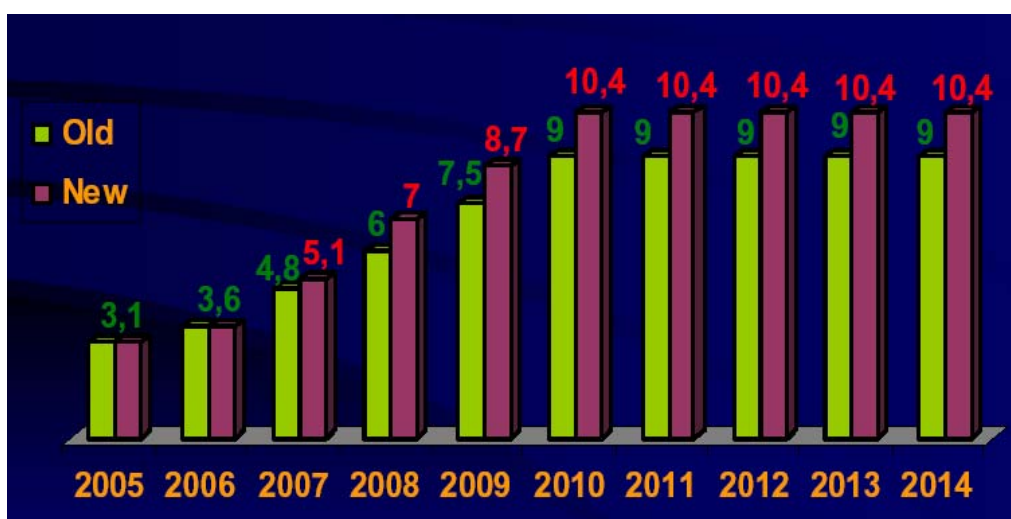
programme under NDP). Another category are enforcement documents, *i.e.* acts and regulations. Acts are prepared by the Parliament; they constitute the legal frames for various areas of social activity.

The “*Energy Act*” approved in 1997 is the basic legal framework document regulating the Polish energy sector. It provides the necessary legal conditions for businesses in the field of energy production, transmission, distribution and trade. Furthermore, the Energy Act defines the responsibilities of the Ministry of Economy and Energy Regulation Office (URE). The Energy Act is accompanied with a set of regulations issued by the Minister of Economy.

Under the provisions of amended Energy Act to the extent pertaining to renewable sources of energy all power companies dealing with generation of electricity or its trade and selling such energy to the end-users on the territory of Poland are obliged to obtain and submit to the President of the Energy Regulation Office the certificates of origin confirming that energy has been generated by a renewable source for the purposes of their cancellation. The task of running a register of green certificates and organisation of trade in proprietary rights under the green certificates was commissioned to the Towarowa Gielda Energii S.A. (Power Exchange). The regulations are stipulated in the “*Regulation of the Minister of Economy of 19<sup>th</sup> December 2005 on the detailed scope of obligation to obtain and submit, payment of the substitution fee and purchase of electricity and heat from renewable energy sources*” (O.J. No 261, pos. 2187).

As per the 2001/77/EC Directive, targets have been set to increase the contribution of renewable electricity to 7.5% in 2010. Electricity suppliers are obliged to provide an increasing share of electricity from renewable sources in the electricity sales, increasing stepwise from 3.1% in 2005 to 9.0%-old target (10.4%-new target) in 2010, which in the amount of TWh corresponds with the requirements of the 2001/77/EC Directive.

Figure 13 Targets for RES electricity.



Calculation of the energy produced during the process of co-firing of the biofuel (biomass, biogas) with the conventional fuel in proportion to the percentage of the chemical energy of green fuel in total amount of fuel is also permitted.

The legal support for energy crops (two species) is stipulated in the “*Act on the Agricultural Subsidies*” of 26 January 2007 (O.J.2007 No 35 pos. 217) with the Regulations.

The market for biofuels is regulated by the “*Act on Biocomponents and Liquid Biofuels*” and the “*Act on the System of Controlling Biofuels*” both of 25<sup>th</sup> of September 2006. The acts stipulate the admixture of biocomponents up to 5%.

### **2.1.2 Co-generation**

The basic act supporting the development of co-generation in Poland is the Energy Act, in which amendments were stimulated by the 92/42/EC Directive (Cogeneration Directive). The Energy Act is accompanied by a set of regulations, among which the most important is the “*Regulation of the Minister of Economy on the detailed scope of sale of energy generated in cogeneration*” (O.J. of 2004 No 267 pos. 2657).

The distributor of electricity to the end consumer is obliged by law to:

- receive and present a co-generation certificate of origin (issued by the Energy Regulation Office);
- or to pay a substitute payment till the 31<sup>st</sup> of March of the next year. For the year 2007 the substitute payment was *c.* 117 PLN/MWh.

In order to receive the co-generation certificate of origin the generator must fulfil the following criteria:

- saving of primary energy: at least 10%,
- total generation efficiency at least 75-80% (depending on the generation technology).

## **2.2 Understanding of national priorities within the SET sector and mapping of relevant financial supporting schemes for SET initiatives**

### **2.2.1 General support for SET**

#### **Financing**

Financing of SET technologies in Poland takes place with the use of domestic resources, the EU structural and cohesion funds as well as outside the EU resources.

#### **EU structural and cohesion funds**

The basic documents which set-out the framework for spending the EU structural funds in the years 2007-2013 are the operational programmes within the National Development Strategy such as:

- Sectoral Operational Programme Infrastructure and Environment for the years 2007-2013,
- Regional Operational Programmes,
- Rural Areas Development Programme.

The aim of the Sectoral Operational Programme Infrastructure and Environment for the years 2007-2013 is to improve the infrastructure and the environment and make Poland more attractive for new investments. For the realisation of the programme in the years 2007-2013 there have been 36 billion EUR foreseen. There are 17 priorities according to which the money will be spent, among which the most important for SET is the “Environmentally friendly energy infrastructure”.

The Regional Development Programmes are developed individually on the Voivodship level, they indicate the socio-economic environment and stipulate the first and second priorities for regional development. For instance in the Kujawsko-Pomorskie Voivodship the development of SET technologies is included in the priority “Development of technical infrastructure”, in which one of the aims has been stipulated as increasing the renewable energy shares. The projects financed from this mechanism are small projects of regional importance (up to 100.000 EUR). There are 16 Regional Development Programmes for which 23.8% of the budget from the structural funds have been foreseen (some 15.9 billion EUR).

The Rural Areas Development Programme for the years 2007-2013 is a financial instrument dedicated to the development of rural areas. There are 3 priorities within which the development of SET technologies can be financed: 1) Modernisation of farms 2). Diversification towards non-agricultural activity, basic services for rural population, creation and development of micro enterprises).

#### Outside the EU resources

Pursuant to the provisions of art. 128 of the European Economic Area Treaty, new member countries of the European Union join, upon submitting a relevant application, the European Economic Area (EEA). A relevant agreement was signed by the Polish government on 14<sup>th</sup> October 2003. One of the elements the aforementioned agreement provides for is the award, for Poland and for other new EU members, of financial resources under the so-called EEA Financial Mechanism and the Norwegian Financial Mechanism. The resources are donated by three EFTA (European Free Trade Association) countries – Norway, Island and Liechtenstein, which form, along with the European Union, the European Economic Area. In exchange for taking advantage of the common market freedoms, the said countries undertook to provide financial assistance to the least affluent members of the European Union. In order to make the resources available, Poland signed, with the donor countries, agreements in the form of Memoranda of Understanding – the Memorandum of Understanding on the implementation of the Norwegian Financial Mechanism was executed on 14<sup>th</sup> October 2004, while the Memorandum of Understanding on the implementation of the EEA Financial Mechanism on 28<sup>th</sup> October 2004. Poland has been awarded, under both Mechanisms, the total of 533.51 million euro for the years 2004-2009. The resources will be used for supporting projects implemented within strictly defined priority sectors between 2004-2009. Both mechanisms have been covered by the same principles and procedures, and are subject to a single system for their management and implementation in Poland. The role of a coordinating authority is performed by the Ministry of Regional Development.

There is also a possibility to use the Kyoto flexible mechanisms as a co-financing for renewable energy projects. There are a couple of World bank projects realised in Poland as well.

## Domestic funds

The domestic funds are the resources of the National and Regional and Municipal Funds for Environmental protection and Water Management, Ecofund, Environmental Protection Bank, Energy Efficiency Funds.

SETs in Poland have been supported mainly through grants and soft loans. Environmental taxes, or tax exemptions, have been of less importance. Essentially in the 1990's all investments in industrial and DH applications have been made with 30-50% investment subsidies. Institutions responsible for financing of investment in the area of environment protection such as the National Fund for Environment Protection (NFOS), EcoFund, Voivodeship Environmental Funds, the Environment Protection Bank (BOS) have been active bioenergy lobbying groups in the recent years.

The Funds for Environmental Protection (national, regional and municipal) are financed by the incomes from emission fees and fines as well as licenses issued for the utilization of natural resources. The National Fund of Environment Protection is the largest institution financing environmental protection projects in Poland.

The ECOFUND is a foundation established in 1992 for effective management of funds obtained through the conversion of a part of Polish foreign debt with the aim of environment protection supporting (swap for dept projects). The ECOFUND is co-financing environmental protection-related projects and best technologies transfer. Financial support is available in the form of preferential loans or grants.

Other financing possibilities include:

- third party financing by the ESCO companies (investment repayment trough achieved savings and income allocation between owner and “ESCO” company),
- leasing of equipment and appliances for heat supply sector,
- the EU structural and cohesion funds.

## Fiscal incentives

In Poland there is a 0.02 PLN/kWh (0,5 EUR¢/kWh) excise tax on electricity. There is also a value added tax of 22% on both electricity, district heat and fuels. There is also a value added tax of 22% for both electricity, district heat and fuels. The Energy Law gives generators of green electricity a chance to receive a bonus resulting from the participation in the quota obligation system and the market for green certificates.

## Support for green electricity

*‘The Regulation of the Minister of Economy of 19th December 2005 on the detailed scope of obligation to obtain and submit, payment of the substitution fee and purchase of electricity and heat from renewable energy sources’* (O.J. No 261, pos. 2187) obliges electricity suppliers to provide an increasing share of electricity from renewable sources in their supply mix, *i.e.* 3.1% in 2005 to 9.0% in 2010-2014. But previously there were other legal solutions for the support of RES electricity, which are presented in the table below.

Figure 14 Development of RES-e support schemes

INVESTMENT SUPPORT	Feed-in tariff	2000	Feed in tariffs, obligation for utilities to buy green electricity from sources <5MW, price same as for final consumers
	Quota obligation	2001	Quota obligation (7,5% in final sale balance) for electricity suppliers and distribution companies, no strict penalty
		2002	Obligation to achieve quota (7,5%) and to prove origin of electricity for suppliers and distribution companies, no strict penalty defined
		2003 2004	Obligation to achieve quota (7,5%) and to prove it (CoO) for electricity suppliers and producers (TPA), penalty defined 30%, introduction of biomass co-firing as eligible RET-E
	Quota obligation + TGC	2005 2006	Obligation to achieve quota (7,5%) and to prove it (CoO) for electricity suppliers and producers (TPA), introduction of CoO (TGC) trade; penalty followed by voluntary charge for non-compliance (240 PL/MWh); biomass co-firing as eligible RET-E but demand for increasing of biomass use from energy crops and wastes by 2014; increased quota (from 7,5 do 9% in 2010), distribution companies obliged to buy "physical" green electricity by the market price of "black" electricity
		2007	Increase of the quota obligation from 9% in 2010 to 10,4% (compliance with EU 2001/77/EC directive).

Figure 15 Green electricity production 2000-2005 [GWh/year], according to changes in the support schemes.

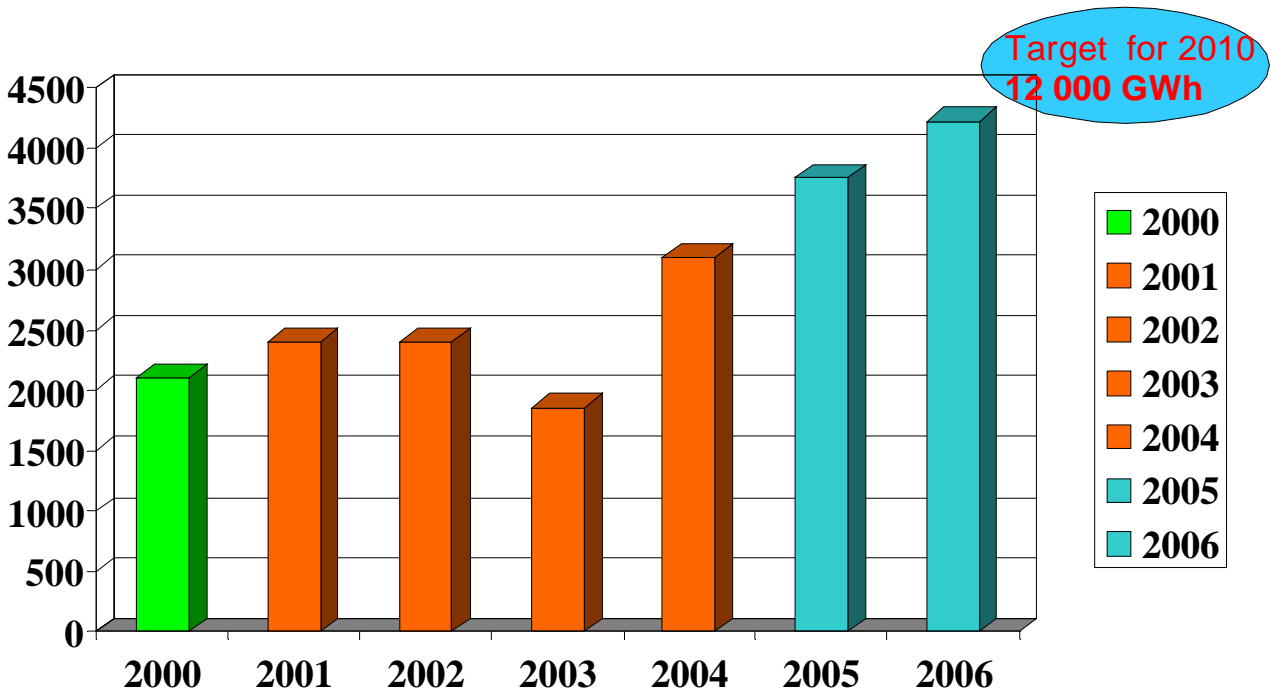


Table 15 Current visions for RES-E in '2010

	<b>MG '2005*</b>	<b>Updated vision of EC BREC IEO '2006</b>
• <b>Biomass</b>	<b>4,0%</b>	<b>2,5%</b>
• <b>Hydro</b>	<b>1,2%</b>	<b>2,0%</b>
• <b>Wind</b>	<b>2,3%</b>	<b>2,5%</b>
• <b>Biogas</b>	<b>-</b>	<b>0,5%</b>
<b>Total</b>	<b>7,5%</b>	<b>7,5%</b>

According to the opinion of the Ministry of Economy *ca.* 4% of the 7.5% of the electricity required by the 2001/77/EC Directive should come from the biomass utilisation. Due to the already limited access to biomass on the market it is proposed that energy crops should be used. The Ministry's official document stipulates that biomass used in co-firing systems should come mainly from energy crops but it does not give any explicit indications on how to achieve this goal in the situation when the existing incentives for farmers to grow them are far from being sufficient.

The bioenergy is expected to be the main contributor to reaching the renewable energy targets. It is a challenge to deliver large supplies of solid biomass - up to +100-120PJ will be required to reach the 2010s goals. A 2-3 fold increase in bio-energy volumes is expected in the next decades. The amount of green electricity sold to end users in 2005 was 107 TWh, which makes 3.51% of the total electricity sold to end users, whereas the Ordinance required 3.1% for that year. To conclude the obligation has been fulfilled successfully.

The current support scheme based on the "green certificates" assumes support for RES-electricity producers. The producers receive two payments for their energy produced: yearly average price for the electricity on the market plus a green certificate price. Additionally, for those sellers of electricity who do not buy a required amount of green certificates a substitute fee or later a penalty is foreseen. The revenues from substitute fees and penalties supply the revenues of the National Fund for Environmental Protection and Water Management. This financial resources are spent solely for the renewable energy project.

Green electricity generators receive a bonus at the level of 60 EUR/MWh, which together with the basic electricity prices amounts to circa 90 EUR for one MWh of electricity supplied to the grid<sup>20</sup>. The fines for non-compliance (which amount to 130% of the substitution fee price *i.e.* 83 EUR/MWh) are to be submitted to the National Fund for the Environment Protection (NFOŚ) and be distributed solely for the purpose of supporting renewable energy project in Poland.

Figure 16 Price for green electricity in Poland.

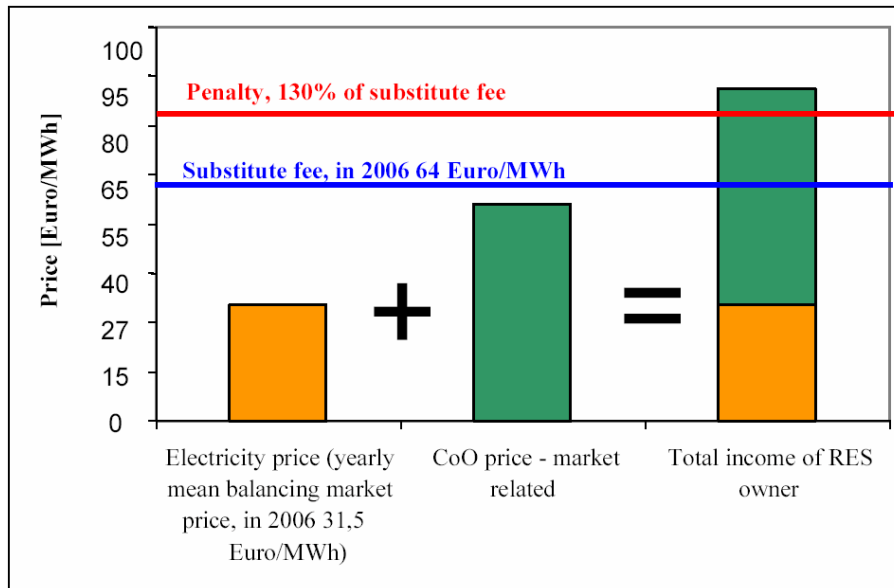
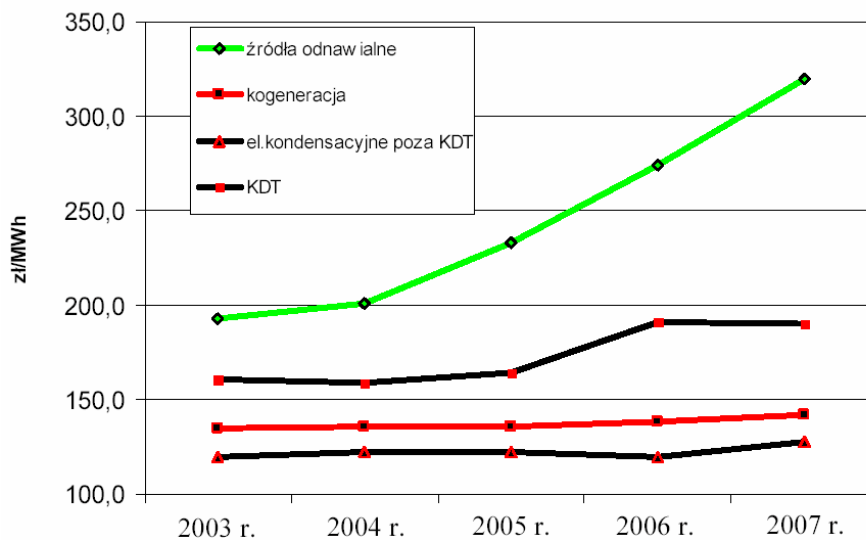


Figure 17 Comparison of green energy prices for utilities with final black electricity prices for wholesale market and with electricity for households and industry.



In 2004-2005 Poland improved support scheme for green electricity, but it is not yet optimized and future bioelectricity/bioheat prospects are unclear. Biomass co-firing with coal in power plants is substantially supported and is encouraging farmers for production of energy crops but required better attention for sustainability in the full processing chain. Supporting scheme based on quotas/TGC needs active use of others policies and measures (e.g. RTD policy, subsidies) in order to support small scale.

### Support for biofuels

- Up to 5% of biocomponents in traditional fuels.
- Common availability of particular kinds of biofuels: - B20, B100 (at present), - E85 (in the process of preparation).
- Designated fleets,
- Possibility of producing of liquid biofuels by farmers for own use,
- Obligation of minimal share of biocomponents.

Support for transportation biofuels based on a mixture of tax exemption and obligation for blending gives better opportunity for biodiesel development than for traditional bioethanol. Target for 2010 – 5,75%; fulfilment for 2006 – 0,92%; target for 2020 – 10%.

### Support for RES heat:

- Purchase obligation imposed on heat suppliers,
- The scope of obligation cannot exceed the amount of heat demanded by final consumers.

As far as the heat sector is concerned the support depends on local conditions, which are triggered by both the local funds and the provisions of the Energy Act, which obliges the municipalities to prepare Energy Master Plans, in which the role of renewables should be stipulated. Biomass heating installations have the biggest chance to develop but also solar thermal collectors do play a role. There is a considerable development of solar thermal, with the support of national environmental funds (subsidies and low interest credits).

The prospects for other heating and cooling RES technologies in 2020 are following:

- Biomass – mostly cogeneration units;
- Geothermal including heat pumps – big development is expected;
- Solar collectors – essential development is expected.

In order to better support the energy crops the ECOFUND gives establishment subsidies for energy crops in the amount of 1.000 PLN/ha (250 EUR/ha) for the plantations 50-500 ha acreage, under the condition that the demand is secured by a forward signed contract for long term supplies of biomass produced. The support for renewable heat depends on the priorities of financing institutions, mainly on the regional level. As per the regulation of the Council of Ministers the amount of subsidy for *Salix sp.* or *Rosa multiflora var.* was 217.32 PLN/ha in 2005 and 276.28 PLN/ha. In 2006 there were 625 submitted for subsidies for *Salix sp.* With a total area 7200 ha. This regulation was replaced by another one- supporting all energy crops in Poland.

In the ‘*Act on Support of Energy Efficiency Investments in Buildings*’<sup>30</sup> insulation of buildings along with the conversion of installations based on fossil fuels to installations based on renewables is considered as energy efficiency. The Act stipulates principles of financial contribution for investments from this area. At least 25% heat demand decrease is required as the effect of the overall energy efficiency retrofits. Only investment, which prove that the savings induced by the introduced measures are bigger than the credit can receive the premium, *i.e.* only investments with better financial feasibility are realised. The energy efficiency premium is paid in the amount of 25% of the investment credit, after the whole investment. The financial resources are given from the state budget. The Act has been criticised for creating a market for energy audits (2-6% of investment costs) which significantly increase the initial benefits to the investor.

### 3 NATIONAL ALLOCATION PLAN

#### 3.1 First National Allocation Plan

Since 1 January 2005, new air protection economic mechanism has been in force in the Community– the European Emission Allowance Trading Scheme<sup>35</sup>. Poland's trading plan is the largest among the new Member States and one of the four largest in the EU with more than 1,100 installations covered by the scheme. The legal framework for operation of this instrument was established by *Directive 2003/87/EC*<sup>36</sup>.

Poland set up an authority: Krajowy Administrator Systemu Handlu Uprawnieniami do Emisji-KASHUE (National Administrator of the Emissions Trading Plan) to establish and run an allowances register: Krajowy Rejestr Upawnień do Emisji (National Register of Emissions Allowances) and to hold all relevant information. According to the draft regulation, the entity running an installation is obligated to monitor the CO<sub>2</sub> emission level. The monitoring method chosen by an entrepreneur from the range of methods prepared by the Ministry of Environment is subject to the administrative approval by the relevant Voivode. Those running smaller installations (with annual emissions of less than 0.5 thousand tones of greenhouse gases) have the right to apply their own monitoring and reporting methods, without complying with the recommended precision levels. The report on emission levels is to be prepared for the period of a calendar year, *i.e.* from 1<sup>st</sup> January to 31<sup>st</sup> December, and is to be submitted to the National Administrator by 31<sup>st</sup> March every consecutive year.

With the decision the European Commission found that the Polish allocation plan exceeds projected emissions and contravenes several criteria of the emissions trading directive. It accepted that all companies in the plan qualify for trading but said that they will only be allowed to do so once Poland has reduced the total number of allowances and amended the allocation plan as requested. Polish authorities have requested to exempt 221 small installations in the buildings material sector from the scheme, saying that they would account for less than 0.2% of the emissions covered by the NAP 1. The main condition for the European Commission to accept the Polish NAP was to reduce the total number of CO<sub>2</sub> emission allowances from 858.6 to 717.3 million tones. The reduction of the originally established pool of allowances included diminishment of the basic pool and withdrawal of additional bonus allowances related to “early action” and “cogeneration effects”. The total quantity of CO<sub>2</sub> emission allowances has been decreased by 16.5% (141.3 Mtones) in relation to the level originally proposed by the Polish authorities. The Commission considered the original version of the Polish allocation plan as exceeding the anticipated emission level and against several criteria of the Directive on the scheme of emissions trading, including those concerning its ex-post verification.

The comments submitted in result of the consultations were then to the farthest possible extent taken into account. In October 2005, the allocation methodology for professional power plant sector was agreed jointly by Ministry of the Environment and Ministry of Economy. On 6<sup>th</sup> October 2005, the Draft Proposal for Regulation of the Council of Ministers on the National Allocation Plan was considered by the Committee of the Council of Ministers, which provided conditional

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<sup>36</sup> *Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC that was transposed into the Polish legal framework by the Act of 22 December 2004 on the Greenhouse Gas and Other Substance Air Emission Allowance Trading Scheme (Official Journal of 2004, No. 281, Item 2784)*

recommendation for its consideration by the Council of Ministers. On 27<sup>th</sup> December 2005, the Council of Ministers adopted Regulation on the Approval of the National Allocation Plan of Carbon Dioxide Emission Allowances for 2005 - 2007 and on the Specification of the Installations Temporarily Excluded from the Community Trading Scheme in the Period between 1<sup>st</sup> January and 31<sup>st</sup> December 2007.

Till Spring 2005 “emission trading” was perceived positively by the Polish industry as Poland had a surplus of emission reduction units under the Kyoto Protocol and the Polish industry were hoping that this fact will also be reflected in the limits specified under the NAP. The main arguments of the Polish industry was that a tremendous effort in the past to invest in SET in the 1990’s will be finally become financially accountable by selling extra AAUs on the European market. Procedure has it that member states have to send their NAP to the EU Commission for approval. In March 2005 the Commission rejected the Polish NAP, demanding a cut from 256 to 239 million tonnes of CO<sub>2</sub> annually. This put end to optimistic plans of the Polish industry to sell larges surpluses of CO<sub>2</sub> emissions on the European market. However, the Polish NGOs argued that the function of the first trading period 2005-2207 is to prepare for a much harsher conditions of the second trading period 2008-2012. Thus the Polish companies would be much better prepared to become market players in the later stage, despite the “lost” benefits of the first period.

### **3.2 Second National Allocation Plan**

Poland, like other countries which joined the European Union on May 1<sup>st</sup>, 2004, has to individually fulfil until 2012 its commitments under the Kyoto Protocol. Therefore, economic development and situation in individual sectors of the economy, which are now covered by the Community emission trading scheme (further: Community scheme), are key elements in Poland’s interpretation of its commitments with respect to GHG emission reduction. Because of the transformation process, ongoing since the late 1980’s, and due to large expenditure on environment protection, Poland has at its disposal a considerable surplus of emission reductions in comparison with the emission reduction target in 2012, accepted in the Kyoto Protocol. That undisputed success has been paid for with large social costs, including unemployment nearing 20%.

Upon the preparation of NAP II, benchmarking, considered to be the simplest and most effective method, was applied in all possible situations. The issues of new entrants and closures are regulated by law. As a result of amending the act, detailed requirements for new entrants to the Community scheme shall be specified in detail.

Emission allowances shall be allocated to installations on the basis of the production and emission data for 2005, according to the benchmarking method and with reference to the documented development plans, or on the basis of other agreed and approved method. The installations which have already started or will start to operate in 2005-2012, including those at the stage of technological start-up (to meet the targets of the production capacity), or those being modernised and increasing their production capacity, received emission allowances according to the well-documented production and emission forecast in w 2008 2012. Special rules of allocation based on the reference indicators will apply to installations producing combined heat and power in order to provide the high energy efficiency units with a so-called cogeneration bonus. In case of documented early action reductions, a so-called early action bonus was awarded. The process of collecting and verifying data on the installations covered by the Community scheme was intended to prepare the list of installations that meet the criteria which make them eligible to participate in the scheme.

Collected information are necessary for the emission allowances to be properly allocated between the installations. The process of collecting information is stipulated by the provisions of the Regulation of the Minister of Environment of 7<sup>th</sup> March 2006 on the information required for the preparation of the National Allocation Plan. The preparation of the NAP II was followed by gathering the information under the form and according to the procedures referred to in the Ordinance of the Minister of Environment of 7<sup>th</sup> March 2006 on the information required for the preparation of the National Allocation Plan. The entities maintaining the installation covered by the Community scheme provided KASHUE with the information on:

- installation identification,
- type and volume of the fuel consumed,
- combustion processes,
- technological processes,
- emission volume being the result of the actions taken,
- planned or new fuel combustion installations activated after 1 January 2008,
- planned or new installations other than fuel combustion installations activated after 1 January 2008.

In the course of preparation of National Allocation Plan II it has been necessary to consider the specific structure of primary energy sources. For Poland, which has energy sector based mainly on hard coal and lignite, this is a key issue in the context of long-term energy security. CO<sub>2</sub> emission in Poland is caused primarily by combustion processes in power and heat generation sectors. Fuel usage structure in Polish power sector is specific on the account of the significant scale of use of own coal resources, in comparison to other EU member states. Activities in the area of modernization of production potential, and increasing energy efficiency of our economy may bring further emission reductions, including GHG emission reduction. Poland has already exhausted the cheapest methods of emission reductions, and some industrial sectors have already achieved the maximum technical levels of emission reduction. Therefore, each further emission reduction activity involves exceedingly high financial costs, punitive for the Polish economy. Moreover, large investments connected with achieving additional emission reduction require time, so such a reduction will only become visible after 2012. The work on the NAP II preparation was a continuation of assumptions adopted in the course of preparation of the first National Allocation Plan of Emission Allowances for the years 2005-2007 (further referred to as NAP I). The consultations and negotiations with industrial sectors, carried out in Poland on such a scale for the first time, were a considerable achievement and experience, contributing to a large extent to partnership and co-operation in the course of implementation of the NAP I, and in the course of preparation of the NAP II. Both the NAP I and the NAP II were prepared in reference to the development strategies of individual sectors, taking into account legitimate emission allowances needs.

Similarly as in the case of NAP I, upon the preparation of NAP II, by means of lengthy discussions and consultations with various industries, Poland has obtained an agreement on the suggested allocation of the emission allowances between various sectors. It was approved and stated that the method of dividing the emission allowances within the frames of sectors and among the entities maintaining system execution does not infringe the rules of competition.

The rules for the introduction of allowances trading scheme within the Community, aimed at the achievement of targets adopted in the Kyoto Protocol in the economically most effective mode

possible, are specified by the Directive 2003/87/EC and the Directive 2004/101/EC. The flexible mechanism, which is the emission allowances trading scheme, was transposed into the Polish legal system by means of the Act of 22 December 2004 on the Greenhouse Gases and Other Air Pollutants Emission Allowance Trading Scheme (hereinafter referred to as the Act) together with the following executive acts:

- Act of 22nd December 2004 on the Greenhouse Gas and Other Substance Air Emission Allowance Trading (Official Journal of 2004, No 281, Item 2784);
- Regulation of Minister of the Environment of 13<sup>th</sup> September 2005 on the appointment of the National Administrator of the Emission Allowance Trading Scheme (Official Journal No. 186, Item 1562);
- Regulation of Minister of the Environment of 30<sup>th</sup> September 2005 on the types of installations covered by the Community Carbon Dioxide Emission Allowance Trading Scheme for 2005 - 2007 (Official Journal No. 199 Item 1646);
- Regulation of Council of Ministers of 27<sup>th</sup> December 2005 on the Approval of the Carbon Dioxide Emission Allowance Trading Scheme for 2005 - 2007 and on the Specification of the Installations Temporarily Excluded from the Community Trading Scheme in the Period between 1st January and 31st December 2007 (Official Journal No. 264, Item 2206);
- Regulation of Minister of the Environment of 12<sup>th</sup> January 2006 on the monitoring method of the quantities of emissions covered by the greenhouse gas emission allowance trading scheme (Official Journal No.16, Item 124);
- Regulation of Minister of the Environment 6<sup>th</sup> February 2006 on setting out the requirements on the verifiers authorised to verify the Annual Reports;
- Regulation of the Minister of Environment of 31<sup>st</sup> March 2006 on types of installations covered by the ETS.
- Draft Regulation of Minister of the Environment on setting out the format, scope and schedule of forwarding data for the purpose of suitable development of the National Plan 2008-2012;
- Draft Regulation of Minister of the Environment on the types of installations covered by Emission Allowance Trading Scheme amendment in the Minister's Regulation of 30<sup>th</sup> September 2005;
- Draft Regulation of Minister of the Environment on setting out the specimens of forms, the schedule of and method for their forwarding to the National Registry.
- Regulation of the Minister of Environment of 6<sup>th</sup> March 2007 changing the regulation on the installations covered by the ETS.
- Regulation of the Minister of Environment of 10<sup>th</sup> April 2007 on conditions and ways of cost calculation for verification of annual reports.
- The Regulation of the Council of Ministers of 2<sup>nd</sup> of October 2007 changing the NAP Regulation for the years 2005-2007 with a list of list of installations temporarily excluded from the ETS in the period of 1<sup>st</sup> January 2005 to 31<sup>st</sup> of December 2007.
- Regulation of the Minister of Environment of 7<sup>th</sup> March 2007 information required for elaboration of NAP.

The Work on the National Allocation Plan (NAP) for Carbon Dioxide Emission Allowances in 2008-2012:<sup>35</sup>

- by 30 June 2006 the NAP was notified to the European Commission;
- consultations began with the sectoral and branch organizations;
- the CO<sub>2</sub> emission data for 2005 are of key importance that will be collected after verification of the Annual Reports (the Reports must be verified by 31<sup>st</sup> March 2006) according to the aforementioned Act, the NAP Has to be developed by the National Administrator;

The allocations given for the ETS companies in the first and the second trading period are presented in the Table below.

Table 16 Participants of the ETS market in Poland and their allocation - as sent to the Commission in 2006 - before reductions.

no	code	Activities	Allocation of allowances				
			NAP 2005-2007		NAP 2008-2012		
			annually	for five years	annually	share	share
1	E1	Combustion installations excepting hazardous or municipal waste installations	199 108 100	1 107 757 000	221 551 400	82,4%	79,24%
2	E2	Mineral oil refineries	3 371 100	23 849 500	4 769 900	1,8%	1,71%
3	E3	Coke ovens	3 983 600	19 158 000	3 831 600	1,4%	1,37%
4	F1	Metal ore (including sulphide ore) roasting or sintering installations	0	15 615 000	3 123 000	1,2%	1,12%
5	F2	Installations for the production of pig iron or steel (primary or secondary fusion) including continuous casting	13 547 400	52 876 500	10 575 300	3,9%	3,78%
6	M1.1	Installations for the production of cement clinker in rotary kilns	11 326 400	65 355 500	13 071 100	4,9%	4,67%
7	M1.2	Installations for the production of lime	2 868 800	16 534 000	3 306 800	1,2%	1,18%
8	M2	Installations for the manufacture of glass including glass fibre	1 934 700	9 402 500	1 880 500	0,7%	0,67%
9	M3	Installations for the manufacture of ceramic products by firing	1 489 600	9 942 000	1 988 400	0,7%	0,71%
		Installations temporarily excluded in the period 2005-2007	357 065				
10	O1	Installations for the production of pulp from timber or other fibrous materials	0	0	0	0,0%	0,00%
11	O2	Installations for the production of paper or board (in NAP 2008-2012 including energy production)	289 100	10 357 000	2 071 400	0,8%	0,74%
12		<b>Total allocation for the installations under EU ETS</b>	237 918 800	1 330 847 000	266 169 400	99,0%	95,19%
13		<b>Quantity of allowances for auctioning</b>	0	13 194 424	2 638 885	1,0%	0,94%
14		<b>RESERVE for JI projects</b>	0	9 000 000	1 800 000	-	0,64%
15		<b>RESERVE for new entrants</b>	824 135*	45 000 000	9 000 000**	-	3,22%
17		<b>RESERVE for forests ***</b>		12 900 000***	2 580 000***		
18		<b>TOTAL</b>	239 100 000	1 398 041 424 (1410941424)	279 608 285 (282188285)	-	100,00%

However, with Commission Decision of 26<sup>th</sup> March 2007 concerning the national allocation plan for the allocation of greenhouse gas emission allowances notified by Poland in accordance with Directive 2003/87/EC of the European Parliament and of the Council; the figures allocated in the Table 16 had to be changed. The draft NAP II was again criticised by the Commission as incompatible with the EU regulations. The following aspects of the national allocation plan of Poland for the first five-year period mentioned in Article 11(2) of the Directive are incompatible respectively with:

1. criteria 1, 2 and 3 of Annex III to the Directive: the part of the intended total quantity of allowances, amounting to the sum of 76.132937 million tonnes CO<sub>2</sub> equivalent per year and the adjustment resulting from any lowering of the number of installations covered and one fifth of the total number of allowances Poland decides to issue pursuant to Article 13(2) of the Directive, that is not consistent with assessments made pursuant to Decision 280/2004/EC and not consistent with the potential, including the technological potential, of activities to reduce emissions; this part being reduced in respect of emissions of project activities which were already operational in 2005 and resulted in 2005 in emission reductions or limitations in installations falling under the scope of the Directive to the extent that the resulting emission reductions or limitations due to these project activities have been substantiated and verified; in addition, the part of the total quantity potentially amounting to 6.2884 million tonnes of allowances in respect of additional emissions of combustion installations annually to the extent that this is not justified in accordance with the general methodologies stated in the national allocation plan and on the basis of substantiated and verified emission figures and does not exclusively relate to the expansion element of the installations concerned;
2. criterion 5 of Annex III to the Directive: the allocations to certain installations going beyond their expected needs as a result of the application of bonuses for early action, biomass or co-generation;
3. criterion 6 of Annex III to the Directive: the information on the manner in which new entrants will be able to begin participating in the Community scheme;
4. criterion 10 of Annex III to the Directive: the intention of Poland to transfer allowances from an installation in the coking industry to a power generator in the event of the sale of coke oven gas by the former to the latter;
5. criterion 12 of Annex III to the Directive: the maximum overall amount of CERs and ERUs of 25% which may be used by operators in the Community scheme as a percentage of the allocation of the allowances to each installation that is inconsistent with Poland's supplementary obligations under the Kyoto Protocol and decisions adopted pursuant to the UNFCCC or the Kyoto Protocol, to the extent that it exceeds 10%.

Table 17 Participants of the ETS market in Poland and their allocation - after the decision of the Commission - subject to public consultation till January 2008.

		Allocations for the period 2008-2012
E1	Combustion installations excepting hazardous or municipal waste installations	800,874,390
E2	Mineral oil refineries	17,570,505
E3	Coke ovens	15,444,080
F1	Metal ore (including sulphide ore) roasting or sintering installations	10,938,860
F2	Installations for the production of pig iron or steel (primary or secondary fusion) including continuous casting	35,602,935
M1.1	Installations for the production of cement clinker in rotary kilns	62,884,135
M1.2	Installations for the production of lime	13,763,675
M2	Installations for the manufacture of glass including glass fibre	8,624,285
M3	Installations for the manufacture of ceramic products by firing	5,217,195
M3	Installations temporarily excluded in the period 2005-2007	
O1	Installations for the production of pulp from timber or other fibrous materials	0
O2	Installations for the production of paper or board (in NAP 2008-2012 including energy production)	10,820,215
	<b>Total allocation for the installations under EU ETS</b>	196,348,055
	RESERVE for JI projects	750,505
	RESERVE for new entrants	60,086,195

#### 4 ETS COMPANIES

The Polish National Allocation Plan NAP includes over 1,100 installations for the 2005-2007 period and 1,117 for the second period.

##### *For heat and power industry*

1. installations for fuel combustion with power of 20 MW (excluding installations for dangerous and urban waste),
2. petroleum refineries,
3. coke furnaces.

##### *For metallurgical and steel industry*

1. installations for calcinations and roasting of metal ores,
2. installations for pig-iron smelting with a capacity of over 2.5 tones per hour.

##### *For mineral industry*

1. installations for cement clinker production, in rotation furnaces, with a capacity of over 500 tones per day,
2. furnaces for lime production with a capacity of over 50 tones per day,
3. installations for glass production with a production capacity of over 20 tones per day,
4. installations for ceramic products burning with a capacity of over 75 tones per day or furnace volume of over 4m<sup>3</sup> and density over 300kg of products per m<sup>3</sup> of furnace.

##### *For other sectors of industry*

1. installations for wood fibre-pulp production or other fibre materials,
2. installations for pulp and paper production with a production capacity of over 20 tones a day.

In order to assess the SET opportunities and needs among the ETS companies it is important to understand the ETS companies and the rationales behind their climate activities or lack of activities. The assessment should include:

- Mapping of key stakeholders at the ETS market
- Mapping of trends within each ETS sector with regard to production patterns, fuel types used in the production, possibilities for fuel switch/conversion of production
- Mapping of interests for initiating climate activities within each ETS sector
- Understanding of the various possibilities for ETS companies to fulfil their commitments under the NAP and investigate the rationale behind the selection of activities
- Identification of drivers and barriers for promoting SET among the ETS companies

The Allowance Trading Scheme covers the following industrial branches and sectors:

- Professional power plants;
- Professional combined power and heating plants;
- Professional (municipal) heating plants;
- Mineral oil refineries;
- Coke production plants;

- Ferrous metallurgy branch;
- Cement industries;
- Lime industries;
- Glass industries;
- Ceramic industries;
- Paper and pulp industries;
- Sugar production branch;
- Chemical sector;
- Other industries (where the installations covered by the scheme were not registered in any separate industry branch).

The NAP II has been prepared on the basis of the sector development strategies of:

- Hutnicza Izba Przemysłowo – Handlowa (Smelting Industry Chamber of Commerce),
- Polskie Towarzystwo Elektrociepłowni Zawodowych (Polish Association of Commercial Heat and Power Plants),
- Polska Izba Przemysłu Chemicznego (Polish Chamber of Chemical Industry),
- Stowarzyszenie Papierników Polskich (Association of Polish Papermakers),
- Stowarzyszenie Producentów Cementu (Association of Cement Producers),
- Stowarzyszenie Przemysłu Wapienniczego (Lime Industry Association),
- Techniczna Grupa Robocza ds. Przemysłu Koksowniczego (Technical Working Group for Coking Industry),
- Towarzystwo Gospodarcze Polskie Elektrownie (Economic Association Polish Power Plants),
- Związek Producentów Cukru w Polsce (Union of Sugar Producers in Poland),
- Związek Producentów Ceramiki Budowlanej i Silikatów (Sanitary Ware and Silicate Producer's Union),
- Związek Pracodawców „Polskie Szkło” (“Polish Glass Employer's Union).

The Ministry of Environment established a consultation working group, which helped elaborate the II NAP. In such meetings the delegates of the Ministry of Environment, Economy, Treasury, Agriculture, Finance as well as representatives of industry associations, scientific institutes as well as NGOs participated. The consultations of the II NAP with interested market participants have led to a conclusion that major changes in the both country's Climate as well as Energy Policy (especially referring to renewables) will have to be made.

The installations for fuel combustion with power of 20 MW are the biggest group encompassed by ETS- over 80% of allowances is given to this particular group. One of the biggest energy producer in Poland BOT concern is planning to co-fire some 100.000 tones of biomass annually in Opole and Turów. It is also planning to build wind farms in Kamieńsko near Bełchatów and in Przełęcz Dukielska in the Karpaty Mountains<sup>37</sup>.

The Branch Industries Association Forum CO<sub>2</sub> expressed their support for the NAP II revised version- it was subject to public consultation till 11<sup>th</sup> of January 2008. The main assumptions of the reduced allocation plan were evaluated as a good compromise. Poland was forced to allocate 208.5 million of tones of CO<sub>2</sub> thus more than 20 million less than the total emissions in 2006. Thus it was

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<sup>37</sup>Interview with J. Łaskawiec, president of BOT Górnictwo i Energetyka SA. In April 2006 URL: [http://www.emisje-co2.pl/index.php?option=com\\_content&task=view&id=2496&Itemid=42&limit=1&limitstart=1](http://www.emisje-co2.pl/index.php?option=com_content&task=view&id=2496&Itemid=42&limit=1&limitstart=1)

not possible to distribute the allocations in such a way that all the market participants are satisfied. In the statement of Forum CO2 there is a request to the government to urgently elaborate a plan which would minimise negative impacts of the reductions resulting from the EU's decision for the Polish society and economy as well as to make use of the surplus emissions resulting from the Kyoto Protocol.

The Chamber of Metals has also made its independent standing regarding the reduced NAPII – they believe that further negotiations with the European Commission and increasing of the emissions limits are necessary.

The Association of Cement Producers requested from the Polish government the inclusion of the additional 2.8 million tones resulting from the further development of the building market and increase demand for cement to the level of 23 million tones annually.

The new reduced NAPII was, however received negatively by the energy sector, which experiences biggest reductions. The price of energy produced from coal will surge dramatically due to limits to allocations and difficulties to buy new allocations on the market. The privatisation plan for power plants can also fail due to the fact that the investors will not be willing to buy unprofitable companies. In this situation building a nuclear power plant will be the only solution for Poland in the future.

## 5 R&D PRIORITIES

In Poland, a bottom up approach), for the stimulation of innovative and emerging energy research (researchers initiatives and project proposals), is more common rather than the top down approach, based on politically determined priorities. However, in the area of innovative energy technologies and processes, there are examples of individual research projects as well as national programmes related both, to basic and applied research.

Polish R&D public actors can be divided into 3 categories:

- around 20 institutes linked to the Polish Academy of Sciences and covering a wide range of fields;
- Universities and Technical Universities, under the umbrellas of the Ministry of Education and Research;
- other independent public institutes linked to other ministries such as the Ministry of Economy. They are still mostly working for industry.

The State Committee for Scientific Research (KBN) is a governmental body, established by the Parliament in 1991 as the supreme authority to co-ordinate the State's policy in the area of science and technology. The Committee is the major central governmental research funding source. There are 3 types of RTD units: higher education institutions, branch R&D units and the Polish Academy of Science (PAN). PAN as a research center encompasses 81 scientific institutions and has 9,500 employees. There are 275 institutions of higher education in Poland, of which 7 agricultural universities, 17 technical universities and 16 universities. The networking activities of the SET sector include forming of national thematic networks for biomass and wind energy. There are several departments on technical universities having energy faculty and green energy programmes in their educational program. Some agricultural universities have educational programmes on energy crops production and bioenergy implementation.

The main characteristic of the Polish energy technology research actors is the sector they emerge from. The coal sector is by far the most important, the wealthiest and the most influential of all: even the governmental bodies responsible for renewable energies originate from the coal sector. There are significant number of research groups dedicated to coal energy all over Poland, especially in Silesia in the South. Some of them work on the issues connected with the environmental protection of coal-based processes: coal gasification, hydrogen from coal.

So far the EU, as far as it is concerned, did not seem to plan to invest much of its RTD efforts on coal, but following the raising energy security problems, "clean coal" became again the RTD priority under the FP7. Existing divergence between the Polish RTD potential and the EU RTD priorities leads to the paradoxical situation where all realistic analyses agree to say that coal is and will be the key energy source in Poland for the next decades but, since it is not a priority in EU RTD agenda and since the Polish coal industry can, in some extent afford to perform research without any massive support from EU, it is by far the energy sector where intra-European synergies are the weakest. On the contrary, the impact of the EU RTD programmes has by far become the strongest in the renewable energy sectors, technologies which are unlikely to play a significant role in the future national energy policy. For energy RTD the complementarity between Structural Funds and FP7 seems to be crucial in Poland.

The research of universities or branch research institutes are financed by grants of the national RTD programmes and projects of the KBN. Since several years Polish research institutions have had access to the EU RTD Programmes managed by the European Commissions. The research projects are co-funded by the KBN in mainly two ways: as a part of the general grant for the statutory activity of the research institutions and through general call for proposals for RTD projects. Some projects are funded through bilateral co-operation between Poland and some others countries (Norway, Germany, Sweden, Denmark, the USA, the UK).

The bottom up approach for defining and initiation of research programmes has been used in shaping up of the National Development Programme. This programme strongly emphasised the implementation of modern energy technologies, especially renewable energy. The issues related to modern renewable energy were particularly important in the sub-programme Innovation and Improvement of the Competitiveness dedicated to technological innovations, managed by the Ministry of Scientific Research and Information Technology. Its budget has not been strictly defined, (considerable part dedicated to research infrastructure and innovation, including energy infrastructure (e.g. solar energy laboratory, bioenergy laboratory).

In the National Energy Policy up to 2025 approved by the Council of Ministries in 2005, in the section concerning direction of research the assumptions for research programmes the following quotation can be found: “the use of biomass in the heat and electricity production, wind power and fuel cells are among the most promising new technologies. R&D activities of enterprises should be more intensively supported by the legal measures (Act on Financing of Science, National Foresight Study)...“. In the same document the following research programmes are planned for realization until 2008:

- a) determination of research and development for the support of energy policy, as an element of the domestic framework program,
- b) the support for acquiring of the EU funding for research and development in the energy field– both realized under the leadership of the minister responsible for science in co-operation with the minister responsible for economy.

The National Development Programme for the years 2007-2013 and its Operational Programme “Energy Infrastructure” with some innovative priorities, including the most innovative part - the priority No 3 “Development of renewable and alternative energy sources, with the total indicative budgeted of 1.8 billion Euro. The programme was supposed to focus on the investment support for innovative energy technologies, however, in the mean time it was suspended.

In September 2005 the Minister of Science and Information Technology approved the National “*Framework Research Programme*” (NFRP) for the coming years, as per the Act on the Principles for Financing of Science<sup>38</sup>. NFRP is prepared by the Minister but incorporates the opinions received from other ministries, voivodships (Polish Provinces), regional self-government authorities, the President of the Polish Academy of Sciences, universities, research institutes and national industry associations. The Programme also takes into account the assumptions of the following governmental strategic documents: 1) the Sectoral Operational Programme – Improvement of the Competitiveness of Enterprises, for the, years 2004 – 2006, 2) the National Development Plan for the years 2007-2013, 3) the Sectoral Operational Programme Science, Modern Technologies and

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<sup>38</sup> O.J. No 238, position 2390 of 8<sup>th</sup> October 2005.

Knowledge-Based Society for the, years 2007-2013, 4) the Strategy to Increase the R&D budgets in order to achieve the Lisbon Strategy Goals, 5) the Assumptions to the State Science, Technology and Innovation Policy to 2020, 6) the Strategy for the Development of Science in Poland to 2013 with the 2020 perspectives, 7) the Proposed Directions for the Development of Science and Technology in Poland to 2020, 8) Poland's official negotiation position on the 7<sup>th</sup> Framework Programme of the European Union, and 9) the National Foresight Study.

The NFRP (updated in the future on a regular basis) stipulates 9 strategic research areas, *e.g.* "Energy and Energy Resources Strategic Research Programme", consisting of 4 priorities including: a) new energy technologies (FC, hydrogen, PV), b) clean and efficient coal (gasification and supercritical vapour parameters), c) national energy security (including electricity grid balancing and grid flexibility), d) renewable energy sources and biofuels. The NFRP will be implemented through multi-annual interdisciplinary integrated projects, starting from 2006.

As the possible source of financing of the tasks specified under NFRP the state budget and the EU funds under the National Development Plan for the years 2007-2013 are mentioned. The projects accepted for financing by the European Commission under Framework Programmes can also receive financial support from the Ministry of Science in the amount of up to 60% of the necessary costs to be covered by the domestic resources. The *'Regulation of the Minister of Science and Information Technology on the Criteria, Allocation and Financial Reporting for Financing Science'*<sup>39</sup> stipulates the procedures.

Although the Lisbon Strategy has been mentioned in *the Act on the Rules for Financing of Science*, it is doubtful whether its targets can be reached. The goal of the Lisbon Strategy is to achieve the 3% of the GDP for R&D spending. However, the current level of R&D expenditures is circa 0.6% in Poland and it is still doubtful whether it will be feasible to increase it fivefold to the year 2010. It is also worrisome that the share of grants for institutions winning projects under the new EU Framework Programme would decrease due to the limited opportunities to obtain co-financing domestically.

A great emphasis should be put on the need for technological transfer. This is mostly what is expected from RTD partnerships. Poland, along with other new EU member states, since being less technologically advanced, tend to be imitators rather than energy technology inventors. Competition with the more technologically advanced countries such as the US and Japan, for instance on fuel cells, would be of no avail. There is a risk that Polish decision-makers wish to follow the EU in some ambitious projects, driven by the objective of world competitiveness. It is not clear whether Poland can afford to always follow this path due to the lack of financial resources and very dim prospects for success. So, as underlined above, technological transfer sounds more pragmatic in the situation when the priorities are not clear and the financial resources are scarce.

Bureaucracy and financial requirements seem to be another obstacle. Polish partners of the EU funded RTD projects perfectly understand that all participants in a co-operative project have to co-finance their participation, which without sufficient domestic support for R&D is a critical obstacle. Because of a lack of financial resources, they cannot afford to participate in all the projects they would be interested in.

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<sup>39</sup> I.J. 2005 No 161 position 1359 of the 4<sup>th</sup> August 2005

Possible research topics related to SET include issues related to<sup>40</sup>:

All renewables:

- Optimisation of support mechanisms;
- Reduction of investment and O&M costs;
- Increase of environmental benefits;
- Potential use of renewables in aviation;
- CHPs in agriculture, forestry, water economy and observation systems;
- Demonstrations for innovative technologies;
- Desertification and its impact on the biomass and hydro power potentials;
- Impact of micro and micro energy systems on the ecosystems;
- GIS systems to estimate RES potentials;
- Analysis of the domestic manufacturing potential in the global context.

Geothermal energy:

- Evaluation of utilizable potential vs. huge theoretical potential.

Solid biomass:

- Optimisation of energy crops cultivation;
- Impact of *Salix* monoculture on desertification;
- Efficiency of *Salix* cultivation;
- Use of cereals for energy;
- Estimation of potentials of different kinds of biomass and degradable waste;
- Solid biomass properties for production of other fuels liquid, gaseous;
- Direct utilization of syngases in microturbines;
- Construction of machines for collection of crops from fields;
- Combustion efficiency improvements;
- Analysis of combustion process for different energy crops as well as properties of different biomass fuels;
- Development of small and medium size boilers (up to 15 MW<sub>e</sub> and 50MW<sub>th</sub>);
- Adjustment to the requirements of existing boilers;
- Direct co-firing with the omission of coal milling processes (wood burners, gas generators);
- Pyrolysis, gasification and fermentation with the use of accessible infrastructure;
- Corrosion problems connected with the use of biomass;
- New species of energy crops;
- SWOT analysis for different energy crops;
- Techno-economic analysis ;
- Utilisation of heat biomass.

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<sup>40</sup> Minutes of the seminar „RES In Poland in R&D programmes” within the CEERES 6FP. 2nd December 2005.

Poland has a significant potential for all kind of bioenergy source. Agricultural universities are also interested in new areas of their activities, they are starting research on new energy crops production as well as implementation of bioenergy system in rural areas. The biggest challenge for the bioenergy sector in the nearest future is the implementation of a full biomass supply-demand chain on a larger scale. Further relevant renewable policy objectives and solid biofuels market development should create foundations for large scale biomass projects.

The EU ETS will provide additional incentive to reduce emissions for plants covered by the scheme. The question remains open as which role the biomass will play in their investment plans. It is a strategic near-term choice whether bioenergy should be supported to be used as a fuel in smaller plants or for co-firing in larger plants where the environmental benefits are likely to be smaller. In principle, Poland has already made this choice through the implementation of a quota obligation, which can considerably increase the share of co-firing for electricity production in large systems.

In the near term, the expanded use of bioenergy for heat and electricity does not conflict with the ambitions to increase the use of biomass based transportation fuels. In the longer run, strategic choices must also be made concerning the use of surplus agricultural land - whether for starch-rich crops for ethanol production, or for cellulose rich crops for the production of liquid and gaseous fuels, or for cellulose rich crops for heat and electricity production.

#### Wind energy:

- Wind energy potentials for Poland;
- Methods for verification of potentials for different sites;
- Energy storage technologies;
- Utilisation of sites with lower wind speeds;
- Integration with pumped storage hydro;
- Methods for balancing the electricity supply-demand;
- Coupling with other RES;
- Impact of marine conditions on installation components;
- Impact of the intermittent supply on the security of the grid;
- Costs analysis of the grid system due to development of wind investments;
- Impact on ecosystems.

#### Hydro energy:

- Update on potentials and existing plants;
- Evaluation of cascade and low land systems and their utilization;
- Application of modern technologies to the construction of dams.

#### PV:

- Small chances for extensive R&D in Poland.

#### Solar thermal collectors

- Looking for cheaper alternatives to copper;
- Development of solar air collectors and their application for drying processes in food and industry, agriculture.