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PERMANENT REPRESENTATION OF THE REPUBLIC OF POLAND
TO THE EUROPEAN UNION

PERMANENT REPRESENTATION OF THE REPUBLIC OF POLAND
TO THE EUROPEAN UNION

Brussels, 14 October 2011

WEH/AJ/4023/14-109/11

Philip Lowe
Director General
Directorate General for Energy
European Commission

Dear Director General,

In accordance with provisions of art. 3 para. 3 of the Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market I hereby forward to you the Report containing the analysis of the attainment of the results and quantitative targets in the field of electricity production from renewable sources in the years 2009-2010 taking into account wider time perspective adopted by the Committee of European Affairs on the 7th of September, 2011 together with the letter réf. n0 DE-III-41022-2/22/11 dated 7th of October, 2011 from Mr. Maciej Kaliski, Undersecretary of State in the Ministry of Economy sent on behalf of Mr. Waldemar Pawlak, Minister of Economy

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Sincerely Yours,

Karolina Ostrzyniewska
Deputy Permanent Representative
of the Republic of Poland to the EU

End: Letter ref. n° DE-IIf-41022 -2/22/11 + Report

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MINISTER OF ECONOMY

REPORT
CONTAINING THE ANALYSIS OF THE ATTAINMENT OF THE RESULTS AND QUANTITATIVE TARGETS IN THE FIELD OF ELECTRICITY PRODUCTION FROM RENEWABLE SOURCES IN THE YEARS 2009-2010 TAKING INTO ACCOUNT WIDER TIME PERSPECTIVE

Document adopted by
the Committee for European Affairs
on 9 September 2011.

Warsaw, 2011

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1. Legal basis:

This report fulfils the disposition of Article 9f (4) of the Act of 10 April 1997 — Energy Law (Journal of Laws of 2006, No 89, item 625, as amended), as well as further obligations pursuant to Article 3 (3) of Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 *on the promotion of electricity produced from renewable energy sources in the internal electricity market* (OJ L 283 of 27.10.2001, p. 33; (OJ Polish special edition, chapter 12, v. 2, p. 121), hereinafter referred to as "Directive 2001/77/EC". Pursuant to Article 3 of the Directive, EU Member States shall publish, for the first time not later than 27 October 2003 and every two years thereafter, a report which includes an analysis of success in meeting the national indicative targets in the production of electricity from renewable energy sources.

This report includes years 2009 and 2010, taking into account the data for 2005-2010 in order to present a wider time perspective allowing for the analysis of the results and quantitative targets for the production of electricity from renewable energy sources. Moreover, the most recently available data (including the year 2011) was used to analyse the use of the European funds for the development of renewable energy sources.

2. The purpose of the report

The purpose of the report is to analyse and evaluate the effectiveness of measures taken to promote the production of electricity from renewable energy sources (RES), taking into account the measures resulting from climate change commitments.

The most important tasks of the Polish energy policy include ensuring reliable supplies of fuels and energy, increasing the competitiveness of the economy, improving energy efficiency, and reducing the environmental impact of the energy sector. One of the elements which contribute to delivering these priorities consists of increasing the use of renewable energy sources, which leads to decreasing the dependence of the Polish economy on imported energy, and to reducing air pollution by avoiding emissions created when conventional energy is used.

It was a strategic objective of the Polish energy policy to increase the use of renewable energy sources and reach a 7.5% share of electricity produced from renewable energy sources of the gross national energy consumption in 2010. Furthermore, the EU climate and energy package, which implements the conclusion of the European Council of March 2007, will be of key importance for the further development of renewable energy sources. One of the main components of the package is the Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 *on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC* (OJ L 140, 5.06.2009, p. 16). The Directive assumes an increase of the share of energy from renewable sources in the EU final energy balance by 20% in 2020. For Poland the share is to reach 15%. At the same time, all Member States should increase the share of renewable energy in transport to reach 10% by 2020.

The share of electricity from renewable energy sources assumed for 2010 is in accordance with the indicative targets set for Poland in Directive 2001/77/EC.

Pursuant to Article 9f(4) of the Energy law (and also in order to present uniform statistical data), this report was prepared on the basis of information provided by the Energy Regulatory Office and the Ministry of the Environment.

3. Indicative target values

Table 1 presents the percentage share of electricity produced from renewable energy sources in Poland of the total gross national energy consumption, aiming at reaching the indicative target in 2010 in accordance with Directive 2001/77/EC.

Table 1 - Percentage share of electricity produced from renewable energy sources of total gross national energy consumption, according to the established targets.

Year	Share of electricity from RES [%]
2001	1.9
2002	2.0
2003	2.2
2004	2.3
2005	2.5
2006	3.0
2007	3.9
2008	5.0
2009	6.2
2010	7.5

4. Generation of electricity from RES

Experts believe that sources using the energy of biomass (energy crops, forest biomass, agricultural and industrial waste), biogas, wind, and moving water have the greatest potential to be used in Poland within the existing support mechanisms. Currently, technologies using solar energy, due to their low economic effectiveness in relation to electricity production, may play an important role mainly in the production of heat and in off-grid systems, not connected to the national grid. It is assumed that in the long term geothermal resources will also be used for electricity production.

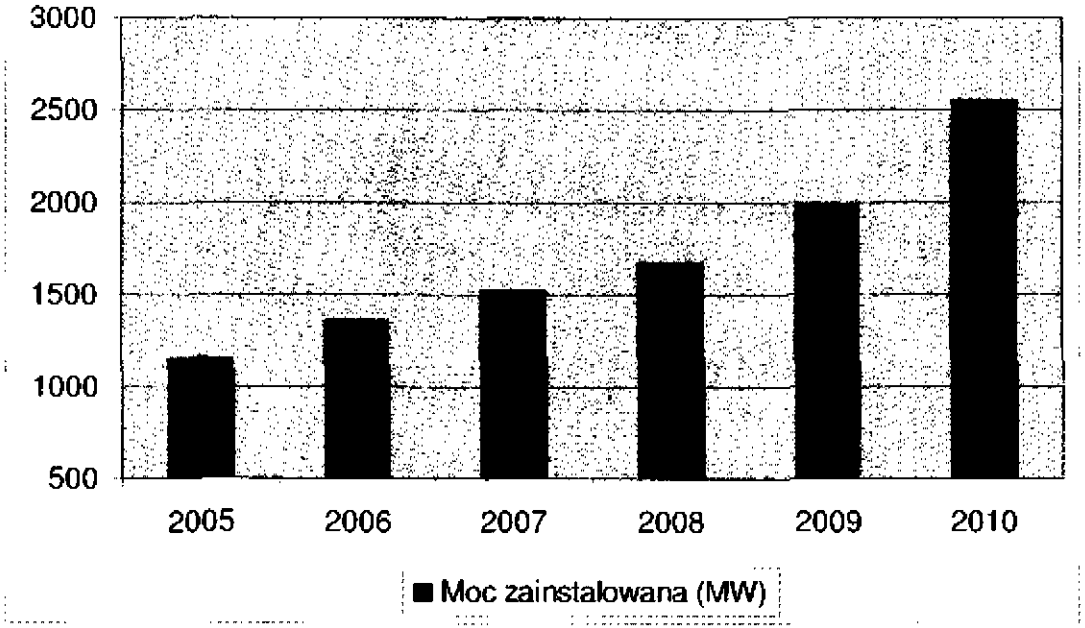
Table 2 and figure 1 present the capacity installed in all the renewable energy source technologies since 2005 to 2010, and table 3 presents the number of RES installations in 2006-2010.

Table 2 - The capacity installed in all of the RES technologies from 2005 to 2010 (source - Energy Regulatory Office)

No	Type of generating unit		Year 2005 Installed capacity in MW	Year 2006 Installed capacity in MW	Year 2007 Installed capacity in MW	Year 2008 Installed capacity in MW	Year 2009 Installed capacity in MW	Year 2010 Installed capacity in MW
1.	Power plants producing electricity from biogas	producing electricity from biogas coming from wastewater treatment plants	31.972	11.113	15.536	19.688	23.654	28.474
		producing electricity from agricultural biogas		0.741	0.741	1.366	7.246	8.416
		producing electricity from landfill gas		24.907	29.422	33.561	39.988	45.994
2.	Power plants producing electricity from biomass	producing electricity from forest, agricultural, and garden waste	189.79	0.790	0.790	5.210	8.910	12.110
		producing electricity from mixed biomass		0.000	0.000	3.580	20.380	113.880
		producing electricity from industrial wood-based and pulp and paper waste		238.000	254.600	223.200	223.200	230.200
3.	Wind farms	onshore	83.280	152.559	287.909	451.090	724.657	1180.272
4.	Power plants producing electricity from solar radiation		-	-	-	-	0.001	0.033
5.	Hydroelectric power plants	flow-of-the-river up to 0.3 MW	852.495	42.523	43.271	42.778	41.972	41.873
		flow-of-the-river up to 1 MW		41.723	41.723	44.525	46.105	48.248
		flow-of-the-river up to 5 MW		129.525.	129.525	132.513	136.373	126.163
		flow-of-the-river up to 10 MW		47.780	47.780	48.280	48.280	48.280
		flow-of-the-river over 10 MW		289.800	289.800	289.800	289.800	289.800
		flow-of-the-river with pumped storage units		382.680	382.680	382.680	382.680	382.680
6.	Power plants using co-incineration technology*'	fossil fuels and biomass fossil fuels and biogas	-	-	-	-	-	-
	TOTAL		1157.537	1362.141	1523.777	1678.271	1993.246	2556.423

* in the case of installations using co-incineration technology in conventional power plants, this brings about a change in their operating conditions, which in turns changes the licence. Given the large variations in the percentage share of biomass (in the entire fuel stream), the total installed capacity is not given in the case of those installations.

Figure 1 - Capacity installed in RES from 2005 to 2010 (source - Energy Regulatory Office)



Installed capacity (MW)	

Table 2 - The number of RES installations from 2006 to 2010 (source - Energy Regulatory Office)

	2006	2007	2008	2009	2010
Biogas power plants	74	87	103	125	144
Biomass power plants	6	7	11	15	18
Power plants producing electricity from solar radiation	0	0	0	1	3

Hydroelectric power plants	684	694	710	724	727
Wind farms	104	160	227	301	413
Co-incineration	NDA	NDA	28	38	41
Total	868	948	1079	1204	1346

The share of electricity produced from renewable energy sources of the gross national consumption in Poland increased from 2.58 % in 2005 to 6.98 % in 2010.

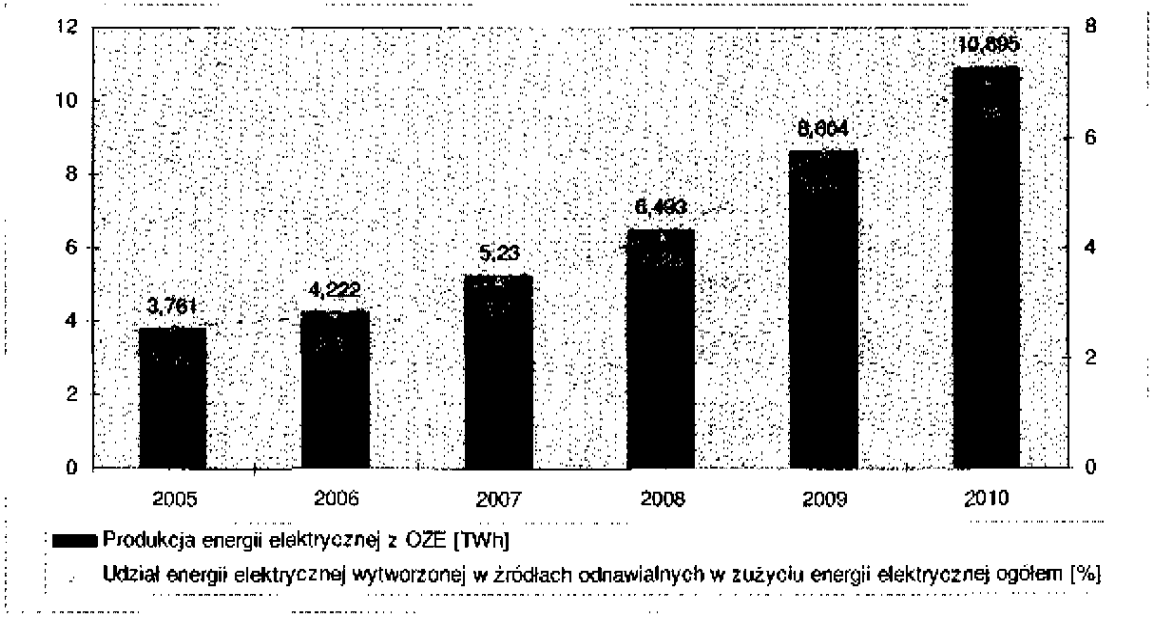
The amount of electricity produced from renewable energy sources and its share in the gross electricity consumption from 2005 to 2010 is shown in table 4 and figure 2.

Table 4 - The share of electricity from RES of the gross national electricity consumption from 2005 to 2010 (source - Energy Regulatory Office)

	2005	2006	2007	2008	2009	2010
Electricity production from RES [TWh]	3.761	4.222	5.230	6.493	8.604	10.895
Electricity consumption in Poland [TWh][1)]	145.7	150.8	154.0	153.4	149.5	156.1
The share of electricity produced from RES [%]	2.58	2.80	3.40	4.23	5.76	6.98

Figure 2 - The share of electricity from RES of the gross national electricity consumption from 2005 to 2010 (source - Energy Regulatory Office)

[1)] Source – Energy Market Agency S.A.



Production of electricity from RES [TWh]	
The share of electricity produced from RES [%] in the total electricity consumption [%]	

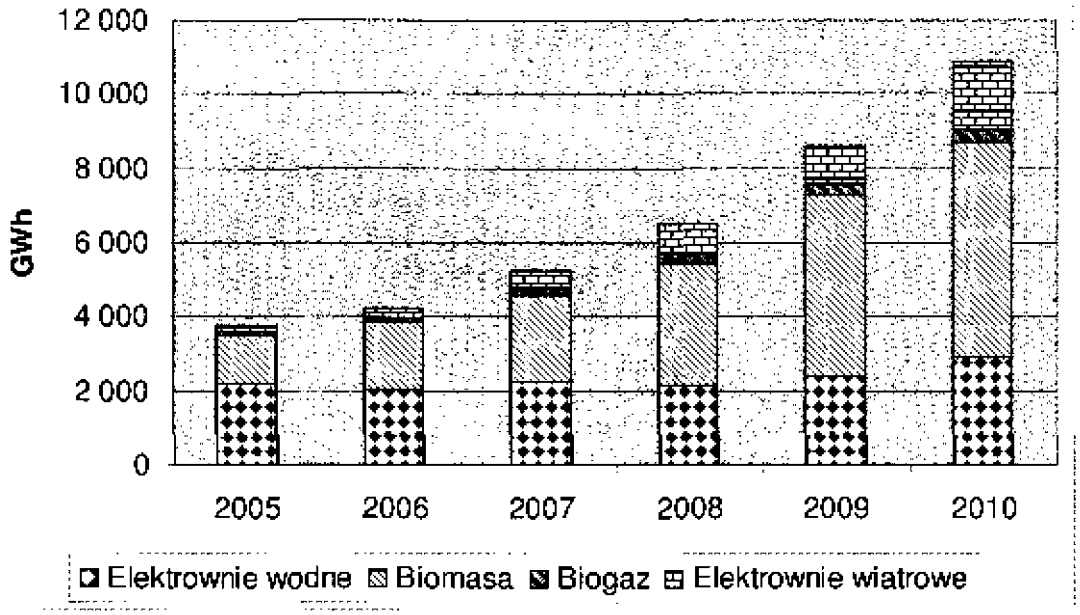
In 2010 the share of electricity produced from renewable energy sources of the total electricity consumption in Poland increased as compared to 2005; the increase was not evenly spread throughout the six years. The increase largely occurred within the last 3 years, as a result of the functioning support scheme for electricity production from RES. The system provided conducive conditions for investments in renewable energy sources.

In 2006 electricity production from renewable energy sources exceeded 4 TWh for the first time, and in 2008 it exceeded 6 TWh, only to reach almost 11 TWh in 2010. The quantity of electricity produced since 2005 in the given renewable energy source technologies is shown in table 5 and in figure 3.

Table 5 - The quantity of electricity produced since 2005 in the given renewable energy source technologies from 2005 to 2010 [in GWh] (source - Energy Regulatory Office)

Source type	2005	2006	2007	2008	2009	2010
Hydroelectric power plants	2176	2030	2253	2153	2376	2922
Biomass	1345	1818	2343	3313	4888	5788
Biogas	105	117	162	221	295	363
Wind farms	135	257	472	806	1045	1822
Total	3761	4222	5230	6493	8604	10 895

Figure 3 - The quantity of electricity produced since 2005 in the given renewable energy source technologies from 2005 to 2010 [in GWh] (source - Energy Regulatory Office)



Hydroelectric power plants	
Biomass	
Biogas	
Wind farms	

The structure of electricity production from renewable energy sources from 2005 to 2010 shows that power plants and heat and power plants using biomass, as well as hydroelectric power plants, have the greatest share in the production of electricity from RES. Furthermore, the importance of wind power installations continues to grow.

5. Measures taken to meet the obligations resulting from international climate protection agreements

The Republic of Poland, as a party to the Kyoto Protocol[2)], has assumed the obligation to reduce greenhouse gas emissions by 6%, and agreed that 1988 was the base year for obligations under UNFCCC convention and its Kyoto Protocol concerning the emissions of the three basic gases, carbon dioxide, methane, and nitrous oxide, as well as 1995 as the base year for industrial gases from the group of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SFg).

Poland has been reducing greenhouse gas emissions for years. The main factor reducing the emissions consisted in reducing the use of primary energy in the national economy. At the same time, there has been a change in the structure of fuels used, consisting in the decrease of coal consumption and increase of the use of renewable energy sources. Nevertheless, we should emphasize, that from 1988 to 2009 there were periods when greenhouse gas emissions increased due to robust economic growth.

Table 6 presents national greenhouse gas inventory from 1988 to 2009.

Table 6 - The national inventory of greenhouse gas from 1988 to 2009 according to the IPCC categories [Gg eq. CO_2]

Category	1988[3)3]	1995	2002	2003	2004	2005	2006	2007	2008	2009
	Gg eq. C02	Gg eq. C02	Gg eq. C02	Gg eq. C02	Gg eq. C02	Gg eq. C02	Gg eq. C02	Gg eq. C02	Gg eq. C02	Gg eq. C02
1. Energy	469 676.96	369 090.22	308 574.57	318 261.43	318 115.85	314 862.18	325 446.57	321 178.01	316 711.95	307 128.59
2. Industrial processes	32 533.05	22 999.34	19 349.17	22 348.06	23 640.59	28 854.99	31 086.82	32 906.78	32 804.66	24 630.39
3. The use of solvents and other products	1006.46	524.80	664.25	647.39	704.67	688.81	762.36	733.04	742.04	742.31
4. Agriculture	50 648.48	37 696.60	34 624.24	33 922.84	33 734.17	34 173.47	35 707.19	36 551.06	36 538.04	35 512.41
5. Land use, changes in the land use, and	-18 000.88	-15 787.97	-25 004.21	-26 078.30	-29 477.63	-30 988.34	-35 621.51	-37 703.10	-33 134.59	-38 068.60

[2]Kyoto Protocol to the Unites Nations Framework Convention on Climate Change, drafted in Kyoto on 11 December 1997 (Journal of Laws of 2005, No 203, Item 1684).

[3)] emissions for 1988 were estimated together with the entire series until 2009 in order to achieve a coherence of data and methodology; the emissions differ from those approved for the purpose of the national reduction target accounting under the Kyoto Protocol.

forestry										
6. Waste	9366.32	9971.42	9573.48	9441.59	9361.23	9437.36	9336.47	9325.91	8927.55	8865.84
Total - net with category 5	545 230.39	424 494.41	347 781.50	358 543.02	356 078.90	357 028.47	366 717.91	362 991.69	362 589.45	338 810.92

Carbon dioxide emissions are calculated by deducting the balance of emissions and absorption of the gas for category 5 given in the table above – Land use, changes in the land use and forestry from the total emissions in all other categories. Pursuant to the UNFCCC guidelines, CO_2 emissions were presented by both taking the values of category 5 into account and without these values (tables 5 and 6, respectively). Furthermore, pursuant to the methodology of IPCC (Intergovernmental Panel on Climate Change), the inventory does not include the balance of the national CO_2emissions from biomass. For gases other than CO_2, the results of the inventory may be presented – for comparison purposes – in CO_2 equivalent units using appropriate values of the Global Warming Potential (GWP), the amount of which is 21 for methane and 310 for nitrous oxide.

As shown in table 6, CO_2 emissions (less category 5) in 2009 was estimated at approximately 310.652 million tonnes. It is 33.8% less than the emissions in the base year (1988). Additionally, in 2009 the share of carbon dioxide (less category 5) is the largest in national emissions, reaching 82.4%, and the share of methane and nitrous oxide (less category 5) is far smaller: 9.2% and 7.3%, respectively. All industrial gases constitute a fraction of total national greenhouse gas emissions (approx. 1.1% in total).

Table 7 presents the national greenhouse gas inventory from 1988 to 2009 divided into gas types, and figure 4 shows greenhouse gas emissions (without category 5 listed in table 6) from 1988 to 2009.

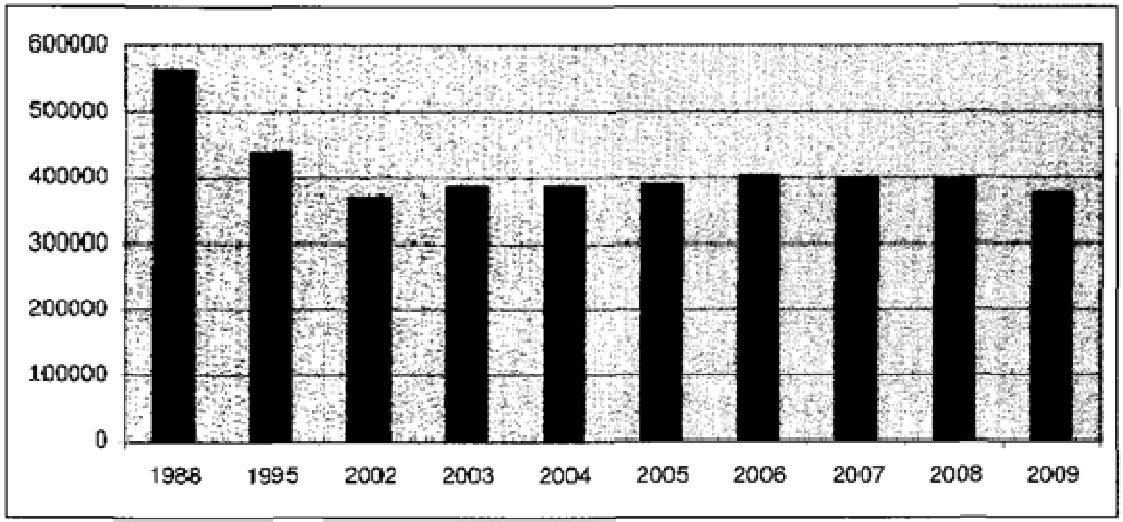
Table 7 - The national greenhouse gas inventory from 1988 to 2009 according to gas types [Gg eq. CO_2] (source - Ministry of the Environment)

Pollution	1988[4)]	1995	2002	2003	2004	2005	2006	2007	2008	2009
	Gg eq. $C0_2$	Gg eq. CO_2,	Gg eq. CO_2	Gg eq. CO_2	Gg eq. CO_2	Gg eq. CO_2	Gg eq. CO_2	Gg eq. CO_2	Gg eq. CO_2	Gg eq. CO_2
CO2 net with category 5	450 732.71	348 216.65	277 925.85	287 831.76	284 857.03	284 448.79	292 654.63	288 326.78	289 150.67	270 215.06
CO_2 - without category 5	470 941.69	366 223.64	305 198.92	316 291.10	316 619.11	317 753.00	330 601.16	328 362.47	324 628.64	310 624.91
CH_4 net with category 5	54 132.79	45 256.52	39 605.86	39 984.15	39 452.31	39 882.18	40 149.11	39 349.11	38 363.63	37 072.28

[4)] emissions for 1988 were estimated together with the entire series until 2009 in order to achieve a coherence of data and methodology; the emissions differ from those approved for the purpose of the national reduction target accounting under the Kyoto Protocol.

CH_4 without category 5	51 940.41	43 049.45	37 354.70	37 630.28	37 175.11	37 576.02	37 835.09	37 023.23	36 027.36	34 737.51
N_2O net with category 5	40 148.91	30 712.04	28 419.37	28 610.86	29 047.38	29 393.80	30 564.46	31 495.57	31 152.74	27 524.78
N_2O without category 5	40 133.18	30 700.09	28 410.66	28 583.70	29 040.13	29 384.10	30 553.46	31 488.86	31 145.64	27 518.31
HFCs	NA,NO	26.44	1519.43	1816.13	2413.66	3015.65	3045.15	3488.91	3661.70	3930.82
PFCs	215.99	252.24	286.59	278.39	285.08	259.95	269.75	298.65	226.45	28.56
	NA,NO	30.53	24.41	21.72	23.44	28.09	34.80	32.66	34.46	39.42
Total - net with category 5	545 230.39	424 494.41	347 781.50	358 543.02	356 078.90	357 028.47	366 717.91	362 991.69	362 589.65	338 810.92
Total - without category 5	563 231.27	440 282.39	372 785.71	384 621.32	385 556.52	388 016.31	402 339.41	400 694.79	395 734.24	376 879.53

Figure 4 - Greenhouse gas emissions (without category 5 listed in table 6) from 1988 to 2009 [Tg CO2 eq.] (source - Ministry of the Environment)



6. Types of renewable energy sources

6.1. Power plants producing electricity from biomass

5.788 TWh of electricity was produced in 2010 in installations where biomass is used. As compared to 2005, the production of electricity from that source increased by 4.443 TWh, which is an increase in production by 4 times. It is estimated that in the nearest future, the growing trend for electricity production from these sources will continue, mainly due to the development of a distributed generation on the basis of the combined production of electric power and heat. The use of biomass in the co-incineration process should increasingly often include biomass

from waste and energy crops. Thus, mechanisms enforcing the use of biomass other than forest biomass were introduced (regulation of the Minister of Economy of 14 August 2008 *on the detailed scope of the duty to obtain and submit certificates of origin, settle substitution fee, purchase electricity and heat produced from renewable energy sources and the obligation to confirm the data concerning the quantity of electric energy produced from renewable energy source* (Journal Of Laws No 156, item 969, and of 2010, No 34, item 182)). Forest biomass should be used, first of all, in the wood industry, pulp and paper industry, and the plywood industry.

As of 31 December 2010 there were 18 licensed biomass power plants (including power plants producing electricity from forest, agricultural, and garden waste – 7, producing electricity from industrial wood-based and pulp and paper waste – 6, and power plants producing energy from mixed biomass – 5). Furthermore, there were 41 power plants using the co-incineration technology.

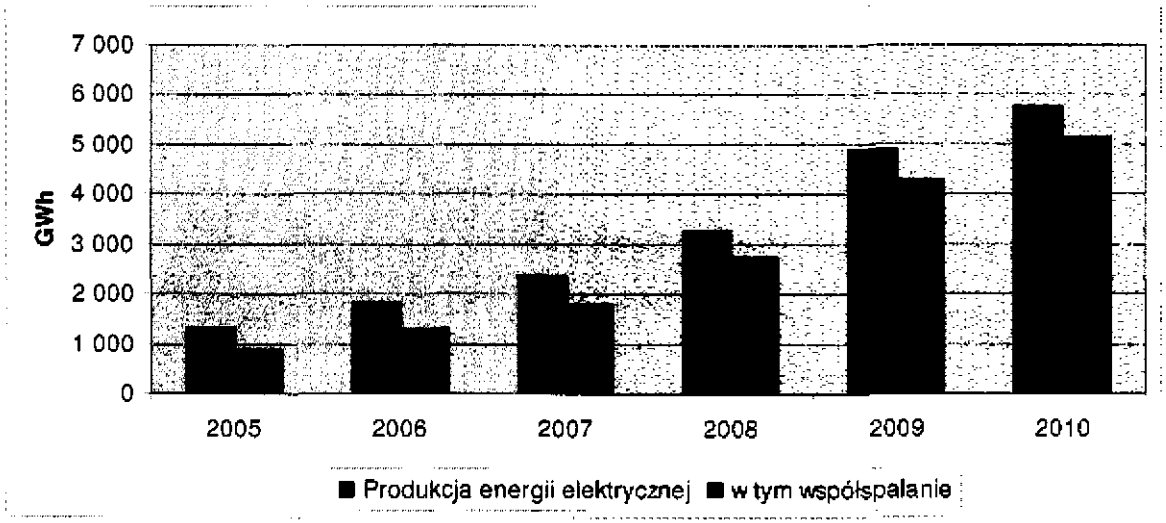
Table 8 and figure 5 show the size of electricity production and installed capacities in plants using biomass in Poland.

Table 8 - Electricity production and capacities installed in plants using biomass in Poland from 2005 to 2010[5] (source - Energy Regulatory Office)

	2005	2006	2007	2008	2009	2010
Electricity production (GWh)	1345	1818	2343	3313	4888	5788
of which is co-incineration	875	1314	1797	2752	4287	5152
Installed capacity (MW)	190	239	255	232	252	356

Figure 5 - Electricity production in plants using biomass in Poland from 2005 to 2010 (source - Energy Regulatory Office)

[5] Data on installed capacity relates only to dedicated units, not including co-incineration installations, given the large variations in the percentage share of biomass (in the entire fuel stream) in respect of those sources.



Electricity production	
of which is co-incineration	

6.2. Hydroelectric power plants

Apart from installations using biomass, hydroelectric power plants are the most important producers of electricity from renewable energy sources, as proved by over a 26% share of hydroelectricity in the total electricity produced from renewable energy sources in 2010. Still, note that the share of hydroelectricity is decreasing, which is related to the dynamic development of other RES (including particularly wind installations and biomass power plants). In 2010 we recorded the largest production of electricity in hydroelectric power plants in the entire 6-year period (for which detailed statistical data is given in this report), which was due to the large amount of rainfall and its distribution during the year. In the nearest future we expect an increase in the capacities of mainly small hydroelectric power plants. The construction of new large hydroelectric power plants in Poland is difficult due to significant investment expenditure required for such projects, and due to environmental conditions.

As of 31 December 2010 there were 727 licensed hydroelectric power plants (including: flow-of-the-river plants up to 0.3 MW - 578 installations, flow-of-the-river plants up to 1 MW - 78, flow-of-the-river plants up to 5 MW - 56, flow-of-the-river plants up to 10 MW - 6, flow-of-the-river plants over 10 MW - 6, and flow-of-the-river plants with pumped storage units - 3).

Table 9 shows the capacities installed in hydroelectric power plants from 2005 to 2010. The amount of electricity produced in hydroelectric power plants is shown in table 10, and its graphic representation is shown in figure 6.

Table 9 - The capacities installed in hydroelectric power plants from 2005 to 2010 (source - Energy Regulatory Office)

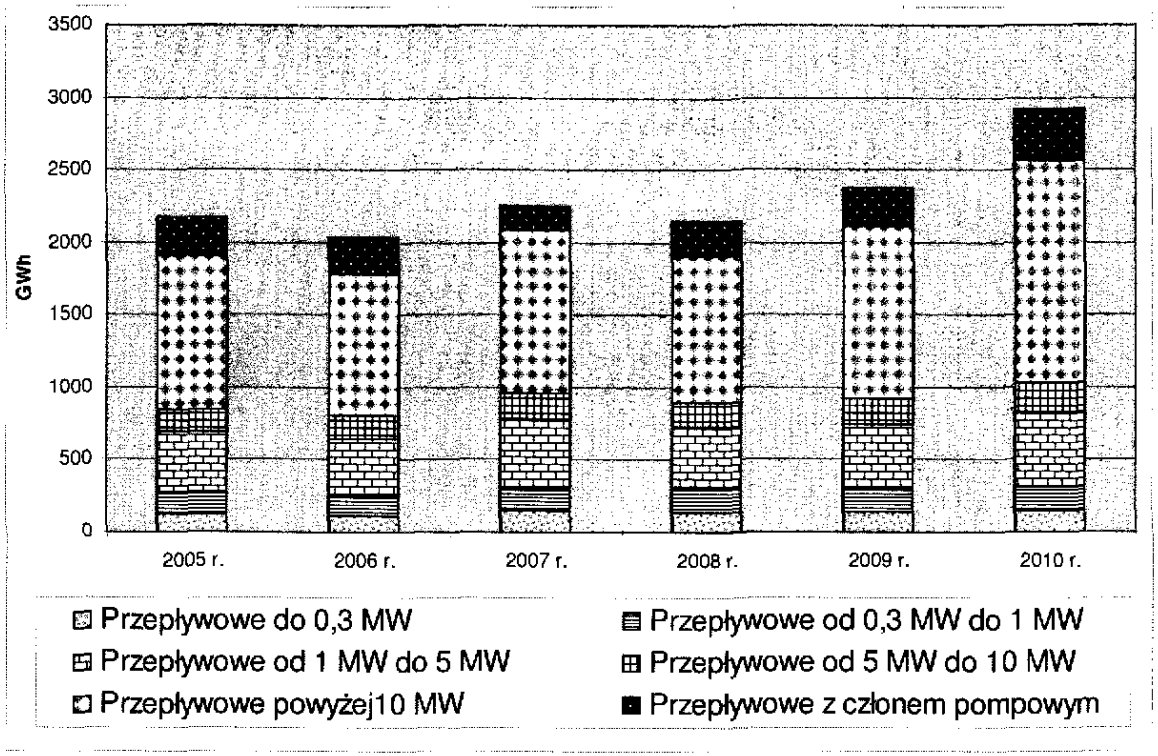
No	Type of the hydroelectric power plant	Installed capacity (MW)					
		2005	2006	2007	2008	2009	2010
1	Flow-of-the-river up to 0.3 MW		42.5	43.3	42.8	42.0	41.9
2	Flow-of-the-river from 0.3 MW to 1 MW		41.7	41.7	44.5	46.1	48.2
3	Flow-of-the-river from 1 MW to 5 MW		129.5	129.5	132.5	136.4	126.2
4	Flow-of-the-river from 5 MW to 10 MW		47.8	47.8	48.3	48.3	48.3
5	Flow-of-the-river over 10 MW		289.8	289.8	289.8	289.8	289.8
6	Flow-of-the-river with pumped storage units		382.7	382.7	382.7	382.7	382.7
	Total	852.5	934.0	934.8	940.6	945.3	937.1

Table 10 - Electricity production in hydroelectric power plants in Poland from 2005 to 2010 (source - Energy Regulatory Office)

No	Type of the hydroelectric power plant	Electricity amount (GWh)					
		2005	2006	2007	2008	2009	2010
1	Flow-of-the-river up to 0.3 MW	124.7	116.9	146.2	140.0	139.2	152.3
2	Flow-of-the-river from 0.3 MW to 1 MW	150.2	137.2	162.1	158.9	164.8	169.4
3	Flow-of-the-river from 1 MW to 5 MW	413.9	396.1	479.0	427.7	437.0	511.3
4	Flow-of-the-river from 5 MW to 10 MW	157.1	152.3	176.3	168.6	178.2	202.0
5	Flow-of-the-river over 10 MW	1063.7	977.4	1120.5	1010.5	1196.0	1532.8

6	Flow-of-the-river with pumped storage units	266.0	249.9	168.6	247.3	260.6	354.0
	Total	2175.6	2029.8	2252.7	2153.0	2375.8	2921.8

Figure 6 - Electricity production in hydroelectric power plants in Poland from 2005 to 2010 (source - Energy Regulatory Office)



Flow-of-the-river up to 0.3 MW	
Flow-of-the-river from ... to ...	
Flow-of-the-river over	
Flow-of-the-river with pumped storage units	

6.3 Wind farms

From 2005 to 2010 an increase in the production of electricity in wind power installations was observed, from 135 GWh to 1810 GWh, and installed capacities in wind farms grew over 14 times (from 83.3 MW to 1180.3 MW). The level of 1822 GWh, reached in 2010, constituted 16.7% of electricity produced from renewable energy sources, and 1.17% of the gross national electricity consumption, but it is forecast that the share of wind power installations in the production of electricity from renewable energy sources in 2020 will reach approx. 47 [6]). It should be noted that the development of wind farms is planned both on- and off-shore. Initial data for the 1st half of 2011 concerning both the installed capacity and the production of electricity from wind shows that there are still good growth dynamics in this sector.

Moreover, note that it is one of the important components of the Polish sea policy to create favourable conditions for using the potential of sea area for the production of wind energy from the so-called European wind resources over open seas, located particularly in the eastern part of the Baltic Sea coast. The issue is a part of one of the priorities of the maritime policies of the Republic of Poland entitled Improvement of Poland's energy security, which were defined in the government document "Objectives of the sea policy of the Republic of Poland by 2020". According to the text of the "Forecast of the fuel and energy demand by 2030" (annex to "The Power Policy of Poland until 2030"), the market potential of the offshore wind farms in 2020 is estimated at 1.7 TWh of electricity produced and 550 MW of installed capacity.

Currently, a draft map is being developed, indicating potential locations for offshore wind farms, under action 4.6 of the measure 4 "The executive actions programme for 2009-2012", an annex to "The Power Policy of Poland until 2030". The construction of grids at sea and coastal areas should follow the principles of Integrated Management of Coastal Areas (IMCA), the provisions of a strategic document in spatial development of Poland - "The concept of spatial development of Poland 2030" (KPZK 2030), and the requirements concerning the protection of sea environment.

As at 31 December 2010, there were 413 licensed wind power installations.

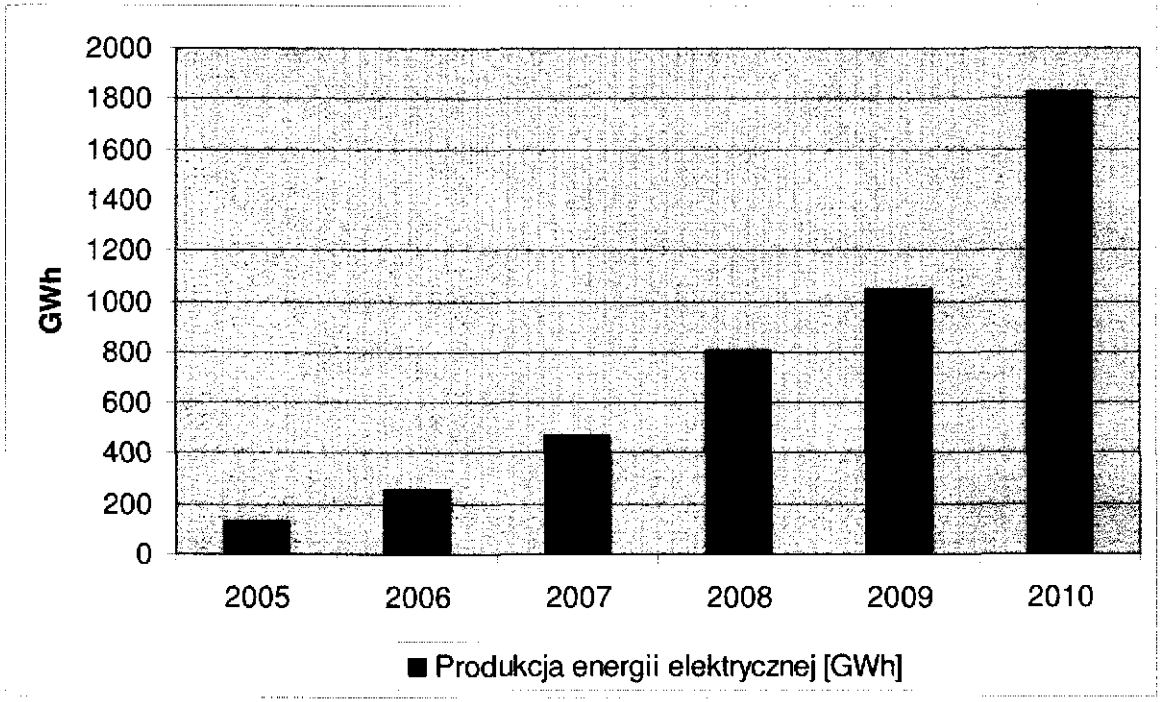
The amount of electricity produced and the installed capacities of wind farms is shown in table 11, and in figure 7.

Table 11 - Installed capacity and electricity production in wind farms in Poland from 2005 to 2010 (source: Energy Regulatory Office)

Wind farms	2005	2006	2007	2008	2009	2010
Installed capacity (MW)	83.3	152.6	287.9	451.1	724.7	1180.3
Electricity production [GWh]	135.3	257.0	472.1	806.3	1045.2	1822.0

Figure 7 - Electricity production in wind farms in Poland from 2005 to 2010 (source: Energy Regulatory Office)

[6]Source - *National renewable energy action plan.*



Electricity production [GWh]	
GWh	

6.4. Power plants producing electricity from biogas

Electricity production from biogas has risen by three times since 2005, from 105 GWh to 363 GWh in 2010. Electricity is generated from landfill biogas, biogas from the fermentation of sewage sludge in wastewater treatment plants and from biogas from agricultural biogas plants. Another promising direction for biogas, in addition to electricity and heat production (mainly CHP), is to use it as transport fuel. As at 31 December 2010 there were 144 licensed biogas plants (of which: power plants generating electricity from biogas from wastewater treatment plants - 56, power plants generating electricity from landfill biogas - 80, power plants generating electricity from agricultural biogas - 8).
The greatest amount of biogas is obtained from landfill substrate and from wastewater treatment plants. In recent years, the production of electricity and heat in agricultural biogas plants also increased. It is expected that in the future we will see a further development of such plants which use as fuel not only animal waste, but also the agricultural raw materials (biomass from energy crops), agricultural waste products, by-products or residues from the agro-food industry, and forest biomass in the methane fermentation process. Agricultural biogas plants, due to the greatest energy potential (production of biogas with quality parameters of methane-rich combustible natural gas), will in the long term constitute the dominant direction of development for this energy carrier.

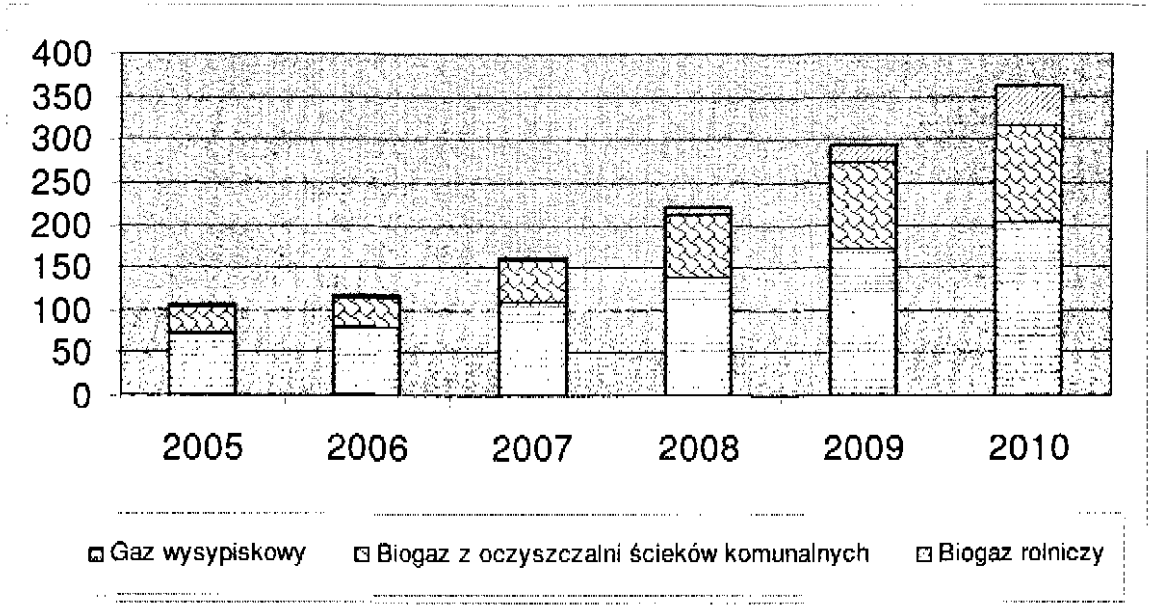
Table 12 shows the size of installed capacities in plants using biogas, and the amount of electricity generated in those plants. Its graphic representation is shown in figure 8 and 9.

Table 12 - The production of electric power and installed power in sources using biogas in Poland in 2005 - 2010 (source - ERO)

Biogas	2005	2006	2007	2008	2009	2010
Electricity production [GWh]	105	117	162	221	295	363
Landfill biogas	74	80	111	139	172	204
Biogas from wastewater treatment plants	30	35	48	74	101	112
Agricultural biogas	1	2	3	8	22	47
Installed capacity (MW)	32	37			71	
Landfill biogas	24	25	29	34	40	46
Biogas from wastewater treatment plants	7	11	16	20	24	29

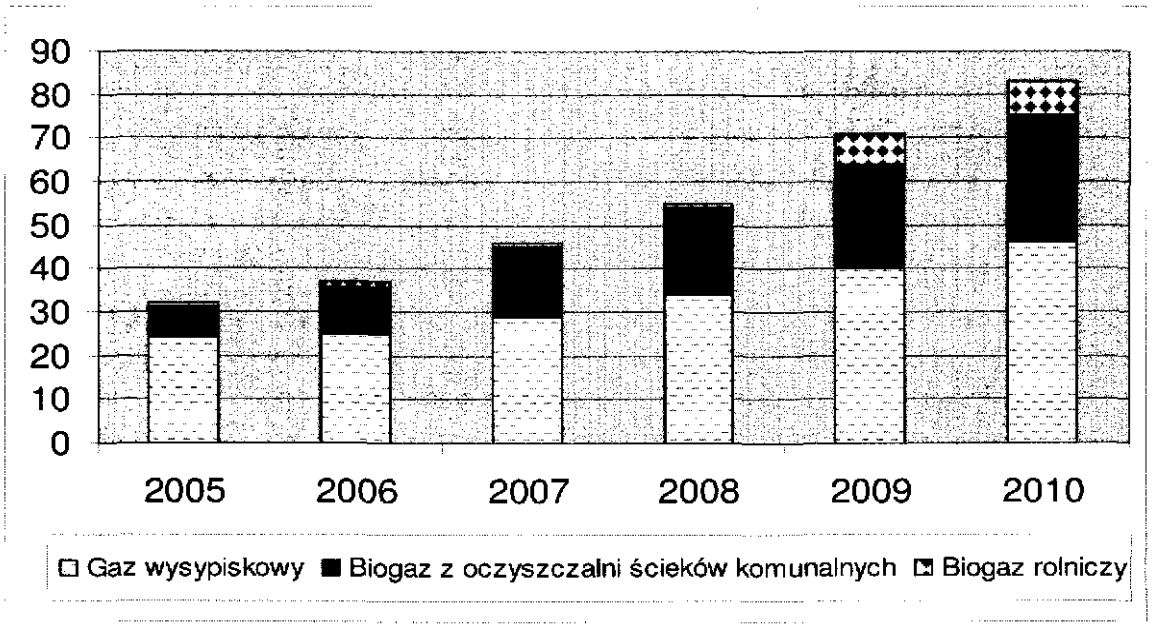
Agricultural biogas	1	1	1	1	7	8

Figure 8 - Electricity production in plants using biogas in Poland from 2005 to 2010 (source - Energy Regulatory Office)



Landfill gas	
Biogas from wastewater treatment plants	
Agricultural biogas	

Figure 9 - Installed capacities in plants using biogas in Poland from 2005 to 2010 (source - Energy Regulatory Office)



6.5. Power plants producing electricity from solar radiation

The installed capacity of photovoltaic cells in Poland is close to 1 MW, and most sources are not connected to the grid. Currently, the share of photovoltaics in the total production of electricity from renewable energy sources is negligible due to very high capital costs, and the use of photovoltaics is limited to special purposes. Following new developments in the photovoltaic technology, for example in cost-effective thin-film cell production, in the future these types of energy sources may play a greater role in the structure of electricity production from renewable energy sources.

6.6. Plants using geothermal energy

Favourable hydrogeological conditions in the immediate time frame offer great possibilities of using geothermal water only in the heat sector, as the issue concerning the use of geothermal energy for heating purposes is well recognized. The theoretical resources of geothermal energy in Poland reach 387 thousand EJ (exajoules). Poland has a significant potential and resources of geothermal energy. They are mainly

related to groundwater, the temperature of which reaches 20-130°C at depths of up to 3-4 km. However, the technical potential of geothermal energy which may be used in the nearest future, is much smaller.

According to the document: "National renewable energy action plan" (KPD), production of heat from geothermal sources (without the use of heat pumps) in 2020 is to reach only 178 ktoe (kilotons in oil equivalent). Nevertheless, KPD does not expect geothermal energy to be used for electricity production due to a too high economic calculation.

7. The promotion of electricity produced from renewable energy sources

7.1. Current support scheme

Since 1 October 2005, Poland has a support scheme for electricity produced from renewable energy sources. Pursuant to the Act – Energy Law, energy companies producing or trading in electricity and selling electricity to the final customers, final customers who are members of a commodity exchange market within the meaning of Article 2(5) of the Act of 26 October 2000 on commodity exchange markets (Journal Of Laws of 2010, No 48, item 284, as amended), in relation to transactions concluded on their own behalf on the commodity exchange market, commodity brokerage house or brokerage house referred to in Article 2(8) and (9) of the Act on commodity exchange markets, in relation to transactions conducted at the order of the final customers on the commodity exchange market, are obliged to obtain and submit to the President of the Energy Regulatory Office certificates of origin for electricity generated from renewable energy sources, or to pay a substitution fee. The support scheme introduced in Poland, which is a form of the so-called green certificates, is a market mechanism conducive to optimal development and competition. Thanks to the separation of the certificates of origin for electricity produced from renewable sources from physical energy, it is possible to trade property rights arising from these certificates on the market.

As a consequence of the separation of the physical energy from the certificates, the mechanism is complemented by the obligation imposed on energy companies who are mandatory providers to purchase the entire electricity produced from RES, and connected to the grid located in the area of the provider's service, at an average selling price for electricity in the previous calendar year, determined by the President of the Energy Regulatory Office under Article 23 (2)(18)(b) of the Act - *Energy Law.*

Additional incentives for developing renewable sources of energy include:

- 50% reduction in actual grid connection costs for RES up to 5 MW,
- obligation imposed on the power system operator to ensure primacy in the transmission of electricity from RES,
- exemption from licence fees and fees for obtaining and registration of certificates of origin which confirm that energy was produced from RES offered to energy companies producing electricity from renewable energy sources with capacity up to 5 MW.

A very important element of support for renewable energy is also the exemption from excise duty on electricity generated from RES.

To demonstrate the costs of the current support scheme, volume weighted average prices of property rights (for 1 MWh) in 2005 to 2010 are given in table 13. The prices were calculated from session transactions on Property Rights Market of the Polish Power Exchange (TGE S.A.), the table shows the amount of the substitution fee referred to in Article 9A(1)(2) of the Energy Law.

Table 13 - Volume weighted average prices of property rights in 2005 to 2010 (source - TGE S.A.)

	Instrument PMOZE* PLN/MWh	Instrument PMOZE_A** PLN/MWh
2005	175.00	unlisted instrument
2006	221.26	unlisted instrument
2007	239.17	unlisted instrument
2008	240.79	unlisted instrument
2009	247.28	267.10
2010	255.51	274.49

* PMOZE Instrument – for property rights resulting from certificates of origin which confirm the production of energy from RES until 28 February 2009
** Instrument PMOZE_A – for property rights resulting from certificates of origin which confirm the production of energy from RES since 1 March 2009. Redemption of property rights in instrument PMOZ E_A allows for a refund of excise duty in the amount of 20.00 PLN/MWh.

Table 14 – Amount of the replacement fee 2006-2010 (source: National Fund for Environmental Protection and Water Management)

	2006	2007	2008	2009	2010
The amount of replacement fee	PLN 1 958 654.79	PLN 88 990 383.17	PLN 286 267 290.94	PLN 470 333 755.16	PLN 441 063 448.23

Moreover, note that the estimated amount of costs for exemptions from license fees for energy companies producing electricity from renewable energy sources with capacity up to 5 MW was PLN 72 688 in 2010 (118 licences were issued at PLN 616 each), and 50 512 in 2009 (82 licences were issued at PLN 616 each).

Additionally, due to the fact that energy companies with a capacity up to 5 MW producing energy from renewable energy sources are exempt from fees resulting from registering the certificates of origin in the Register of Certificates of Origin, kept by TGE S.A., table 15 shows the values of exemptions from said fees.

Table 15 - The values of exemptions from fees resulting from registering the certificates of origin in the Register of Certificates of Origin from 2006 to 2010 (source: TGE S.A.)

Year	Value of exemption in PLN
2006	228 555.06
2007	332 586.73

2008	344 396.01
2009	393 688.36
2010	543 568.63
Total	1 842 794.79

7.2 Direct support from EU funds

In addition to the above mentioned systemic support, there is also direct financial support for investments relating to renewable energy, e.g. from EU funds, and mainly from the Operational Programme "Infrastructure and Environment", in particular under Priority IX "environment friendly energy infrastructure and energy efficiency." The Programme assumes a decrease of the environmental impact of the energy sector, and an increase in the efficiency of generation, transmission and distribution of energy, improvement of energy efficiency in the process of energy use and the increased use of energy from renewable energy sources. Within the above mentioned priority, measure 9.4 "Production of energy from renewable sources" and measure 9.6 "Networks facilitating reception of energy from renewable sources" are the most important ones for the development of renewable energy sources.

Additional support is provided for the development of the industry manufacturing equipment for renewable energy, under Priority X "Energy security, including diversification of energy sources", measure 10.3 "The development of industry based on renewable energy sources". The support is provided for the construction of modern technology lines manufacturing equipment used for the production of electricity and heat from renewable sources.

It should also be noted that the measures associated with the development of renewable energy sources are available both within the Operational Programme "Innovative Economy", including particularly the priority axis 1 - Research and development of modern technologies, priority axis 2 - R&D Infrastructure, priority axis 3 - Capital for innovation, priority axis 4 - Investments in innovative projects, and priority axis 5 - Diffusion of innovations, as well as from the Rural Development Programme 2007-2013, in particular within the following measures: 121. Modernisation of agricultural holdings, 123. Adding value to primary agricultural and forestry production, 311. Diversification towards non-agricultural activities, 312. Establishment and development of micro-businesses, and 321. Essential services to the population and economy in the rural areas.

The total value of all contracts for financing within the above mentioned operational programmes signed to date reaches PLN 1 199 762 367.25 (figure as at 22 April 2011).

Financial support from the EU funds may also be obtained from the Regional Operational Programmes (ROP), which are the responsibility of the individual voivodship governments. Funding may be offered to projects related to the construction of installations using all known types of renewable energy, however the types of implemented RES projects result from the character and conditions of the individual ROP. Regions use a competition procedure to select projects to be subsidized, or add the projects to the List of individual projects of the given voivodship.

Table 16 shows the status of implementing RES investments from the regional operational programme funds (16 ROP), and tables 17 and 18 present the compilation of information related to the number of filed applications and signed subsidy contracts within the above mentioned measures and priority axes of the Operational Programme “Infrastructure and Environment”, Operational Programme “Innovative Economy”, and Rural Development Programme 2007-2013.

Table 16 - The status of implementing RES investments from the regional operational programme funds (16 ROP) - as at Q2 2011 (source - Ministry of Regional Development)

Category	Intervention code	Available allocation PLN funds[7] (total for 16 ROP)	The number of contracts signed (total for 16 ROP)	The total value of all contracts signed in PLN (total for 16 ROP)	The amount of all eligible expenses in the signed contracts in PLN (total for 16 ROP)
Renewable energy - wind	39	[redacted]			
Renewable energy - solar	40				
Renewable energy - biomass	41				
Renewable energy - hydroelectric, geothermal and other	42				
Total	162				

Table 17 - The number of applications filed and contracts signed within the above mentioned measures and Operational Programme "Infrastructure and Environment" (status as at 22 April 2011) (source - Ministry of the Environment)

Measure / Sub Measure	Formally correct applications			Applications approved by the Intermediate Body of Operational Programme Infrastructure and Environment			Total allocation for 2007-2013, in PLN	Signed contracts for subsidies		
	number	value in PLN	% allocations	number	value in PLN	% allocations		number	value in PLN	% allocations

[7]calculated at 1 PLN = 3.795 EUR

		Cohesion Fund/ERRD			Cohesion Fund/ERRD				Cohesion Fund/ERRD	
9.4	212	4 634 166 513.18	306.00%	31	676 759 141.36	44.70%	1 505 846 480.13	23	548 324 985.71	36.22%
9.6	0	0.00	0.00%	0	0.00	0.00%	149 928 836.07	0	0.00	0.00
10.3	15	218 311 441.37	106.49%	0	0.00	0.00%	131 125 440.00	0	0.00	0.00
Total	227	4 852 477 954.55	271.56%	31	676 759 141.36	37.87%	1 787 900 756.20	23	548 324 985.71	30.69%

Table 18 - The number of applications filed and contracts signed within the above mentioned priority axes / Operational Programme "Innovative Economy" (status as at 15 April 2011) (source - Polish Agency for Enterprise Development, Ministry of Science and Higher Education)

Priority axis / Measure	Signed contracts for subsidies	
	Number of applications	The amount of subsidy applied (in PLN)
1.1.	1	39 150 873.32
1.3	1	59 500.00
1.4	3	2 139 405.00
1.4 - 4.1	13	45 445 606.36
1.1.	1	43 812 060.00
3.3	2	411 600.00
4.2	1	1 262 100.00
4.4	12	242 096 572.25
5.1.	4	57 002 741.00
5.2.	1	6 107 800.00
5.3.	1	68 952 941.00
Total	40.	506 441 198.93

Table 19 - The number of applications filed and approved within the above mentioned measures within the Rural Development Programme 2007-2013 (status as of 31 March 2011) (source - Agency for Restructuring and Modernisation of Agriculture)

Measure	Filed applications		Signed contracts for subsidies	
	Number of applications	The amount of subsidy applied (in PLN)	Number of applications	The amount of subsidy applied (in PLN)
[redacted]				
123	227	1 146 843 626.05	41	104 499 610.00
311	262	18 297 870.37	108	7 437 691.50
[redacted]				
312	296	51 473 854.19	54	6 993 071.00
[redacted]				
321	61	36 218 742.84	46	25 469 486.11
413/311	17	1 269 895.00	5	336 675.00
[redacted]				
413/312	21	2 702 823.00	3	259 649.00
[redacted]				
Total**	884	1 256 806 811.45	258	144 996 182.61

* applies to applications, the scope of which only partially includes issues related to renewable energy sources
** item includes only projects which as a whole concern renewable energy sources

7.3. Support from the National Fund for Environmental Protection and Water Management (Narodowy Fundusz Ochrony • rodowiska i Gospodarki Wodnej - NFO• iGW)

Following the recommendation of the government of the Republic of Poland presented in the Stability and Growth Pact, in 2009 NFO• iGW developed a Support programme for investments in renewable energy sources and high-efficiency cogeneration facilities. Funds for the programme come from fees and fines, paid by entrepreneurs under the Energy Law to a separate NFO• iGW account.

The programme was divided into three parts, two of which are related to subsidizing sources like RES, producing electricity:

1. *Programme for undertakings in renewable energy sources and high-efficiency cogeneration – Part 1) implemented directly by NFO• iGW.*

The budget of the programme is PLN 1.5 billion. The programme will be implemented until 2015. The programme is addressed to all investors undertaking to build renewable energy sources and high-efficiency cogeneration facilities with total cost exceeding PLN 10 million.

The programme includes e.g. support for the following undertakings:

- production of electricity and heat in cogeneration with the use of biomass (distributed sources with capacity below 3 MWe),
- production of electricity and/or heat with the use of biogas created in the process of sewage disposal or treatment, or decomposition of plant and animal remains,
- wind farms with capacity up to 10 MWe,
- acquiring energy from geothermal water,
- hydroelectric power plants with capacity up to 5 MWe.

Within the *Programme for undertakings in renewable energy sources and high-efficiency cogeneration – Part 1)* two competitions were held, and within the third one the call for applications was completed. The first competition was announced on 16 March 2009, and applications were accepted from 6 April 2009 to 27 April 2009. Allocated funds amounted to PLN 750 million. Within the first competition, 61 applications were filed to the NFO• iGW, for a total subsidy amount of PLN 1 045 million. Following an evaluation, 54 applications were rejected, of which 20 applications were not completed as requested, and 15 applicants sent in their resignations. 7 applications for a total requested subsidy of approx. PLN 131.67 million were listed on the ranking list.

The second competition was announced on 22 October 2009. Applications were accepted from 1 January 2010 to 1 February 2010. Allocated funds amounted to PLN 500 million. Within the second competition, 87 applications were filed to the NFO• iGW, for a total requested subsidy amount of PLN 1 452 million. Following an evaluation, 77 applications were rejected, of which 65 applications were not completed as requested, or applicants sent in their resignations. 10 applications for a total requested subsidy of approx. PLN 177.22 million were listed on the ranking list.

Taking into account past experience, gathered during the 1st and 2nd competition, as well as the information from potential investors, the National Fund for Environmental Protection and Water Management in Warsaw suggested an altered formula of the 3rd competition, introducing a subsidy commitment after initial evaluation of applications. Due to numerous problems faced by applicants with timely delivery of supplementary documents for the ecological, technical and financial evaluation, the time for submitting such documents was extended in the 3rd competition (from 3 months in the 1st competition and 1 month in the 2nd competition) to 12 months (in justified cases it may be further extended by another 3 months). The change will allow the applicants to complete the documents related to the investment and appropriately prepare all attachments to the subsidy application. The applicants will be allowed to gradually send the completed documents, at a convenient time, thereby shortening the time for the final review of the applications and speeding up the signing of the contract with the applicant. Moreover, the cost eligibility period was extended to 2015.

All applicants from the 1st and 2nd competition, who did not receive a positive evaluation, were invited to take part in the 3rd competition.

The third competition was announced on 30 July 2010. Applications were accepted from 6 December 2010 to 7 January 2011. Allocated funds amounted to PLN 1 260 million.

Within the third competition 151 applications were filed to the NFO• iGW, for a total requested subsidy of PLN 3 077.4 million.

2. *Programme for undertakings in renewable energy sources and high-efficiency cogeneration – Part 2) – implemented by the voivodship funds for environment protection and water management (WFO• iGW).*

The budget of the programme is PLN 330 million, and the implementation period will close at the end of 2014. Competitions are announced by WFO• IGW under their own rules and criteria. Subsidies are available for investments of PLN 0.5 to 10 million.

- The programme includes e.g. support for the following undertakings:
- combined heat and power generation with the use of biomass (distributed sources with capacity below 3 MWe),
- production of electricity and/or heat with the use of biogas created in the process of sewage disposal or treatment, or decomposition of plant and animal remains,
- wind farms with capacity up to 10 MWe,
- acquiring energy from geothermal water,
- hydroelectric power plants with capacity up to 5 MWe,
- generation of electricity in photovoltaic installations.

In September 2009 NFO• iGW extended contract commitments for ten WFO• iGW (Warsaw, Bia•ystok, Opole, Toru•, Gda•sk, Szczecin, Rzeszów, Wroc•aw, Olsztyn, Pozna•) for the amount of PLN 328 million. WFO• iGW organise the selection of undertakings by means of competitions according to their own criteria set by the individual WFO• iGW branches, and the selection criteria include cost effectiveness of the projects. All applications for a subsidy commitment received a positive evaluation. So far, 3 loan contracts were concluded with WFO• iGW in Gda•sk, Toru• and Bia•ystok for a total amount of PLN 14 277 207.

In addition to the above mentioned programme, there are other programmes in energy management and RES use within the National Green Investment Scheme. The following programmes are related to supporting renewable energy sources for electricity production:

1) Green Investment Scheme - Part 2 - agricultural biogas plants.
   The programme is addressed to entities (natural persons, legal persons, or organisational units without legal personality who are given legal personality by the Act of law), who undertake projects in electricity or heat production using biogas created in the process of decomposition of plant and animal remains, and production of agricultural biogas to introduce it to the distribution and direct gas network.
   The applications within the first competition were accepted until 28 September 2010. The allocation of funds in the competition was PLN 36 million, in the form of subsidies. Applicants could apply for additional funds in the form of loans, from the funds of NFO• iGW made up by fees and fines calculated in accordance with the provisions of the Act – Energy Law. During the competition, applications were filed requesting subsidies for 62 projects. The requested amount of financing in the form of subsidies is PLN 36 million, and in the form of a loan is PLN 550 million. Currently, applications are being evaluated.
2) Green Investment Scheme - Part 3 - Combined Heat and Power (CHP) plants and biogas heating plants.
   The programme is addressed to entities (natural persons, legal persons, or organisational units without legal personality who are given legal personality by the Act of law), who undertake projects in renewable energy sources and combined heat and power generation facilities using biomass only (distributed sources with nominal heating capacity up to 20 MWt).

The applications were accepted until 28 October 2010. The allocation of funds was PLN 36 million, in the form of subsidies. Applicants could apply for additional funds in the form of loans, from the funds of NFO• iGW made up by fees and fines calculated in accordance with the provisions of the Act – Energy Law. 11 applications were filed in the subsidy competition, for a total amount of subsidies equal to PLN 59.18 million. Nine applicants, together with their subsidy application, filed applications for loans from the NFO• iGW funds, which totalled PLN 75.88 million. Currently, applications are being evaluated.

7.4. Measures related to creating strategic programmes for boosting the use of renewable energy sources (RES)

The document prepared in the Ministry of Economy, "The Power Policy of Poland until 2030", which was adopted on 10 November 2009 by the Council of Ministers, included the main objectives related to the development of renewable sources of energy, which include e.g.:

1) an increase in the share of renewable energy sources in the final energy consumption to reach at least 15% in 2020, and continued growth of the index in the following years;
2) protection of forests against excessive exploitation to acquire biomass, and sustainable use of agricultural areas for RES purposes, including biofuels, so as not to allow any competition between renewable energy and agriculture, and to preserve biodiversity;
3) the use of existing weirs, property of the State Treasury, for the production of electricity;
4) increasing the degree of diversification of supply sources and establishing optimal conditions for the development of a distributed energy system based on raw materials that are locally available.

To achieve these objectives, the Power Policy of Poland until 2030 assumes that, among others, the following measures will be taken:

1) designing a path to reach a 15% share of renewable energy sources in the sustainable use of final energy, broken down into individual energy types, namely: electricity, heat, cold and renewable energy in transport;
2) retaining support mechanisms for producers of electricity from renewable sources, e.g. by means of a system of certificates of origin;
3) implementing the directions of building agricultural biogas plants, on the assumption that at least one biogas plant is set up in each municipality by 2020;
4) creating conditions to facilitate investment decisions on building offshore wind farms;
5) retaining the principle of exempting energy from renewable sources from excise duty;
6) direct support to building new renewable energy generation units and power grids that could be connected with the use of European funds and environmental protection funds, including funds gathered in the form of substitution fees and fines;
7) stimulating the development of the Polish industry which manufactures machinery for the renewable energy sector, also with the use of European funds;
8) supporting the development of technologies and building installations to obtain renewable energy from waste comprised of biodegradable materials (e.g. municipal waste with biodegradable fractions);
9) evaluation of the plausibility of using the existing damming structures owned by the State Treasury to generate power by way of taking their inventory, establishing their framework environmental impact, and devising the rules of making them available.

Furthermore, *The executive actions programme for 2009-2012*, which is an annex to *The Power Policy of Poland until 2030*, the specific measures were included to implement the above mentioned objectives. A significant part of the measures is related to the

implementation of Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 *on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC* .

One such measure is the Council of Ministers' adopting on 13 July 2010 *"Directions of development for agricultural biogas plants in Poland between 2010-2020"* , which assumes that at least one biogas plant, using agricultural biogas, is set up in each municipality by 2020, on the assumption that there are appropriate conditions in the municipalities to launch such a project.

An important component of the *"Directions of development for agricultural biogas plants in Poland between 2010-2020"* is the optimisation of the legal and administrative system in terms of establishing agricultural biogas plants in Poland, and indicating the possibilities for co-financing such installations from public funds, both national and EU funds, available within national and regional operational programmes.

The document comes across the demands concerning the need to establish a system for promoting and supporting the production of biogas and using it to produce electricity and heat. It is expected that biogas will be generated in rural municipalities and in areas with large resources of land where biomass can be obtained, which in a way constitutes a harmonization of national measures of the Government with the priorities of the Common Agricultural Policy.

The method of using agricultural biogas depends on many factors typical for the location of individual installations (distance from the grid, general and local demand for a particular energy carrier, etc.). Therefore, the document does not define the minimum or maximum capacity of the installed devices, or the method of using the produced biogas (purification and delivery to the network, electricity and/or heat production). These decisions are left to the investors that manage specific installations.

Within one year after the date of adoption of the programme by the Council of Ministers, the relevant ministers are obliged to prepare appropriate legislation to implement the priorities concerning the development of agricultural biogas plants in Poland.

The implementation of the *"Directions of development for agricultural biogas plants in Poland between 2010-2020"* is mainly related to the amendments to the *Act – Energy Law, the Act on Waste, the Act on Fertilizers and land application of fertilizers,* and implementing provisions. In addition, amendments in the *Real Estate Management Act* are considered, with the aim to define agricultural biogas plants and public interest investments. It is also expected that uniform solutions in fire safety and explosion prevention in agricultural biogas plants will be adopted.

It should be emphasized that although the *"Directions of development for agricultural biogas plants in Poland between 2010-2020"* were adopted by the Council of Ministers on 13 July 2010, the implementation of some measures had been initiated earlier. For example, a set of solutions to streamline the process of development the use of renewable energy sources including agricultural biogas plants was prepared, and it was included in the Act of 8 January 2010 amending the *Act – Energy law and certain other Acts (Journal* Of Laws No 21, item 104).

Additionally, the Ministry of Agriculture and Rural Development, implementing the "*Directions of development for agricultural biogas plants in Poland between 2010-2020",* pursued legislative tasks with the aim to remove administrative and legal barriers which hinder the development of agricultural biogas plants. The work on amendments to the Act of 10 July 2007 *on fertilisers and the land application of fertilisers* continued. The bill undergoes inter-ministerial consultations and contains the provisions which e.g. facilitate the production of fertilizer from post-fermentation products made in the process of production of agricultural biogas from the fermentation of manure and plant biomass derived from

agricultural and forest biomass. The bill sets out the rules of trading post-fermentation products and their disposal for direct agricultural use. Post-fermentation products produced in an agricultural biogas plant on a farm, and intended for agricultural use, could be used under the same rules as natural fertilizers without having to meet additional formalities.

Moreover, the procedures related to the use of waste for fertilizing or improving soil, substances produced in the process of anaerobic decomposition of manure, slurry, plant waste from agriculture and food processing were simplified during the work on the new regulation of the Minister of the Environment *on R10 recycling*. The drafted regulation is convergent with the Act *on fertilizers and land application of fertilizers*. The project was notified to the European Commission and has been submitted to the Minister of Environment to sign.

In 2010, when the regulation of the Council of Ministers on *undertakings which may have a significant environmental impact* was drafted, agricultural biogas installations with capacity up to 0.5 MW were excluded from the group of undertakings which may have a significant environmental impact. In order to evaluate the correctness of the transposition of Council Directive 85/337/EEC, a draft regulation and its justification were sent to the EC.

The regulation of the Minister of Agriculture and Food Management of 7 October 1997 *on technical conditions to be met by agricultural structures and the location thereof* is also currently undergoing revision for amendments. In 2010 consultations were held with e.g. entities interested in investing in agricultural biogas plants. Following the consultations, proposals for amendments will be prepared, to amend the provisions of the regulation which require updates or changes as regarding the removal of barriers for creating agricultural biogas plants.

Moreover, the Rural Development Programme 2007-2013 was amended in the scope of measure *Diversification towards non-agricultural activities*; the change consisted in increasing the PLN 500 000 support for investments related to the production of agricultural biogas. The above mentioned change was notified to the EC for approval.

In addition, under the provisions of *"Directions of development for agricultural biogas plants in Poland between 2010-2020"* various bodies of government and local administration are charged with relevant responsibilities in terms of providing information and education on the construction and operation of agricultural biogas installations. The campaign will be targeted at entrepreneurs, farmers, agricultural producers, and local communities. The tasks will be performed on the basis of materials, educational and journalist programmes, as well as trainings and seminars. It will be performed in cooperation with research centres and training centres, agricultural extension centres, research and development centres and the media.

On 7 December 2010 the Council of Ministers adopted *The National renewable energy action plan* – a very important document, required by Directive 2009/28/EC.

The national renewable energy action plan sets out Member States' national targets for the share of energy from renewable sources consumed in transport, electricity and heating and cooling in 2020, taking into account the effects of other policy measures relating to energy efficiency on final consumption of energy, and adequate measures to be taken to achieve those national overall targets for the share of RES in the final energy consumption.

In addition, the document defines the estimated surplus of electricity from renewable energy sources which could be transmitted to other Member States, the strategy for developing existing biomass resources and mobilising new biomass resources for different uses, and the measures to be taken to fulfil the requirements resulting from Directive 2009/28/EC. It is assumed that the increase in the share of energy produced from renewable sources will be reached based on a greater use of biomass and wind power.

7.5. Legal regulations conducive to reaching the quantitative targets in RES

An important measure which had a positive influence on the increase of the use of renewable energy sources was the above mentioned amendment to the Act – *Energy Law,* which introduced e.g. provisions related to connecting renewable energy sources to the grid, which included:

1) introducing advance payments on account of the fee for grid connection. The necessity to introduce such a solution was caused by speculative booking of locations and connection capacities in the grid. In the previous legal order, when the applicant met the formal requirements necessary to initiate the procedure of defining the connection conditions, energy system operators had no grounds to refuse issuing the terms for connection, if only there were technical and economic conditions for the grid connection and reception. The procedure did not include an analysis whether the applicant was interested in completing the investment in the foreseeable future, which resulted in blocking connection capacities. The obligation of advance payments on account of connection fees allowed for unblocking some connection capacities and reduced the chances of such adverse phenomenon occurring in the future. When the energy company which issued the connection conditions, refuses to conclude a connection agreement, the advance payment is returned to the applicant;
2) disciplining grid companies to obey deadlines for issuing grid connection conditions. A fine of no less than PLN 3 000 per every day of delay is charged for failing to meet the deadline. To provide complete transparency of the grid connection process, companies involved in the transmission or distribution of electricity are obliged to ensure public availability of information on entities which apply for a connection with voltage exceeding 1 kV, the location of the connection, connection capacity, the date of issuing connection conditions, the date when connection agreement is concluded and electricity is delivered, as well as the information on the available connection capacity for electricity stations or groups thereof, which are a part of a grid with rated voltage exceeding 110 kV, and estimated changes in the connection capacity within the next 5 years from the date of publishing the data.

In addition, according to the above mentioned act, energy companies involved with the transmission or distribution of gas fuels should define the legal basis and conditions for connections to the distributing gas network for agricultural biogas installations. The said Act includes a support instrument, by means of correlating the system promoting agricultural biogas with the functioning scheme of certificates of origin for electricity generated from renewable energy sources. The instrument is expected to become a significant stimulus for potential investors to pursue projects related to biogas plants construction. Agricultural biogas purified to reach quality parameters of methane-rich CNG or high-nitrogen CNG, will be pumped to distribution networks or local installations constructed on the initiative of local governments. At the same time, the act contains provisions under which the economic activity in the field of agricultural biogas production is done on the basis of the registration in the register of agricultural biogas producers. The register is held by the President of the Agricultural Market Agency, who is in charge of monitoring and control of energy companies producing agricultural biogas.

In addition, another measure facilitating investments in agricultural biogas plants is the provision in the regulation of the Council of Ministers of 9 November 2010 *undertakings which may have a significant environmental impact* (Journal of Laws No 213, item 1397) excluding the installations with capacity up to to 0.5 MW from undertakings which may have a significant environmental impact.

Furthermore, we need to mention the Act of 23 October 2009 *amending the act on income tax on natural persons and the act on lump-sum income tax on certain income gained by natural persons* (Journal of Laws No 201, item 1541) which assumes that revenue from disposing, for consideration, of certificates of origin received by energy companies generating energy from renewable energy sources upon request referred to in Article 9e(3) of the Act – Energy law, shall be subject to taxation similar to that of revenues from a business activity.

The use of electricity from biomass is boosted by the amendment introduced by the regulation of the Minister of Economy of 23 February 2010 *amending the regulation on the detailed scope of the duty to obtain and submit certificates of origin, settle substitution fee, purchase electricity and heat produced from renewable energy sources and the obligation to confirm the data concerning the quantity of electric energy produced from renewable energy source* (Journal Of Laws No 34, item 182) which extends the definition of biomass to include cereal grains which do not comply with quality requirements for cereal in intervention buying set forth in Article 4 of the Commission Regulation (EC) No 687/2008 of 18 July 2008 *establishing procedures for the taking-over of cereals by intervention agencies or paying agencies and laying down methods of analysis for determining the quality of cereals* (OJ L 192 of 19.07.2008, p. 20) and cereal grains which are not subject to intervention buying.

The possibility to use cereal grains for energy purposes was expected both by the energy sector and by the agricultural sector, which encounters problems with disposing its products which are not suitable for consumption. The specifics of agricultural production, dependent on weather conditions, show that 5 – 10% of the general plant production volume is not suitable for food production, or its usefulness is significantly limited.

Profitability of agricultural production is low, as a result of which the grounds lie fallow or withdrawn from agricultural production by afforestation. Providing a possibility to use those grains for energy purposes allowed for the development of crops, and thus for including to biomass production land which thus far lay fallow. An additional benefit is the maintenance of soil in the right agricultural condition and the production of agricultural biomass for energy purposes, available locally or regionally. It should be emphasized that the use of cereal grains useless in terms of consumption for energy related purposed does not pose a threat to the food market; it is a logical and viable alternative to agricultural production on areas where food production is not possible. Also, it should be noted that the use of agricultural biomass, including grain, for energy purposes is common in many countries (e.g. Sweden, Finland, USA, Canada).

The normative act that facilitates the development of renewable energy sources is the Regulation of the Minister of the Environment of 15 June 2009 on *detailed conditions for granting public aid on undertakings related to the search and exploration of thermal waters* (Journal of Laws No 97, item 814) which identified the opportunities for financial support for research concerning the search and exploration of thermal waters.

In addition, the Ministry of Economy is currently working on the act *on renewable sources of energy*, which will include provisions to facilitate investments in such energy sources.

7.6. Future actions aimed at increasing the share of electricity from renewable energy sources

Poland, recognizing the need for legislative transparency in developing RES, intends to extract and systematise support mechanisms for energy from renewable energy sources included in the current legislation. The first step of transferring the system of support for energy from renewable sources should apply to legal regulations, subject to transitional periods for the functioning of RES support mechanisms. New principles of supporting the

development of energy produced from RES are to be designed. The support will vary depending on the carrier of renewable energy, installed capacity of energy generating equipment, and the date of launching or upgrading the installation. New principles will support the development of distributed renewable energy sources, establish the conditions to preserve the already acquired rights for investments completed or initiated, define their duration, and will allow to reduce the burden on the final user. Detailed solutions will be included in the law *on renewable energy sources.*

Legislative intentions planned in Poland will result in the economic rationalization of the existing support mechanism for RES, which also provide for increased investments in new capacities of energy generation. The development of energy from renewable energy sources is based on the principles of rational use of existing resources of the energy. It is one of the objectives of the climate-energy package, which implements the conclusion of the European Council of March 2007. In order to ensure that the objectives of Directive 2009/28/EC are met, it is required to prepare many analyses of the renewable energy market, continuously monitor the production of energy across the renewable energy sector and broken down into individual technologies which use RES for the production of electricity. Poland is also facing the possibility of a substantial acceleration of technological development and modernization of the existing energy infrastructure. The implementation of these activities must be supported by the government administration in order to coordinate the activities at the national level and to use consistent, flexible and most effective support mechanisms. The new, planned regulations will therefore aim at directing a greater systemic and multi-faceted support system for the sustainable development of the renewable energy sector. It should be noted that the statutory level of regulation will provide for a proper coordination of activities for the development of RES and thus for achieving even greater benefits as regarding the protection of environment as invaluable goods of the entire society.

The efforts planned with the view to increase RES will require the introduction of a number of changes in the legislation concerning: the definitions, general objectives and the necessary measures to achieve these objectives, the rules for calculating the share of renewable energy, administrative procedures, regulations and codes, information, and certification of installers, guarantees that electricity was generated from renewable energy sources, access to education and reporting.

The planned act *on renewable energy sources* is the main legislative instrument intended to systematically increase the share of energy from renewable sources in the total gross energy demand. The regulation will be aimed at, among others, implementing a unified and clear system for producers of green energy, which would provide sufficient investment incentive for building a new generation capacity, thus increasing the share of renewable energy. This system will be based on the mechanism of the so-called certificates of origin, just like it is at present. The suggested mechanism will depend on the RES technology and it will take into account e.g. the degree of return on investment, technical progress, including the reduction of technology costs, and the estimated effective period of plant operation. At the same time, the system will introduce a simplified way of calculating the replacement fee, and remove the threat of annual, uncontrolled growth of the fee, resulting in increasing electricity prices. The introduction of a minimum guaranteed level of income into the support system is an additional regulation allowing for a more efficient use of resources and the elimination of investment risk barriers. The analyses demonstrated that such a regulation would significantly increase investor interest in RES technologies.

From the point of view of the development of renewable energy, a stable and long-term support system will be crucial to ensure investment security for entities interested in building energy generating units.

Poland, aiming at increasing the share of renewable energy generated in individual systems and for the needs of individual households, will strive to provide direct support for such installations, and to calculate the energy produced in them and include it in the relevant statistics.

7.7. Future actions aimed at developing the transmission and distribution grid with regard to the target amount of electricity from renewable energy sources

According to *Energy Law*, the responsibility for the development of the transmission and distribution grid, in order to consider the target amount of electricity from renewable sources, while maintaining the security of power system operation, shall be borne by energy companies involved in the transmission or distribution of electricity. They are the companies designated by the President of Energy Regulatory Office as power systems operators in the grid area where they conduct their business on the basis of a license for transmission or distribution issued by the President of the ERO. The President of ERO designates operators upon the request of grid owners.

The companies are required to draw up development plans to meet the present and future energy demand for the area of their operation. Development plans should take into account the local spatial development plan or the directions of the municipality development as defined in the study of conditions and directions of spatial management. It should be noted, however, that the study of conditions and directions of spatial management is not the basis for issuing administrative decisions, so if there is no local spatial development plan, energy companies may not base their development plans to meet present and future energy demands for the area solely on the findings of the study. When there is no local spatial development plan, location of the investment should be based on the decision according to the zoning approval, which pursuant to Article 4(2) of the Act of 27 March 2003 on *spatial planning and land development* (Journal of Laws No 80, item 717, as amended) may be divided, depending on the investment, into: decision on the location of the public interest investment, or decision on land development conditions. Development plans regarding the present and future energy demands in the area of the company's operation shall be made by energy companies for periods of at least three years, and they shall include, in particular, undertakings related to modernization, expansion or construction of the grid and the acquisition of potential new sources of gas, electricity or heat, including renewable energy sources. The plans include also projects concerning the modernization, expansion or construction of connections to the grids of other countries. The plans should define the planned manner of investment financing, expected revenues necessary to implement the plans and the anticipated schedule for the investment. Pursuant to the Act – *Energy Law,* draft plans should be approved by the President of ERO, as they affect the development and calculation of tariffs for transmission and distribution services, which are the source of funds for the development of transmission and distribution grid. Development plans should ensure the optimization of costs and expenses incurred by an energy company, in relation to the planned grid expansion effects. Costs and expenses in each year should not cause excessive growth of prices and electricity tariffs, while continuity, reliability and quality of supply are ensured.

Recognizing the need to develop the grid infrastructure for the transmission of electricity, including energy from RES, the work on new legislation is in progress in Poland, aimed at facilitating the expansion of the network as needed. New regulations will provide for a more dynamic development of the infrastructure, which will significantly improve the access to the system also for the distributed RES installations.

It is also planned to introduce regulations facilitating grid access for producers of renewable energy, in accordance with Directive 2009/28/EC.

8. Impact of further development of renewable energy sources on the public finance sector, including the state budget

The following factors may indirectly or directly affect budget expenditure decrease and revenue increase:

1) increase in revenue as a result of investments related to the increase in the capacity of renewable energy generation;
2) increase in revenue due to growth of employment in the sector of renewable energy, construction, agriculture, etc.;
3) increase in revenue due to the growth of the industry manufacturing equipment for renewable energy;
4) increase in revenue from local taxes from completed investments;
5) decrease in expenditure for measures related to preventing negative effects of the conventional energy sector (including e.g. environment and health protection);
6) decrease in expenditure related to other measures aimed at increasing energy supply security (including the decrease in dependence from states exporting energy raw materials);
7) improving the national balance of commodity and payments (limiting the import of energy raw materials and simultaneous decrease in the flow of money abroad).

The following factors may indirectly or directly affect budget revenue decrease:

1) decrease in revenue as a result of declining revenues of companies involved in the extraction, sale, transport and use of fossil fuels;
2) decrease in revenue from excise duty as a result of increased share of electricity generated from renewable sources.

Furthermore, increased electricity production from RES will result in decreasing revenue from excise duty in 2010-2020, as shown in table 20.

Table 20 - Influence of the increased production of electricity from RES according to the assumed targets[8] on the decrease of excise duty revenue

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Estimated consumption of electricity from renewable energy sources	GWh	12 678	14 845	16 478	18 338	19 875	21 605	23 374	25 416	27 828	32 400
Decrease in revenue from excise duty as a result of increased share of electricity generated from renewable sources (assuming that excise duty for electricity is PLN 20.00 for 1 MWh)	PLN thousands	253 560	296 900	329 560	366 760	397 500	432 100	467 480	508 320	556 560	648 000
Decrease in revenue from excise duty as a result of increased share of electricity generated from renewable sources – accumulated value	PLN thousands	465 920	762 820	1 092 380	1 459 140	1 856 640	2 288 740	2 756 220	3 264 540	3 821 100	4 469 100

[8] Targets set out in the National Renewable Energy Action Plan

9. Conclusions related to attaining indicative targets

The strategic objective of the Polish energy policy, resulting e.g. from Directive 2001/77/EC, was to increase the use of renewable energy sources and reach a 7.5% share of electricity produced from renewable energy sources of the gross national energy consumption in 2010.

In spite of a dynamic growth in the production of electricity from RES, the target assumed for 2010 was not reached, which primarily resulted from the large increase in electricity demand in the recent years. Forecasts concerning electricity consumption in Poland, included in the *Energy Policy of Poland until 2030*, indicated that the consumption would reach approximately 141 TWh in 2010. At such a level of consumption, the share of electricity produced from renewable resources of the national gross electricity consumption would be guaranteed to reach 7.73%. However, early data of the Energy Market Agency indicate that the consumption of electricity by the Polish economy reached 156 TWh in 2010, which eventually brought the index to 6.98%.

Note, nevertheless, that electricity production from renewable energy sources reached 10.895 TWh in 2010, and it was higher than the amount expected in the "*National renewable energy action plan*" (10.618 TWh). The increased growth rate allows us to hope that despite greater electricity consumption, mandatory indicative targets for 2020 included in the *National renewable energy action plan* will be achieved. Reaching the indicative targets for 2020 will also be facilitated by measures taken at present and in the future, described in point 7.5, 7.6 and 7.7 herein.

It should also be noted that the growth rate in the installed capacity of renewable energy sources is also higher than expected in the *National renewable energy action plan*, as demonstrated by the data for 2010 and Q1 2011.