



Renewable Energy in Poland

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1. Renewable energy market in Poland - facts and figures

Global warming caused by carbon dioxide and methane emissions into the atmosphere, reaching increasingly high levels since the industrial revolution, is a key ecological, social and economic threat to our civilisation. In March 2007 the European Council issued a directive commonly referred to as „3 x 20%”, requiring EU member states to reduce CO₂ emissions by 2020 through investments in renewable energy sources. Under the directive in question Poland is obligated to reduce CO₂ emissions through increased use of renewable energy sources (RES) in energy production. By 2020, energy from renewable sources must account for 15% of gross final energy consumption in Poland.

In a bid to implement EU's decisions regarding energy, Poland adopted assumptions for internal energy policy enshrined in a document entitled "Poland's energy policy till 2030" covering a long-term development strategy for the power sector, fuel and energy demand forecasts, an implementation action plan, and projections for the use of renewable energy sources and development of this segment of the power sector.

„3 x 20%" objectives

- 20% reduction of CO₂ emissions (reduction of greenhouse gas emissions, parallel efforts to cut emissions by even 50% by 2050 from 1990 levels),
- 20% reduction of energy consumption through improved energy efficiency,
- 20% share of energy from renewable sources in final energy consumption.

Source: Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009.

The following are the key objectives of Poland's energy policy on RES:

- Increase the share of renewable energy sources in final energy consumption to 15% by 2020 and 20% by 2030,
- Achieve a 10% share of biofuels in the transport fuel market by 2020 and maintain this level in the years to follow,
- Protect forests against excessive exploitation aimed to obtain biomass and promote sustainable use of farmland for RES-related purposes, including biofuels, with a view to preventing competition between energy generation from renewables and agriculture.¹

Currently, given the actual technological potential that can be used in economic terms, Poland's renewable energy resources suffice to meet almost half of the demand for final energy (heat, electricity, transport fuels). This potential will be growing as RES application technologies keep evolving proportionally to the development of RES technologies. If realised, Poland's potential will allow to meet 48% of the demand for renewable energy by 2050. This potential is currently scarcely used, at a level of 17%.

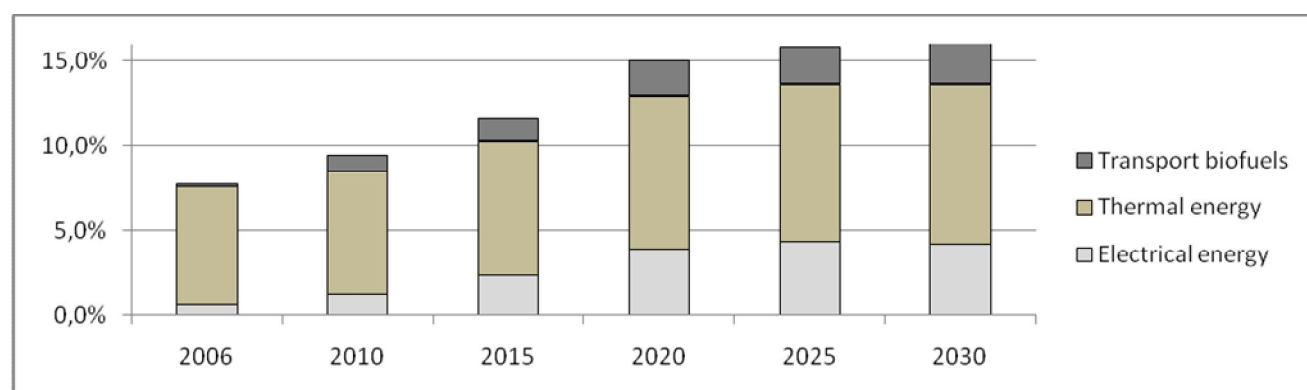
¹ "Poland's energy policy till 2030", 2009, Poland's Ministry of Economy

Table 1. Projected consumption of gross final energy from RES by energy type [ktoe].

	2006	2010	2015	2020	2025	2030
Electrical energy	370.6	715.0	1516.1	2686.6	3256.3	3396.3
Solid biomass	159.2	298.5	503.2	892.3	953.0	994.9
Biogas	13.8	31.4	140.7	344.5	555.6	592.6
Wind	22.0	174.0	631.9	1178.4	1470.0	1530.0
Water	22.0	174.0	631.9	1178.4	1470.0	1530.0
Photovoltaics	0.0	0.0	0.0	0.1	1.1	2.1
Thermal energy	4312.7	4481.7	5046.3	6255.9	7048.7	7618.4
Solid biomass	4249.8	4315.1	4595.7	5405.9	5870.8	6333.2
Biogas	27.1	72.2	256.5	503.1	750.0	800.0
Geothermal	32.2	80.1	147.5	221.5	298.5	348.1
Solar	3.6	14.2	46.7	125.4	129.4	137.1
Transport biofuels	96.9	549.0	884.1	1444.1	1632.6	1881.9
Sugar/starch bioethanol	61.1	150.7	247.6	425.2	443.0	490.1
Rapeseed biodiesel	35.8	398.3	636.5	696.8	645.9	643.5
2nd generation bioethanol	0.0	0.0	0.0	210.0	240.0	250.0
2nd generation biodiesel	0.0	0.0	0.0	112.1	213.0	250.0
Biohydrogen	0.0	0.0	0.0	0.0	90.8	248.3
TOTAL Gross final energy generated from RES	4780.0	5746.0	7447.0	10387.0	11938.0	12897.0
Gross final energy	61815.0	61316.0	63979.0	69203.0	75480.0	80551.0

Source: APAX Consulting Group Sp. z o.o. basing on FUEL AND ENERGY DEMAND FORECAST TILL 2030 report, 2009, (attachment No. 2 to „Poland's energy policy till 2030”).

Chart 1. Projected consumption of gross final energy from RES by energy type [share in total gross final energy].



Source: APAX Consulting Group Sp. z o.o., basing on FUEL AND ENERGY DEMAND FORECAST TILL 2030 report, 2009, (attachment No. 2 to „Poland's energy policy till 2030”).

To implement EU guidelines and projections contained in "Poland's Energy Policy till 2030", Poland must build tens of thousands of energy facilities in the years 2008-2020. Construction of RES facilities is estimated to cost over 60 billion PLN and can be supported by European funds and environmental protection funds.

2. Segments of renewable energy market

2.1. Biomass

Biomass is regarded as the most abundant source of renewable energy in Poland. It is so cheap to use that it can compete with fossil fuels. Solid biomass resources are currently based on surpluses of straw and hay, woodchip, energy crops and farm waste.

Biomass is chiefly used for the production of thermal energy in distributed generation low- and medium-capacity units (individual boilers and local boiler plants) and for the production of electrical energy in coal-fired condensing boilers in high-capacity power stations in co-firing process.

Poland's renewable energy sector currently pins high hopes on biomass as it can be used for energy generation in direct burning of solid and gaseous biofuels and be processed into liquid fuels used for the production of electrical and thermal energy. The coming decade is expected to see the conversion of farm products (straw, rapeseed oil, potato) plants (trees, branches) and other products into thermal energy.

*Power capacity of plants producing energy from biomass in Poland in 2009: 246.490 MW
Volume of electrical energy produced from biomass in 2009: 334 015.572 MWh*

Development prospects for energy production from biomass:

- Very abundant biomass resources in Poland,
- Biomass components attractive price-wise in the fuel market,
- Possibility to use biomass for the production of both thermal and electrical energy.

2.2. Biogas

Biogas, obtained from fermentation process, can be used for various purposes:

- For electrical energy production – 1 m³ of biogas can provide 2.1 kWh of electrical energy,
- For thermal energy production – 1 m³ of biogas can provide 5.4 kWh of heat,
- In electrical and thermal energy cogeneration systems – 1 m³ of biogas can provide 2.1 kWh of electrical energy and 2.9 kWh of heat,
- As vehicle fuel, and
- Can be transmitted to gas network.

According to government calculations, Poland can produce 5-6 billion m³ of biogas with natural gas parameters per year. It is estimated that farm and agri-food industry by-products alone can suffice to generate around 1.7 billion m³ of biogas per year which accounts for ca. 10% of domestic gas consumption.

Table 2. Development of biogas plants in Poland till 2010.

Specification	Type	Unit	2008	2009	2010
Power installed MW	Heat	MW _{th}	36	42	49
	Electrical energy	MW _e	8	9	11
Energy production	Heat	TJ	634.2	740.1	846.1
	Electrical energy	GWh	48.5	55.1	61.8

Source: Renewable energy sources as an element of regional development, EC BREC IBMER, 2009.

The Ministry of Environment assumes that more than 2 thousand of farm-scale biogas plants with a power capacity of ca. 1 MW each will be built in Poland by 2020. Construction of a 2.1 MW biogas plant costs ca. 28 million zlotys. Around 50% of investment costs will be covered by investors and the remaining funding will come from subsidies or preferential credits.

Power capacity of biogas power plants in Poland in 2009: 51.000 MW

Number of biogas power plants: 87

Development prospects for energy production from biogas:

- Energy generation independent from atmospheric conditions,
- Precise biogas production schedule, not always possible in the case of renewable energy sources,
- Possibility to match energy volumes with current demand,
- Easy storage,
- Possibility to produce engine fuel from biogas,
- High energy efficiency.

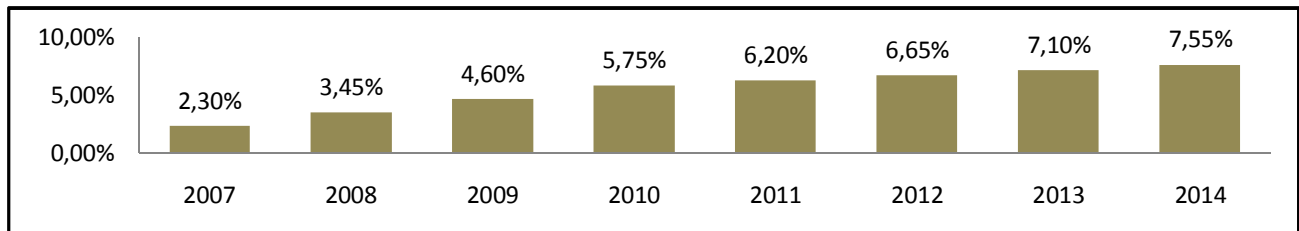
2.3. Biofuels

The term biofuels refers to transport fuels produced from organic materials. Biodiesel (produced from vegetable oils) and bioethanol (produced from sugar and starch plants) are the most common forms of biofuels called 1st generation of biofuels. The international biofuel market is dominated by bioethanol, but biodiesel still reigns in EU countries, accounting for over 80% of total biofuel production in volume terms. Biodiesel is so popular because it can be used in its pure form or as any mix with diesel oil.

Over the next few years the 2nd generation of transport fuels produced from non-consumable / energy crops and waste (wood, grass and certain types of waste) will appear in the Polish market. 3rd generation biofuels, derived from hydrogen, will appear in the market by 2020. Hydrogen share will be on a constant increase, while the 2nd generation biofuel market will become saturated around 2050. Towards the end of the period in question 1st generation biofuels will be ousted from the market.

Considering the minimum share of biocomponents in the transport fuel market, the following are the respective values that Poland is expected to achieve in the years 2010-2014.

Chart 2. Share of biofuels in the transport fuel market in Poland till 2014.



Source: APAX Consulting Group Sp. z o.o. basing on GUS (Central Statistical Office) data, 2009.

According to data released by the Energy Regulatory Office, domestic production of biofuels totalled 15.6 thousand tonnes in the first half of 2009, while total biofuel sales in the domestic market reached as many as 60.4 thousand tonnes. This means that the volume of imported biofuels offered in the Polish market is three times higher than production at home. 45.5 thousand tonnes of pure ester were sold in Poland in the first half of 2009, with only 2.1 thousand tonnes of the fuel being produced internally. Total sales of diesel-based biofuels reached 14.9 thousand tonnes, including 13.5 thousand tonnes produced at home (90% of market demand). In the first half of 2009 Poland did not report sales of biofuels based on engine petrols.²

Development prospects for biofuels:

- Low excise tax on biofuels,
- Limited process of vehicle wear - reduced corrosion of engine and exhaust removal system elements.

2.4. Photovoltaics

Photovoltaics technology allows to convert sunlight into electrical energy. Photovoltaic installations are regarded as the most environment-friendly technology for electrical energy generation. Production of energy obtained through systems of solar cells does not involve harmful emissions of gases, waste or noise into the environment.

Currently photovoltaic is most widely applied in the form of standalone systems generating from a few to a few thousand W of energy. There are a few dozen installations of their kind working currently in Poland. The systems are mainly installed in difficult access areas or locations far away from power lines. Photovoltaics applications include navigation systems in the Baltic Sea, demonstration systems, installations for drying and ventilating agricultural produce, lighting in individual recreation homes, power supply for warning lights.

Photovoltaic systems have a number of merits, including infallibility and no need for maintenance. Among faults mention is chiefly due to costs related to the production and installation of such systems. Also, with technological advances and growing costs of energy generated by conventional methods, attention is drawn to the fact that the payback time for investments in solar energy becomes increasingly short. Over the past 50 years the efficiency of photovoltaic installations has increased from a few to a dozen-so percent. During the same time the price of 1W of the nominal power of a photovoltaic installation has dropped from 1500 USD/W to ca. 4.5 USD/W.³ Forecasts predict that the

² Wirtualny Nowy Przemysł, 2009.

³ <http://www.fotowoltaika.net>, 2009.

prices of electrical energy produced by photovoltaic systems may catch up with the prices of energy generated in conventional power stations as early as 2020.

In 2006 the power of photovoltaic systems installed in Poland totalled 440 kW, with autonomous systems (mainly road signs) accounting for ca. 75%. According to experts, photovoltaic in Poland has huge technological potential.⁴ It is assumed that by the mid 21st century solar power plants will provide ca. 30% of energy.

In view of increasing profitability of these solutions and expanding road network, there is no doubt that the solar energy sector will continue to develop at a level of 100-200 kW annually.

Development prospects for photovoltaic systems:

- No emissions of pollutants, noise or waste in energy production process,
- Inexhaustibility of solar energy,
- Possibility to generate direct current that can be easily converted into alternating current,
- Possibility to store energy.

2.5. Wind energy

227 licensed wind power stations are currently sited in Poland which means that a single turbine installed has a capacity of nearly 2MW. Wind power density per km² in Poland ranks among the lowest in Europe. Installed wind power per capita is 0.0037 kW per km² of water area and 0.45 kW per km² of land area.

Among wind farms built in Poland mention is due to 14 existing professional projects and 13 facilities under construction.

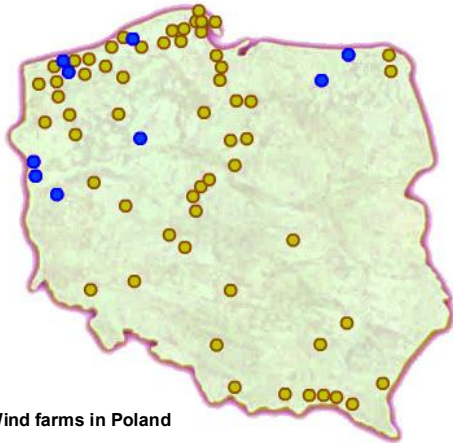
Location	Power
Barzowice	5.1 MW
Cisowo	18 MW
Zagorze	30 MW
Lisewo	10.8 MW
Tymien	50 MW
Puck	22 MW
Kisielice	40.5 MW
Kamiensk	30 MW
Jagniatkowo	30.6 MW
Losina near Slupsk	48 MW
Gniezdzewo	22 MW
Karscino	69 MW
Lebcz	8 MW
Suwalki	41.4 MW

Location	Power
Malbork	18 MW
Gorzycza	-
Rzepin	-
Zajaczkowo and Widzino	90 MW
Tychowo	50 MW
Jeleniewo	30 MW
Sniatowo	32 MW
Kozanki Wielkie	-
Margonin	120 MW
Kuslin	>70 MW
Mieleszyn	120 MW
Dobrzyn on Vistula	34 MW

Source: Polish Wind Energy Association (PSEW), 2009.

⁴ Czysa Energia, December 2008, 12(86), 2008, p. 28-29.

Wind farm locations in Poland in 2009.

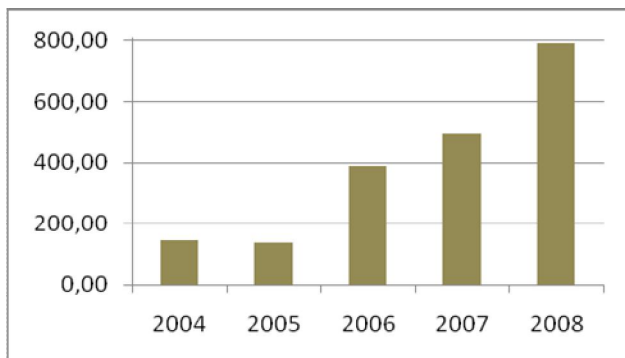


Wind farms in Poland

Wind energy production in Poland in 2008 totalled 729 GWh, and the share of wind energy accounted for ca. 0.5% of total domestic consumption of electrical energy. Wind farms installed in this country currently have a power capacity of ca. 666 MW. Even though the market is developing at a very quick pace (ca.171 MW added in 2008), we are still lagging way behind European leaders. According to a report of the Polish Wind Energy Association entitled "Assessment of wind energy development opportunities and potential in Poland till 2020", installed power capacity of 14000 MW and generated electricity at a level of 30 TWh are the realistic targets for the wind energy segment till 2020.

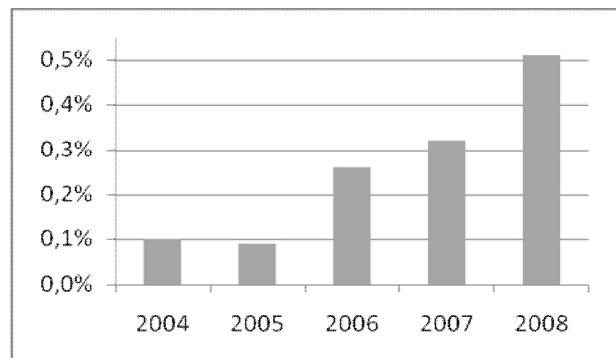
Source: APAX Consulting Group Sp. z o.o. basing on data from the Polish Wind Energy Association (PSEW), 2009.

Chart 4. Wind energy production in Poland.



Source: APAX Consulting Group Sp. z o.o. basing on PSEW data, 2009.

Chart 5. Share of wind energy in domestic consumption of electricity in Poland



Source: APAX Consulting Group Sp. z o.o. basing on PSEW data, 2009.

Wind power potential is put at 6.0 – 8.0TWh of electrical energy per year. According to government plans, wind turbines should generate 2.3% of domestic energy consumption by 2020. To achieve this goal Poland must install at least 2000 MW of wind power.

Wind energy resources are strongly interconnected with local climate and terrain conditions. Particularly good wind conditions occur along the Baltic coast, especially in its western stretch, and in Poland's north-eastern corner. Investors planning construction of wind power plants can also consider other locations, especially areas lying at higher altitudes above sea level, areas without terrain roughness, and unforested areas of hills and slopes in southern Poland. Such areas can also be found in the Sudety, Beskid Slaski and Zywiecki mounting ranges, in the Bieszczady mountains, the Dynowskie Plateau, the Hump of Lubawa, and in Kielce area.

Wind farm power capacity in Poland in 2009: 666.332 MW

Amount of electricity generated by wind farms in 2009: 499 235.352 MWh

Development prospects for wind energy:

- Low exploitation costs of wind energy generation,
- No fuel costs (wind is immune to the risk of fuel price fluctuations which allows to eliminate the impact of fuel price fluctuations on the economy),
- Wind farms do not require much space and do not hinder activities such as farming or gardening,
- Inexhaustibility of wind as energy source,
- Absence of high risk in technology application (like, for example, reactor breakdown in a nuclear power plant).⁵

3. Legal regulations pertaining to the renewable energy sector in Poland

3.1. Certificates of origin

The system of certificates of origin has been launched with a view to promoting investment in RES. A certificate of origin is a document confirming production of electrical energy derived from RES. A certificate of origin is issued by the President of the Energy Regulatory Office (ERO) upon an application submitted by renewable energy producer. According to legal regulations, producers of energy from RES and enterprises trading in and selling such energy to recipients not using it for their own purposes (that is, not to end users) are required to submit certificates of origin in their possession to entities they sell energy to. Energy enterprises selling energy to end users are required to:

- Obtain a RES certificate of origin and submit it to ERO President for redemption, or
- Pay a substitution fee calculated as envisaged by legislation in force.

Certificates of origin have property rights attached thereto. They are granted to energy producers not selling energy to end users. Individual types of property rights can be traded on the RES Property Rights Market of the Polish Power Exchange.

The current system of certificates supports the development of new unconventional energy generation installations. The fastest tempo of power growth has been reported by the wind power segment. A further expansion of agricultural biogas plants can also be expected in the near future. Such projects will be supported by a system of certificates of origin for biogas, modelled upon already existing certificates of origin for wind energy.⁶

3.2. Energy generation licensing

Procedures pertaining to "power generation" licences have been set out in the Energy act and in the Act on the freedom of economic activity. Such licences have the form of administrative decisions issued to applicant entities, empowering them, under administrative law, to pursue economic activity in the sector in question.

⁵ <http://www.elektrownie-wiatrowe.org.pl>, 2009.

⁶ <http://www.archiwum.ekologia.pl>, 2009.

The obligation to obtain a licence rests with the entrepreneur intending to produce fuels or energy for commercial purposes, excluding:

- Production of solid or gaseous fuels,
- Production of electrical energy in sources with total installed electric power capacity not exceeding 50 MW not classified as renewable energy sources or sources producing electrical energy in cogeneration,
- Production of heat in sources with total installed heat power capacity not exceeding 5 MW.

Licences are issued by ERO President. As the applicant company must precisely document having "technical capability guaranteeing the correct pursuance of activities", a possibility exists to obtain a promissory licence upon the start of investment process.

3.3. Conditions for connection of installations producing energy from RES to the grid

The following is step-by-step procedure conducive to the connection of installations producing energy from RES to the grid:

- Investor submits an application to energy distributor, including an expertise assessing the impact of production installations on the power system,
- If the installation is to be connected to a 110 kV grid, investor is also required to provide a description of the investment project, including the planned number, power capacity and types of wind turbines (in the case of wind farms), power request, as well as a 1:25000 map showing the location of the installation and a 110/SN transformer station,
- Distributor processes the application and sets out connection conditions - at this stage distributor can submit comments for expertise,
- Distributor sends the application back together with a draft agreement on the connection to the grid - signature of the agreement means that the investment process aiming to connect the production unit to the grid can begin,
- In cases where grid parameters in the chosen location do not allow to connect an installation with capacity stated in power request, the operator offers connection conditions basing on the actual grid capacity.

In the case of installations with a production capacity of up to 2 MW, applications are processed basing on a simplified procedure, not requiring an expertise attached.

3.4. Legal conditions for wind farm construction

Construction of wind farms must be preceded by a range of necessary steps. Conditions that must be met prior to wind farm construction are specified in table below.

Table 5. Conditions to be met prior to construction of wind farms.

Location procedure	<ul style="list-style-type: none"> • Provisions regarding possibilities of RES project construction entered into a study of conditions and directions of land use, • Application submitted for adoption of a local area plan or for a planning decision, • Resolution to start the development of a local area plan adopted by the commune council, if this procedure is chosen, • Local area plan adopted / planning decision issued.
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Environmental procedure	<ul style="list-style-type: none"> • Application for a decision on environmental constraints submitted to the relevant administrative authority, • Motion for opinion regarding the need to produce an environmental report and its scope filed by the organ handling the application with Regional Director for Environmental Protection and County Sanitary Inspector, • Public consultations held, • Investor's application, approvals, community comments and requests examined by the organ handling the application, • Decision on environmental constraints issued and go-ahead for the project given.
Building permit procedure	<ul style="list-style-type: none"> • Assessment of the project's impact on the environment or assessment of the project's impact on the Natura 2000 network carried out, • Permits, approvals or opinions of administrative bodies, including building permit, obtained by investor.

Source: APAX Consulting Group Sp. z o.o., 2009.

To obtain a permit for construction of a wind farm, investors are also required to obtain a decision on the connection of installations producing energy from RES to the grid, according to the procedure described above.

3.5. *Obligation to purchase energy from renewable sources*

The Polish Energy act imposes an obligation to purchase energy from renewable sources:

- Energy companies producing electrical energy and enterprises dealing with energy trading and sale to end recipients are obliged to purchase electrical energy generated in RES or to produce electrical energy from RES.
- Enterprises dealing with heat trading and sale are obliged to purchase heat generated in grid-connected RES units,
- Enterprises dealing with transmission and distribution of electrical energy whose grid is connected to RES are obliged to purchase all electrical energy generated in such sources.

Providers of energy from renewable sources are treated on a priority basis. Grid operators are obliged to make sure that RES energy providers get priority in the provision of transmission services in the area of electrical energy and energy used for heat production.

4. Investments in the RES market in Poland


Investors show greatest interest in wind power generation that is currently developing at the fastest pace compared to other investments in energy derived from RES. In the period between 2007 (276 MW) and the end of 2008 (451 MW), power installed in 227 wind energy sources licensed by ERO President increased by 70%. The biomass sector is also attracting robust interest, especially in view of its high growth potential given the fact that arable land in Poland accounts for 60% of this country's area. And this means that the potential to obtain cheap biomass is very high.

Table 6. Selected key investments in renewable energy sources in Poland in the last 3 years.


Facility	Location	Power [MW]	Launch	Investment value
Wind farms	Kisielice	40.5	2007	50 million EUR
	Jagniatkowo (Lake Ostrowo)	30.6	2007	160 million EUR
	Kamiensk	30	2007	30 million EUR
	Suwalki	42	2009	250 million PLN
Biomass fuelled thermal and electric power plants	Electric power plant in Ostroleka - co-firing of steam coal and biomass	200	2007	11 million PLN
	Plonsk – biomass fuelled heat and power plant	12	2008	22.6 million PLN
	Electric power plant Kielce - biomass fuelled power block	16.4	2008	5.06 million PLN
Biogas plants	Liszkowo	2.1	2009	40 million PLN
Solar installations	Voivodship hospital in Czestochowa	n/a	2007	4 million PLN
	10 solar installations in 10 newly built houses in a residential estate in Lublin	n/a	2007	1 million PLN


Source: APAX Consulting Group Sp. z o.o., 2009.

Descriptions of investments in RES in Poland

Investment:	Biomass fuelled heat and power plant and modernisation of the town's heating system.	
Location:	Plonsk – town and gmina (commune, local administrative unit) in the Mazovian Voivodship	
Investor:	Przedsiębiorstwo Energetyki Ciepłej Sp. z o.o. in Plonsk; Przedsiębiorstwo Projektowo-Handlowo-Usługowe JUWA in Białystok	
Contractor:	GROS-POL Sp. z o.o. in Poznan	
Funding:	Preferential loan granted by the National Fund for Environmental Protection and Water Management (53% of project cost) Subsidy from the EcoFund (33% of project cost) Own funds	
Project value:	33.7 million PLN	
Facility details:	<p>The key elements of the project covered modernisation of the existing central heat source aiming to adjust it to biomass burning and modernisation of transmission lines and heat transfer stations. Energy generated therefrom is regarded 100% "green". The annual "green" energy output will total ca. 11 thousand MWE. Over 25 thousand tonnes of biomass will be burnt per year and culm consumption will drop by 70%. The plant will have a capacity to handle and burn biomass from ca. 800 hectares of energy crops. The use of a renewable energy source and an installation allowing to generate heat and electricity in a single process (so-called cogeneration) basing on biomass burning will help</p>	

	reduce coal consumption and cut emission of pollutants, including carbon dioxide, by over 35 tonnes a year.
Reference:	NFOSiGW (National Fund for Environmental Protection and Water Management) Information Bulletin, Heat from Biomass for Plonsk, 17 April 2008; www.nfosigw.gov.pl,2009; www.pecwplonsku.li.pl, 2009.

Investment:	Biogas fuelled heat and power plant
Location:	Liszkowo – village with a population of ca. 5 thousand, located in the Kuyavian-Pomeranian Voivodship, county Inowroclaw, commune Rojewo
Investor:	Agrogaz Sp. z o.o. and Aufwind Schmack Nowa Energia Sp. z o.o.
Contractor:	Agrogaz Sp. z o.o. in Poznan
Project value:	ca. 40 million PLN
Project description:	 <p>Biogas production technology used in the plant in Liszkowo is based on solutions provided by Schmack Biogas AG, already proven in Germany, Austria, Holland, Japan and Luxembourg. "Liszkowo" produces energy from vegetable waste, including material from the Bonduelle vegetable processing plant in Gniewkowo.</p>
Facility details:	Biogas is used for electricity and heat generation. The installation will produce biogas from vegetable waste for the production of electrical energy using renewable energy sources. The project has a total power capacity of 2.1 MW and occupies a total area of 2.3 ha.
Reference:	www.agrogaz.pl/projekty.html, 2009; www.egospodarka.pl, 2009.

Investment:	Wind Farm Suwalki
Location:	Suwalki - town with county status in north-eastern Poland in the Podlachian Voivodship, covering an area of 65.24 km ² , with ca. 70 thousand residents.
Investor:	International Energy Concern RWE Innogy Essen
Funding:	The project received various size funding from Irish, Polish and Belgian banks, the German investor and a Polish design company belonging to RWE.
Project value:	Ca. 250 million PLN
Facility details:	 <ol style="list-style-type: none"> 1. Wind turbine type - Siemens SWT-2.3-93 2. Nominal power – 2 300 kW 3. Number of turbines - 18 4. Total power – 41 400 kW 5. Annual output - at least 80,000,000 kWh 6. Total height - 150.6 m 7. Minimum wind speed - 4 m/s 8. Maximum wind speed - 25 m/s 9. Avoidance of CO₂ emissions - at least 80,000 t/year
Reference:	www.wiatraki.suwalki.pl, 2009; www.forum.suwalki.pl,2009; www.elektrownie-wiatrowe.org.pl, 2009; inzynieria.com/projekty.aid, 2009.

Plans to invest in renewable energy in the coming years have been declared by the biggest energy companies operating in Poland, including:

- RWE – to build wind farms with a power capacity of 300 MW by the end of 2015,
- Tauron Polska Energia – to earmark 8.6 billion PLN for investments in RES,
- PGE – to invest in wind farms with a power capacity of 1000 MW by 2016,
- Enea S.A., and
- Dalkia Polska.

5. Renewable energy research and development

Research into RES development is carried out by Polish institutions of higher education. Among higher schools engaged in R+D into RES special mention is due to Technical Universities (including Silesian, Warsaw and Wrocław Technical Universities), Warsaw University of Life Sciences (SGGW) and private institutions of higher learning.

R+D in RES area is also conducted by institutes, associations, clusters and technology parks. The past few years have seen a particularly dynamic development of clusters and technology parks strongly involved not only in R+D into energy, but also in RES promotion. Clusters and technology parks comprise the following entities:

- Innovation-oriented enterprises,
- Higher schools and scientific institutions,
- Local government units,
- Providers of energy/ecological technologies and equipment for innovative power generation.

Clusters and technology parks support the research and development of renewable energy sources and to promote, implement and popularise EU's "3x20" energy policies in Poland. Activities pursued by those institutions include:

- R+D into renewable energy, especially into the development of technology used for the production of energy from RES,
- Support for actions aiming to improve the condition of the natural environment,
- Support for innovations within RES area,
- Organisation and running of training sessions and seminars within RES area,
- Advisory services and consultations with experts from academic milieus,
- Paid placements for academic workers delegated by cluster members
- Support for SME's in obtaining financial means.

Some clusters pursuing activities in the RES area in Poland:

- 3x20 Cluster,
- Euro-Centre Science and Technology Park
- Polish Renewable Energy Cluster,
- Lower Silesian Renewable Energy Cluster,
- Lublin Ecoenergy Cluster,
- Lesser Poland/Subcarpathian Clean Energy Cluster.

6. Trade associations and organisations and institutions

Poland boasts numerous organisations, associations and institutes dealing with RES, including:

- Polish Economic Chamber of Renewable Energy (PIGEO) - established on 12 October 2004 as a self-regulatory trade organisation.
In pursuance of its objectives the Chamber aims to:
 - Integrate, represent and strengthen the position and competitiveness of entrepreneurs, institutions and individuals working for the development of the renewable energy sources market at home and abroad;
 - Help shape legislation regulating the development of the RES market, monitor the implementation of regulations and intervene if not observed;
 - Increase and facilitate investor access to finance for RES projects, particularly from EU's structural funds and state appropriated funds;
 - Promote Poland's RES industry at home and abroad;
 - Create a friendly climate around the renewable energy sector among the public and state and local government authorities;
 - Popularise the knowledge of investment needs and possibilities, investment management and RES-related benefits among the Chamber's members and local government authorities;
 - Contribute to coordination and cohesion of sectoral policies (economy, power industry, agriculture and rural development, environmental protection) within the scope of RES market development.⁷

- Polish Wind Energy Association (PSEW) - non-governmental organization established in 1999 (formerly known as „VIS VENTI Association for Supporting Wind Energy”). The Association gathers leading companies active on the wind power market in Poland: investors, developers, turbine and components manufacturers, both from Poland and abroad.
The organisation conducts the following activities:
 - Active participation in consultations on the legislative framework (laws, ordinances), sectoral strategies, policies and programmes, activities aiming to introduce new legal solutions supporting the development of wind energy applications in Poland;
 - close cooperation with the Ministry of Economy, the Ministry of Environment and other ministries directly or indirectly linked with the power industry and renewable energy sources;
 - cooperation with the European Commission's Directorate General for Energy and Transport, Directorate General for Environment, Directorate General for Research;
 - cooperation with Euro MP's and parliamentarians from Sejm and Senate Commissions;
 - popularisation of wind energy knowledge, particularly information about benefits ensuing from the use of wind for the production of electrical energy and Poland's potential for developing the wind energy generation sector;

⁷ Polish Economic Chamber of Renewable Energy (PIGEO), 2009

- organisation of the Wind Energy Forum and annual "Wind energy market in Poland" trade conferences; participation in national and international trade conferences in the capacity of an expert on wind energy generation in Poland.⁸
- Institute for Renewable Energy (EC BREC IEO) – founded in 2001 by a team of experts of the former EC Renewable Energy Center (EC BREC/IBMER).

The Institute's mission is to generate and use the up-to-date scientific and technical knowledge in the area of RES. The main task of the Institute is to bring to the market players modern technologies, which have been elaborated either by own staff or other R+D domestic and foreign institutions. The key clients for the Institute's products and services are small and medium size enterprises, local authorities, corporative clients (e.g. due-diligence) and independent RES energy producers (e.g. feasibility studies).⁹

Among other organisations and associations one can list:

- Polish Foundation for Energy Efficiency,
- Institute for Eco-development,
- Polish Chamber of Power Industry and Environmental Protection,
- Polish National Energy Conservation Agency,
- Polish Chamber of Biomass,
- Polish Solar Energy Society ISES,
- Polish Society for Electrical Energy Transmission and Distribution,
- Polish Association of Renewable Energy.

7. Support for investors from EU funds

Entrepreneurs investing in RES can apply for EU finance from the following programs for years 2007-2013.

Programme	Action/ priority	Purpose / voivodship	Budget (million EUR)
Infrastructure and Environment Operating programme	Action 9.1 High-efficiency energy generation	<ul style="list-style-type: none"> • Construction of cogeneration units producing electrical energy and heat, meeting the requirements for high-efficiency cogeneration set out in directive 2004/8/WE, • Reconstruction of cogeneration units producing electrical energy and heat so that they can meet the requirements for high-efficiency cogeneration set out in the directive, • Conversion of thermal power plants into cogeneration units meeting aforementioned requirements. 	84

⁸ Polish Wind Energy Association PSEW, 2009.

⁹ Institute for Renewable Energy (EC BREC IEO), 2009.

Programme	Action/ priority	Purpose / voivodship	Budget (million EUR)
	Action 9.4 Generation of energy from renewable sources	<ul style="list-style-type: none"> Projects for the construction or capacity increase of small hydro power stations up to 10 MW and units producing electrical energy from biomass or biogas with the minimum value of 10 million PLN, Projects for the construction or capacity increase of units producing electrical energy using wind energy or solar and geothermal heat with the minimum value of 20 million PLN. 	352
	Action 9.5 Generation of biofuels from renewable sources	Projects worth 20 million PLN and more, for the construction of plants or installations for the production of liquid biocomponents and biofuels.	70,5
	Action 9.6 Power grids capable of carrying energy from renewable sources	Construction and modernisation of power grids allowing to connect units generating energy from RES. In view of the so-called demarcation line, the minimum value of a project is 20 million PLN.	47
	Action 10.3 Development of industrial facilities for RES	Construction of plants producing equipment necessary for realisation of projects that will be supported within POIS actions 9.4 and 9.5. The minimum value of a project is 20 million PLN.	27.4
Regional operating programmes	Environment, hazard prevention and power generation	Mazowieckie (Mazovian) Voiv.	198
	Development of infrastructure for environmental protection	Podlaskie (Podlachian) Voiv.	62
	Natural environment	Warmińsko-Mazurskie (Warmia and Masuria) Voiv.	93
	Environment and environment-friendly power generation	Pomorskie (Pomeranian) Voiv.	62
	Infrastructure for environmental protection	Zachodniopomorskie (Western Pomeranian) Voiv.	61
	Conservation and rational use of environment	Kujawsko-Pomorskie (Kuyavian-Pomeranian) Voiv.	118
Regional operating programmes	Natural environment	Wielkopolskie (Greater Poland) Voiv.	174
	Protection and management of natural environment resources	Lubuskie (Lubusz) Voiv.	70
	Improvement of the condition of the natural environment and ecological and flood safety	Dolnośląskie (Lower Silesian) Voiv.	129

Programme	Action/ priority	Purpose / voivodship	Budget (million EUR)
	Environmental protection	Opolskie (Opole) Voiv.	43
	Environment	Slaskie (Silesian) Voiv.	181
	Environmental protection	Lodzkie (Lodz) Voiv.	171
	Development of infrastructure for environmental protection and energy generation	Swietokrzyskie (Holy Cross) Voiv.	101
	Environment and clean energy	Lubelskie (Lublin) Voiv.	156
	Environmental protection and hazard prevention	Podkarpackie (Subcarpathian) Voiv.	170
	Infrastructure for environmental protection	Malopolskie (Lesser Poland) Voiv.	93
Innovative Economy Operating Programme	Action 1.4. Support for targeted projects	Improvement of entrepreneurs' innovativeness through the application of results of R+D work carried out for their needs.	331
	Action 4.1. Support for implementation of R+D work	Improvement of innovativeness levels in enterprises including through supporting the application of results of R+D work carried out as part of action 1.4.	331.5
	Action 4.4. New investments with high innovation potential	Investment projects (including necessary educational and advisory activities) regarding the application of new technological solutions in production and services (applied internationally for no longer than 3 years).	1. 207
Rural Development Programme	Action: Modernisation of farms	Investments aimed to start or modernise the production of agricultural food or non-food products, including products earmarked for energy generation purposes.	1.800
	Action: Increasing the added value of basic farm and forest production	Investments solely aimed to process agricultural products into food or non-food products, including products used for energy generation purposes (e.g. for the production of biofuels - oils, ethyl alcohol).	1.100
	Action: Basic services for rural economy and population	Investments aimed to use, generate or distribute energy derived from renewable sources (e.g. biomass, solar, geothermal, wind energy).	1.500
Total budget			8.732,4

Source: APAX Consulting Group Sp. z o.o. basing on www.funduszeuropejskie.gov.pl, 2009.

There are also many other financial institutions supporting the development of renewable energy sources in Poland. Some examples:

Institutions dealing with environmental protection	Institutions dealing with farmland development
<ul style="list-style-type: none"> • National Fund for Environmental Protection and Water Management, • EcoFund, • Voivodship Environmental Protection and Water Management Funds, • Small Grants Programme GEF. 	<ul style="list-style-type: none"> • Foundation of Assistance Programmes for Agriculture, • Agricultural Property Agency of the State Treasury, • Agricultural Foundation.

8. Legislation governing the renewable energy market

The following legal acts have been adopted with a view to supporting the establishment of a system of expenditure of EU funds:

- Within EU legislation:
 - Directive 2001/77/WE of the European Parliament and of the Council on the promotion of electricity produced from renewable energy sources in the internal electricity market.
 - Directive 2003/30/WE of the European Parliament and of the Council on the promotion of the use of biofuels or other renewable fuels for transport.
- Within Polish legislation:
 - Biocomponents and liquid biofuels act,
 - Energy act,
 - Environmental protection act,
 - Act on the release of information about the environment and its protection, society's involvement in environmental protection and on environmental impact assessments,
 - Nature protection act,
 - Building act,
 - Water act,
 - Ordinance of the Council of Ministers on National Indicator Goals for 2008 – 2013,
 - Ordinance of the Minister of Economy establishing detailed provisions regarding the obligation to obtain certificates of origin and to present them for redemption, payment of substitution fee, purchase of electrical energy and heat generated in renewable energy sources and obligation to confirm data related to the amount of electrical energy generated in a renewable energy source.