

POLISH INFORMATION AND FOREIGN INVESTMENT AGENCY

Energy Sector in Poland

Sector profile



Polish Information and Foreign Investment Agency 2013

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Energy sector in the world

The access to raw materials, the generation and transmission of electricity are among the primary issues determining the efficient operation of an economy. Assuming a global economic growth of 2.8 per year until 2040 (including 4.5% in non-OECD countries and 1.9% in the OECD) and a 35% improvement in energy utilization efficiency in this period, the growth of demand in this sector is estimated at 1.3% per annum. This growth will also vary for the respective sources of energy. According to forecasts, the annual average growth of demand for oil-based energy until 2040 will amount to just 0.5% with the peak of demand falling around 2030.

On the one hand, demand for oil will be curbed by high prices, technological advances and environment protection policies, on the other, it will be fuelled by emerging markets, recording growing income, and the popularization of private transportation. Renewable sources will see the fastest growth – according to Statoil's forecast, this sector will grow at a pace of 8.9% per annum.

The energy sector has always been immensely popular with investors. Despite the drop in the value of foreign direct investment in the sector of the supply of electricity, gas and water by 28% in 2012 (effect of the persisting economic crisis in developed countries), the share of the sector in global FDI amounted to 8.9%.² The sector also has a nearly 5% share in the value of global cross-border mergers and takeovers.

¹ Statoil, Energy Perspectives 2013.

² UNCTAD, World Investment Report 2013, share in FDI carried out by sovereign wealth funds.

Sector overview in Poland

In 2012, the production of primary energy (i.e. acquired directly from renewable and non-renewable natural resources) in Poland amounted to 3035.6 PJ. Coal remains the most important raw material (hard coal and lignite); it accounts for 80% of the energy produced in Poland.

The next sources in line are peat and wood (6.6%), natural gas (high-methane natural gas and high-nitrogen natural gas, jointly 5.3%), solid waste fuels (3%) and industrial waste (2%). The share of renewable sources was very low: liquid biomass fuels and biogas jointly supplied only 1.3% of produced energy, water and wind: 0.8% and geothermal energy had a negligible share in the balance of primary energy.

Table 1. Production and consumption of primary energy in Poland, 2012.

Sauraa	Production		Consumption	
Source	PJ	Share	PJ	Share
Hard coal	1 887.7	62.2%	1 776.6	40.6%
Lignite	533.1	17.6%	532.1	12.2%
Crude oil	28.9	1.0%	1 068.9	24.4%
Natural gas	160.3	5.3%	569.4	13.0%
Peat and wood	201.5	6.6%	201.5	4.6%
Other	224.1	7.4%	223.9	5.1%
Total	3 035.6	100.0%	4 372.5	100.0%

Source: Central Statistical Office, Fuel and energy economy in 2011, 2012

Disparately different proportions applied to the consumption of primary energy which in 2012 amounted to 4 372.5 PJ. The share of hard coal and lignite amounted to 52.8%, crude oil 24.4% and natural gas 13.0%. The difference in production and consumption structures was chiefly the result of the import of crude oil. Domestic generation of crude oil-based energy catered for a mere 3% of the consumption of energy from this source. Poland also imported natural gas and surplus in production over coal consumption in 2012 was primarily reflected in the growth of stock.

Production of electricity

In 2012, the electricity generation capacity of Polish power plants and combined heat and power plants amounted to 38.1 GW.³ 82% of electric power was delivered by Main Activity Producer Combined Heat and Power (CHP) Plants (i.e. producing energy for distribution in sales in the domestic energy system) using traditional fuels (hard coal: 54.5%, lignite: 25.2%, gas: 2.3%). The next 6.3% was generated by wind power plants. Hydro power plants (until recently the main source of green energy) were capable of delivering 5.7% of the generation capacity. Autoproducer Combined Heat and Power (CHP) Plants, producing electricity and/or heat primarily for the purposes of own industrial plants, accounted for the remaining 5%.

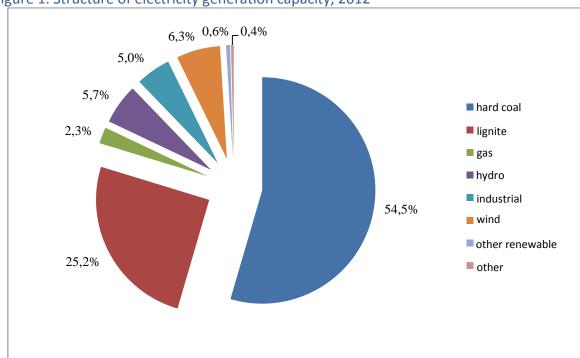


Figure 1. Structure of electricity generation capacity, 2012

Source: Energy Market Agency

Main polish CHP plants and power plants are presented in table 3 and figure 2.

³ Source: Energy Market Agency; as at end of Q3 2012.

Table 2. Main CHP plants and power plants in Poland.

Table 2. Wan	Table 2. Main CHP plants and power plants in Poland. Electricity					
No.	Name	Location	generation capacity	Maximum heat capacity		
1	BOT Elektrownia Bełchatów	Rogowiec	5298	-		
2	Elektrownia Kozienice	Kozienice	2820	-		
3	BOT Elektrownia Turów	Bogatynia	2106	-		
4	Elektrownia Połaniec	Połaniec	1800	-		
5	Elektrownia Rybnik	Rybnik	1775	-		
6	Zespół Elektrowni Dolna Odra	Nowe Czarnkowo k. Gryfina	1742	-		
7	PKE SA Elektrownia Jaworzno III	Jaworzno	1535	372 MWt		
8	BOT Elektrownia Opole	Brzezie k. Opola	1532	-		
9	ZE PAK Elektrownia Pątnów I	Konin	1200	-		
10	PKE SA Elektrownia Łaziska	Łaziska Górne	1155	196 MWt		
11	PKE SA Elektrownia Łagisza	Będzin	840	425 MWt		
12	PKE SA Elektrownia Siersza	Trzebinia	786	36.5 MWt		
13	Elektrownia Ostrołęka	Ostrołęka	647	-		
14	ZE PAK Elektrownia Adamów	Turek	600	-		
15	Elektrownia Skawina	Skawina	575	511 MWt		
16	ZE PAK Elektrownia Konin	Konin	488	-		
17	ZE PAK Elektrownia Pątnów II	Konin	474	-		
18	Elektrownia Stalowa Wola	Stalowa Wola	350	-		
19	PKE SA Elektrownia Halemba	Ruda Śląska	200	58 MWt		
20	PKE SA Elektrownia Blachownia	Kędzierzyn Koźle	165	174 MWt		

Source: Energy Market Information Center

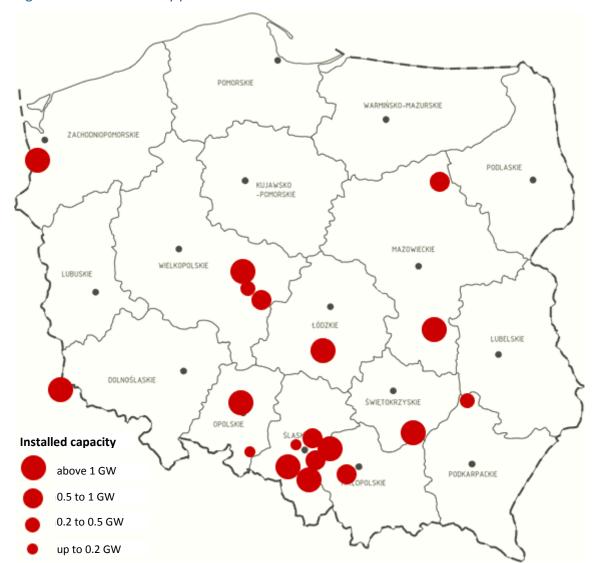


Figure 2. Main electricity production centers in Poland

Source: Energy Market Information Center

The effects of modernization process occurring in the Polish energy industry include numerous investment in the construction of new or expansion of existing power units. Please note that the official strategy for the development of the energy industry in Poland takes into account the use of nuclear power. Considering significant and recurring controversies surrounding this source of power, plans concerning the construction of a nuclear power plant in Poland should be treated with a considerable reserve.

Table 3. Power plants and CHP plants under construction: under construction, expanded and planned.

Power plant / CHP plant	Investor	Planned capacity	Fuel
EC Zgierz	PGE	20 MW	Hard coal, lignite, biomass, gas, oil
Elektrownia Rybnik	EDF	900 MW	Hard coal and biomass
EC Zabrze (new cogeneration unit)	Fortum	130 MW +180 MW	Hard coal and biomass
EC Nowa - Dąbrowa Górnicza	Tauron	50 MW	Hard coal and gas
Elektrownia Jaworzno	Tauron	910 MW	Hard coal
Elektrownia Kozienice (power unit no. 11, super-critical parameters)	Enea	900 - 1000 MW	Hard coal
Elektrownia Opole (power units no. 5 and 6)	PGE	2 x 900 MW	Hard coal
Elektrownia Ostrołęka	Energa	1 000 MW	Hard coal
Elektrownia Północ, Rajkowy	Jacek Strzelecki, Radwan Investments GmbH, Kulczyk Holding	2x1000 MW	Hard coal
Kopalnia Murcki-Staszic and Mysłowice-Wesoła	Katowicki Holding Węglowy	40 - 60 MW each	Hard coal
EC Tychy	Tauron	50 MW	Hard coal
EC Zofiówka	Spółka Energetyczna "Jastrzębie" SA	75 MW + 110 MW	Hard coal
Power plant on the land of former Czeczott mine	Kompania Węglowa	approx. 1000 MW	Hard coal
Kędzierzyn (new CHP plant on premises of Zakłady Azotowe Kędzierzyn)	Zakłady Azotowe Kędzierzyn	50 MW + 250 MW	Hard coal
Zakład Wytwarzania Tychy (new cogeneration unit)	Tauron	50 MW + 90 MW	Hard coal
Elektrownia Turów (power unit no. 11)	PGE	430 - 450 MW	Lignite

Nuclear power plants	PGE	2 x 3000 MW	Nuclear fuel
Dąbrowa Górnicza (construction of turbo generator in Zakład Wytwarzania Nowa)	Tauron Ciepło	50 MW	Blast furnace gas
Koksownia Przyjaźń w Dąbrowie Górniczej (energy power unit)	Koksownia Przyjaźń	71 MW	Coke oven gas
Wrocław (new CHP plant)	Fortum	400 MW + 290 MW	Gas and biomass
EC Zielona Góra (new gas and oil power unit)	EC Zielona Góra	160 MW	Gas / oil
Kędzierzyn-Koźle (CHP plant)	Grupa Azoty Tarnów	130 or 360 MW	Gas and hard coal
EC Gorzów (new combined cycle cogeneration power unit)	PGE	138 MWe i 90 MWt	Gas
EC Katowice (new gas power unit)	Tauron	135 MW + 90 MW	Gas
EC Rzeszów (new cogeneration unit)	PGE	29 MW + 26 MW	Gas
EC Siedlce (new combined cycle unit)	Przedsiębiorstw o Energetyczne w Siedlcach	36 MWe i 34 MWt	Gas
EC Stalowa Wola	Tauron and PGNiG	450 MW + 240 MW	Gas
EC Żerań	PGNiG Termika	approx. 450 MW	Gas
Elektrociepłownia Bydgoszcz (new power unit)	PGE GIEK	437 MW	Gas
Elektrownia Blachownia (new gas power unit)	Tauron and KGHM Polska Miedź	800-910 MW	Gas
Elektrownia Kozienice (power unit no. 11)	Enea and PGNiG	800 - 900 MW	Gas
Elektrownia Łagisza (new cogeneration unit)	PGNiG and Tauron	413 MW	Gas
Elektrownia Skawina (new combined cycle power unit)	CEZ	430 MW + 200 MW	Gas
Grudziądz (combined cycle power plant)	Energa	420 - 600 MW	Gas
Lublin	PGE	135 MW	Gas

Płock	PKN Orlen	400 to 600 MW	Gas
Płock (construction of new turbine set)	PKN Orlen	70 MW	Gas
Przemyśl (new CHP plant)	PKP Energetyka	25 MWe	Gas
Puławy	ZA Puławy and PGE Górnictwo and Energetyka	800-900 MW	Gas
Warszawa (two new CHP plants)	PKP Energetyka	2x50 MWe	Gas
Włocławek	PKN Orlen	463 MW	Gas
Zespół Elektrowni Dolna Odra - Elektrownia Pomorzany (new combined cycle power unit)	PGE	from 200 to 270 MWe	Gas
Water power plant on the Vistula river	Energa	60 - 100 MW	Hydro power
EC Elbląg (new power unit)	Energa	25 MW + 30 MW	Biomass
EC Tychy (new power unit)	Tauron	40 MW	Biomass
Elektrownia Jaworzno III (new power unit)	Tauron	50 MW	Biomass
Elektrownia Konin (new power unit)	ZE PAK	50 MW	Biomass
Elektrownia Połaniec (new power unit)	GDF SUEZ Energia Polska	205 MW	Biomass
Elektrownia Stalowa Wola (new power unit)	Tauron	50 MW	Biomass

Source: Energy Market Information Center

Transmission network

The distribution of electricity in Poland belongs to two types of entities: the Transmission System Operator and Distribution System Operators. The role of the first one is fulfilled by Polskie Sieci Elektroenergetyczne S.A. (PSE S.A., from 2013 operating under the business name PSE-Operator S.A.), which has 245 power lines of the total length of 13.4 thousand km and 101 extra high voltage substations (EHV). The energy grid operated by PSE S.A. comprises, among others:

- a 114 km 750 kV line,
- 77 400 kV lines of the total length of 5 383 km,
- 167 220 kV lines of the total length of 7 948 km,

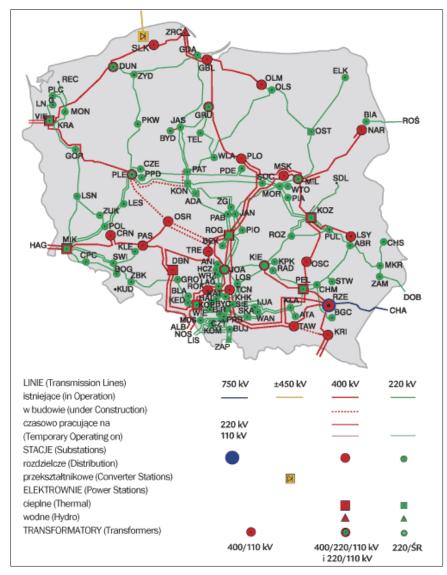


Figure 3. Diagram of transmission grid in Poland

Source: PSE S.A.

PSE S.A. is a company wholly owned by the State Treasury and the dominant entity of GK PSE, one of the largest groups of companies in Poland. Its tasks include domestic and foreign trade in electricity.

In the "Development Plan 2010-2025", updated in May 2013, PSE S.A. outlined the development plans for the domestic power grid. The plan also discusses such aspects as the development of cross-border connections, modernization of transformer stations and the construction and expansion of the existing grid. Details of specific undertakings are available at the company's website.¹

¹http://www.pse-operator.pl/uploads/kontener/Plan_Rozwoju_2010_2025_aktualizacja_2013-2017.pdf

Table 4. Main Distribution System Operators

Logo	Institution
	Tauron Dystrybucja SA
	Seat: Kraków
TAURON	Market share: 37.3%
DYSTRYBUCIA	www.tauron-dystrybucja.pl
	PGE Dystrybucja SA
	Seat: Lublin
' PGE `	Market share: 26.6%
	www.pgedystrybucja.pl
	Enea Operator Sp. z o.o.
	Seat: Poznań
Lnea	Market share: 14.4%
Operator	www.operator.enea.pl
	Energa-Operator SA
O Foorga	Seat: Gdańsk
Energa operator	Market share: 16.1%
	www.energa-operator.pl
	RWE Stoen Operator Sp. z o.o.
The energy to lead	Seat: Warszawa
	Market share: 5.5%
	www.rwestoenoperator.pl

Source: Energy Market Information Center

The electricity distribution subsector comprises Distribution Systems Operators. The task of the particular DSOs is to maintain and service the distribution grid (i.e. usually no higher than 110 kV), used for the distribution of the electricity on the area indicated by the President of the Energy Regulatory Office. In total there are 160 DSOs², of which the majority are local operators, operate within a city, poviat, or industrial plant. The list of the largest operators and their area of operations is presented in table 4 and figure 4.

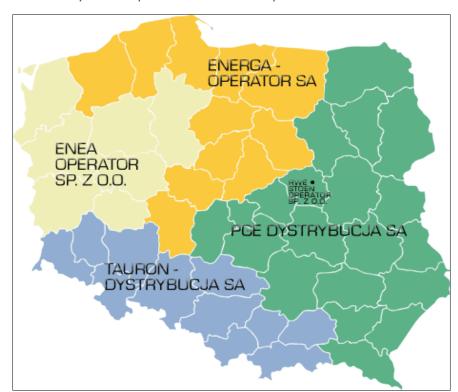


Figure 4. Distribution Systems Operators – areas of operation

Source: Energy Market Information Center

Export and import of energy

Poland's electricity grid system is part of a single EU electricity market. The capacity of connections between Poland and the remaining EU countries complies with the requirement defining the minimal transfer capacity of cross-border connections at a level of 10% of the electricity generation capacity of the national electricity grid system.

Currently, Poland is a net exporter of energy. The main export destinations are: Germany, the Czech Republic and Slovakia. The factor contributing to the growth of export is the process of phasing out nuclear energy in Germany, and the factor curbing export is the

² http://bip.ure.gov.pl/bip/rejestry-i-bazy/operatorzy-systemow-el.

limitation of electricity generation capacity in Poland related to the necessity of modernizing the existing generation infrastructure.

The main sources of the import of electricity to Poland are Sweden and Ukraine. However, intersystem connections are not sufficient to allow import to ensure security of supply on the internal market and, thus, it cannot be considered as an alternative source of electricity in the long run.

Renewable sources of energy

The detailed goals of Poland's energy policy focus on increasing the share of renewable sources of energy in the final consumption of energy to 15.5% in 2020 (19.3 for electricity, 17% for heating and cooling, 10.2% for transport fuels). This means that money has to be invested in new generation capacity. Currently, wind energy and the utilization of biomass for energy purposes are seeing the most dynamic growth.

According to the data of the Energy Regulatory Office, in November 2013 the total electricity generation capacity of power plants using renewable sources of energy exceeded 5000 MW³.

This represents a 17% growth as compared to the previous years and an impressive 68% as compared to the end of 2011. Nearly 60% of capacity from renewable sources of energy is generated by wind power plants (growth of total capacity by 23% in 2013), and another 19% from biomass power plants (growth by 19% in 2013). The capacity of hydro power plants (19% of available capacity from renewable sources of energy) has not changed significantly. With respect to number and capacity, photovoltaic power plants are only marginal.

Table 5. Renewable sources of energy in Poland

Type of installation	Number	Total capacity of installation		
Type of installation	Number	MW	share	
Wind power plants	785	3079.6	59.5%	
Biomass power plants	33	973.0	18.8%	
Hydro power plants	782	968.9	18.7%	
Biogas power plants	220	153.5	3.0%	
Solar power plants	14	1.8	0.0%	
Total	1834	5176.8	100.0%	
Power plants with co- incineration	41	-	-	

Source: Energy Regulatory Office, as at 30.09.2013

³ Current data along with a list of installations are available at http://www.ure.gov.pl/uremapoze/mapa.html.

The list of 1834 power plants using renewable sources of energy should be supplemented by 41 installations using co-incineration technology (coal and biomass, gas and biomass etc.). Due to the manner of operation of such installations, the estimation of the capacity delivered by renewable sources of energy is not practiced.

Nuclear energy

Poland has no tradition, nor significant experiences related to nuclear energy. The key strategic documents defining the future of Polish energy ("Poland's Energy Policy until 2030" from 2009, "Update of the Forecast of Demand for Fuels and Energy until 2030" from 2011) assume, however, building a nuclear power plant in Poland.

According to the "Update..." the power unit of the capacity of net 1 5000 MW should be commissioned around 2022, and by 2030 units of the total capacity of 4 500 should be operational. This would generate approx. 17% of domestic production of electricity. However, please note that the evolution of the approach to nuclear power around the world and Europe may prompt a revision of Polish plans in this respect.

Heat power engineering⁴

In 2012, 466 licensed heat companies, operating on the regulated heat market, were involved in the production of heat energy in Poland. The total heat generating capacity of licensed producers amounted to 58.1 GW, which represents a slight decrease as compared to the previous year.

The generation of heat in 2012, together with heat generation in processing (heat recovery) amounted to 431.4 thousand TJ. The vast majority (over 62%) of heat was generated in cogeneration with the production of electricity, however, only 22% of producers use this technology.

Hard coal is dominant in the structure of the generation of heat -74.5%. The remaining used fuels include, among others, fuel oil, natural gas and biomass. Please note that the usage of hard coal is gradually decreasing, while the usage of biomass (increase by 4 percentage points as compared to the previous year) and natural gas (increase by 3.7 percentage points) is increasing.

⁴ After: Energy Regulatory Office, Heat power engineering in numbers 2012.

7,8%

6,5%

1 hard coal

1 fuel oil

2 natural gas

3 biomass

3 other

Figure 5. Structure of the production of heat by fuel used in 2012.

Source: Energy Regulatory Office, Heat power engineering in numbers 2012

In 2012, licensed heating companies operated grids spanning 19.8 thousand km, including heating grids connecting sources of heat with heat centers and low-parameters grids (external receiving installations).

Polish gas market

In 2012, Poland's demand for natural gas (adjusted against change of stock) amounted to 15.6 billion m³. As compared to 2011, this represented a growth by over 4%. 28% of the demand was catered for by exploitation of domestic deposits, 58% by import from Russia, Azerbaijan and countries of Central Asia, 11% by import from Germany and 3% from the Czech Republic.⁵

Despite considerable import of gas from Russia, Poland remains one the countries of the EU that is least dependent on the import of gas. Actions seeking to further increase the security of supplies cover, among others, increasing capacities for import from Western Europeans, expanding underground gas storages, and investments in the LNG terminal in Świnoujście.

The largest Polish producer and importer of gas in the Polskie Górnictwo Naftowe I Gazownictwo (PGNiG) group of companies. Polish gas deposits lie primarily in Southern and Western Poland. According to specialists, Poland may have considerable potential in exploitation of shale gas.

⁻

⁵ Source: Report of the Minister of the Economy on the results of monitoring the security of the supply of gas fuels from 1 January 2012 to 31 December 2013.

Labor market in the sector

The Polish fuel and energy sector employs around 300 thousand persons (125 thousand in the coal mining sector, nearly 150 thousand involved in the supply of electricity and gas). Wages in the energy sector are markedly higher than average wages in the Polish economy. While in October 2013 the average national wage and salary in the economy amounted to PLN 3.8 thousand, the average monthly gross wage and salary in the electricity, gas, steam and hot water generation and supply sector in the 1st half of 2013 amounted to over PLN 6 thousand (Central Statistical Office). The wage and salary median in the energy sector amounted to PLN 4 700 in 2012 (Sedlak & Sedlak 2013), which makes the energy sector one of the best-paid industries.

In the academic year 2012/2013 there were 139.2 thousand persons majoring in engineering and technical studies (which include majors related to the energy sector), of which 43 thousand were 1st year students.⁶ The creation of post-graduate studies, educating specialists in renewable sources of energy, should be seen as manifestation of adaptation to the labor market.

Future of the energy market

The basic study concerning forecasts of the consumption of energy in Poland was the government document "Poland's Energy Policy until 2030" adopted in 2009. The first version of the document assumed that the Polish economy will maintain a robust growth rate, which would entail an annual average growth of demand for electricity by 2.2% per year in the forecasted period (i.e. from 2008 to 2030). The economic crisis prompted a revision of these forecast in the year of adoption of the document when demand for energy dropped by 4%. In 2010 demand returned to the level from 2008, to remain on a steady level in 2011-2012 (162 TWh in 2012). In the "Update of the Forecast of Demand for Fuels and Energy until 2030" drafted in 2011, it was determined that the average growth of demand for electricity from 2008 to 2030 will amount to 1.6% per year.⁷

In the near future the Polish electricity sector will require significant investment outlays. This is a natural consequence of the ageing process of existing power plants and transmission installations. Nearly 40% of power units in Poland are over 40 years old and over 15%, over 50 years old, should be decommissioned. Outlays on modernization are also motivated by EU requirements, especially those concerning decreasing the emission of dust particles and

⁶ Central Statistical Office, Institutions of higher education and their finance in 2012.

⁷ ... which would require an average growth of 1.8% per annum throughout 2011-2030.

carbon dioxide. The necessity of complying with requirements concerning emissions may prompt the shutdown of power units using coal.

According to PwC experts, investors in the energy sector in Poland should pay particular attention to gas CHP plants. According to the forecast from 2008, very high CO² emission prices and the growing prices of electricity validate investments in gas power plants. Considering low actual CO² prices, the viability of such undertakings depends on gas prices. Gas CHP plants seem to be a more safe investments that allow for the sale of heat and using support instruments. In Poland there is a market for investments in small gas units operating as CHP plants.

In the coming years, the main investment trends in the Polish electricity sector will concern:

- 1) the modernization and exchange of existing power units;
- 2) the modernization and expansion of the high- and mid-voltage transmission grid;
- 3) renewable energy;
- 4) the potential construction of a nuclear power plant;
- 5) mergers and takeovers resulting from intense consolidation processes;
- 6) energy market transformation and liberalization processes (increasing energy efficiency, systems of monitoring the grid and analysing information, billing systems;
- 7) development of intelligent power grids using new energy consumption methods ("smart metering"), Home Area Network, municipal system of managing energy efficiency ("smart cities").

Available forms of public assistance

Entrepreneurs carrying out new investment projects in Poland may take advantage of various forms of investment incentives granted as part of public assistance, in particular:

- tax exemptions in Special Economic Zones (SEZ),
- exemptions from local taxes, including property tax,
- government grants for strategic investments,
- support from EU funds,
- tax incentives for the acquisition of new technologies, and research and development,
- technology and industrial parks.

The primary tax incentive is exemption from income tax in one of 14 special economic zones that will remain active until 2026. Each zone has numerous sub-zones in various parts of Poland. In the special economic zones investors may count on the availability of attractive

investment lands equipped with the necessary utility infrastructure and comprehensive assistance in legal and administrative procedures related to their project.

Communes also incentives have at their disposal – they are authorized to grant exemptions from local taxes and levies, including property tax.

Cash subsidies for the support of new investments come from the State budget (government grants) and EU funds.

Government grants (for the creation of new jobs and investments) are granted under the Program for supporting investments of major importance to the Polish economy for the years 2011–2020 for investments in the following sectors:

- automotive,
- electronic,
- aviation,
- biotechnology,
- modern services,
- research and development activity.

Moreover, considerable investments from other sectors (creating at least 200 new jobs with qualified costs of at least PLN 750 million or creating at least 500 new jobs with qualified costs of at least PLN 500 million) may also be eligible for support under the Program.

As a member of the EU, Poland is the largest beneficiary of support from EU funds. The funds are allocated to, among others, innovative investments, research and development, infrastructural projects, environment protection, renewable sources of energy, employee trainings.

Throughout 2007-2013 Poland had at its disposal approx. EUR 67 billion and in the new 2014-2020 budget this will be approx. EUR 73 billion. The priority in the new budget will be to support the research and development activity of enterprises.

As the investment incentives are available under various programs, and vary in terms of conditions and availability in time, we suggest contacting the Polish Information and Foreign Investment Agency to obtain current information about available incentive packages.

Main institutions and industry organizations

Institutions

Ministry of the Economy

Plac Trzech Krzyży 3/5 00-507 Warszawa tel. +48 22 693 50 00 e-mail: mg@mg.gov.pl

www.mg.gov.pl

Energy Regulatory Office

ul. Chłodna 64, 00-872 Warszawa tel: +48 22 661 61 07 e-mail: <u>ure@ure.gov.pl</u>

Scientific institutes

www.ure.gov.pl/

Energy Studies Institute

ul. Śniadeckich 17 00-654 Warszawa tel.: +48 22 629 97 46 e-mail: office@ise.com.pl www.ise.com.pl

Institute for Renewable Energy (EC BREC IEO)

ul. Fletniowa 47B, 03-160 Warszawa tel./fax +48 22 825 46 52 e-mail: biuro@ieo.pl www.ieo.pl

Polish National Energy Conservation Agency

ul. Nowowiejska 21/25 00-665 Warszawa tel.: +48 22 626 09 10 e-mail: kape@kape.gov.pl www.kape.gov.pl

Industry organizations

Chamber of Heat Engineering

ul. Elegijna 59 02-787 Warszawa tel. +48 22 644-70-19, 644-02-50 e-mail: <u>igcwaw@pro.onet.pl</u> www.igcp.org.pl

Polish Chamber of Power Industry and Environment Protection

ul. Krucza 6/14 00-950 Warszawa skrytka pocztowa 897 tel. +48 22 621-65-72, wew. 320 e-mail: <u>sekretariat@igeos.pl</u>

Polish Economic Chamber of Electrotechnics

ul. Szubińska 17 85-312 Bydgoszcz tel. +48 52 373-09-04

www.igeos.prv.pl

e-mail: biuro@elektrotechnika.org.pl

www.elektrotechnika.org.pl

Contact details for investors

Polish Information and Foreign Investment Agency Foreign Investment Department, UI. Bagatela 12, 00-585 Warszawa, Poland Tel. (+48) 22 334 9875, fax (+48) 22 334 99 99

e-mail: invest@paiz.gov.pl