ENERGY SECURITY IN POLAND IN CASE OF THE POLICY OF ENERGY RESOURCES DIVERSIFICATION

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Introduction

Increased energy efficiency in the processes of generation, transmission and use of energy is one of pillar of a sustainable energy policy. It is reflected in national and international laws. To regulate related to energy efficiency include:

- Directive 2006/32/EC of the European Parliament and of the council of 5 April 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC;
- Strategy „Europe 2020";
- A sustainable Europe for a better world - A European Union strategy for sustainable development;
- Green Paper for a European Union Energy Policy;
- White Paper. European Transport Policy for 2010: Time to Decide.
- Poland as a member country of the European Union participates in the creation of a common energy policy and implements EU legislation in the country. Basic directions of the Polish energy policy are:
- Improving energy efficiency;
- Diversify the structure of electricity generation;
- Increase security of fuel and energy;
- The development of energy from renewable sources;
- The development of competitive markets for fuels.

For all these directions have been formulated specific aims. The issue of energy efficiency is treated as a priority. Its improvement is a priority in the EU's energy policy. The main objectives of energy policy in Poland shall be aiming at maintaining non-energy economic growth and reduce energy consumption in the Polish economy.

Polish Energetic Balance and GDP

Poland after accession to the EU in 2004 was focused on the exploitation of coal energy resources. But the EU plan to reduce CO_2 emissions - the main product of burning coal - by 80% to 2050 forces on Poland the implementation of technological change in the energy sector for economic growth. These changes involve the reduction of energy-intensive technologies and the use of environmentally friendly technologies, as exemplified by biofuels and renewable energy. In the analyzed period we can see steady growth in GDP in current prices (Table 1) reaching up to 11% YoY in years 2006/07. The lowest growth of GDP at current prices occurred in years 2008/09 and amounted to 5.3%. The growth in the years 2004-2009 was as high as 45.3% which ensured Poland second to Slovakia among EU member states. However, GDP growth at constant prices reached a maximum during years 2006/07 - 6.8%, at least in years 2008/09 - 1.6%. During years 2004-2010 GDP growth was estimated at 30.2% giving Poland the second place among EU countries, as in the case of GDP at current prices.

With GDP growth in developing countries is connected the increase emission of pollutants into the atmosphere, often connected to the demand for energy resources.

Analyzing changes in consumption of LPG by the automotive industry in Poland can be noted clearly visible two periods. The first period of growth occurred

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in years 2004-2007, and it amounted to almost 9%. Then, as a result of trends and changes taking place in the global economy we can see a slight decline in volume in 2009 by 6.2% compared to 2007. We can see some kind of convergence with the increase in GDP, and it's slowing down since 2008.

Table 1. Growth of GDP at current prices and constant prices in years 2004-2010 in Poland

	Growth in current prices	Growth in constant prices
	Previous year = 100	
2004	-	105,3
2005	106,4	103,6
2006	107,8	106,2
2007	111,0	106,8
2008	108,4	105,1
2009	105,3	101,6
2010	.	103,8
2009- 2010 (2004=100)	**145,3**	**130,2**

Source: own elaboration based on "Concise statistical yearbook of Poland", 2006-2011

In the analyzed period we can also see an increase in oil consumption in 2008 compared with 2004 by 16.4% and then decline in 2009 by 3,6% to 20 282 thousand of tons. A significant increase in demand can be observed in the consumption of products resulting from refining crude oil. The largest increase can be observed in years 2005/06, when it amounted to 10.6%. Throughout studied period can be observed increase in the consumption of petroleum products, but in 2009 has seen a significant inhibition of growth of consumption to 1.3%.

Suggested reduction of CO_2 emissions associated with coal mining restriction in Polish power plants, and thus, reducing its output. Over the years 2004-2009 we can noted a decrease in coal consumption in the Polish economy from the level of 144 million of tons to almost 133 million of tons, it is 7,7% (Table 2). This was caused by:

- decline in the profitability of coal mining;
- decline in steel production;
- increase the cost of storage of coal;
- salary increases - consequently reducing the number of employees.

Table 2. Total consumption and energy content in years 2004-2009 in Poland

	LPG	Crude Oil	Oil Products	Coal & Coke	Lpg	Crude Oil	Oil Products	Coal And Coke	Energy Total
	thous. of tonnes				TJ				
2004	2,232	18,068	10,946	143,949	103,788,0	767,810.6	479,620.0	2,437,317.6	3,788,536
2005	2,388	18,191	11,470	142,027	111,042,0	773,037.5	502,057.7	2,370,390.5	3,756,528
2006	2,407	20,050	12,685	146,929	111,925,5	852,036.9	554,711.8	2,500,590.7	4,019,265
2007	2,432	20,024	13,674	130 586	113,088,0	850,932.0	597,431.5	2,096,760.7	3,658,212
2008	2,391	21,036	14,857	142 318	111,181,5	893,937.5	648,982.7	2,416,066.2	4,070,168
2009	2,281	20,282	15,052	132 814	106,066,5	861,895.8	657,137.8	2,218,868.0	3,843,968

Source: own elaboration based on "Energy Statistics", 2004-2009

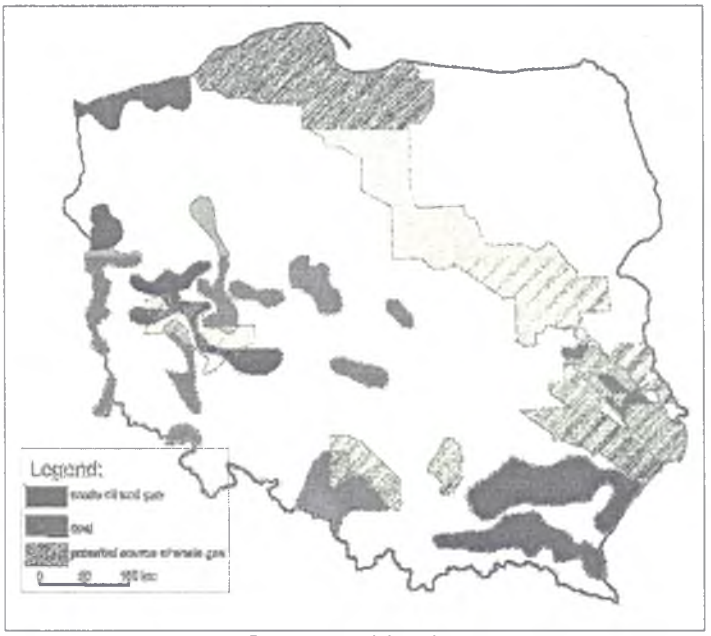
By analyzing used energetic of raw materials and their products we can see very little increase in used energy. The largest increase we can see in 2008 and it

amounted to 11.3% YoY in the scale. But comparing 2009 to 2004 we can see an increase of only 1.5%. This is an increase disproportionately low in relation to GDP in constant prices for the same period which took 25.5%.

Sources of Energy Raw Materials in Poland

Analyzing the source of energy resources in Poland should be considered two possibilities. Own production and imports. Crude oil production in Poland is around the island of Wolin, on the northern shelf of Rozewie Cape, in Podkarpackie region, in Barnówo and near Gorzow Wielkopolski (Fig. 1.). Crude oil production in Poland covers only 3.4% (Table 3) of the total demand for this raw material. Because of it Poland is forced to import this material from abroad, mainly from Russia and small part from the Persian Gulf region.

Fig. 1. Location of energy resources in Poland



Source: own eleboration.

The most widely-used present energy source in Polish economy is coal, and various variations thereof. The Polish economy remains independent of the supply of raw materials to industrial plants and coal plants which are the main providers of electricity. However, rising production costs in the case of deep mining and competitive price of coal from open cast mines in South Africa and Australia, forcing the Polish industry to increasing imports of raw materials while reducing its exports.

Table 3. Own production of primary raw materials in 2004-2009 in Poland

	2004	2005	2006	2007	2008	2009
	thous. of tonnes					
Crude Oil	886	848	796	721	755	687
Coal & Coke	161.284	159.540	156.065	145.850	144.013	135.172

Source: own elaboration based on "Energy Statistics", 2004-2009

Liquid gas as a product of oil refining is consumed as fuel for automobiles. In the analyzed period we can see that there was a temporary increase in raw material

consumption by 2007 (Table 4). With the increase in consumption we can see an increase in its imports. About 90% of LPG is imported product. From 2004 to 2006 there was an increase in imports by sea, followed by a decline in the import of this kind of transport (Fig. 2).

The main sources of import of this raw material are:

- by sea through the LPG terminal in Gdansk from Russia;
- by sea through the Petrolinvest terminal in Gdynia from Lithuania;
- overland from the Czech Republic.

A small amount of LPG produced In Poland comes from an oil refinery in Gdansk, Plock, Czechowice-Dziedzice and Trzebinia.

Table 4.

Consumption, total imports and by sea of raw materials and related products in years 2004-2009 in Poland

	LPG			Crude Oil			Oil Products			Coal & Coke		
	Consump.	Import		Consump	Import		Consump	Import		Consump	Import	
		Total	By Sea		Total	By Sea		Total	By Sea		Total	By Sea
	thous. of tonnes											
2004	2.232	1.989	227	18.068	17.316	293	10.946	2.565	384	143.949	2.28	377
2005	2.388	2.140	353	18.191	17.912	479	11.470	3.033	651	142.027	3.72	539
2006	2.407	2.168	402	20.050	19.813	960	12.685	3.017	1.727	146.929	5.76	746
2007	2.432	2.221	394	20.024	20.885	1.570	13.674	3.649	2.450	130.586	5.32	1.396
2008	2.391	2.124	329	21.036	20.787	2.679	14.857	2.913	2.221	142.318	10.51	4.779
2009	2.281	2.015	156	20.282	20.098	2.853	15.052	2.641	2.370	132.814	10.23	3.532

Source: own elaboration based on "Energy Statistics", 2004-2009

Crude oil as the main source of liquid fuels in Poland is more than 99% imported. However, only a small part goes to Poland by sea. In 2004 it was 1.7% with an increase to 14.2% in 2009. This large share of imports by land is caused by an open in 1964 thread northern oil pipeline "Friendship" transporting crude oil from Russia's Tatarstan by Poland to Leipzig in Germany. The construction of this pipeline was the primary reason for the construction of Poland's largest oil refinery in Plock near which passes the said pipeline. Another reason for this location was the location of the town on the Vistula River - a source of water for industrial purposes. Transportation by sea takes place mainly from Primorsk in Russia by Naftoport in Gdansk.

Despite the increase in consumption of products derived from refining crude oil we can see a general decrease in imports of these products from 23,4% in 2004 to 17,5% in 2009 while the overall volume growth of imports by sea from almost 15% of total of imports in year 2004 to almost 90% of the volume of imports in 2009. This was due to increased capacity in Polish refineries, for example, through such programs as "10 +"[1].

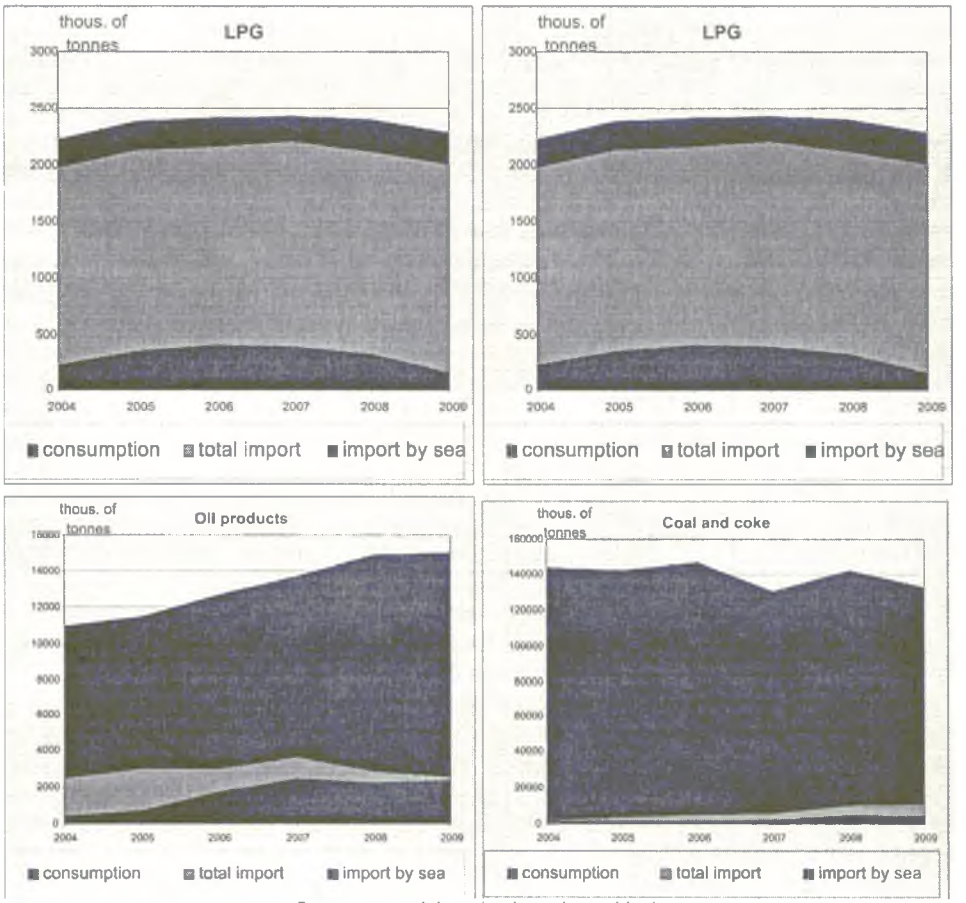
Analyzing the situation in the coal market during the period can we noted a decrease in the consumption by more than 7.7% (11 million of tons) with an increase in the share of coal imported from 1.6% in 2004 to 8.15% in 2009. At the same time was increased the share of coal imported by sea from 16.2% in 2004 to 32.6% in 2009.

[1] The 10+ Programme is a strategic investment task performed by Grape LOTOS within the development of the refinery in Gdansk. In terms of scale and value, it is one of the largest projects implemented in the Polish economy until 2010.

The main directions of coal imports by land are the Russian Federation and Ukraine. Coal is importing by sea from the USA and South Africa. This state of affairs is due to the decline in profitability of production in Poland and dumped used by our business partners around the world. Poland, despite the first place on the list of coal producers in the EU and second place in Europe after Russia has become from exporter in a short time to the importer.

Fig. 2.

Consumption, total imports and by sea of raw materials and related products in years 2004-2009 in Poland



Source: own elaboration based on table 4.

By analyzing energy exports sector it should be noted to the dominance of the export volume of LPG by sea (Table 5) over the volume of export of LPG produced in Poland (Table 6). Like the other two groups of liquid raw materials this is due to the re-export character of their international trade.

Fuels, which Poland is a re-exporter mainly, come from the Russian Federation. They are transported mainly by the Polish part of pipeline "Friendship" to Naftoport in Gdansk where by sea goes to the EU markets. Such significant changes in the size of oil exports by sea are the result of the geopolitical situation in Central Europe. Russia wanting to wean transport raw materials to Western Europe through Poland, Belarus and Ukraine. Russia decided to start building the Nord Stream pipeline under the Baltic Sea.

Table 5. Exports of of energy resources and related products by sea

	LPG	Crude Oil	Oil Products	Coal & Coke
	thous. of tonnes			
2004	32	4.038	414	11.348
2005	197	8.724	1.653	12.792
2006	166	8.813	2.144	8.602
2007	154	6.132	2.610	4.786
2008	155	4.215	2.452	2.419
2009	3	4.029	1.934	4.612

Source: own elaboration based on "Energy Statistics", 2004-2009

It is estimated that this operation can reduce the cost of transporting crude oil, and consequently reduce the price of the raw material. On the other hand, the threat of restricting access to oil in Central Europe creates a kind of tool to conduct foreign policy. In recent years several times announced the cessation of oil transit through Naftoport in Gdansk. However, this plan never came fully into force. After the temporary stoppages in transit Russian oil reaching back to the port of Gdansk.

Table 6. Exports of raw materials and related products of domestic origin

	LPG	Crude Oil	Oil Products	Coal & Coke
	thous. of tonnes			
2004	14	138	705	19.711
2005	25	216	1.017	19.377
2006	35	282	704	16.735
2007	25	288	515	11.900
2008	38	247	381	8.462
2009	18	226	456	8.464

Source: own elaboration based on "Energy Statistics", 2004-2009

Differently looks the situation in the case of export of coal. The main source of export of raw material is domestic production. May reflect the fact that despite the rich resources of this raw material in a short time Poland became a netto importer. This is caused by reducing the profitability of production, competitive prices on world markets and diversified calories. For individual business ventures are needed specific types of material, not available in Poland.

Prospects for Energy Security

In order to ensure national energy security becomes necessary diversification of sources of energy raw materials. For this purpose it becomes necessary to implement the investment in infrastructure and transport transshipment. The most important such an investment for several years was the construction of a gas port in Swinoujscie. Implementation of this plan would allow for diversification of sources of gas. In 2010 most of the gas came directly or indirectly from the Russian Federation. Swinoujscie gas terminal construction would allow changing the direction of imports of this raw material in 50% on Norway and the Middle East.

Conducted for many years preparatory work involving the creation of "Report on the environmental impact, the project involving the construction of the waterfront at the externalport of Swinoujscie" and the preparation of detailed investment plan

which was finally completed in 2009. Pursuant to the resolution of the Council of Ministers of 19 August 2008, construction of gas terminal was recognized as a strategic investment for Polish interests. In 2010 it was the first execution of construction work, which should be completed in 2014. On the way to use the full capacity gas terminal stayed construction of the Nord Stream pipeline. At the end of 2010 placed the first stream. Its location has caused shallow track approach to the newly built port to 13 m with initial plans for a possible approach, assuming the port of vessels with a maximum draft of 15 m. At the beginning the draft of ships was expected from Qatar gas at 14.3 m. This course of the situation caused a lot of confusion among politicians and experts who missed time for raising objections to the Russian-German project. Nord Stream consortium responsible for the construction pipeline during the discussion said that at this stage of the project is uneconomic track the course of advancing the pipeline and laying it over again.

A chance for a proper process of diversification of gas is handling terminals in Gdansk. Power handler of the current terminal is 400 tons/h with a capacity of 13.2 thousand of tons. During operation of the port was shown the idea of building a second gas port in Gdansk. Consent for its construction was issued in 2008. However, problems from investment in financing caused postponement of its implementation. Same investment would have to rely on the construction of gas tanks with a capacity of 15.6 thousand of m^3 with transshipment infrastructure. This would be the first Polish mobile gas port located on the sea. This would reduce the cost of its construction and maintenance of the level of risk of hazardous substances at the externalport proper. A great opportunity for the proper diversification of gas sources are investments in exploration and production of shale gas. According to preliminary research and analysis found that it occurs over the entire length of the country eastwards of a line Teisseyre - Tornquist and its resources amount to 5.3 trillion of m^3 of gas. At current consumption of Polish suffice it to 300 years of operation. A significant impetus towards the use of LPG inhibition is proposed by the EU excise tax increase. The proposed increase in its value from $125/ton to $500/ton of lead may increase the final price to over 4 PLN per liter. But the chances of introducing such increases seem unrealistic in the current economic situation as it would lead to halting economic growth.

A significant problem of the Polish energy security is to increase netto imports coal and coke. Within several years from strong leadership in the export of this energy raw material we have become the importer. This was caused by increased variable costs associated with access to lower and lower layers of coal and prices charged by major exporting countries. In addition, the decline in profitability of the Polish coal mining coal prices drops appeals. The global economic crisis adversely affected the coal used in the structure of energy production. The result was to increase the stocks of coal in power stations and ports of import. However, according to Coal Energy Outlook 2008[1] world coal consumption over the next 20 years will grow much faster than consumption of other energy resources. There is talk of doubling coal production in China and India. The result of the policy, Poland lost its prominent position in world markets that trade raw material. In addition the increase in raw material prices may decide to introduce excise duty at the beginning of 2012. For half a year before its introduction is not yet known whether it will be covered by producers or consumers. When this obligation will fall on producers, the price of raw materials will increase, leading to an increase in netto imports.

Polish alternative to the rising imports and a decline in coal production is planned from the 70s of the twentieth century the construction of nuclear power plant. This

[1] Coal Market Outlook 2008. World Energy Outlook 2008

investment appears to be essential to ensure continuity in the supply of electricity for the economy and consumers. The investment initially planned to carry out near the Żarnowieckie Lake was abandoned in 1992. This was a consequence of socio-economic transformations in Poland. However, this idea was revived again in 2005, and in 2010 Żarnowiec won a ranking of location for the construction of new nuclear power plant. It is planned that it will be launched in 2020. This investment will satisfy 13.2% of electricity demand in Poland.

Polish threat to energy security is also the construction of the BTS-2. Its implementation will result in reduction or complete inhibition of transit of oil through Belarus and Poland. This may result in forcing Poland to import oil from Germany, which may affect the growth of its price. So becomes necessary to diversify sources of obtaining the raw material. A chance to meet this objective may be oil imports from Kazakhstan. That will be transported through the Odessa-Brody-Gdańsk pipeline. This would maintain the role of Naftoport in Gdansk and the diversification of sources of procurement. The issue of imports crude oil from Persian Gulf region is surreal. The composition of crude oil from that part of the world has a different sulphation, so for its refining would be needed the technological change in the Polish refineries.

Literature:

1. Concise statistical yearbook of Poland
2. Energy Statistics
3. Coal Market Outlook 2008. World Energy Outlook 2008