

**POLISH INFORMATION AND FOREIGN INVESTMENT AGENCY**

# **ENERGY SECTOR IN POLAND**

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**Invest**  
in Poland

## Outline of the energy sector worldwide

Energy security is of strategic importance to all countries. For each country, generation and transmission of electricity is the life blood of the economy, which, besides the transport system, allow the economy to function efficiently.

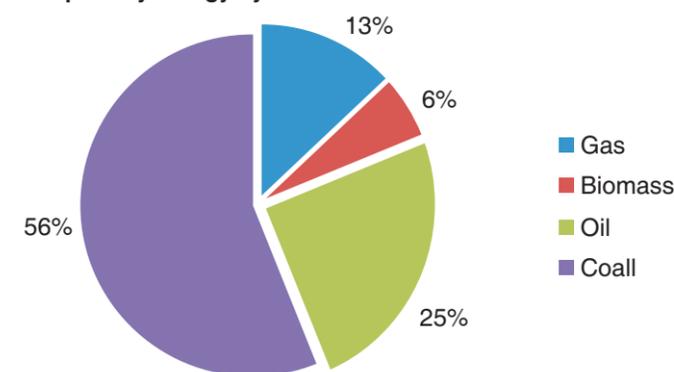
A country's economic growth depends on its access to energy. It is forecasted that until 2040 the world economy will grow annually at 2.8%. Even given the forecasted constant increase in energy generation effectiveness, it still translates to an annual growth of the global energy sector at 1.1%. At the same time, it is forecasted that the use of conventional sources (coal and crude oil) will grow slower (forecasted annual growth 0.4%) and of renewable sources (solar, wind and geothermal energy) much more dynamically (7.4%). Development of the renewable energy sector should contribute to renewable sources achieving the share of around 20% in energy generation in 2040.<sup>1</sup>

In 2011, the energy sector attracted strong interest from investors globally. According to UNCTAD, projects concerning supply in gas, water and electricity were approximately 8% of all direct investments worldwide. The value of such investments in 2011 increased by 43% compared to the preceding year and by approximately 6% compared to the average level from before the crisis (mean from 2005–2007).<sup>2</sup>

## Characteristics of the sector in Poland

Production of primary energy in Poland is based mainly on fossil fuels. First place belongs, and will most likely belong for a long time to hard coal and lignite, which cover 56% of the demand. Crude oil also has a significant share of 25%.

**Diagram 1. Demand for primary energy by source**



Source: Energy Mix 2050. Analysis of Scenarios for Poland. Ministry of Economy 2011, page 7.

The Polish Government forecasts that primary energy consumption in Poland will grow between 2010 and 2020 at 1.5%. Use of renewable energy sources between 2010 and 2020 should reach 12%.<sup>3</sup>

**Table 1. Forecast of demand for final energy by sectors [Mtoe]**

|              | 2015        | 2020        | 2025        | 2030        |
|--------------|-------------|-------------|-------------|-------------|
| Industry     | 19.0        | 20.9        | 23.0        | 24.0        |
| Transport    | 16.5        | 18.7        | 21.2        | 23.3        |
| Agriculture  | 4.9         | 5.0         | 4.5         | 4.2         |
| Services     | 7.7         | 8.8         | 10.7        | 12.8        |
| Households   | 19.1        | 19.4        | 19.9        | 20.1        |
| <b>TOTAL</b> | <b>67.3</b> | <b>72.7</b> | <b>79.3</b> | <b>84.4</b> |

Source: Forecast of demand for fuels and energy by 2030, Ministry of Economy 2009

## The National Power System

Continuity and stability of the energy supply is guaranteed by a group of entities creating the National Power System. These entities are subordinate to different institutions and regulations. Subsystems creating NPS are:

- generation subsystem,
- transfer grid,
- distribution grid.

<sup>1</sup> Energy Perspectives 2012. Long Macroeconomic Perspective, Statoil 2012

<sup>2</sup> World Investment Report, UNCTAD 2012

<sup>3</sup> Poland Energy Report, Enerdata, July 2012

Generation subsystem encompasses power plants, industrial powerplants, industrial heating plants, hydro-electric power plants, wind power, biomass and biogas.

Created energy is distributed via the transmission grid: lines and energy stations 750 kV, 400 kV and 220 kV. The transmission grid is managed by one company – PSE Operator SA.

The target customer receives energy due to the distribution grid – 110 kV and medium and low voltage.

### Production of electricity

The gross national electricity production volume in 2011 was 163.2 TWh (4% growth compared to 2010). The domestic consumption of electricity was 157.9 TWh (the difference was exported)<sup>4</sup>.

Table 2. Forecast of domestic demand for electricity [TWh]

|                                      | 2015         | 2020         | 2025         | 2030         |
|--------------------------------------|--------------|--------------|--------------|--------------|
| Final energy                         | 115.2        | 130.8        | 152.7        | 171.6        |
| Energy sector                        | 11.6         | 12.1         | 12.7         | 13.3         |
| Transmission and distribution losses | 13.2         | 13.2         | 15.0         | 16.8         |
| Net demand                           | 140.0        | 156.1        | 180.4        | 201.7        |
| Own needs                            | 12.8         | 13.2         | 14.2         | 15.7         |
| <b>Gross demand</b>                  | <b>152.8</b> | <b>169.3</b> | <b>194.6</b> | <b>217.4</b> |

Source: Forecast of demand for fuels and energy by 2030, Ministry of Economy 2009.

The Polish energy sector is historically based on fossil fuels, which occur abundantly in Poland (ninth largest deposits in the world). In electricity production, two major fuels play a key role: hard coal and lignite, which produce nearly 90% of Poland's electricity<sup>5</sup>.

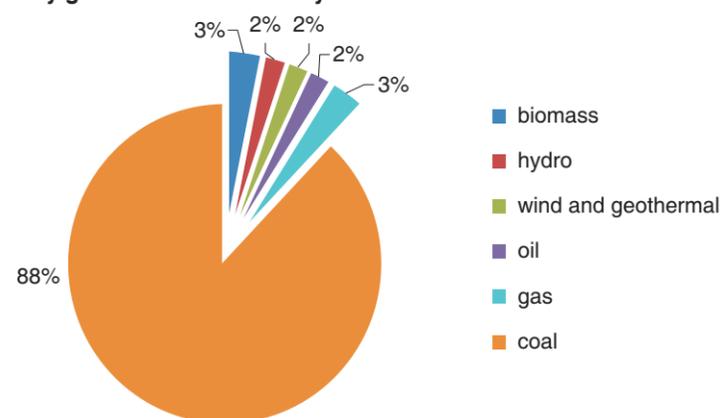
Table 3. Consumption of primary fuels in commercial power industry in Poland

| Fuel type        | 2009   | 2010   | 2011   |
|------------------|--------|--------|--------|
| Hard coal        | 58.95% | 60.42% | 58.95% |
| Lignite          | 34.95% | 32.60% | 33.58% |
| Biogas / biomass | 3.17%  | 3.78%  | 4.27%  |
| Gas              | 2.92%  | 3.20%  | 3.27%  |

Source: ARE S.A.

- In 2011, installed capacity at the National Electricity System (KSE) grew compared to preceding years and was 37.4 GW (37.4 GW). The capacity increased by more than 1600 MW compared to 2010.
- Mean annual demand for capacity was 24.8 GW in 2011.

Diagram 2. Electricity generation in Poland by source



Source: Poland Energy Report, Enerdata, July 2012

<sup>4</sup> URE President's Report on Operations 2011, page 19

<sup>5</sup> Hard coal 55.7%, lignite 32.9%, URE President's Report on Operations 2011, page 21

Total capacity of connections of the Polish electric power system with EU member states is 2000–3000 MW (depending on system operation configuration) and is limited by transmission capacities within the domestic system. The current capacity of cross-border connections achieves the goal recognized by the Council of Europe which requires a minimum 10% transmission capacity of cross-border connections in relation to installed capacity in the domestic electric power system.

At present, the electricity market is competitive only in the wholesale part. End buyers participating in the market are treated in the same way as wholesale buyers. In practice, the term "electricity market" most often means a competitive, wholesale market of electricity served by system operators.

The average purchase price of electricity by trading companies in 2011 was 198.90 PLN/MW (approx. 48 EUR/MW). Trading in electricity is done on the Polish Power Exchange (TGE). In 2011, turnover was 126.7 TWh (78% of domestic electricity production in 2011). The daily weighed average price of electricity from all transactions in 2011 on the Polish Power Exchange was 205.19 PLN/MWh.

In retail trade, the transaction party is the end buyer purchasing fuels and energy for own purposes. Market participants are households and companies. The total number of entities holding concessions for electricity trade is approximately 340.

Ever since sector transformations began in 1997, the structure of companies operating in the electricity market has been **systematically changing**. Initial horizontal consolidation of state-owned companies was replaced by changes of a vertical nature. Simultaneously, consistent privatisation of the sector is carried out. The effect of the ongoing processes of consolidation of capital groups is a **high degree of concentration**. According to the Energy Regulatory Office data, the three biggest producers<sup>6</sup> had more than half of installed capacities and produced nearly 2/3 of Poland's electricity. **At present, the largest companies in the energy sector include:**<sup>7</sup>

- Grupa Kapitałowa (GK) PGE** – the company manages among others over 40 power stations and heat and power plants, 8 operators of distribution grids, 7 retailers and 3 lignite mines; in 2011 it produced 56.5 TWh of electricity (approx. 40% of the domestic production) and had installed capacity of 13.1 GW;
- GK Tauron** – installed capacity of the group's coal-fired plant is 5300 MW; the group has 35 hydro plants (132 MW) and two wind farms (61 MW); in 2011 it produced 21.4 TWh of electricity, i.e. 14% of domestic production, and also 16% of thermal energy in Poland;
- GK Enea** – operator of the coal-fired plant in Kozienice (2.9 GW) and distributor of energy in western Poland; the total installed capacity of the group is 3.1 GW; in 2011 the group produced 12.3 TWh and sold 15.5 TWh of energy to 2.4 million buyers;
- EDF** – operator of among others the power plant in Rybnik; energy distributor; the group has installed capacity of 3500 MW and produces 10% of Poland's electricity and 15% of network heat; the group was formed thanks to a French investor which entered the Polish market in 1997;
- ZE PAK** – second biggest producer of energy from lignite; has installed capacity of 2900 MW; in 2010 the group produced 12% of Poland's energy and sold 7.9 TWh of electricity;
- GK Energa** – operator of 47 hydro plants and of the coal-fired plant in Ostrołęka; in 2011 the group produced 4.7 TWh of energy, distributed 19.6 TWh to 2.9 million buyers and sold 19.3 TWh of energy.

### Renewable energy sources

In Poland, renewable energy sources also develop quite rapidly. The leading position is held by wind energy. According to the data of the Energy Regulatory Office (URE), as at the end of September 2012, there were 663 wind plants in Poland of a total capacity of 2341 MW. Most wind farms are located in north-western Poland. The leader is the Zachodniopomorskie Province (716.8 MW), followed by the Pomorskie Province (246.9 MW) and the Wielkopolskie Province (245.3 MW). The current share of wind energy in all sources of electricity of renewable origin is 57.6%. It ranked first among renewable energy sources already in 2009.

Table 4. Electricity from renewable energy sources

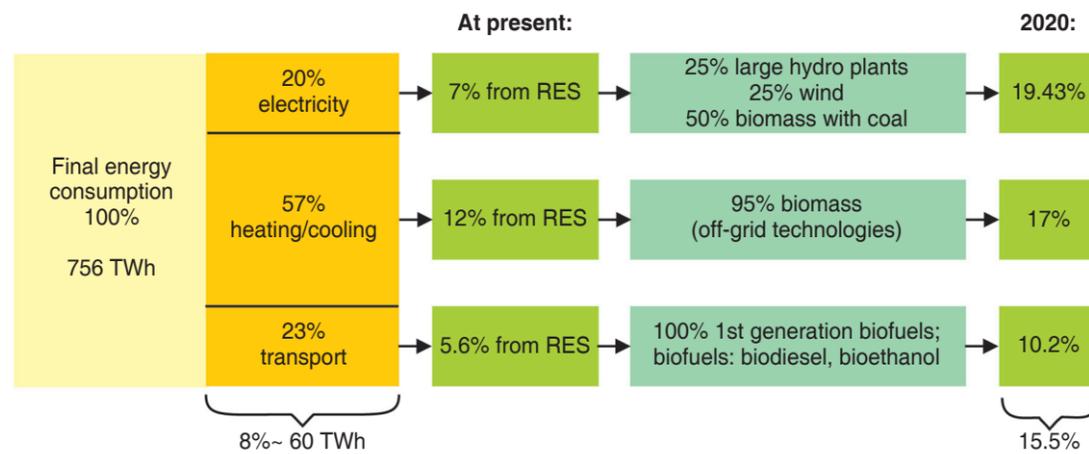
| Installation type   | Installations | Generated energy (MW) |
|---------------------|---------------|-----------------------|
| Biogas plants       | 193           | 124                   |
| Biomass plants      | 24            | 559                   |
| Photovoltaic plants | 8             | 1,251                 |
| Wind plants         | 663           | 2 341                 |
| Hydro plants        | 765           | 958                   |
| Co-firing plants    | 44            | data not available    |

Source: URE, 30.09.2012

<sup>6</sup> Grupa Kapitałowa PGE Polska Grupa Energetyczna SA, GK TAURON Polska Energia SA, EDF

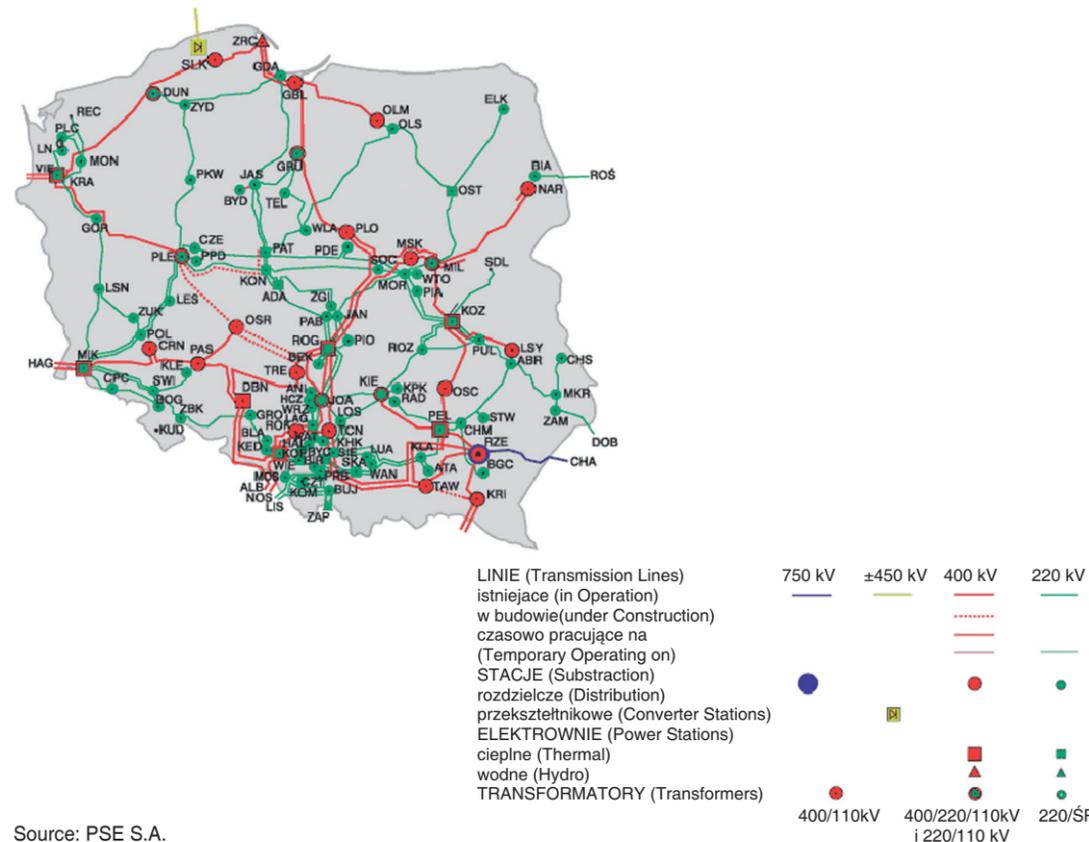
<sup>7</sup> Poland Energy Report, Enerdata, July 2012

Fig. 1. Share of renewable energy sources (RES) in energy consumption in 2010 and forecast for 2020



Source: PIGEO; National renewable energy action plan

Fig. 2. Map of Polish transmission grid



Source: PSE S.A.

### Distribution of electricity

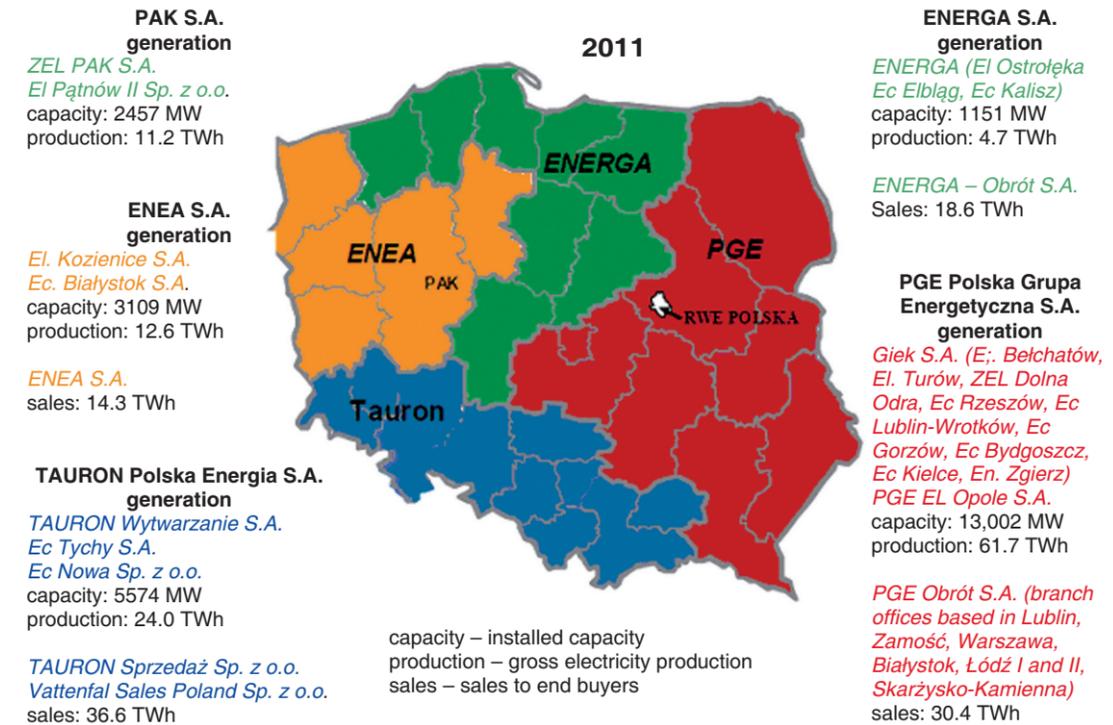
Distribution of electricity is based on a transmission grid owned and operated by in Poland by PSE Operator. PSE Operator acts as a transmission system operator based on its extra high voltage transmission grid, consisting of:

- 242 lines of a total length of 13,396 km, including:
  - 1 750 kV line of a length of 114 km;
  - 74 400 kV lines of a total length of 5 340 km;
  - 167 220 kV lines of a total length of 7 942 km;
  - 14 110 kV lines of a total length of 34 km;
- 100 extra high voltage stations

as well as a submarine 450 kV DC link between Poland and Sweden of a total length of 254 km.<sup>8</sup>

<sup>8</sup> <http://www.pse-operator.pl/index.php?dzid=79&did=22>

Fig. 3 Selected consolidated capital groups: territorial range (criterion – area of operation of distribution system operators within groups), group members, business activity



Source: Energy Regulatory Office (URE)

### The Polish thermal energy market

Volume of national production of thermal energy generated by licensed heating companies in 2010 was 462.5 thousand TJ. Volume of total heat sold was 434 thousand TJ and grew by 9% compared to the preceding year.

The dominant fuel in thermal energy generation is **hard coal (76%)**. The remaining fuels include among others fuel oil, natural gas and biomass. It should be noted that the use of hard coal is gradually decreasing and the use of biomass is increasing.

In 2010, installed capacity in licensed heat producers was **59.2 GW** and **generating capacity was 58.1 GW**. Compared to 2002, installed capacity decreased by 16.5%.

In 2010 licensed heating companies had **grids of a total length of 19,400 km**, however it should be pointed out that this size included heating grids linking heat sources with heating nodes and low parameter grids – external receiver installations.<sup>9</sup>

### Natural gas and shale gas

In accordance with the data of the Ministry of Economy, Poland's annual demand is approximately **14.5 billion cubic meters**. In 2012, it is planned to increase domestic extraction of natural gas to 4.7 billion cubic meters. On average, approximately 30% of gas consumption in Poland is covered by domestic deposits. Approximately 63% of annual consumption comes from Germany. The remaining part is covered from import, mainly from Germany and the Czech Republic. Despite this significant level of gas import from Russia, Poland still remains in the EU one of the countries that are least dependant on imported gas.

In Poland, activities aimed at gas supply diversification are underway. In 2011, Gaz-System, the Polish operator of gas pipelines, increased by 30% the possibility of import from the South and West. The supply diversification strategy is also implemented through investments in the LNG terminal in Świnoujście. Initially the terminal will be able to receive 5 billion m<sup>3</sup> of gas annually, but the target volume will eventually increase to 7.5 billion cubic meters.<sup>3, 10</sup>

The biggest Polish producer and importer of gas is Grupa Kapitałowa Polskie Górnictwo Naftowe i Gazownictwo (PGNiG). In Poland gas is produced from deposits located mainly in southern and western Poland (mainly the Podkarpacie region and the western Wielkopolska region).<sup>11</sup> Poland also has a vast potential

<sup>9</sup> Heating energy in numbers 2010, Energy Regulatory Office 2010

<sup>10</sup> <http://www.polskielng.pl/?id=877>

<sup>11</sup> <http://www.pgnig.pl/pgnig/216>

for shale gas production. The Polish Geological Institute (PIG)<sup>12</sup> estimates that the Polish deposits most probably range between 346 and 768 billion cubic meters of gas.<sup>13</sup>

The Polish energy sector is peculiar in that the trade unions (more than half of workers are members of trade unions) hold a strong position. It translates to a relatively stable pay growth and employment guarantees which are more favourable than in other industry sectors.<sup>14</sup>

As at 30 November 2010, in Poland there were in total 132 thousand students of engineering (including energy-related programmes). Of this number, more than 40 thousand were first year students. There are also postgraduate programmes educating specialists in renewable energy sources.

### Investment potential

**In the near future the Polish energy sector will require substantial investments.** Development opportunities for the sector result from dynamic growth of Polish economy, which despite the crisis grows fast. Also, it is a natural consequence of aging of the existing power plants and industrial installations. Modernisation is also motivated by EU requirements, especially as regards lowering dust, nitrogen oxide and carbon dioxide emissions. The fact that emission requirements will have to be met might result in a necessary retirement of many power blocks (fired on coal and thus producing high emissions) when stringent emission standards become effective.<sup>15</sup>

The sector will require significant investments, as confirmed among others by the average age of existing power plants. Almost **40% of power blocks are over 40 years old** and **15% of them are over 50 years old** and qualify for immediate retirement. Professor Krzysztof Żmijewski, Secretary General of the National Emission Reduction Plan states that **over 70% of blocks are more than 30 years old.**

Only within the next few years necessary investments will include the replacement of units of few thousand megawatts of capacity. Total funds necessary for modernising the Polish energy sector (investments in power blocks and transmission grid) **are estimated at PLN 150–200 billion in the next 15 years.** Power plant owners **cannot afford to finance such extensive investments from own equity**, so it will be necessary to find financing from external sources. Nevertheless, modernisation is already in progress.

One way to invest in the Polish energy sector is to participate in privatisation processes. **The Privatisation Plan 2012–2013 covers 12 companies from the energy sector**<sup>16</sup>. The plan includes both, privatisation of sole-shareholder treasury companies and sale of shares in the remaining companies from this sector. Shareholder transformations will cover among others: **Energa S.A., ENEA S.A., PGE Polska Grupa Energetyczna S.A., Zespół Elektrowni Pątnów-Adamów-Konin S.A. and Zespół Elektrowni Wodnych Niedzica S.A.** Privatisation through the Warsaw Stock Exchange (GPW) will be preferred.

Intense **consolidation processes** are also underway in the energy sector, resulting in a significant number of transactions in the form of **mergers and take-overs**. In 2011, one of the most significant transactions was the profitable sale by Vattenfall of almost all of its shares in Poland. The shares were taken over by Tauron (Vattenfall Distribution Poland) and PGNiG (Vattenfall Heat Poland).<sup>17</sup> In another transaction, SPEC was sold by the City of Warsaw and taken over by Dalkia.

**Investment opportunities should however be sought basically in any market sector.** Apart from the above-mentioned **privatisation processes and market consolidation**, investment opportunities are especially related with:

- modernisation and extension of the high and moderate voltage transmission grid;
- construction of a nuclear power plant;
- modernisation and replacement of existing power blocks.

Investment opportunities also exist in the area of renewable energy (especially wind energy). There will be investment opportunities in sectors related with gas extraction (including shale gas). There will be opportunities related with building power blocks generating energy from gas.

According to the Central Statistical Office (GUS), in 2010 in Poland there were **451 entities** with at least 10% foreign shareholding active in the sector of generation and supply of electricity, gas, water vapour and hot water. According to the National Bank of Poland (NBP), **total income from investments** of this type of entities in Poland **in 2011 was USD 678.8 million. French, German and Swedish companies are the most frequent investors in the energy sector in Poland.**

The **biggest foreign investors** in the energy generation and distribution sector in Poland are: **the French groups – EDF** (production of 10% of electricity and 15% of district heating in Poland), **GDF SUEZ** (controls the fourth biggest Polish power plant in Pofaniec) and **Dalkia** (has among others installed capacity to supply

<sup>12</sup> <http://www.pgi.gov.pl/pl/institut-geologiczny-surowce-mineralne/2705-nowe-perspektywy-gaz-lupkowy-i-gaz-zamkniety.html>

<sup>13</sup> [http://msp.gov.pl/portal/pl/29/22805/Gaz\\_lupkowy\\_jak\\_wejscie\\_do\\_UE.html](http://msp.gov.pl/portal/pl/29/22805/Gaz_lupkowy_jak_wejscie_do_UE.html)

<sup>14</sup> Earnings and work in the energy sector, CIRE 2011

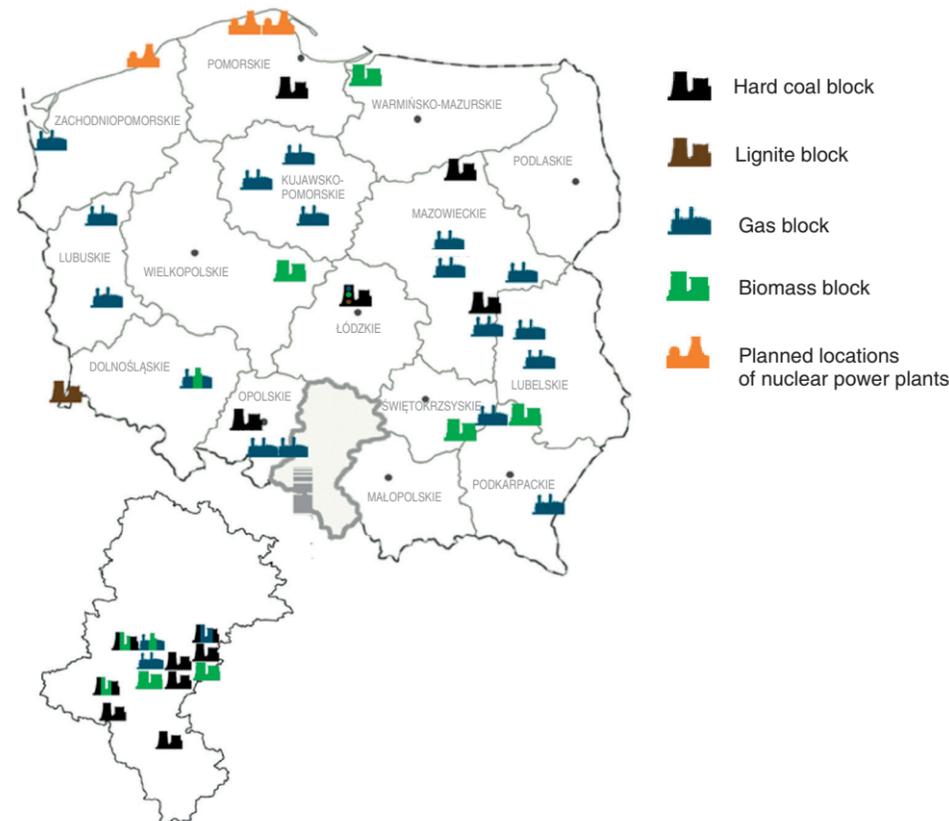
<sup>15</sup> [Directive 2001/80/EC on the limitation of emissions of certain pollutants into the air from large combustion plants, Directive 2001/81 on National Emission Ceilings for certain atmospheric pollutants, and draft directive on industrial emissions]

<sup>16</sup> Privatisation Plan 2012–2013, Ministry of Treasury, March 2012

<sup>17</sup> Top 500 Central Europe 2012, Energy and resources, Deloitte 2012

4290 MW of heat and 820 MW of electricity). Other active entities include: **the Czech group ČEZ**, which since 2006 is among others the operator of two coal-fuelled power plants, **the Finnish company Fortum** – active both in conventional and renewable energy, **the German company E.ON**, and the **Spanish company Iberdrola** specialising in wind energy.

Fig. 4. Location of newly-created energy blocks



Źródło: Ministerstwo

### Polish labour market potential

Approximately 300 thousand people are employed in the fuel and energy sector in Poland (125 thousand are employed in the coal mining industry and nearly 150 thousand are engaged in supply of electricity and gas).

Earnings in the energy sector are distinctly higher than average earnings in the Polish economy. Median salary in the energy sector is PLN 4100, making it one of the best-paid sectors. Bottom-level staff is particularly well paid compared to other sectors. High earnings can be observed especially in crude oil processing companies, i.e. in Orlen and Lotos (PLN 7604 on average).

### Investment incentives

#### Available forms of aid

Aid for conventional and renewable energy projects is possible under various structural funds and EU programmes. **Read more:** <http://www.funduszedlaenergetyki.pl/>

The Polish Government supports the production of energy from renewable sources by:

- Investment incentives for producers of renewable energy (system of differently coloured certificates);
- Obligating energy companies trading in and selling electricity to purchase electricity from renewable sources;
- Priority access to the transmission grid for producers of renewable energy;
- Exemption of electric energy from renewable sources from the excise tax;
- Decreasing by 50% the fee for connecting small installations (<5 MW) to the grid. These type of installations are also exempt from the licence fee and the annual fee paid by licence holders;
- Co-funding investments in clean energy under the National Fund for Environmental Protection and Water Management (NFOŚiGW).

**Read more:** [http://www.paiz.gov.pl/prawo/odnawialne\\_zrodla\\_energii](http://www.paiz.gov.pl/prawo/odnawialne_zrodla_energii)

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### Polish Economic Chamber of Electrotechnics (PIGE)

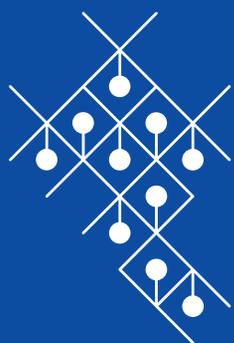
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